Making Transit Work in Suburbs

ROBERT CERVERO

Rapid decentralization of population and employment over the past several decades has chipped away at the U.S. transit industry's market share. The implications of decentralization on the ridership, operating performance, and fiscal health of the nation's largest transit operators are examined. On the basis of the results of a national survey, a number of service strategies that offer hope for reversing transit's decline are explored, including timed transfers, paratransit services, reverse commute and specialized runs, employer-sponsored van pools, and high-occupancy-vehicle and dedicated busway facilities. Land use options, like traditional neighborhood designs and transit-based housing, are also examined. A discussion of various institutional, pricing, and organizational considerations when implementing suburban-targeted service reforms and land use initiatives is also provided. Century-old models involving joint public-private development of communities and transit facilities, it is argued, also deserve reconsideration.

The ongoing decentralization of U.S. cities continues to plague the nation's transit industry. Today transit competes with the automobile in an environment of low densities, dispersed trip patterns, abundant free parking, cheap fuel prices, and inhospitable walking environs. It is losing the competition. From 26 billion passengers in 1946, U.S. transit patronage fell steadily for 30 years, reaching 8.8 billion in 1980. Through the 1980s the total number of transit riders remained roughly the same, but those numbers represented a smaller share of commute trips, from 6.4 percent in 1980 to 5.3 percent in 1990 (*1*).

This paper explores the challenges of making transit work in the suburbs—that is, making it viable, competitive, and sustainable. Performance statistics are used to compare suburban and urban transit operations in the United States. On the basis of the results of a national survey of suburban transit operations, the paper then turns to various service strategies that offer mass transit the most promise in competing with the private automobile in suburbia. The paper ends with a discussion of institutional, pricing, and land use considerations.

The challenge of making transit work in suburbia is not new. In the keynote address at the 1940 meeting of the American Transit Association, H. Bartholomew (*2*) warned, "Can we not pause long enough in this headlong decentralization process to see where we are going? The mass transportation industry is caught in a strong tide which is sweeping this and many other businesses toward disaster."

DECENTRALIZATION AND TRANSIT

Transit's falling fortunes in suburbia are an outcome of many factors. Traditional fixed-route services radially linked to downtowns are ill-suited for lateral suburb-to-suburb journeys, the most rapidly growing travel market (*3,4*). Also the densities and built environment of U.S. suburbs are generally not conducive to transit riding. A recent survey of several thousand office workers whose jobs were relocated from downtown San Francisco to the 560-acre Bishop Ranch Office Park found that transit's modal split plummeted from 58 percent before the move to under 3 percent after the move (*5*).

Demographics and institutions also work against transit in suburbia (*6*). Suburban residents and workers tend to be more affluent and own more cars than do their central-city counterparts. Suburbs also produce high rates of off-peak and weekend travel, when bus headways tend to be longest. Service coordination is also sometimes hampered by a multitude of competing suburban jurisdictions. In the San Francisco Bay Area, for instance, some two dozen separate transit agencies operate bus services outside of central cities.

Suburbanization and Transit Commuting

How has decentralization had an impact on transit? The following statistics were drawn to address this question for the nation's largest metropolitan areas (by using 1980 and 1990 census data from Summary Tape File 3A). Figure 1 shows that suburban population and employment grew rapidly in the four largest consolidated statistical areas (CSAs) in the United States. (For each CSA the suburbs are defined as areas outside the central city, using U.S. Bureau of the Census definitions of what constitutes a central city.) Suburbanization of jobs was the dominant trend, increasing on average 50 percent in the four CSAs compared with only 13 percent in their central cities.

The movement of jobs from the metropolitan core to the metropolitan periphery and beyond has been spurred by postindustrialization—the restructuring of the U.S. economy from a predominantly manufacturing base to a service and information processing economy. For example by 1990 New York City, Philadelphia, and Boston each had more employees in white-collar service industries—in which executives, managers, professionals, and clerical workers dominate—than in the manufacturing, construction, retail, and wholesale industries combined (*7*). Although many decentralized jobs have involved back-office support functions, corporate headquarters and entire companies in fields such as finance, retailing, and wholesaling are increasingly relocating to the suburbs (*8*). And where jobs and people go, so does retailing. New York's suburban ring now has 48 fully enclosed regional malls encompassing 49 million ft^2 of retail space (*9*).

Paralleling the rapid suburban growth has been a diminishing role for transit. Transit commutes actually fell by about 50,000 trips per day in the Chicago region during the 1980s and increased only slightly in the other three large metropolitan areas. In all four metropolitan areas, transit's modal share fell between 1980 and 1990; in the greater New York area this fall was by 10 percentage points (Figure 2). This trend was hardly limited to the biggest

Department of City and Regional Planning, University of California, Berkeley, 228 Wurster Hall, Berkeley, Calif. 94720.

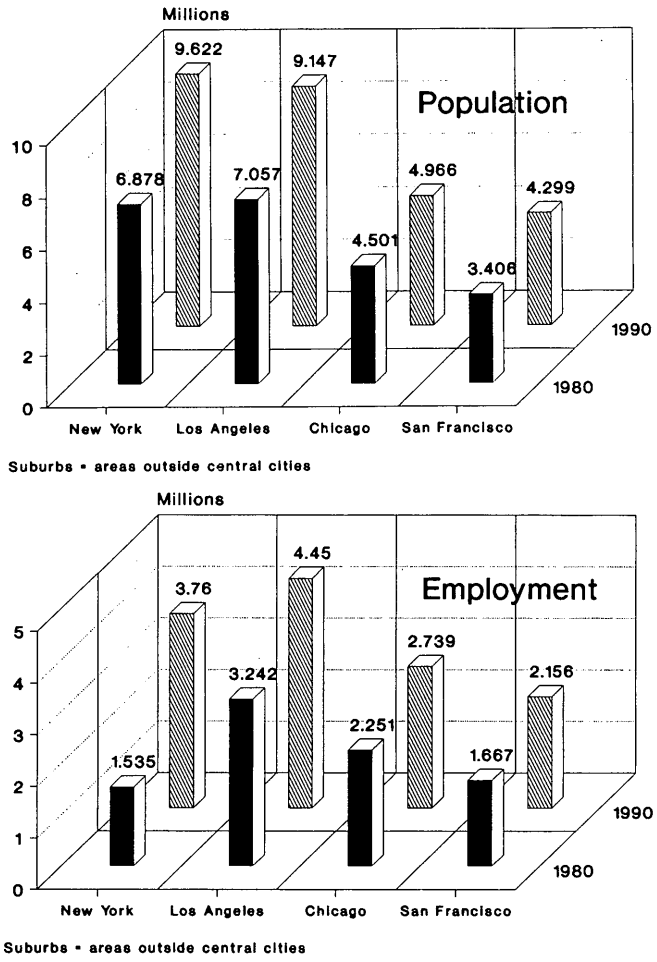


FIGURE 1 Suburban population and employment changes in four largest CSAs, 1980 and 1990.

areas—only 12 of the 75 largest U.S. metropolitan areas registered an absolute increase in transit journeys to work during the 1980s (mostly from the Sun Belt and western regions), and in only 4 of these (Houston-Galveston, Orlando, Dallas–Fort Worth, and San Diego) did transit's market share of work trips increase (*10*).

Trends Among Suburban Residents

Transit's falling fortunes are more alarming among suburban residents. Figure 3 shows that there were actually about 130,000 fewer daily transit work trips made by the suburban residents of the four largest metropolitan areas in 1990 than in 1980. This is despite the 6.2 million residents who were added to the suburbs of these four metropolises during the 1980s. The net result was a sharper decline in transit's market share commute trips of suburbanites than the metropolitan averages (Figure 4).

Trends in the New York metropolitan area were particularly pronounced. From 1980 to 1990 Manhattan added 54 million ft^2 of office space. The suburban ring, including Long Island, northeast New Jersey, and Westchester County, added 173 million ft^2 (equal to the entire Chicago metropolitan office market). Thus suburban counties captured two-thirds of the region's office growth during the 1980s. The impact on transit commuting was unequivocal. In 1980 about one of four suburbanites rode buses and trains to jobs, many of which were in Manhattan; by 1990 fewer than one of 10 suburbanites commuted by transit, many choosing to drive to suburban office parks and other outlying work destinations.

Performance Comparisons

Comparing the performance of urban and suburban transit operations is fraught with difficulties, in part because operating statistics within metropolitan areas are not usually broken down to match the census definitions of the core cities and the suburbs. A second-best approach is to compare operations for those metropolitan areas that have set up different transit properties to serve

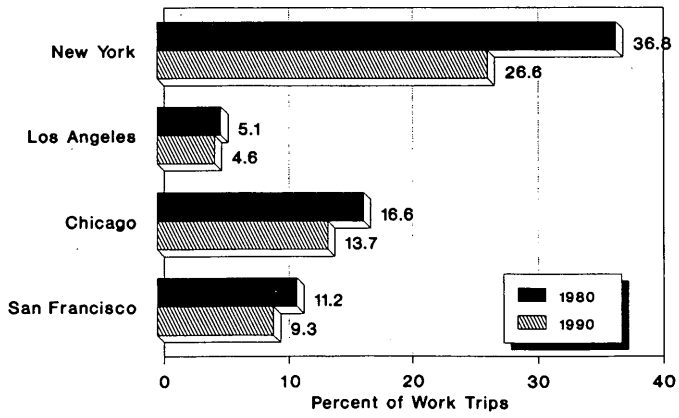


FIGURE 2 Changes in transit modal splits for work trips in four largest CSAs, 1980 and 1990.

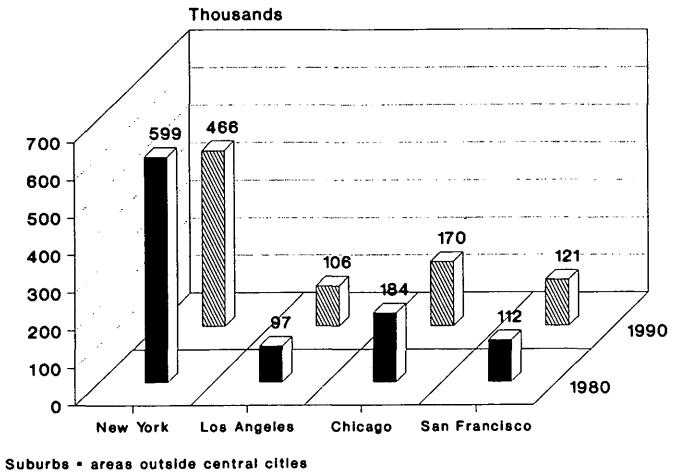


FIGURE 3 Changes in daily commute trips by suburban residents, large CSAs, 1980 and 1990.

central-city and suburban markets. The best example of this is metropolitan Chicago, wherein the Regional Transportation Authority has divided administrative and operating authority for transit in the region into two groups: CTA, which is in charge of rail and bus services in the city of Chicago (as well as portions of suburban Cook County), and the operators in charge of suburban commuter rail (Metra) and bus (Pace) services.

Figure 5 gives performance statistics for suburban operators as a share of regional totals for four large metropolitan areas for which suburban operators could be reasonably distinguished from urban operators. (See footnotes b to e of Table 1 for transit operations that were defined as urban versus those that were defined as suburban.) Statistics for metropolitan San Diego instead of the San Francisco–Oakland–San Jose Bay area were used in this analysis mainly because the San Diego region has two operators that operate almost exclusively in the suburbs (North San Diego County Transit and San Diego Regional Transportation Service) and two that operate mainly in the central city (San Diego Transit and San Diego Trolley). On the other hand, many of the Bay Area's largest operators, Alameda–Contra Costa County (AC Transit) and Santa Clara County Transit, operate in both central cities (Oakland and San Jose) and suburban areas. The data in Figure 5 are from the 1991 Section 15 report on transit operating performance.

Figure 5 shows that relative to ridership and service output suburban transit services in the four metropolitan areas for which data are shown were far more dependent on public operating assistance than their urban counterparts (except in the New York region, where many suburban operations are either private or contracted). This was mainly because of their low passenger volumes relative to their costs (Table 1). (On a revenue mile basis, however, suburban services cost less than urban ones in three of the four metropolitan areas.) In the Chicago region the operating assistance per passenger for suburban services was more than four times that for urban services ($1.89 versus $0.84); on a revenue mile basis they were twice as high ($5.60 versus $2.85). To the extent that transit's customer base shifts to suburbia, funding allocations should be responsive to these shifts. Currently funding

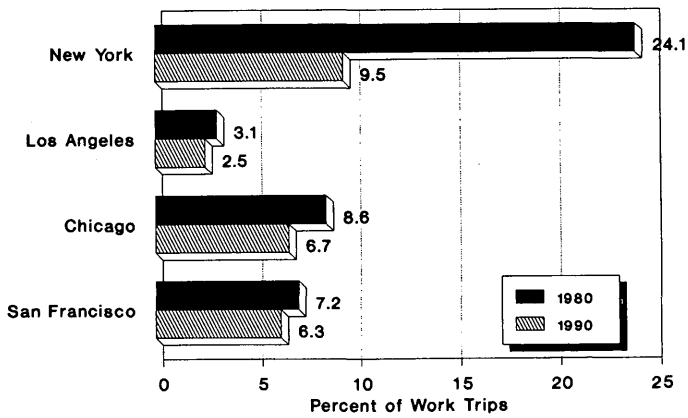
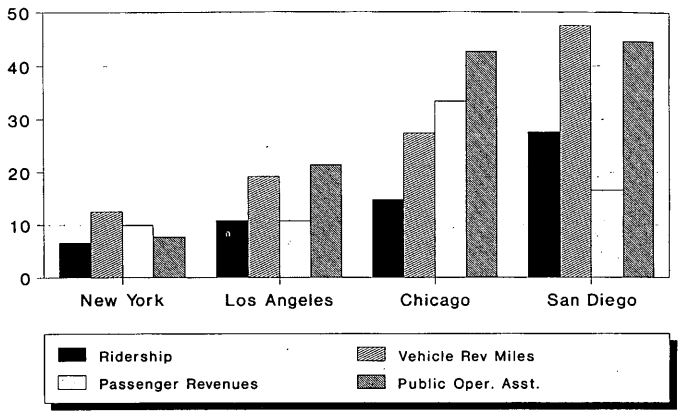


FIGURE 4 Changes in transit share of work trips by suburban residents, large CSAs, 1980 and 1990.



Source: 1990 Section 15 Data

FIGURE 5 Suburban transit as percentage of regional totals for four large metropolitan areas, 1991.

in all four metropolitan areas favors higher-cost suburban services. If economic efficiency is to be rewarded, any redistribution of funding should be based on output (e.g., ridership) instead of input (e.g., service delivery) measures, balanced by some recognition of the harder task of cost-effectively serving suburban markets.

A second comparison was carried out. That comparison examined urban versus suburban performance for a larger set of metropolitan areas; however, data only for the largest suburban versus urban bus operators in each metropolitan area were used. Table 2 summarizes the findings drawn from 1991 Section 15 statistics for (urban followed by suburban) operations in the following areas: New York (New York City Transit Authority and Metropolitan Suburban Bus Authority), Los Angeles (Southern California Rapid Transit District, now renamed Metropolitan Transit Au-

TABLE 1 Operating Cost Comparisons Between Urban and Suburban Services for Four Large Metropolitan Areas, 1991

	Operating Cost per Passenger[a]		Operating Cost per Revenue Mile[a]	
	Urban Services	Suburban Services	Urban Services	Suburban Services
New York[b]	$1.94	$2.43	$8.18	$5.08
Los Angeles[c]	1.39	1.98	5.76	4.20
Chicago[d]	1.26	3.49	5.53	7.06
San Diego[e]	1.19	1.80	4.92	2.25

[a] Statistics are for both bus and rail transit operations in the New York, Los Angeles, Chicago, and San Diego regions, based on 1991 Section 15 data. Data are exclusive of non-surface transit (e.g., ferries) and specialized services like dial-a-ride.

[b] Urban: New York Metropolitan Transit Authority (NYCTA, Metro-North, Long Island Rail Road, SIRTOA), PATH (rail only), Queens Surface Corporation, New Jersey Transit (non-contract and urban division services), and Command Bus Company; Suburb: NYMTA Metropolitan Suburban Bus Authority, New Jersey transit (all contract services and Suburban Transit Corporation), Westchester County Bus, Jamaica Buses, Hudson Bus Transportation, Green Bus Lines, Liberty Lines Express, New York Bus Tours, Putnam County Transit, Rockland Coaches, Suffolk Transit, Triboro Coach, and municipal service for Rockland, Clarkstown, Long Beach, and Spring Valley.

[c] Urban: Southern California Rapid Transit District, Los Angeles County (LACTCT) Motor Bus, and municipal services for Santa Monica, Montebello, Long Beach, Commerce, Gardena, Torrance, and Culver City; Suburban: Orange County Transit District, Omnitrans, Riverside Transit Agency, and municipal services for Laguna Beach, Arcadia, Corona, and Riverside.

[d] Urban: Chicago Transit Authority (including contract services, but excluding suburban Cook County bus runs); Suburban: Metra (including contract services), Pace (including contract services), and municipal services for Niles and Willmette.

[e] Urban: San Diego Transit Corporation and San Diego Trolley; Suburban: North San Diego County Transit and San Diego Regional Transportation Services.

TABLE 2 Summary Comparison of Performance Measures, Suburban Versus Urban Operators for Six Metropolitan Areas

	Farebox Recovery Ratio (%)	Operating Cost per Vehicle ($): Hour	Mile	Passengers per Vehicle: Hour	Mile	Operating Cost per ($): Trip	Pass. Mile
Average for Urban Operators	38.9	82.94	8.73	56.2	5.8	1.44	0.59
Average for Suburban Operators	30.4	72.81	5.24	38.8	2.9	2.06	0.42

thority, and Orange County Transit District), Chicago (Chicago Transit Authority and Pace Suburban Bus Division), Detroit (Detroit Department of Transportation and Suburban Michigan Area Regional Transit), San Francisco (San Francisco Municipal Railway and Transit and Santa Clara County Transit Authority), and San Diego (San Diego Transit Corporation and North San Diego County Transit Development).

Table 2 illustrates that on average urban operators outperformed their suburban counterparts in terms of fare box recovery rates and service effectiveness (in terms of passengers per mile by a factor of two). Of course the unit cost per mile or hour of urban services was substantially higher than that of suburban services; however, the costs per passenger were about 30 percent less. Because of the longer average trip distance suburban services cost less on a per-passenger-mile basis. However because most bus operations charge flat fares, fare revenues per passenger-mile for suburban operators tend to be proportionally less than those for urban operators, resulting in a higher deficit per passenger.

POLICY RESPONSES: ADAPT TRANSIT SERVICES

Transit's shrinking market share in suburbia, its relatively poor fiscal and operating performance, and continuing restraints on government spending underscore the need to overhaul how suburban services are delivered. During the 1980s the chief policy response to rising transit deficits was to competitively contract out services with an eye toward lowering input costs, particularly labor. Although this indeed slowed the deficit growth, it did not substantially change the service features of most suburban operations. Transit is continuing to lose market share to the automobile. To effectively compete radical surgery in how transit services are designed and delivered will be necessary.

At the simplest level policy makers can respond to the challenges posed by decentralization by (a) adapting transit services, making them more flexible, demand responsive, and responsive and suitable for serving dispersed origins and destinations and (b) adapting land uses to make them more supportive of transit—for example, greater densities and mixtures of uses. These of course are not mutually exclusive approaches, although pursuit of the first policy complicates efforts to achieve the second.

Adapting transit to a landscape of spread out and automobile-oriented development means, in many ways, making it more automobilelike. Similar to telephone networks, for transit to compete in suburbia it must cast a larger net to allow more patrons to get from anywhere to everywhere. Strategies that make transit more flexible, interconnected, and ubiquitous include initiating timed-transfer services, paratransit, reverse commute and special services, employer van pools, transitways, and advanced technologies, such as automated vehicle locator systems. This section summarizes some of the recent developments with these service strategies, drawing on a recent national survey of 88 U.S. transit properties.

The self-administered survey was sent to all U.S. transit properties with 50 or more vehicles during February and March 1993. In all, 88 of the 192 surveys were returned, providing information on types of service strategies, impacts on ridership and operations, and attitudes toward service changes. For the most part survey respondents were planners or analysts within an agency who were familiar with specific suburban-targeted strategies that had been introduced.

Timed Transfers and Transit Centers

The timed meeting of buses at transit centers improves intersuburban services, especially those with long headways, by reducing wait times. The national survey found that 68 percent of U.S. transit properties have some form of timed-transfer and transit center services; among properties with more than 350 vehicles, almost 90 percent used timed transfers. Comparisons of ridership 1 year after introducing timed transfers showed systemwide ridership increases of 3.2 percent in Dayton, Ohio (between 1990 and 1991), and 40 percent in Painsville, Ohio (between 1989 and 1990), even though ridership was falling for most other Ohio transit properties in the same period. AC Transit, serving the Oakland, California, area has begun phasing in timed transfers, with promising results to date. AC Transit's ridership began falling in the mid-1980s as more and more jobs were locating in suburban areas away from its traditional routes. AC Transit planners initiated a multidestinational transit centers program in early 1989. Table 3 shows that ridership has risen noticeably in the two subdistricts where gridlike, interconnected services operating on a pulse schedule have been introduced. On the other hand patronage on the rest of the AC Transit's service area where traditional radial services remain has continued to fall off.

Tidewater, Virginia [Tidewater Regional Transit (TRT)] converted to a timed-transfer network in 1991. The network was designed by the same transit planners who first introduced timed transfers in Edmonton, Alberta, Canada, in the 1970s. Although TRT's ridership has fallen in recent years because of the local

TABLE 3 Ridership Trends Associated with Phase-in by AC Transit of Multidestinational, Timed-Transfer System

Subdistrict	Average Weekday Ridership December 1989	December 1991	% Change
West Contra Costa County [a]	12,488	28,329	+32
Oakland-Berkeley-Alameda [b]	146,386	156,987	+7
Remainder of AC Transit Service Area	58,671	49,357	-16
SYSTEM TOTAL	226,545	234,673	+4

[a] Grid and Timed-Transfer System introduced in September 1990

[b] Grid and Timed-Transfer System introduced in April 1991

recession, patronage has increased at four large employment centers in Virginia Beach served by buses operating in sync. A recent survey, moreover, revealed that three-quarters of TRT's customers prefer timed transfers to previous services (*11*).

Paratransit

Paratransit services, like shared-ride taxis and minibuses, are particularly suited to suburbia because of their flexible routing and curb-to-curb service features. From the national survey, 43 percent of U.S. transit properties were found to operate some form of demand-responsive service that is available to the general public (instead of exclusively for the elderly or other targeted groups); smaller agencies relied most heavily on paratransit. In the case of Broward County, Florida, five fixed-route services were converted to contract route-deviation dial-a-ride services in 1991—1 year later ridership increased from 15,000 to 27,000/month; this was accompanied by a 47 percent decline in operating costs.

Private jitneys have been part of greater Miami's transportation scene for many years, serving a number of inner-city neighborhoods unserved by public transportation. In 1992 Miami's jitneys carried nearly 50,000 riders per weekday, or about one-quarter of Miami Metrobus's ridership (*12*). Surveys show that Miami's jitneys have developed a market of their own instead of merely siphoning off riders from Metrobus. Jitneys were also mobilized to provide cross-country services in the wake of Hurricane Andrew, which left thousands of south Florida residents without vehicles and homes and displaced many businesses to temporary sites in northern Dade County.

One promising marriage is paratransit and automated vehicle locator (AVL) technologies. Satellite vehicle tracking systems enable vehicles equipped with sensors to be located and promptly dispatched to customers to minimize waits, detours, and deadheading. In Germany paratransit vehicles with on-board terminals are linked to central computers, allowing flexible-route buses, shared-ride taxis, and minibuses to be dispatched to customers waiting at suburban rail stations and rural areas. Ridership on these "call-a-bus" services has increased between 36 and 80 percent above those on the fixed-route bus services that they replaced in several German metropolises (*13*).

The biggest barriers to successful paratransit in the suburbs are restrictive regulations, subsidized bus fares, and free parking. Attempts to operate jitneys in Los Angeles as well as suburban-targeted, on-call shuttle buses (e.g., airport shuttles) in the 1980s were scrapped because the private operators could not compete with cheaper public buses and win over commuters who enjoyed free parking (*14,15*). One of the primary reasons regional shuttle services such as Supershuttle focus almost exclusively on airports is that commercial rates are charged for airport parking, whereas at most other locales parking is free or heavily subsidized. At airports shuttles are cost-competitive; at most other destinations they are not.

Reverse Commutes and Specialized Runs

Special reverse commute and rail station feeder runs are incorporated by about 38 percent of the U.S. transit properties surveyed, most of which are large operators. Most reverse commute services introduced in the 1970s and 1980s as "poverty abatement transportation programs" folded over time because of high attrition. A reverse commute program initiated in the mid-1980s in greater Washington, D.C., that connected inner-city residents to jobs in Fairfax County, Virginia, found that only 18 percent of the 255 original participants who got jobs still had their jobs 2 years later (*16*). In general many of these specialized programs overestimated the extent of suburban vacancies matched to the skills of inner-city residents, the willingness of suburban employers to hire and train inner-city residents, and the willingness of inner-city residents to endure long commutes for low-paying, often dead-end service-sector jobs.

The success of reverse commute services should not be gauged in transit ridership terms however. A study of another program in the Washington, D.C., area found that many of the original passengers either had earned enough money to buy a car to drive to work or had met coworkers and formed car pools (*17*). The ultimate success of reverse commute services lies in helping urban

residents find jobs with some growth potential. Surveys by Pace of two reverse commute runs from south Chicago to job centers in DuPage County revealed that the services influenced the decision of 60 to 66 percent of surveyed passengers to take and retain the jobs (*18*). Moreover surveys found that about 30 percent of Pace's reverse commuters formerly drove alone to work.

Employer-Sponsored Van Pools and Subscription Services

Employer-sponsored van pools and subscription services are suited mainly for highly dispersed suburban markets, such as office parks in the exurbs. Particularly where fixed-route schedules cannot be justified, van can serve the commuting needs of clusters of workers. They are most economical when employees operate the vehicles. Pace's subscription van services, wherein employers and Pace share van purchase and operating expenses and rely on employee drivers, enjoy an 83 percent cost-recovery rate (*19*). More than half of Pace's 75 vans serve the new Sears center in Hoffman Estates. The program has been very successful, with about 30 percent of Sear's 5,000 suburban workers commuting by some form of mass transit (*20*). When these workers were in downtown Chicago, 92 percent of them commuted by mass transit, so part of this success is no doubt attributable to workers' ingrained habits of patronizing transit. Pace capitalized on the situation by designing an ambitious market development program that approached all employees about their individual commuting needs and delivered a rich mix of transit options (subscription bus runs, fixed-route services, and car pools in addition to employer-sponsored van pools). In the case of Sears and others, guaranteed ride home programs and on-site retail and other mixed-use activities have encouraged workers to join van pools.

HOV Lanes and Dedicated Busways

Dedicated busways and high-occupancy-vehicle (HOV) facilities improve suburban services because, unlike rail systems, vehicles can leave guideways and filter into low-density neighborhoods, reducing the need for a transfer. About 12 percent of the U.S. properties surveyed have some form of HOV or contraflow lanes for suburb-to-suburb runs in addition to the more traditional radial services. The 30-km busway in Ottawa, Ontario, Canada, captures as much as one-third of all trips to several large shopping plazas and work centers outside the core (*3*). Houston's transitway, slated to extend to 95 mi by 1995, is already the world's largest, a seemingly perfect technology for a region that is spread out but that features a dozen or more large-scale activity centers. Despite strong economic growth, Houston's average freeway speeds and transit patronage have increased faster and arterial congestion levels have fallen more than those of any large U.S. city in the past 5 years (*10,21*). Presently more than 6 percent of commuters from the Woodlands, an affluent community about 50 mi north of downtown Houston, patronize the Woodlands Express bus services that operate via the I-45 Transitway to downtown Houston, the Medical Center, and Greenway Plaza.

LAND USE INITIATIVES

A criticism of suburban-targeted strategies is that they reinforce the low-density, automobile-reliant development patterns that they attempt to serve. Some observers argue that regions should be restructured so that more people will ride transit. Transit works best when it connects relatively dense nodes along radial axes (*22*). The presence of mixtures of apartments-condominiums, office towers, and other activities is also needed for balanced, two-way flows. Greater Stockholm, Sweden, has such a built environment and operates a world-class rail system that handles 60 percent of all suburban work trip origins and destinations (*23*).

Traditional Neighborhoods

Transit-oriented and neotraditional developments have gained popularity in recent years as design motifs that reduce dependency on the automobile and create attractive environments for walking and using transit. Neotraditionalist designers borrow many of the successful elements of traditional turn-of-the-century transit villages: commercial cores within walking distance of most residents, well-connected (typically grid) street patterns, various densities of housing, and mixed land uses. It is still not known whether designing such places in the 1990s will lure many people from their cars. A Montgomery County, Maryland, study found that workers in "transit and pedestrian friendly neighborhoods" use transit 8 to 45 percent more often than workers from neighborhoods conducive to automobile use (e.g., with curvilinear roads and no retail shops). All neighborhoods in the study were about the same distance from transit facilities (*24*). Another recent study of "streetcar" neighborhoods (ones that at one time were served by a streetcar and have inherited higher densities, gridded streets, and mixed uses) and relatively close by "automobile" neighborhoods (postwar, typical suburban neighborhoods) reveals some degree of elasticity between urban design and travel behavior (*23*). A comparison of San Francisco Bay area neighborhoods matched in terms of comparable average household incomes and levels of bus service intensities showed that the denser, mixed-use streetcar neighborhoods average 2.5 to 5.5 percent more work trips by transit and 1.2 to 13.2 percent more work trips by walking or cycling.

In recognition of the need to build communities more easily served by transit, about 30 U.S. transit properties have prepared site and urban design guidelines in the past decade (*23*). These guidelines are meant to encourage developers to incorporate public transportation considerations into their project designs. Although none of the design guidelines have yet to be codified into local ordinances, eight of the transit properties with guidelines have prepared checklists that local planners use in evaluating the degree to which a proposed project encourages transit and pedestrian access.

Transit-Based Housing

In some suburban area with rail services transit-based housing is being actively promoted. In the San Francisco Bay Area Bay Area Rapid Transit (BART) officials have entered into joint development agreements with private home builders at several stations that will convert portions of park-and-ride lots to housing projects, using lease revenues to help finance replacement parking. Besides boosting ridership, planners hope that the placement of new housing near rail stations will allow more riders to walk or ride bikes to the station, yielding important air quality benefits. Short automobile trips currently account for about 60 percent of access trips

to suburban BART stations; high levels of pollutants are emitted from automobiles during these trips as a result of the impacts of cold starts.

Recent research shows that 32 percent of residents living within 1,500 ft of a suburban BART station patronize transit to work, compared with only about 5 percent of the region's suburbanites who live more than 1,500 ft away (*25*). These market shares are smaller than those found in studies or ridership by proximity in suburban Toronto (*26*) and Washington, D.C. (*27*). Trip destination and parking policies at the workplace were the major determinants of whether those living near stations ride BART. More than 95 percent of suburban residents commuted by BART if they worked in downtown San Francisco and paid for parking. If they worked in downtown Oakland, Berkeley, or Walnut Creek and paid for parking, about 65 percent commuted by BART. For most other destinations (where employees typically park for free), BART's share was between 3 and 12 percent. As jobs continue to suburbanize, the ability of transit-based housing to serve work trips will be jeopardized. Thus successful transit-based housing programs will need to be matched by initiatives that target more employment growth around major suburban transit stops as well as policies (such as free parking) that eliminate subsidies to commute alone.

Land Use Dilemma

Other land use initiatives that have been suggested as a means of reducing automobile dependence and ostensibly increasing the regional role of mass transit include jobs-housing balancing, urban growth limits, and urban reinvestment. All of these initiatives are politically unpopular, however, because they interfere with market forces and in the minds of most Americans involve excessive government regulation (*28*). In general land use initiatives as a response to transportation problems suffer from the lack of common vision on the ideal metropolis (i.e., how a region should be planned) and not-in-my-backyard (NIMBY) resistance. They also receive lackluster political support because they typically yield mobility dividends only over the long run, well beyond existing politicians' terms of office.

INSTITUTIONAL, FISCAL, AND PRICING CONSIDERATIONS

Suburbanization also calls for creative institutional responses. New regional alliances are one option. A successful model in Germany has been transit federations. In greater Munich, Hamburg, and Essen-Dortmund regional federations have been formed to reverse the fragmentation of transit enterprises. These federations set fares, decide on route changes, and coordinate timetables to improve integration and avoid duplication. The concept is basic: a single organization should be managing services for the entire "commuteshed" of a region. Day-to-day operations of the urban, suburban, and inter-city carriers are run by individual transit companies. Managers of these companies sit on the boards of the transit federations. The federations collect all revenues and redistribute them so that each operation averages the same cost recovery rate, currently about 65 percent. Fares are totally integrated—a ticket purchased for U-Bahn (urban rail) services lets one transfer free to an S-Bahn (suburban rail), bus, or tram.

From a fare policy standpoint rapid suburbanization means that costs will likely vary increasingly more among individual trips depending on travel distance and perhaps even time of day. Areas experiencing rapid suburban growth should address whether zonal, peak surcharge, or other differentiated fares are needed. Of the seven U.S. transit properties that in 1989 charged a flat fare within the region's main city and a zonal charge for crossing into the suburbs, the average cost recovery rate was 4 percent (*29*). This compared with a 25 percent recovery rate for properties serving comparably sized metropolitan areas that had flat fares. For three U.S. transit agencies that had peak and off-peak fare differentials, on average, 39 percent of the operating costs were covered by fare receipts. More differentiated pricing is correlated with higher fare box recovery rates.

Rapid suburbanization will also invariably create political tensions between city and suburban agencies competing for the same shrinking share of public operating assistance. This battle is being played out in nearly all large metropolitan areas, including Chicago, Los Angeles, and San Francisco–Oakland, where multiple transit agencies vie for dedicated sales tax receipts that are returned to a regional transportation commission. Two principles should be considered when setting fiscal allocation policies. First, agencies should be rewarded with public assistance by doing something that benefits the region—such as achieving higher ridership and controlling costs. Such criteria are essential for stimulating innovation. Second, funding policies should be more people oriented than place oriented. Targeting public monies to places, whether in the form of transit subsidies or enterprise zones, will yield few societal benefits if the people in those places do not gain. Perhaps the most promising people-oriented fiscal policy in the transit arena would be to convert most subsidies from the provider side to the user side. Placing funds in the hands of the intended beneficiaries of most subsidies—those who are poor and disadvantaged—would, along with regulatory reforms, encourage sorely needed transit service innovations among competing transit operators. Everyone, inner-city and suburban residents alike, would benefit from the increased diversity in travel options.

BACK TO THE FUTURE

Fixed-route, fixed-schedule transit services will have a difficult time competing and surviving in the suburbs. Today transit's market shares are rapidly eroding nearly everywhere. Major policy reforms are needed. We are well advised to borrow from yesteryear as we look to the future. Early streetcar suburbs were successful in part because private entrepreneurs were allowed to link transit investments and land development, producing moderately dense, mixed-use land patterns (*30*). Well over half of suburban rail services in greater Tokyo are privately built, typically by large consortiums that link transit investments to new town development. In California private tollway franchises are building four different tollways throughout the state with the hope of reaping a nice profit, perhaps less from toll revenues than from selling land at key interchanges that the franchisers own; possibilities for franchising rail line extensions, however, have largely been ignored. Resurrecting the jitney services found three-quarters of a century ago in most U.S. cities might also be considered. Given the freedom to operate, door-to-door van and jitney services, similar to regional airport shuttles, would likely emerge in many suburban

settings, tapping new market niches such as suburban mall and office complexes, sports stadia, and recreational theme parks.

The model of publicly led transit and privately led land development has been tried in the past 50 years with generally disappointing results. Another option deserves consideration: allowing developers to link transit and real estate projects and entrepreneurs to carve out new transit market niches in suburbia—with the hope that they will create more transit-oriented communities in the process.

Although the private sector is probably better suited to responding to many of the needs of suburban travelers, there will always be a role for the public sector: assembling rights-of-way for dedicated busways, providing start-up funds for smart transit technologies, and zoning for moderate-density housing around major transit stops. In combination profit-seeking entrepreneurs and community-minded governments can create the kinds of built environments and service innovations that within a decade or two could allow transit to compete successfully with the automobile in suburbia.

ACKNOWLEDGMENT

This research was supported by a grant from the University of California Transportation Center. Mark Dunzo was a research assistant on the project.

REFERENCES

1. American Public Transit Association. *Transit Fact Book*. Washington, D.C., 1991.
2. Bartholomew, H. Effects of Urban Decentralization Upon Transit Operations and Policies. *Proc., American Transit Association*. Washington, D.C., 1940.
3. Cervero, R. *Suburban Gridlock*. Center for Urban Policy Research, New Brunswick, N.J., 1986.
4. Pisarski, A. *New Perspectives in Commuting*. FHWA, U.S. Department of Transportation, 1992.
5. Cervero, R., and J. Landis. Suburbanization of Jobs and the Journey to Work. *Journal of Advanced Transportation*, Vol. 26, No. 3, 1992, pp. 275–297.
6. Rosenbloom, S. *Developing a Comprehensive Service Strategies to Meet a Range of Suburban Travel Needs*. Urban Mass Transportation Administration, U.S. Department of Transportation, 1990.
7. Kasarda, J. Economics and Technology. In *Land Use in Transition*. Urban Land Institute, Washington, D.C., 1993.
8. Stanback, T. *The New Suburbanization: Challenge to the Central City*. Westview Press, Boulder, Colo., 1991.
9. Hughes, M. Regional Economics and Edge Cities. In *Edge Cities and ISTEA—Examining the Transportation Implications of Suburban Development Patterns*. FHWA, U.S. Department of Transportation, 1992.
10. Cervero, R. Surviving in the Suburbs: Transit's Untapped Frontier. *Access*, Vol. 2, 1993, pp. 29–34.
11. Tidewater Regional Transit. *TRT On-Board Ridership Survey*. Norfolk, Va., 1992.
12. Urban Mobility Corporation. *The Miami Jitneys*. Federal Transit Administration, U.S. Department of Transportation, 1992.
13. Benke, R. *German "Smart Bus" System: Potential for Application in Portland, Oregon*. FTA, U.S. Department of Transportation, 1993.
14. Teal, R. Transportation Privatization: Experiences and Issues. *Urban Resources*, Vol. 4, No. 1, 1986, pp. 7–12.
15. Cervero, R. *Fostering Commercial Transit: Alternatives in Greater Los Angeles*. The Reason Foundation, Los Angeles, Calif., 1992.
16. Rosenbloom, S. *Reverse Commute Transportation: Emerging Provider Roles*. FTA, U.S. Department of Transportation, 1992.
17. Lemov, P. Impossible Commute. *Governing*, June 1993, pp. 32–35.
18. Paquet, J., B. Reynolds, and A. Murphy. *Reverse Commuting: How Do You Measure Success*? Pace Transit, Chicago, Ill., 1991.
19. *1993 Operating and Capita Program*. Pace Transit, Chicago, 1992.
20. Grzesiakowski, T. Pace's Experiences with Sears' Move to Hoffman Estates. *Proc., Second Annual Metropolitan Conference on Public Transportation Research*, Chicago, Ill., 1993.
21. Hanks, J., and T. Lomax. Roadway Congestion in Major Urban Areas: 1982–1988. In *Transportation Research Record 1305*, TRB, National Research Council, Washington, D.C., 1990, pp. 177–189.
22. Smith, W., Mass Transit for High-Rise, High-Density Living. *Journal of Transportation Engineering*, Vol. 110, No. 6, 1984, pp. 521–535.
23. Cervero, R. *Transit-Supportive Development in the United States: Experiences and Prospects*. FTA, U.S. Department of Transportation, 1994.
24. *Transit and Pedestrian Oriented Neighborhoods*. Maryland National Capital Park and Planning Commission, Silver Spring, Md., 1992.
25. Cervero, R. *Ridership Impacts of Transit-Focused Development in California*. Institute for Urban and Regional Development, University of California, Berkeley, 1993.
26. Stringham, M. Travel Behavior Associated with Land Uses Adjacent to Rapid Transit Stations. *ITE Journal*, Vol. 52, No. 4, pp. 112–116.
27. *Metrorail Ridership Survey*. JHK & Associates, Washington Metropolitan Area Transportation Agency, Washington, D.C., 1989.
28. Downs, A. *Stuck in Traffic: Coping with Peak-Hour Traffic Congestion*. The Brookings Institution, Washington, D.C., 1992.
29. Cervero, R. Transit Applications of Pricing and Market-Based Approaches. *The Role of Pricing and Market-Based Strategies: Summary of Proceedings*. UCLA Extension Public Policy Program, Los Angeles, Calif., 1992.
30. Warner, S. *Streetcar Suburbs*. Harvard University Press, Cambridge, Mass., 1962.

Publication of this paper sponsored by Committee on Public Transportation Planning and Development.