Policy Considerations for Carsharing and Station Cars

Monitoring Growth, Trends, and Overall Impacts

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Since the late 1990s, more than 25 U.S. shared-use vehicle programs—including carsharing and station cars—have been launched. Given the presumed social and environmental benefits, the majority of these programs received some governmental support, primarily in the form of start-up grants and subsidized parking. As of July 2003, 15 shared-use vehicle programs were in existence, including 11 carsharing organizations, 2 carsharing research pilots, and 2 station car programs. Over the past 5 years, membership in U.S. carsharing programs has experienced exponential growth. Despite this expansion, the social and environmental impacts and long-term sustainability of these services remain unclear. As part of a U.S. shared-use vehicle survey (August 2002 to July 2003), market growth and trends as well as limited, systematic evaluation of program impacts were documented. Although 80% of shared-use programs implement internal customer surveys (initially or as follow-up), few independent studies have been conducted to date. Across organizations, participant use and program benefits are measured with various study tools and metrics. Given current shared-use vehicle growth and the ongoing interest of policymakers and governmental agencies in this concept, a longitudinal monitoring approach to better understand market developments, social and environmental impacts, and targeted policy strategies is recommended. Furthermore, it is concluded that coordinated, programwide data collection (consistent survey instruments and performance measures) could enhance overall market awareness and the credibility of shared-use vehicle organizations in leveraging additional public support.

Automobiles have profoundly influenced land use and travel in the United States by providing unprecedented flexibility, convenience, and speed. Despite the myriad benefits offered by private vehicles, the negative social and environmental impacts of car dependence are increasingly recognized (*1, 2*). Costs include traffic-related deaths, congestion, air and water pollution, and suburban sprawl. To date, strategies to reduce automobile use and dependency have largely focused on public transit. Shared-use vehicle programs represent an intermediate solution—situated between public transit and private vehicle ownership—to addressing several automobile-related concerns. Furthermore, shared-use vehicles have the potential to complement existing transportation infrastructure (e.g., transit linkages and parking efficiencies) at significantly lower cost than transit extensions, roadway expansions, and added parking structures.

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Shared-use vehicles can be thought of as short-term automobile rentals in which members pay only for the time they use a car and operators provide for vehicle maintenance, repair, and insurance. The expression "shared-use vehicle service" is an umbrella term that encompasses carsharing and station car programs. One can imagine a continuum of shared-use vehicle services that ranges from carsharing on one end to station cars on the other (*3*). Despite the ongoing linkage of these concepts, it is important to characterize differences between the carsharing and station car models.

Carsharing enables individuals to acquire the benefits of private-vehicle use at a lower cost than vehicle ownership, taxi use, or conventional vehicle rental. More specifically, through collective ownership, the high fixed costs of automobile ownership are shared across a group of individuals, making vehicle miles cheaper than if each member owned or leased a private vehicle. Rather than financing a personal automobile, individuals pay to access a vehicle fleet on an as-needed basis. At present, almost all U.S. carsharing programs are deployed within a neighborhood model, in which vehicles are parked in designated spots throughout a region or locality to provide convenient access to a broad set of members who live in that area.

In contrast to carsharing, station car programs primarily facilitate transit access. For many people, transit use is inconvenient because station end points are often beyond walking distance of final destinations. This situation frequently necessitates commuting by private vehicle. Station cars enable individuals to substitute transit for the middle portion of a journey, providing a critical link between transit and origin or transit and destination. Participants typically lease a station car to access transit. Because of the relatively short travel distances involved, station car programs often further enhance environmental benefits by deploying electric vehicles.

During the mid- to late 1990s, interest increased in U.S. shared-use vehicle services. As of July 2003, 15 shared-use vehicle organizations collectively claimed 25,727 members and 784 vehicles. Since 1998, carsharing organizations have experienced exponential growth in membership. As demand for shared-use vehicle services continues to grow, decision makers and transit operators are increasingly interested in understanding program effects. Potential benefits include

- Promoting alternative transportation modes by enhancing existing transit systems and reducing automobile ownership,
- Enhancing mobility at substantial savings for people who do not drive daily and people in lower income segments,
- Expanding compact growth incentives by reducing parking needs in new or existing developments and enhancing transit-oriented developments,

- Increasing energy and emissions benefits by facilitating modal shifts to alternative transportation as well as the use of clean cars in shared fleets,
- Reducing parking needs by alleviating pressures for publicly funded parking structures, and
- Alleviating capacity expansion requirements by complementing existing public resources (transit, highways, and parking).

Because of the presumed social and environmental benefits of shared-use vehicle services, many governmental agencies and private entities have provided start-up grants and nonmonetary support to such programs throughout the country. Several additional policy measures have also been proposed, including tax-exempt commuter benefits, emergency risk fund support (insurance), innovative pilot funding, and "transportation systems" credits that provide incentives to automakers to place clean vehicles into shared-use fleets in California. Although many shared-use vehicle organizations demonstrate ongoing promise, long-term viability and program impacts remain uncertain. To date, only a few independent studies have been conducted on U.S. operational programs (*4–6*). Although most shared-use vehicle organizations currently use questionnaires to assess program impacts, survey instruments and performance measures are largely inconsistent, and most data gathered are proprietary. Thus, more systematic data collection and monitoring are needed to assess the collective benefits and corresponding policy measures.

This paper examines the developing shared-use vehicle market, the documented social and environmental benefits, and the role of policy instruments in promoting program growth and public benefits. It includes three main sections:

- An overview of shared-use vehicle programs, including organizational dynamics, current funding and parking support, and market trends;
- A review of the literature on social and environmental impacts, as well as a description of ongoing data collection activities; and
- A conclusion that systematic, longitudinal monitoring is needed to develop a deeper understanding of policy mechanisms aimed at supporting market expansion and social and environmental benefits.

CURRENT MARKET DEVELOPMENTS

This section contains results from the U.S. Shared-Use Vehicle Survey (completed in July 2003). The study entailed interviews and questionnaires in December 2002 and July 2003 with 15 operational and 9 planned programs as well as 3 defunct organizations. Although 27 total organizations participated in this study, many were unable to provide detailed information about insurance rates or brokers and funding amounts by source because of proprietary issues.

This discussion has four main parts: an overview of organizational dynamics, including program launches and closures; a review of membership and fleet totals for carsharing and station car programs from 1998 to July 2003; a discussion of current funding and parking benefits received by U.S. shared-use vehicle organizations; and an examination of market trends.

Organizational Dynamics

As of July 2003, there were 15 U.S. shared-use vehicle organizations, including 11 carsharing organizations, 2 carsharing pilots, and 2 station car programs. This analysis focuses on changes in the number of organizations by business model (carsharing or station car) between August 2002 and July 2003 and dynamics in total membership and fleet size since 1998.

Carsharing Organizations

Between August 2002 and July 2003, two carsharing organizations were launched and one ceased operation. Fewer program start-ups and closures occurred during this time frame than during the previous 12 months, which reflected four start-ups and three closures, largely due to insurance rate hikes following the terrorist attacks of September 11, 2001. Recent dynamics may reflect some degree of market stabilization. Since 1998, 20 carsharing programs have been deployed in the United States, and 13 remain; 7 programs have ceased operation. Two of the defunct programs were experimental and designed for limited duration, one merged with another existing organization, and the third suspended operation for 1 year.

Station Car Programs

Since 1998, six U.S. station car programs—of which only two are operational today—were established. Interestingly, station car program closures were not recorded until 2002 and 2003, when 60% of all programs ceased operations. Several underlying factors account for this change, including insurance rate increases, reduced public funding (possibly a result of economic downturn), and decreased customer demand in one instance.

Membership and Fleet Size

This section is an overview of carsharing and station car program membership and fleet dynamics. Since the first U.S. carsharing organization was established in 1998, the carsharing industry has experienced exponential membership growth. As of July 2003, 13 U.S. carsharing organizations were deployed and another 9 were planned. Collectively, existing carsharing organizations served 25,615 members and used 693 vehicles (Figure 1). From August 2002 to July 2003, membership in carsharing programs grew by 112%, and the number of vehicles increased by 52%.

The majority of this growth is accounted for by increased household demand and business customer developments. The three largest carsharing organizations—Flexcar, headquartered in Seattle, Washington, and Zipcar, headquartered in Cambridge, Massachusetts (both for-profit businesses) and City CarShare in San Francisco, California (a nonprofit organization)—accounted for 94% of U.S. membership and 79% of the total fleet.

In contrast, station car programs exhibited negative growth from August 2002 to July 2003, with three of the five programs remaining (as of August 2002) ceasing operations. Funding cuts were a key driver in closures. Station car membership dropped from 163 to 112 participants, and the total fleet decreased from 121 to 91 vehicles (Figure 2; declines of 31% and 25%, respectively). At present, no new station car programs are planned.

Support: Start-Up Funding and Parking Benefits

The majority of shared-use vehicle programs have received start-up funding, parking subsidies, or both because of their presumed social

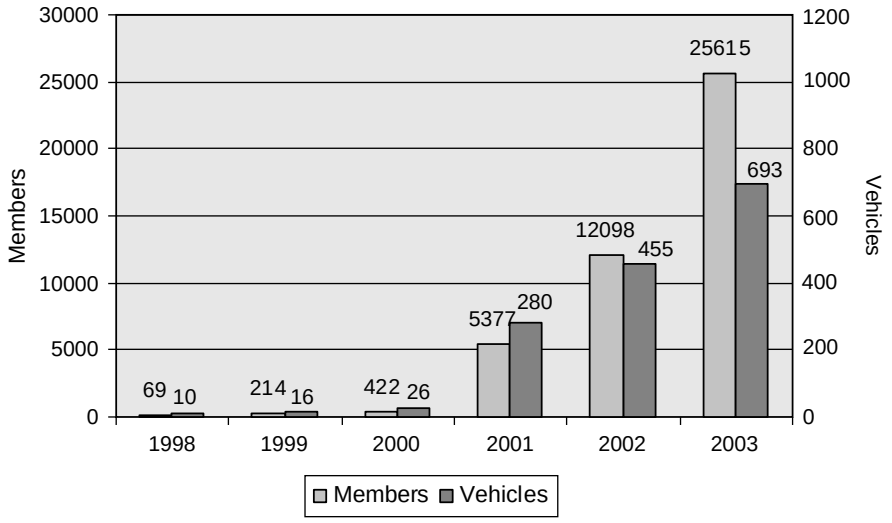

FIGURE 1 U.S. carsharing: vehicle membership and fleet size.

and environmental benefits. At present, funding (public and private) and parking benefits are the most common measures used to support shared-use vehicle organizations. Funding is a particularly powerful means to aid start-ups; 80% of organizations receive some form of financial support from various public (from federal to municipal) and private sources (Figure 3). Federal and private resources are the sources predominantly tapped for funding by organizations.

Parking benefits represent another significant measure to foster market development (i.e., reduced program operating costs) because these subsidies can be quite significant, particularly in congested areas. Seventy-three percent of shared-use vehicle programs reported receiving parking subsidies; 60% obtained parking from public entities, 33% from private entities, and 20% from both public and private sources. Private parking subsidies are linked largely to residential complexes, commercial sites (i.e., activity centers, such as grocery stores), and business partners that directly benefit from access to shared-use vehicles. Other less universal forms of nonmonetary support include donated vehicles, in-kind support services (e.g., staff time and consulting), and joint marketing efforts.

Trends and Developments

This section is an overview of several shared-use vehicle trends and developments we identified in our recent survey. Key discussions include barriers to entry, organizational evolution, member-to-vehicle ratios, the business customer market, carsharing support services, insurance, and low-emissions vehicles.

Barriers to Entry

As noted earlier, the exponential growth observed in carsharing membership is largely attributable to expansion by the three largest organizations, which collectively account for 94% of total membership

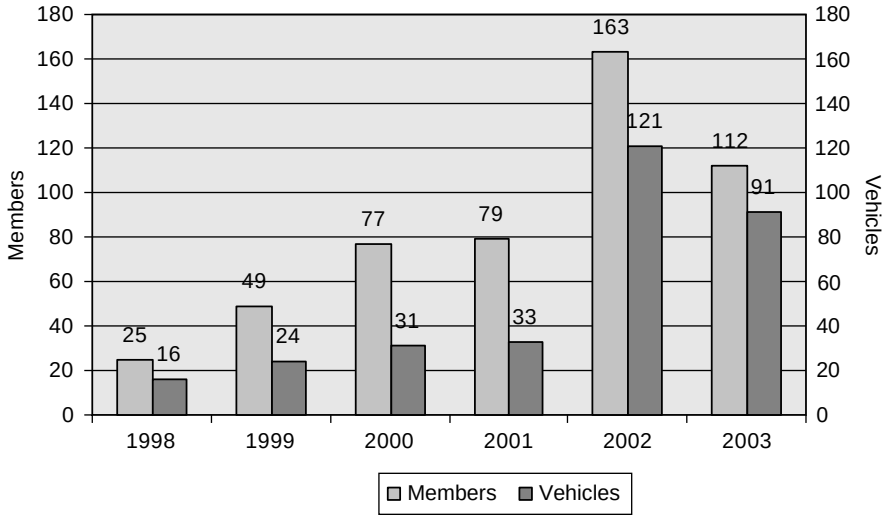

FIGURE 2 U.S. station car programs: membership and fleet size.

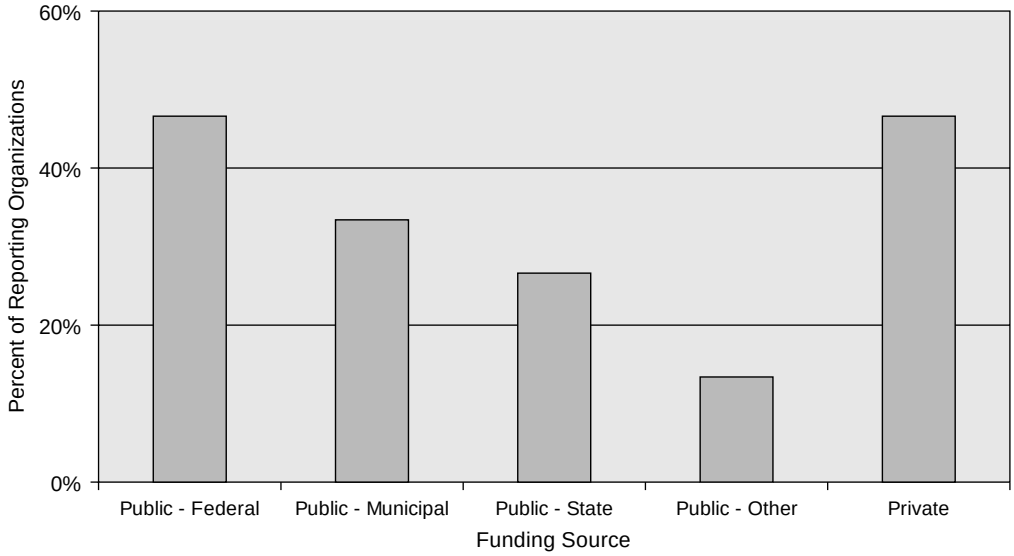

FIGURE 3 Percentage of organizations receiving funding, by source.

and 95% of total growth between August 2002 and July 2003. This concentration reflects the aggressive growth orientation of these operators coupled with entry barriers. These barriers can be divided into two categories: first-to-market advantages and economies of scale.

First-to-market advantages—particularly financial support to offset start-up costs and the establishment of strong relationships with local governments and other organizations to secure critical infrastructure (e.g., parking and preferred marketing locations)—may play a key role in determining the competitive environment. Not surprisingly, incumbent organizations have an inherent advantage if their local relationships enable them to operate at lower cost and more competitively (e.g., from better lot locations) than later entrants to the same region.

Similarly, economies of scale can reduce costs across almost all aspects of an operator's business. Although slight diseconomies might be associated with expansion across interstate boundaries because of variation in insurance requirements, these additional expenditures (e.g., opportunity costs of identifying a new carrier) are likely to be insignificant relative to the overall benefits that scale confers. Table 1 summarizes potential scaling benefits that the largest carsharing

TABLE 1 Potential Benefits Resulting from Economies of Scale

Feature	Description
Service Usability	Program usability increases as a function of fleet size and lot location. The greater number of vehicles and locations an organization can support, the more accessible the service becomes to new and existing customers. In addition, multiple vehicles enable an organization to diversify its fleet, allowing customers to select a vehicle model that optimally addresses their trip needs.
Marketing	Several U.S. shared-use vehicle programs reported that word-of-mouth marketing and decaled vehicles play an important role in customer acquisition. Indeed, one program reported approximately 20 percent of members became aware of their service after spotting a carsharing vehicle in use, while another 30 percent were referred by other users. Such ad hoc marketing would logically increase as the number of vehicles and membership grows.
Technology	Larger organizations can invest in more sophisticated technologies that improve program management and customer service via improved vehicle access, reservations, and billing methods.
Organizational Specialization	As an organization's staff expands and management costs decline per unit of business, employee roles and business activities tend to specialize as firms create departments and hire individuals with specific expertise in areas such as marketing, business development, operations, human resources, and management.
Insurance	Insurance remains a problematic area for shared-use vehicle organizations (*7*). Identifying a carrier that will provide coverage at reasonable rates continues to confound many surveyed organizations. Among those that disclosed insurance costs, rates remained high. Larger organizations appear to be at an advantage with respect to their size and operational history with insurers. Furthermore, larger organizations can budget to implement technological solutions (e.g., vehicle-tracking technologies) that further reduce insurance risks.
Purchasing Discounts	Larger organizations can negotiate more advantageous pricing when leasing or purchasing multiple vehicles, maintenance contracts, insurance, etc.

organizations likely benefit from; when applicable, data also were drawn from interviews with shared-use vehicle organizations.

Organizational Evolution

During the period of our study (August 2002 to July 2003), several U.S. carsharing organizations experienced a leadership shift. To some extent, it reflects a new stage in organizational growth and market development for U.S. carsharing (*7*). A management change can also provide credibility in securing additional capital and reassuring existing investors and board members. The new carsharing directors appear to be focusing on several critical issues: market expansion, cost reduction, increased revenue, and improved service quality.

Increase in Member-to-Vehicle Ratios

Since August 2002, member-to-vehicle ratios across carsharing organizations have increased dramatically. On average, member-to-vehicle ratios increased from approximately 27:1 to 37:1, representing a 39% increase. Because the three largest organizations represent 94% of total membership, this increase presumably reflects a change in operational strategy. This shift probably suggests a combination of factors. First, vehicle use may be slowing on average (e.g., new members subscribe to carsharing as a form of "mobility insurance"), allowing fewer vehicles to serve a larger customer base. Second, a new market segment—supporting time-of-use rentals that are complementary to neighborhood carsharing—is emerging (i.e., business customers).

Business Customer Market Focus

An interesting development observed in our 2002–2003 U.S. Shared-Use Vehicle Survey is the aggressive expansion of carsharing services to business customers by several organizations. This trend could have significant implications for carsharing economics by matching the workday segment to the vehicle demands of neighborhood carsharing. Although evidence is inconclusive, some empirical data support the notion that household carsharing demand is more concentrated on weekends (*6*, *8*). Furthermore, several surveyed organizations reported that business clients could increase use during the workweek when the demand of household users is lower. This development explains, in part, the sizable increase in member-to-vehicle ratios observed since August 2002. To the extent that business vehicle requests are predictable and nonoverlapping with household demand, business customers could be added without unduly straining existing capacity.

For business customers, carsharing's main attraction is reduced cost in contrast to the expense of a traditional corporate fleet. Rather than purchase exclusive vehicle access, a carsharing business customer pays only for actual vehicle use. Additional savings are realized in terms of fleet oversight and management, responsibilities that the carsharing organization assumes. In addition to providing traditional pricing by time and mileage, a carsharing organization might offer various levels of exclusivity (e.g., dedicated vehicle placement at corporate sites) to better align its service with the company's needs. Carsharing, unlike conventional corporate fleets, offers businesses more flexibility based on specific vehicle demands.

Carsharing Support Services

The largest U.S. carsharing organizations are also well positioned to pursue another market opportunity: carsharing support services. At present, this opportunity includes two key areas:

- Licensing carsharing technologies, software, or hardware to other shared-use vehicle service providers or government or corporate fleets, and
- Contracting back-office management support (e.g., reservations and billing).

Many U.S. shared-use vehicle organizations (planned or operational) do not have sufficient capital to independently develop fleet management technologies. Rather than develop their own systems, programs can instead deploy existing carsharing technologies developed by others, through licensing arrangements or direct purchase. Several U.S. shared-use vehicle organizations currently do this. In addition to the growing carsharing market, shared-use technologies could be readily adapted to serve the vehicle reservation and management needs of corporate fleets—a sizable market opportunity. At present, more than 640,000 commercial fleets operate in the United States, representing approximately 9 million vehicles (*9*). Furthermore, the U.S. market for fleet management systems is anticipated to grow to $1.8 billion by 2008 ($6.5 billion worldwide), up from an estimated $.7 billion in 2002 (*10*, pp. 12–14, 53).

Insurance

In 2002, insurance was identified as the most important challenge of U.S. shared-use vehicle organizations (D. Halperin, personal communication, July 15, 2003). Although insurance premiums remain high and search costs are significant, just two organizations surveyed between August 2002 and July 2003 identified insurance as a "critical challenge." It is unclear why the majority of U.S. shared-use vehicle organizations did not explicitly identify insurance as a key issue, given continued high costs. Several surveyed organizations expressed confidence that premiums would decline as insurers become more familiar with the shared-use concept and claims histories can be used to develop more realistic risk factors.

To that end, more than 70% of U.S. shared-use vehicle organizations expressed interest in pooling claims and usage data—contingent on certain confidentiality considerations—to facilitate the development of risk rating factors. Although several surveyed organizations did not disclose their insurance rates, larger organizations generally reported satisfaction with their current premiums. Given the high opportunity costs associated with identifying an insurer and the ongoing difficulties of securing reasonable rates, lower insurance costs represent an important strategic advantage. It implies that some organizations, to the extent that they have relatively lower rates, may be reluctant to assist in industrywide efforts to reduce premiums. Neither of the two remaining U.S. station car programs identified insurance as an important factor. Today, U.S. station car programs do not assume insurance liability for their vehicles, because the end users lease their cars and insure them under their own policies.

Low-Emissions Vehicles

The prevalence of gasoline–electric hybrid vehicles among the providers of U.S. shared-use vehicles is also a notable trend.

Approximately 30% of U.S. carsharing fleets are composed of gasoline–electric hybrid and alternative fuel vehicles, including electric vehicles. One hundred percent of the vehicles deployed in U.S. station car programs are electric vehicles. Approximately 50% of U.S. carsharing organizations (excluding the two carsharing research pilots that already use alternative fuel vehicles) reported that they plan to increase the proportion of hybrid vehicles in their fleets, citing organizational philosophy as a primary motivator.

An additional catalyst to the further adoption of gasoline–electric hybrid vehicles is California's zero-emission vehicle (ZEV) mandate, which requires automakers to sell a certain number of zero-emission vehicles (ZEVs), advanced technology–partial ZEVs (AT-PZEVs), or PZEVS as a percentage of total automobile sales starting in 2005. In addition to receiving ZEV sales credits, automakers can receive credits for placing vehicles in transportation systems (i.e., programs that demonstrate technology-enabled vehicle sharing, links to transit, or both). Although the transportation systems credit application process is being developed, there are indications that several automakers are positioning to capitalize on the additional credits by partnering with shared-use vehicle organizations (e.g., offering vehicle discounts, financial support, or both). [For more information about the ZEV mandate as it relates to shared-use vehicle services, see the 2002 article by Shaheen et al. (*11*).]

SOCIAL AND ENVIRONMENTAL IMPACTS

In this section, the social and environmental impacts associated with U.S. shared-use vehicle programs are discussed. The vast majority of public funding and support is provided to shared-use programs in the interest of mitigating transportation-related problems, including air pollution, traffic congestion, and parking shortages. To a lesser degree, carsharing funding has been provided in the interest of expanding the mobility options available to the poor. Despite the intuitive appeal of shared-use vehicle services, comprehensive and objective evidence to support perceived benefits is limited.

Although 80% of U.S. shared-use vehicle organizations administer some form of survey during the course of customer membership, relatively few (33%) conduct both pre- and postmembership surveys to track behavioral and attitudinal changes. Among the organizations that do collect before and after data, methods and measures are often inconsistent. These inconsistencies are present both across and within organizations, further complicating systematic aggregate analysis. For example, only 13% of shared-use vehicle organizations systematically collect data on sociodemographics, vehicle ownership, and transportation use, which arguably are key variables in assessing market developments as well as social and environmental impacts.

To date, several U.S. shared-use vehicle studies have been conducted to quantify various social and environmental impacts. Although various measures have been tracked [e.g., vehicle miles traveled (VMT), automobile ownership, and modal shift], study methods are largely inconsistent. The majority of the information regarding shared-use impacts comes from European experience (*8, 12–14*). Most European studies document impressive VMT reductions, with annual vehicle mileage declining from 30% to 70% as a result of carsharing. Vehicle ownership impacts are also notable, with 10% to 60% of members selling a vehicle after joining a carsharing program. Although some VMT reductions result from forgone trips, a significant amount of this change is attributed to modal shifts (i.e., members replacing private car use with public transit and nonmotorized options).

Although European carsharing results are encouraging, the methodologies used also vary among studies. First, several rely on data collected only after an individual used carsharing, requiring members to reflect back on prior modal use (versus documenting mode split before membership); not surprisingly, the accuracy of such data is unknown. Second, control groups are seldom used to provide a comparison of behavioral changes for members and nonmembers over the same time period, controlling for outside factors (e.g., economic downturn). Third, many studies only document early adopter behavior. Thus, results may not reflect travel patterns after an individual has fully adjusted to carsharing or even the evolving market impacts (e.g., new target segments and attrition). Contextually, there are also numerous issues. For example, European public transit networks are far denser, fuel prices substantially higher, and car ownership rates lower. Thus, the degree to which European results can be generalized to the United States is questionable.

Several systematic studies have been conducted on U.S. shared-use vehicle research demonstrations and just a few on existing programs. They include Purdue University's Mobility Enterprise shared-car experiment of the early 1980s (*15*) and an evaluation of the Short-Term Auto Rental Service in San Francisco (*16*) around the same time. More recent studies include the San Francisco Bay Area Station Car Program (*17*); CarLink, a commuter-based carsharing system deployed in the San Francisco Bay Area (*18, 19*); and Intellishare's campus car study (*20*). Among operating programs, 2-year evaluations of CarSharing Portland (Oregon) and City CarShare have been completed (*5, 6*).

To date, station car evaluations universally support the notion that increased transit connectivity can dramatically reduce VMT. This finding is not surprising because many of these programs specifically recruit individuals who would otherwise drive to work rather than commute via public transit. CarLink I—a carsharing field test with a station car component—yielded a net VMT reduction of approximately 18.5 miles per day. CarLink also resulted in 20 new daily Bay Area Rapid Transit (BART) trips among CarLink commuters (among a limited sample of 20 individuals) in the San Francisco Bay Area. Several participants stated that if CarLink became a permanent service, they would sell one of their personal cars, which could greatly reduce their transportation costs (*18*). Findings from the San Francisco Bay Area station car demonstration also revealed substantial reductions in commute-related VMT. These findings indicate that personal vehicle mileage declined from 45% to 3% of total VMT, with drivers substituting a combination of rail and electric vehicles (*17*).

Results are less clear in the case of neighborhood carsharing, largely because of limited samples, length of time studied, modest behavioral changes, or a combination of factors. A study of membership behavior in CarSharing Portland after 2 years of operation indicates that aggregate VMT decreased among members by 7.6%. This reduction was driven largely by members who previously owned or leased a car before carsharing. For these former automobile owners, VMT decreased by 25%, implying that carsharing may affect vehicle ownership decisions. For members without household vehicle access, VMT increased by 19% (*5*).

A similar outcome was observed in a 2-year evaluation of City CarShare, which revealed a 2% VMT reduction among members (*6*). It is important to note that this particular measure, although modest, may underestimate carsharing VMT impacts. Among a comparable group of nonmembers (a control group), VMT increased by 95% over the same period, suggesting that carsharing may have reduced total VMT beyond the modest 2% reduction reported. The

authors hypothesize that the influence of carsharing membership on vehicle ownership is likely reflected in reduced VMT among households that either sold or forfeited a car purchase.

Relatively few studies effectively evaluate the modal shift impacts of shared-use vehicle programs across a full range of motorized and nonmotorized modes. Early program studies support differing conclusions. For example, CarSharing Portland's 2-year study indicates a slight increase in transit use, walking, and cycling (*5*), while the City CarShare second-year study reports a decline in walking, cycling, and transit usage (*6*). In the case of City CarShare, carsharing appears to have largely displaced these travel modes among members.

Neighborhood carsharing appears to have a more tangible effect on vehicle ownership. Most U.S. carsharing studies demonstrate that shared-use vehicles have a mitigating influence on vehicle ownership, motivating members to sell or avoid a vehicle purchase. For instance, CarSharing Portland's 2-year study reported that 23% of members sold a personal vehicle, and 25% avoided purchasing one (*5*). Results of the three programs are presented in Figure 4.

Although initial vehicle ownership results are directionally favorable (25% to 67% of members postponed a vehicle purchase, and 12% to 30% sold a personal vehicle), methodological dissimilarities and limited sample size confound systematic comparisons. Most studies are based on limited samples and do not use experimental or statistical controls, making it difficult to attribute behavioral changes to carsharing versus exogenous variables.

Although shared use systems have the potential to enhance the mobility options of the poor—and several programs offer this organizational objective—existing data do not support it. Studies report the majority of members are highly educated, professionally employed, and white (*5, 6*). Low adoption rates among the poor are likely the result of several factors, including limited service availability and program awareness, limited credit history, membership deposits, and application processing fees. Nevertheless, some public funding supports the expansion of carsharing services into low-income areas. Most likely, notable adoption rates among the poor will take a few years to develop. Despite carsharing's enhanced mobility and cost-saving benefits, real or perceived risks associated with serving this segment suggest that this market may not be addressed without governmental support.

To summarize, the efforts of shared-use vehicle organizations to evaluate membership impacts on travel behavior are currently inadequate to characterize long-term effects (particularly across market segments and models). More systematic, longitudinal analysis is needed of the developments, program effects (e.g., by target market and model), and policy impacts (e.g., ZEV Mandate "transportation systems" credits) of shared-use vehicles in the United States. Decision makers, funding agencies, private-sector investors, and shared-use vehicle operators would all benefit from a more systematic understanding of the evolving market and demand for as well as the resulting impacts of shared-use vehicles. Independently, most U.S. organizations do not have sufficient resources to conduct ongoing studies, which implies that collective action may be required.

CONCLUSION AND RECOMMENDATIONS

Since 1998, the membership of U.S. carsharing organizations has grown exponentially. As a result of this expansion, aggregate carsharing member-to-vehicle ratios have also increased, particularly among the largest providers. This change can be attributed to two factors: aggressive market diversification to include business customers, and an increased proportion of users using carsharing as "mobility insurance." In contrast to carsharing, station car programs experienced declines in membership and fleet size as well as program numbers; only two East Coast initiatives remain, largely because of reduced public funding and insurance rate increases. Furthermore, characteristics separating the station car and carsharing concepts continue to blur as numerous U.S. carsharing programs nurture transit partnerships.

Given presumed social and environmental benefits as well as economic potential, 100% of shared-use vehicle organizations have attracted start-up funding (public and private), nonmonetary benefits (e.g., subsidized parking), or both. Although station car programs demonstrate public benefits, their economic viability is less promising than carsharing at present. The largest remaining station car program, however, recently developed a 5-year business plan. This new approach toward station car viability should be monitored.

To date, limited shared-use vehicle data have been systematically collected and analyzed to assess program impacts on enhanced

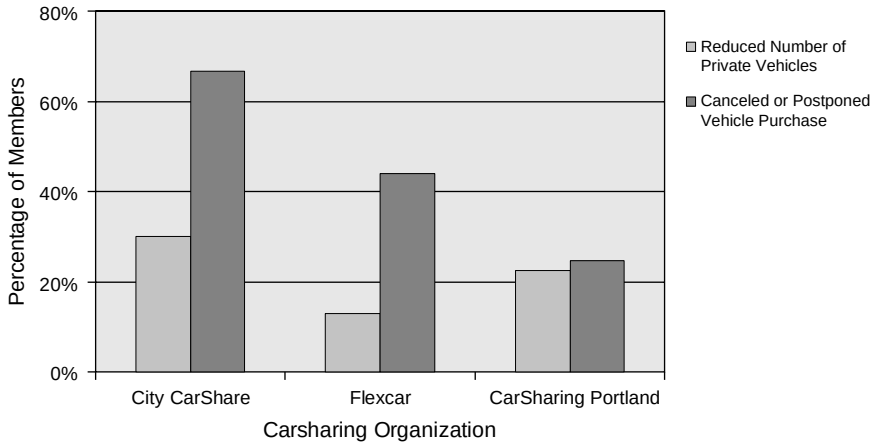

FIGURE 4 Impact of carsharing membership on vehicle ownership (*5, 6;* J. Williams, personal communication, July 2003).

TABLE 2 Potential Shared-Use Vehicle Monitoring Measures

Low-Income Household Mobility	Air Quality	Traffic Congestion	Land Use
- VMT - Transportation Expenditures - Time Spent by Trip Purpose - Distance Traveled to Employment Site - Sociodemographics of Membership	- VMT - Vehicle Ownership - Vehicle Type - Modal Shift - Number of Trips (e.g., Cold Starts)	- VMT - Modal Shift - Time of Trip - Trip Assignment - Trip Generation - Vehicle Occupancy	- Users Served by Parking Space - Vehicle Ownership - Modal Shift - Spaces Displaced (e.g., Development) - New Residential

mobility, congestion, land use, and air quality. Although early studies indicate positive impacts of shared-use vehicles, methodological approaches and findings are inconsistent and thus confound aggregate-level analyses. To evaluate programwide effects, more systematic data collection and analysis approaches are needed.

Although several U.S. organizations have experienced rapid growth, future carsharing dynamics are uncertain; just a few organizations report or approach profitability. Through supportive public–private partnerships, program sustainability could be expedited and enhanced through a range of measures. Furthermore, funding and support should be carefully monitored to ensure that market developments and impacts achieve objectives.

At present, two support mechanisms have been widely used among U.S. shared-use vehicle organizations: start-up funding and parking benefits. Additional policy mechanisms have been discussed. They can be implemented systemwide or targeted at particular organizations or market segments. Public start-up grants represent one important supply-side strategy. Used to aid shared-use vehicle programs overcome high initial costs, start-up grants typically lower market-entry barriers. Insurance subsidies (e.g., a national emergency risk fund supported by the government) are another proposed supply-side mechanism. California's ZEV mandate—which will link credits for clean-fuel vehicles to transportation systems (or shared-use vehicle services) starting in 2005—is another supply-side strategy that could attract automakers as stakeholders to carsharing and station car initiatives on a larger scale.

At present, nonmonetary public support predominantly consists of joint marketing efforts and parking benefits; the latter combines supply- and demand-side incentives. Other policy instruments, with a demand-side focus, include pretax credits and access to high-occupancy vehicle (HOV) lanes. Pretax credits could be aimed at commuters and low-income households.

Finally, HOV lane access for clean-fuel, shared-use vehicles could serve as another incentive to shared-use program participation. After reviewing the U.S. shared-use vehicle literature and existing data collection methods, we conclude that aggregate and systematic monitoring is needed to inform shared-use vehicle market developments, assess program impacts, and guide policy support. Such a monitoring framework should be developed among key stakeholders (e.g., organizations, funding agents, and local governments). A first step toward formulating such a framework might include identifying the appropriate study measures that correspond to program objectives. Social and environmental goals—including enhanced mobility for low-income households, reduced congestion and emissions, increased transit ridership, and better land use—are the primary motives for public support (funding and policy measures). For each of these goals, specific measures should be identified (Table 2). Identifying efficient measures is critical (i.e., those with the greatest explanatory power at least cost). After performance measures are determined, a methodological approach can then be developed.

An effective monitoring strategy would

- Provide a consistent set of measures across organizations,
- Establish standardized data collection techniques (e.g., before-and-after surveys, question wording),
- Identify a sampling framework sufficient to generate statistically significant results,
- Ensure data confidentiality,
- Determine appropriate monitoring duration to assess program and policy impacts over time, and
- Balance organizational data collection costs (e.g., staff time).

If data collection efforts are burdensome, shared-use programs are unlikely to participate, even if the potential long-term benefits are substantial. Thus, cost-effective data collection tools are needed. To that end, Internet-based surveys and online methods for data submission should be considered. An Internet-based monitoring approach could enable national aggregate data collection, enhancing prospects for data consistency and statistically significant results. Furthermore, the availability of a consistent data set of shared-use vehicles could also lead to a more powerful understanding of market dynamics, program impacts, and future potential among various stakeholders.

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