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"Efficiency - Equity - Clarity"

Evaluating Carsharing Benefits

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Abstract

Carsharing is an automobile rental service intended to substitute for private vehicle ownership. Carsharing emphasizes affordability and convenience. Vehicles are rented by the hour, located near residences, and require minimal effort to check in and out. Carsharing services are common in some European countries and are increasing in North America. Carsharing gives consumers a practical alternative to owning a personal vehicle that is driven less than about 6,000 miles (10,000 kilometres) per year. Carsharing has lower fixed costs and higher variable costs than private vehicle ownership. This price structure makes occasional use of a vehicle affordable, even to low-income households. It also gives drivers an incentive to minimize their vehicle use and rely on other travel options as much as possible. Carsharing typically reduces average vehicle use by 40-60% among drivers who rely on it, making it an important transportation demand management strategy. Despite these benefits, carsharing is growing slowly and will need to overcome several barriers to achieve its full potential.

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Introduction

The current transportation market offers consumers many choices when they purchase or lease an automobile, but few practical options for using a vehicle occasionally. Most vehicle rental services are located at major commercial centers and priced by the day or week, making them inappropriate for running short errands. This limited range of options contributes to several problems:

- Some low-income households cannot afford to drive at all, leaving them mobility disadvantaged in an increasingly automobile-dependent society.
- Low-income households often spend an excessive portion of budgets on cars that are only needed occasionally. This is a financial burden and contributes to problems such as uninsured driving.
- It results in inefficient use of valuable assets. Many private automobiles are used only a few hours per week. These low annual-mileage vehicles have high costs per vehicle-mile.
- It increases vehicle use. Because cars are expensive to own but cheap to drive, owners have the incentive to maximize their use. This increases external costs such as traffic congestion, facility costs, accidents and environmental impacts.

Better vehicle rental options could reduce these problems. “Carsharing” describes vehicle rental services intended to substitute for private automobile ownership.¹ Carshare offers short-term rates, residential area locations, and maximum convenience. Carsharing ranges from small informal cooperatives to sophisticated businesses with many vehicles. Carsharing is common in some European countries (the Netherlands, Switzerland and Germany) and is being introduced in some North American markets.² Carsharing is not a new concept, visionaries from Buckminster Fuller to Moshe Safdie have advocated vehicle sharing as a way to use vehicles and parking resources more efficiently.³

North American carshare organizations typically charge a \$300-500 refundable deposit, \$1.00-2.00 per vehicle-hour, plus 25-40¢ per mile (15-25¢ per km)⁴. These charges cover all vehicle operating expenses, including fuel and insurance. There are often special rates for extended trips and infrequent users. Carsharing is considered a cost effective alternative to owning a vehicle driven less than about 6,000 miles (10,000 kms) per year. There are typically 8-15 members per vehicle.

Members reserve vehicles, usually by telephone. Carsharing organizations with multiple vehicles in an area are able to satisfy the majority of schedule requests (the more vehicles in a pool the less likely they are all used at once). Time and mileage are recorded before and after each trip. Users refuel the vehicle as needed using a carshare credit card. Staff perform cleaning and maintenance. Members are usually billed monthly.

Station cars are a variation of carsharing.⁵ Station cars are rented at transit stations for trips from terminals to local destinations. This makes transit use more feasible, particularly in suburban areas. Because they are intended for short trips, station cars can employ small, alternative fuel vehicles, such as battery powered electric cars.⁶

Travel Options Compared

As illustrated in Figure 1, carsharing offers a middle option between having no vehicle and owning a private vehicle. It allows (in fact, it virtually requires) consumers to use a combination of modes rather than relying entirely on automobile travel.

Figure 1 Carsharing is a Middle Option

<u>No Vehicle</u>	<u>Carsharing</u>	<u>Private Vehicle</u>
Rely primarily on non-automotive modes (walking, cycling and public transit). Minimal social costs. Mobility disadvantaged in most communities.	Rely on a combination of walking, cycling, ridesharing, public transit and driving. Moderate social costs. Moderate mobility, maximum mobility choices.	Rely primarily on driving. Maximum external costs. Maximum mobility.

Table 1 compares the convenience and price of personal travel options. Carsharing offers medium convenience, and has low fixed/high variable charges. Private vehicle ownership offers the most convenience, has the highest fixed charges and lowest variable charges. Conventional rentals are convenient at major transport terminals but less convenient elsewhere. They have high daily rates but low mileage costs (usually just fuel costs), so their per-mile costs are high for short trips but low for longer trips. Taxis are relatively convenient and have no fixed charges but the highest variable charges. Public transit has moderate to low convenience (depending on location), and costs about 21¢ per passenger mile, up to a maximum of \$600 per year for unlimited use passes.

Table 1 Vehicle Use Options Compared

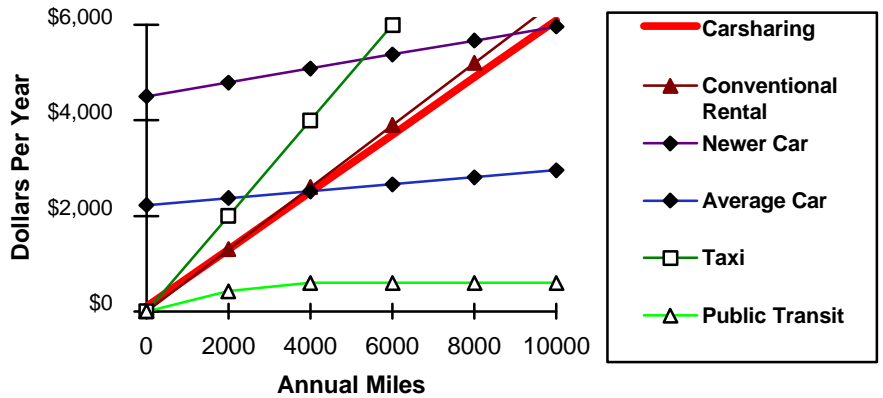
	Carsharing	Private Ownership	Conventional Rental	Taxi	Public Transit
Convenience	Medium	High	Varies	High-Medium	Medium-Low
Fixed Charges	\$100/yr	\$2,000-4,000/yr	None	None	\$600/yr max
Time Charges	\$1.50/hour	None	\$20-40/day	None	None
Mileage Charges	20-40¢	10-15¢	5-10¢	\$1.00	21¢

This table compares convenience and price of five common travel modes.

Figure 2 compares the typical variable charges for each mode. Of course these vary. For example, conventional vehicle rentals may be cheaper per mile than carsharing for longer trips, but much more expensive for shorter trips. Here are typical variable costs for a 15-mile (25 km) round trip errand by different modes:

Carsharing	\$10.00
Conventional Rental	\$32.00
Private Car	\$2.00
Taxi	\$15.00
Transit	\$3.15

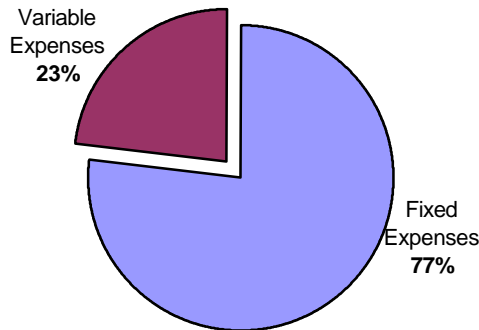
Figure 2 User Expenses for Various Modes⁷



This figure compares the costs of common travel modes. Private cars have high fixed/low variable costs, while other modes have low fixed/higher variable costs.

Less than a quarter of private vehicle expenses are variable, as shown in Figure 3. This price structure gives vehicle owners an incentive to maximize driving in order to get their money’s worth. Carsharing lets drivers pay as they go, with minimal fixed costs but much higher variable costs. Carshare users pay about 60¢ per vehicle mile driven, about five times the variable charges of a private automobile. This gives consumers an incentive to drive less and use other transportation options when possible.

Figure 3 Vehicle Costs⁸



Most vehicle costs are considered fixed – motorists pay depreciation, financing, registration, insurance and some maintenance costs regardless of how much they drive.

As a result of these differences in pricing, households that join carshare organizations typically reduce their vehicle use 40-60%.⁹ Although drivers who would not otherwise have access to a vehicle may increase their automobile use due to carsharing, most research indicates that this is more than offset by reduced driving by those who would otherwise own a personal automobile. As a result, there is usually a significant net reduction in total vehicle travel among carshare users as a group.

Carsharing Market Potential

The ultimate market potential of carsharing is difficult to predict. European experience indicates that carsharing can be useful to a wide range of consumers, including many relatively wealthy households that avoid owning a second or third vehicle.

Carsharing requires a sufficient number of users within convenient walking and cycling distance of where vehicles are parked, and is most effective in areas with good travel alternatives. To have 3 carshare vehicles stationed in a neighborhood with 10 members per vehicle requires at least 30 member households within about one square mile.

Carsharing is therefore most suitable for higher density urban neighborhoods with good walking, cycling and public transit services. According to the 1990 U.S. census about 1/3 of U.S. residents live in cities.¹⁰ Some clustered suburban neighborhoods may also be suitable for carsharing, particularly if they have good transit service, pedestrian-friendly streets and local commercial centers.

About a fifth of vehicles in North America are currently driven less than 6,000 miles (10,000 kilometres) per year.¹¹ Lower-mileage motorists are particularly common in higher density urban areas where carsharing is most practical. Of course, not all lower-mileage motorists want to shift to carsharing, but on the other hand, many motorists who currently drive more than 6,000 miles per year could find carsharing cost effective by reducing their driving.

Assuming that 30% of North American drivers live in higher-density, multi-modal neighborhoods and 20% of these have low annual mileage vehicles, about 6% of current privately owned vehicles could shift to carsharing. Of course, potential demand for carsharing will be much higher in urban areas and lower in rural areas.

A market survey of potential carshare customers conducted in Calgary, Alberta found:¹²

- High fixed fees (such as a \$500 deposit) is a major barrier to membership. Members seem to prefer low fixed/higher variable charges.
- There is little preference for a cooperative organization structure.
- Potential members appear willing to walk more than 400 meters to access a car.
- Residents of urban neighborhoods with restricted on-street parking, and households with lower incomes appear particularly amenable to carsharing.
- There is little preference for new cars, but a definite preference for having a minivan as a vehicle option.

Carsharing Benefits

Specific benefits from carsharing are discussed below.

1. *User Benefits from Increased Mobility*

Carsharing provides people who cannot own a private car the ability to use a vehicle occasionally. These benefits can be significant since non-drivers' mobility is often so constrained. For example, giving somebody who currently has no access to an automobile the ability to drive just once or twice a week is likely to serve relatively high value trips that are currently foregone or performed inefficiently by other modes.

2. *Economic Development Benefits*

Carsharing can increase economic productivity by allowing job seekers who cannot afford a personal vehicle use of a car if needed for job searching and employment.¹³ Carsharing can also fill special market niches. For example, small businesses could use carsharing as a more efficient and flexible alternative to owning vehicles that receive only occasional use if no conventional vehicle rental service is located nearby.

3. *Equity*

That non-drivers enjoy less mobility and a competitive disadvantage compared with drivers when competing for jobs and education is unfair and inequitable.¹⁴ Carsharing can therefore increase equity by improving the mobility options of people who are transportation disadvantaged.

4. *Option Value*

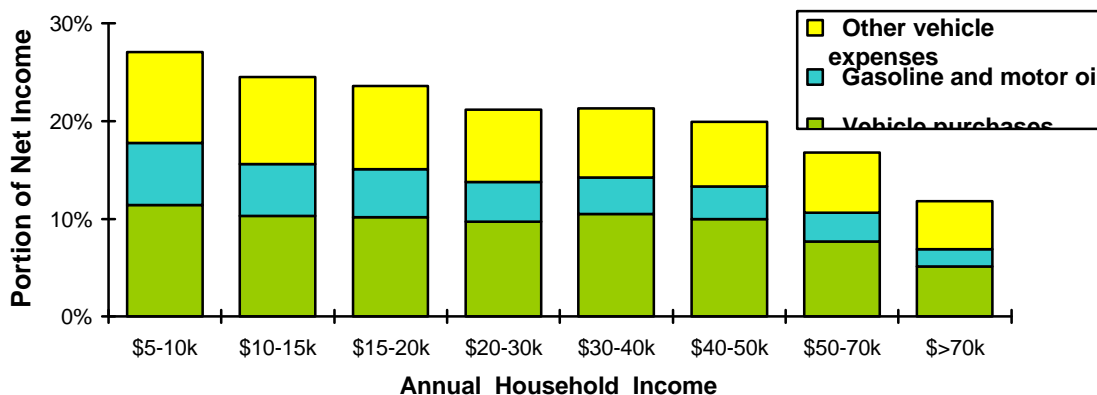
Even people who do not currently use carsharing may benefit from having it available in case of emergencies or if their situation changes. This is called "option value."¹⁵ For this reason, people who currently own their own vehicle may value having carsharing options in their neighborhoods, just as many drivers value the existence of public transit services.

5. *User Savings and Benefits*

Vehicle ownership is a major household budget expense that can be a major burden to moderate- and low-income households, as indicated in Figure 4. Households that share rather than own a car can reasonably save \$500 to \$1,500 per year. Some households can save on residential parking costs as well as vehicle expenses.¹⁶

Although Carsharers forego some benefits when they reduce their annual vehicle mileage, they must be better off overall when their incremental savings are compared with their incremental costs or they would not make such changes.¹⁷ Carsharers may also value the convenience of avoiding vehicle maintenance and cleaning tasks, and the security of having no unexpected repair bills.

Figure 4 Transportation Expenditures as Percentage of Household Income¹⁸



Vehicle expenses are a financial burden to many low- and moderate-income households.

6. Vehicle Choice

Motorists often purchase vehicles that exceed their usual requirements for capacity and performance, such as a van or light truck, to meet occasional peak demands, although a cheaper, more resource efficient vehicle would usually be sufficient. Many carsharing organizations offer a choice of vehicle types. Users choose the vehicle type that best meets their needs for a particular trip. This benefits consumers, and may provide external benefits by reducing the use of oversized vehicles when smaller vehicles are adequate.

7. Introducing New Technologies

Carsharing, and particularly station cars, may help introduce and test new technologies. For example, some station car programs are testing neighborhood electric vehicles.¹⁹

8. TDM Benefits²⁰

By reducing per capita vehicle travel carsharing supports transportation demand management (TDM) objectives. It can help reduce congestion, road and parking facility costs, accidents, pollution, resource consumption and other environmental impacts. By reducing vehicle traffic and parking requirements, carsharing allows more flexible, infill development and helps create more livable communities. These benefits can be particularly significant in higher density urban neighborhoods where carsharing is most feasible and the external costs of automobile use are greatest. Specific examples of avoided costs are described below:

- Urban freeway congestion costs are estimated to average 6-9¢ under moderate congestion (50 mph), and 37¢ when congestion is heavy (traffic flows at less than 40 mph).²¹
- An average vehicle receives \$414 to \$1,232 per year in parking subsidies.²²
- One study found that local governments spend about \$275 per vehicle on local roads and traffic services that are funded by general taxes.²³
- Motor vehicles are major contributors to urban air, noise and water pollution.

Maximizing Carsharing Benefits

Several barriers must be overcome before carsharing can provide its full potential benefits. Some carshare organizations have reported difficulty obtaining loans and insurance. Overhead costs for vehicle management, reservations and billing can be significant, so innovations that reduce these costs would help make carsharing more feasible.

A major barrier is the need to establish and maintain a critical mass of users (typically 30 members or more) in individual neighborhoods. Carsharing cannot develop until enough potential users in each area are familiar with the concept, understand how it can benefit them, and develop trust in the organizations. This will require education and marketing. Carshare organizations may require seed money to become established.

Carsharing both supports and is supported by most other transportation demand management (TDM) strategies.²⁴ TDM strategies include measures that increase travel choice and reduce market distortions that encourage excessive automobile travel. These strategies tend to have synergetic effects: they are more effective implemented together than separately. Over the long term they help create a more diverse transportation system and reduce automobile dependency in a community. Other TDM strategies that integrate with carsharing are described below.

- *Improve travel choices.* Good public transit, ridesharing, cycling and walking conditions allow people to reduce their vehicle use and benefit from carsharing.
- *Integrate transportation and land use planning.* Higher density, multi-modal, mixed-use neighborhoods and flexible parking requirements allow residents to reduce their vehicle use.
- *Manage parking for efficiency.* Change building development and management practices so residential parking is rented and sold separately from housing. This would significantly increase (by \$500-1,000) the annual savings from carsharing.²⁵
- *Implement commute trip reduction programs.* Establish Transportation Management Associations in commercial centers. Encourage employers and employees to cooperate to develop better travel choices and incentives to use alternative modes. Cash-out free parking, which means offering commuters cash as an alternative to free parking.²⁶
- *Integrate carsharing with other mobility services.* For example, carsharing could be bundled with public transit passes, taxis service and rideshare matching, giving users an integrated package of mobility options.

Carsharing need not be managed as a cooperative to achieve the benefits described above. For-profit neighborhood car rentals may provide comparable service. They could become more economically viable if rental transactions could be self-serviced or handled as a sideline by existing businesses, such as local stores and service stations. Ironically, one of the best ways to reduce automobile dependency may be to develop a new automobile business: neighborhood car rental services.

Endnotes

- ¹ Susan Shaheen, Daniel Sperling, and Conrad Wagner, “Carsharing in Europe and North America: Past, Present, and Future,” *Transportation Quarterly*, Vol. 52, No. 3, Summer 1998, pp. 35-52.
- ² Ron Neville, *Carsharing – Auto Use Without Auto Ownership*, TAC Annual Mt. (www.tac-atc.ca), 1999.
- ³ Moshe Safdie, *The City After the Automobile; An Architect’s Vision*, Stoddart (Toronto), 1997.
- ⁴ Carsharing Net (www.carsharing.net); Carsharing Portland (www.carsharing-pdx.com), 1999.
- ⁵ National Station Car Association (www.stncar.com).
- ⁶ “Communities Across U.S. Participate in Neighborhood Electric Vehicle Testing,” *Urban Transportation Monitor*, Vol. 12, No. 18, Sept. 25, 1998, pp. 1-3.
- ⁷ Todd Litman, *Transportation Cost Analysis*, VTPI (www.vtpi.org), 1999.
- ⁸ 1997 Consumer Expenditure Survey, BLS (<ftp://ftp.bls.gov/pub/special.requests/ce>), assuming that gasoline, oil, and ½ of vehicle maintenance and repair costs are variable.
- ⁹ K. Steininger, C. Vogl and R. Zettl, “Carsharing Organizations,” *Transport Policy*, Vol. 3, No. 4, 1996, pp. 177-185; Peter Muheim, *CarSharing - The Key to Combined Mobility*, Swiss Federal Office of Energy (www.mobilmanger.ch/IntSummeryE.html#Interduktion), 1998; *CarSharing Portland: Review and Analysis of Its First Year*, ODEQ (<http://ppr.portland.or.us>), 1999.
- ¹⁰ *The World Almanac*, World Almanac Books (New York), 1996, p. 382.
- ¹¹ DesRosiers Automotive Consulting, annual survey of vehicle use patterns, 1999.
- ¹² John Abraham, *A Survey of Carsharing Preferences*, University of Calgary, (<http://www.ucalgary.ca/~jabraham/WTPPCarshare.PDF>), 1999.
- ¹³ Evelyn Blumenberg, Steven Moga and Paul M. Ong, *Getting Welfare Recipients to Work*, University of California Transportation Center Report 389 (<http://socrates.berkeley.edu/~uctc>), 1998.
- ¹⁴ Todd Litman, *Evaluating Transportation Equity*, VTPI (www.vtpi.org), 1998.
- ¹⁵ Johansson, *Economic Theory and Measurement of Env. Benefits*, Cambridge (Cambridge) 1987, p. 5.
- ¹⁶ Wenya Jia and Martin Wachs, “Parking and Affordable Housing,” *Access*, Vol. 13, Fall 1998 (<http://socrates.berkeley.edu/~uctc/access.html>), pp. 22-25.
- ¹⁷ Kenneth Small, “Project Evaluation,” *Essays in Transportation Economics and Policy*, Brookings Institute (Washington DC; www.brookings.edu), 1998.
- ¹⁸ 1997 Consumer Expenditure Survey, BLS (<ftp://ftp.bls.gov/pub/special.requests/ce>), 1997.
- ¹⁹ National Station Car Association (www.stncar.com); Victoria Nerenberg and Martin Bernard, “The EV Station Car Debate,” *Mass Transit*, November/December 1995, pp. 72-78.
- ²⁰ Todd Litman, *Guide to Calculating TDM Benefits*, VTPI (www.vtpi.org), 1998.
- ²¹ Herbert Levinson, “Freeway Congestion Pricing,” *Transportation Research Record 1450*, 1995, pp. 8-12.
- ²² Mark Delucchi, *Annualized Social Cost of Motor-Vehicle Use in the U.S., 1990-1991*, Vol. 6, Institute of Transportation Studies (www.engr.ucdavis.edu/~its), 1996, UCD-ITS-RR-96-3 (6), 1997.
- ²³ John DeCicco and Hugh Morris, *The Costs of Transportation in Southeastern Wisconsin*, American Council for an Energy-Efficient Economy (Washington DC; www.aceee.org), 1998.
- ²⁴ Todd Litman, *Potential TDM Strategies*, VTPI (www.vtpi.org), 1998.
- ²⁵ Donald Shoup, “An Opportunity to Reduce Minimum Parking Requirements,” *APA Journal*, Vol. 61, No. 1, Winter 1995, pp. 14-28; Todd Litman, *Pavement Busters Guide*, VTPI (www.vtpi.org), 1998.
- ²⁶ *Local Government Guide to Parking Cash Out*, International Council for Local Environmental Initiatives, (www.iclei.org/us), 1998.

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