Carshare Innovations

Overall Effect on California Petroleum Use		Affects Petroleum Demand Through Intermediate Indicators:	
Magnitude	Medium	**Primary**	Mode Choice
Certainty	Medium	**Secondary**	Distance Traveled
Applicable Level of Government	State, Local, and Federal		
Relevant Laws or Cases Affecting Factor	49 USC . § 30106, California Vehicle Code §22507.1, California Insurance Code §1150.24, San Diego Municipal Code §86.23		
Time horizon for implementation and maturity	Carshare is currently available in California and there are few regulatory barriers to its expansion. Carshare expansion is a near-term strategy to reduce statewide fuel use.		
Relevant Topics	Automobile ownership, transportation services, technology		
Summary	Carshare is an emerging service category that fills existing gaps in travel choice for individuals and households seeking to shed or delay purchase of personal automobiles. Evolution in carshare service offerings will expand the market for the service by reducing the price and providing a greater range of options to meet consumer needs. Because carshare converts a fixed cost to a variable cost, it can reduce driving at the margins.		

Introduction

The range of available transportation options continues to evolve as technology reduces information barriers and transaction costs. Carshare separates the flexibility and convenience associated with personal vehicles from the ownership requirement, providing a close substitute to service users. The latest evolutions in carshare have potential to greatly expand use of the service category. The presence and use of carshare services can lead to reductions in the number of vehicles available to each household and shift the fixed costs of personal vehicle transportation to variable costs. Shifting fixed costs to variable costs lowers the relative incentive for driving versus other modes.

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Types of carshare services

Type of Service	Description	Firms in U.S. or CA
Carshare	Short-term rentals, returned to pick-up location, billed by half hour, vehicles owned by corporation	City CarShare, Hertz on Demand, WeCar, Zipcar,
Point-to-Point Carshare	Short-term rentals, returned anywhere within zone, billed by minute, vehicles owned by corporation	Car2Go
Peer-to-Peer Carshare	Short-term rentals, returned to pick-up location, vehicles owned by individuals	Getaround, JustShareIt, RelayRides, Wheelz

Carshare

Carshare makes automobile access more convenient than with legacy car rental providers. Carshare services typically place vehicles in locations that are more accessible legacy car rental outlets. These locations include within neighborhoods, commercial districts, and other locations – often closer to trip origins than legacy car rental outlets, which zoning in some cities relegates to light manufacturing areas. Carshare services allow users to rent for periods less than 24 hours, which is often the minimum term for legacy car rental services. Transaction times are lower with carshare services than legacy car rental services. An annual membership fee covers member assessment and approval, eliminating the need for a new rental agreement at the time of the rental. Smart card or smart phone access makes entering carshare vehicles only slightly slower than entering a privately-owned automobile.

Carshare services expand the range of transportation options available to individuals and households. For households with automobiles available, the presence of carshare can reduce the vehicle's existence value – the value placed on having the vehicle available when needed, above and beyond the value derived directly from its use. Informal car clubs have for years brought shared automobile access to lower-income communities where automobile ownership and maintenance costs would prohibit household or individual ownership.

If the presence of carshare allows individuals and households to voluntarily reduce the number of vehicles they maintain, it will succeed in shifting travel toward other modes. Some may walk or bike knowing that carshare is available for trips when an automobile would better meet their needs. For walkers, bikers, and those who pre-pay transit with a weekly, monthly, or annual pass, travel is free at the margins and carshare is always more expensive – creating an disincentive to use carshare when viable alternatives exist. Those who typically carpool to work may seek carshare for trips when their personal vehicle is not available and transit alternatives do not met their needs. Even households that own or have access to vehicles may use carshare for times they need an additional vehicle.

Point-to-Point carshare

Point-to-point carshare offers several additional features that regular carshare does not. Point-to-point carshare allows users to only pay for minutes they've used. This can substantially reduce the price of carshare trips where a low proportion of the rental is spent waiting—such as meetings or appointments. Point-to-point carshare also offers the ability for split-mode travel tours, in which a traveler uses carshare for one segment and transit,

real-time rideshare, taxi, or walking in another. The ability to split-modes on a travel tour is common among users of taxis, transit, and rideshare. However, the ability to split-modes on a travel tour is a distinct advantage over regular carshare or privately owned vehicles.

Point-to-point carshare faces several limitations. Point-to-point carshare rentals are currently limited to beginning and ending in a home area where the service provider has formalized a parking arrangement with the municipality. This limits the number of viable trips and increases the time to expand the service to new markets. A model ordinance, sponsored by a county transportation commission or other transportation planning agency, could accelerate the pace of market expansion.

Peer-to-Peer carshare

Peer-to-peer carshare vehicles are owned by individuals, but a service provider coordinates rentals. Peer-to-peer carshare services have a potential to greatly expand the carshare market. Peer-to-peer services can lower the price of carshare services by introducing older, more depreciated vehicles into the market. Commercial carshare operations have a greater incentive to offer newer cars at a higher price point. New vehicles are more marketable and require less staff time for fleet maintenance. Peer-to-peer carshare vehicle owners may assign a lower cost to the time they invest in the operation, seeking to recoup a portion of their own vehicle ownership costs rather than earn a profit. Because of this, individual vehicle owners can introduce peer-to-peer carshare into areas where anticipated willingness to pay and/or utilization levels are too low be profitable for carshare companies. In this way, peer-to-peer carshare can reduce transaction and management costs in order to increase carshare use in lower-income communities and among users with a low willingness to pay.

Carshare Regulations

Carshare and Point-to-Point carshare

California Vehicle Code § 22507.1 defines carshare vehicles as those "operated as part of a regional fleet by a public or private car sharing company or organization" and allows local governments to restrict marked publicly-owned parking spaces to carshare vehicles. State law makes no mention of point-to-point carshare services, which are typically regulated locally.

Car2Go is a subsidiary of Daimler AG that, as of late 2012, operates in Austin, Miami, Portland, San Diego, and Washington, DC and other cities in Canada and Europe. Prior to establishing service in a new city, Car2Go works to pass local legislation to grant point-to-point carshare vehicles special privileges. San Diego (Municipal Code §86.23) allows carsharing vehicles to be parked on public streets when not under lease, to be parked for longer than 72 hours, and creates a special markings for a carshare parking zone. Without such privileges, carshare vehicles would be prohibited from parking at meters and in preferential permit zones. Washington, DC's point-to-point carshare regulations (DC Municipal Code, various amendments to Title 18) establish rules for preferential and permit parking areas, parking at meters, the geographic distribution of vehicles around the city, and sharing operational data with the District Department of Transportation. Local policymakers in Washington, DC wished to assure carshare vehicle coverage in lower income areas of the district.

Because Car2Go and other market entrants must negotiate municipal code changes with

each city, point-to-point trip ends are often limited to a home area. In Washington DC, the home area is the entire District, excluding land subject to federal control. In San Diego, the home area is a small portion of the sprawling 372 square mile city—limited to denser neighborhoods with relatively low curb-parking availability.

Peer-to-Peer carshare

In many states, peer-to-peer carshare faces significant liability risks. In response to these risks, existing peer-to-peer carshare services require all vehicles offered through the service to meet minimum requirements and provide insurance during the rental.

Federal law limits liability to vehicle owners. The 2005 transportation reauthorization act eliminates the vicarious liability of rental vehicle owners when customers engage in negligent driving (49 USC . § 30106). The law does not limit the liability of vehicle owners that are negligent in vehicle maintenance and inspection. Though states have protested this national law as usurping their ability to regulate insurance and liability, courts have upheld the provision on the commerce clause. This federal law is believed to extend to carshare corporations like Zipcar, but it has yet to be applied in a peer-to-peer carshare case. A February 2012 fatal traffic collision involving a car rented through the peer-to-peer carshare service RelayRides may provide the first legal test for the federal law's applicability to peer-to-peer carshare. The parties hit by the now-deceased renter have sued the vehicle's owner and her insurance company (Lieber, 2012).

Californians need not wait for the outcome of this case to understand their liability. A 2010 update to the Insurance Code (§1150.24) explicitly allows individuals to share their personal vehicles under the umbrella of a personal vehicle sharing program, provided that their annual revenue does not exceed the annual cost of owning and operating the vehicle. The personal vehicle sharing program must provide insurance coverage.

Carshare in California

Few academic studies exist to aid in the estimating the potential of new and emerging carshare services to change California's travel demand. Martin, et. al. (2010) estimate that between 9 and 13 vehicles are taken off the road for every carshare vehicle. They also found that the average fuel economy of carshare vehicles was greater than vehicles previously available to members who shed vehicles, and that carshare members drove 8,200 miles per year versus the U.S. average of 12,300.

In a two-year study of City CarShare in San Francisco, Cervero found the following usage rates:

Carshare usage rates, San Francisco study

Month of membership	Percentage of member trips using car share	Percentage of member vehicle miles traveled using carshare
3	2.2%	2.1%
9	8.1%	21.6%
24	6.5%	10.1%

Source: (Cervero & Tsai, 2004) and (Cervero, 2003)

This study occurred in the early market for carshare in San Francisco – between 2001 and 2003. Cervero et. al, (2004) suggest that the novelty of the program wore off after month

9 of the study, resulting in declines in usage between month 9 and 24.

Existing studies are subject to a strong selection bias. Individuals were not randomly assigned to participate in the carshare program—they self-selected. It's likely that the individuals who participate in carshare were already driving less and less reliant on a personal vehicle than the median individual in the carshare's service area.

To estimate carshare's potential to motor fuel use, it's first necessary to determine if potential increases in driving by those at the margins of automobile ownership will offset reductions from other carshare users. It appears that only a small proportion of California households are at the margins of vehicle ownership primarily for economic reasons. After dropping between 1990 and 2006, the percentage of carless Californians increased in 2011. This variation likely has more to do with the real costs of owning and operating a vehicle relative to incomes than the range of transportation options available to Californians. However, the low variation gives some indication that only a small proportion of California households may be at the margins of vehicle ownership – perhaps less than 1.5%.

California households with no Vehicles available

Year	Value	Data Source
1990	8.89%	Decennial Census (SF-3, H7)
2000	7.75%	Decennial Census (SF-3, HCT033A)
2006	7.42%	2006 American Community Survey (1-year sample, B08201)
2011	8.02%	2011 American Community Survey (1-year sample, B08201)

In addition, workers in households without vehicles available drive far less often than the average Californian. In 2011, workers without a vehicle available to their household were 8.7 times more likely to take public transportation to work than were workers with a vehicle available to their household. These workers were 34% as likely to commute alone.

Means of transportation to work for California workers by household vehicle availability, 2011

Means of Transportation to Work	No Household Vehicle Available	Household Vehicle Available	Relative Frequency
Drove Alone	25.68%	75.49%	34.0%
Carpooled	12.21%	11.08%	110.2%
Public Transportation	34.78%	3.99%	871.0%
Walked	12.67%	2.15%	588.8%
Taxicab, Motorcycle, Bicycle, or Other Means	9.16%	2.11%	434.4%
Worked at Home	5.52%	4.99%	110.6%

Source: 2011 American Community Survey (1-year sample, B08141)

The variable cost of carshare use moderates carshare's potential to increase private car use among low income individuals. While carshare trips by low income individuals have a great social benefit, their effects on fuel demand are expected to be minimal as most price-sensitive limited-income individuals are more likely to use carshare only when other, cheaper alternatives do not meet their trip-making needs. California's lower income

individuals and households currently demonstrate well below-average-rates of vehicle use.

Evaluating Carshare's Effects on California's Fuel Use

Several factors will encourage or potentially limit carshare's effect on California motor fuel demand.

Factors encouraging car share use and potential reductions in motor vehicle fuels

- Peer-to-peer carshare services will rapidly increase carshare supply, with supply of carshare vehicles spatially correlated to residential and employment density, transit service quality, and university neighborhoods.
- Expanding carshare supply will improve the spatial and temporal coverage carshare networks, attracting more adoption. The virtuous adoption cycle will also increase demand for other transportation options, like walking, biking, and transit.
- The primary effect of carshare availability on fuel use is not expressed through carshare use, but rather through how carshare alters individual and household travel behavior. Carshare provides a pathway for individuals and households that exhibit below-average vehicle travel to travel even less. Carshare availability improves such household's quality of life by providing a new transportation option.

Factors limiting reductions in motor vehicle fuel use

- Carshare is unlikely to alter the travel behavior of high-driving individuals and households. However, as the transportation network evolves in the long run, the factors which influence car ownership will adjust and adoption will continue.
- Carshare's effects to reduce vehicle ownership will be borne by individuals and households that exhibit below-average vehicle use.
- Carshare services will compete with real-time rideshare and other emerging service categories for each trip. Robust real-time rideshare options could reduce demand for all carshare trips, including point-to-point trips.

As the relative magnitudes of these factors have not been studied, a range of outcomes are possible as California transitions to carshare.

Carshare adoption scenarios and corresponding change in California petroleum use

	Low-Case	Mid-Case	High-Case
Percentage of registered automobiles participating in carshare	0.25%	1%	2.5%
Carshare vehicles in California	49,932	199,728	499,320
Personal automobiles eliminated per carshare vehicle	3	6	11
Average net reduction in miles traveled per eliminated vehicle	1,000	2,300	4,100
Reduction in California motor vehicle fuel demand	0.05%	0.85%	6.98%

The low-case describes minimal adoption of carshare in California—its relegation as niche service used in the densest downtowns and near universities. The high-case scenario describes widespread adoption, with large increases in carpooling and transit use spurred by availability of carshare. The high-case data uses values from Martin, et. al. (2010). The mid-case scenario shows that limited petroleum reductions could occur even with substantial increases in the number of carshare vehicles available.

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