

Demand for Carsharing Systems in Beijing, China: An Exploratory Study

Susan A. Shaheen, Ph.D. and Elliot Martin

Susan A. Shaheen, Ph.D.

Honda Distinguished Scholar in Transportation, University of California, Davis &
Research Director, Transportation Sustainability Research Center (TSRC)

University of California, Berkeley

1301 S. 46th Street, Bldg. 190

Richmond Field Station

Richmond, CA 94804-4648

510-665-3483 (O); 510-665-2183 (F)

sashaheen@tsrc.berkeley.edu; sashaheen@ucdavis.edu

Elliot Martin

University of California, Berkeley, TSRC

Graduate Student Researcher

510-665-3576 (O); 510-665-3537 (F)

elliott@uclink.berkeley.edu

ABSTRACT

Rising auto ownership in China brings significant urban and environmental challenges. Since China is still in the early stages of motorization, there are opportunities to introduce alternatives to personal vehicle ownership. The authors conducted a survey with 800 Beijing residents; collecting data on transportation patterns, automobile ownership, environmental attitudes, and carsharing response. Fifteen of those participants were selected to complete an in-depth questionnaire discussing how they would use carsharing services. This paper assesses the potential for carsharing systems within Beijing, China based on this exploratory study. While the results suggest that carsharing models integrated into existing transit networks could become an important mobility option within China's rapidly growing cities, further study is recommended.

1. INTRODUCTION

China's remarkable economic expansion is a major driving force for present day globalization. Internally, China's growing economy is exhibiting many of the same developmental patterns and trends that were traditionally observed within the world's developed nations during the 20th century. In particular, China's economic growth has been characterized by increased private vehicle ownership and accelerated urbanization.

The central government in Beijing has made auto ownership and the development of a domestic auto industry both national priorities (Gan, 2003). China's automotive expansion has notable implications for the rest of the world. With vehicle ownership rates a mere fraction of those present within most industrialized countries, China is already the world's third largest oil importer after the United States (US) and Japan and the second largest oil consumer (He et al., 2005; Energy Information Administration, 2007). While autos can provide a high degree of personal freedom and mobility to society, their widespread use has negative implications for traffic management, air quality, energy, land use, and human health. China's central government is aware of the impacts of increased auto use, particularly urban air quality and energy security. In response, it has retraced some of its earlier policies by encouraging public transportation development and investigating travel demand management tools, such as carsharing.

This paper includes six main sections. It begins with a brief overview of China's existing transportation system with an emphasis on Beijing. Second, the authors review documented carsharing benefits from Europe and North America. Next, the study methodology, detailed intercept survey results, and expert interview findings are presented. Finally, the authors conclude with a summary of key findings.

2. CHINA'S TRANSPORTATION SYSTEM: TRENDS AND FUTURE DIRECTIONS

With 1.3 billion people, China is the most populous country in the world and the second largest land mass nation. About 90% of its population lives in the eastern half of the country, driving the high population densities observed in many Chinese cities.

Developed East Asian nations, such as Japan and South Korea, have high-density urban environments supported by rich transit networks. While China's population far exceeds that of its neighbors, it is not as spatially confined. Even if China were only half its present size, its average population density would be a little more than half that of South Korea. In this way, China is distinct from other Asian countries in that low-density urban development has historically been more constrained by economics than by geography.

As with most of the world's metropolitan regions, population density in China's largest cities is variable. For instance, the city of Beijing has 18 districts. Four of these—Dongcheng, Xicheng, Chongwen, and Xuanwu—have population densities between 22,000 and 29,000 people per kilometer, which are comparable to some of the densest cities in the world. Four other districts have densities between 3,000 and 5,000. The remaining ten districts have densities below 1,000, with four of those under 200 (Beijing Municipal Bureau of Statistics, 2007). Current urbanization trends show that density is increasing in many Chinese cities. This has been fueled by a massive, and sometimes seasonal, rural-to-urban migration, which has caused local governments to increase edge-city developments and municipal densities to increase in outer districts

(Cherry, 2005). While Beijing is the political and cultural hub of China, Shanghai and Chongqing rival it in population and density.

2.1 Transportation System Evolution in China

Urban transportation systems within China have experienced a unique evolution that has been heavily influenced by the country's communist history. China's centrally planned economy inhibited the advancement of transportation systems across the country. From 1949 to 1980, motorized transportation largely consisted of bus travel. Most trips were short distance; walking and cycling were the dominant modes. And, Beijing had the only subway system in China (Liu and Guan, 2005).

Congestion caused by increasing motorization in China initiated a decline in transit services. While the number of public transit vehicles increased across China during the mid-1990s, there were mixed ridership effects. In some cities, including Beijing, Tianjin, and Ghanzhou, the total number of passengers carried increased, while many other cities witnessed a decline in passengers despite a doubling of transit vehicles (Walsh, 2000). Indeed, China's economic capital of Shanghai initially witnessed one of the most pronounced drops in transit ridership. From 1986 to 1995, transit modal share fell from 24 to 15%. During this timeframe, there was an increase in bicycle ridership and a decline in walking (Chang, 2000). Faced by increasing congestion and industrialization, the central government made investments in urban rail systems in the mid-1990s. These systems are still expanding today, and these investments appear to be reversing some of the declines that occurred during the 1990s. For instance, in Shanghai, suburban growth and transit system expansion have allowed transit ridership in Shanghai to recover back to levels above 20% (Pucher et al., 2007).

The underlying forces fueling China's motorization are consistent with those of other countries. China fits well within the international experience of vehicle growth as correlated with income measures, such as gross domestic product (GDP) per capita (Chinese Academy of Engineering and National Research Council, 2003). Today, China's vehicle ownership density is 28 per 1,000, while the US has 785 vehicles per 1,000 people (Cherry, 2005). Within Beijing, the rate of private vehicle ownership is higher at 11 percent, with 1.8 million private vehicles spread among 15.8 million people (Beijing Municipal Bureau of Statistics, 2007). Furthermore, the prevailing vehicle technology on Chinese roads has had emission levels similar to US autos during the 1970s (Chinese Academy of Engineering and National Research Council, 2003). Recent research also reports that suspended particulates within the city of Beijing are seven times as high as New York and Tokyo (Liu and Guan, 2005).

3. CARSHARING BENEFITS: A BRIEF WORLDWIDE OVERVIEW

Much of the cost of owning and operating a personal auto is fixed as a large majority of private vehicle expenses are paid regardless of how much a car owner drives (Litman, 2000). Shared-vehicle services transform the fixed costs of auto ownership into variable costs because a member's use is closely tied to actual expense (typically an hourly and mileage fee). Thus, carsharing offers individuals many of the benefits of personal vehicle use (e.g., convenience, flexibility) without the costs and hassles of ownership. The higher marginal cost of driving induces consumer to use the automobile more efficiently. Depending upon the location and organization, the maximum annual mileage up to which

carsharing is more cost effective than owning or leasing a personal vehicle lies between 10,000 to 16,000 kilometers (Litman, 2000; Reynolds and McLaughlin, 2001).

Carsharing programs began in Europe during the mid-1980s and later spread to Canada, the US, and Japan during the mid- to late-1990s. Shared-vehicle programs have since expanded to other regions including: Australia, New Zealand, Malaysia, and Singapore. Carsharing is operating in approximately 600 cities around the world, in 20 nations, and on four continents. Another seven countries are exploring shared-vehicle services. There are approximately 348,000 carsharing participants worldwide (Shaheen and Cohen, 2007).

Research from Europe and North America has documented the social and environmental benefits associated with carsharing. Differences in data collection and study methodology frequently produce inconsistent results, often with limited samples, which makes it difficult to precisely estimate carsharing impacts. Thus, results are often represented in the context of a range to account for variability in study results.

Several countries in Europe are home to successful carsharing programs that have had a measured impact on car ownership. In Germany, a review of an unpublished study of 14 carsharing organizations suggested that 13% of shared-vehicle customers gave up their car, while 4% gave up a second or third vehicle (Loose et al., 2006). In the Netherlands, a study in the late-1990s found that carsharing induced a 39% reduction in private vehicle ownership among carsharing users (Autodate, 1998; Shaheen et al., 1998). A review of North American carsharing impacts found that up to one third of participants sold a vehicle after joining a carsharing service (Robert, 2000; Jensen, 2001). And, up to nearly two thirds of participants delayed or forwent a vehicle purchase (Lane, 2005;

Katzev, 1999). Not surprisingly, reduced vehicle ownership leads to declines in personal vehicle kilometers/miles traveled, energy use, air pollution, and land allocations for parking. A survey in Bremen, Germany found that the annual kilometers driven among members had dropped by 32% (an average reduction of 1,627 kilometers) (Koch, 2001). Other European countries, including Denmark and Switzerland, observed reductions in driving among carsharing members (Olsen et al., 2000; Zipcar, 2006). In North America, studies have suggested a wide range in driving reduction—from 8 to 80% (Lane, 2005; Flexcar, 2006; Cooper et al., 2000). Such a range is due to differences in data collection, analysis timeframe, location, and behavioral variations among members. In a recent review of North American studies, Shaheen et al. (2006) calculated an average VMT reduction of 44% among existing programs.

Carsharing also lessens the pressure to expand parking facilities and can facilitate more efficient and compact urban land-use patterns. In the US and Canada, for instance, municipalities are supporting policies, such as parking reduction (i.e., downgrading the number of spaces in a new development) and allowing greater floor area ratios (i.e., developers can build more intensively on the site) (City of Vancouver, 2005; Millard-Ball et al., 2005; Enoch, 2002). Carsharing also can provide an economic benefit to users when the annual cost of shared-vehicle use is less than the annualized cost of ownership (Shaheen et al., 2003).

In contrast to deployments in industrialized nations, carsharing may be more readily incorporated into developing nations where motorization is still in its early stages, perhaps lessening the long-term demand for private vehicle ownership. While carsharing has documented benefits throughout numerous industrialized nations, the greatest impacts

may have yet to be realized in developing countries. The incorporation of carsharing in developing countries may be fundamentally different from its evolution in industrialized countries. Zegras and Gakenheimer (2000) suggest such a scenario for Santiago, Chile, in which the primary customers of carsharing are those who are of modest means and may aspire to own a car, while placing a higher priority on education, living environment, and retirement savings. Carsharing may provide sufficient access to vehicles that, if privately owned, would otherwise require secure storage space, which is in short supply in many developing cities. It is possible that carsharing in developing countries could initially cause vehicle use to rise slightly faster than it would have otherwise due to increased auto access. However, the ultimate impact of carsharing on vehicle use will depend upon auto ownership rates overall. For instance, if rising automobile ownership is considered to be inevitable, then public and private adoption of carsharing could reduce the total long-term demand for vehicle ownership, as consumers achieve a satisfactory level of benefits from the automobile without purchasing one.

4. METHODOLOGICAL APPROACH: BEIJING CARSHARING SURVEY

From May to June 2006, the authors employed a Chinese research institute to implement an intercept survey developed by Dr. Susan Shaheen in several locations within Beijing. This survey was designed to be exploratory. The overall response rate was approximately 33%, with 840 completed surveys. During this period, 12 interviewers in teams of two were dispatched to busy locations within five of Beijing's 18 districts including: Chaoyang, Haidian, Chongwen, Xicheng, and Xuanwu. Three of these districts are

among the densest in Beijing, exceeding 20,000 people per square kilometer. The other two, Haidian and Chaoyang, have a medium but rising population density of 5,000 to 6,500 (Beijing Municipal Bureau of Statistics, 2007).

Researchers intercepted individuals passing by a pre-defined area on the street, near supermarkets, as well as within residential areas. Interviewers received a strict protocol for engaging and surveying citizens and were instructed to approach only individuals who appeared to be between the ages of 20 to 50. Prior to being asked questions about carsharing midway through the survey, respondents were read a thorough description of carsharing as it is commonly understood in the US. Participants then answered questions ascertaining the degree to which carsharing defined in this way would offer any enhancements in satisfying their current travel needs. One of those questions assessed whether the respondent had heard of carsharing services before. Those who indicated they had heard of carsharing were considered familiar, while those who had not were considered unfamiliar with carsharing. While carsharing can be a challenging concept to convey to those unfamiliar with it, the description was carefully tailored and pre-tested for understanding in close collaboration with our Chinese research partners to represent it as accurately as possible. Nonetheless, physical examples of carsharing did not exist in Beijing at the time of the survey; thus, these results should be considered exploratory. A subsequent study employing videos, brochures, or both, which provide a more comprehensive introduction to the concept, is recommended as a next step.

Interviewers were instructed to seek out approximately 400 individuals who were familiar with carsharing and 400 who were not. Participants who were familiar with

carsharing were intentionally over sampled as they were understandably a minority of the population. The success rate for recruiting those familiar with carsharing was approximately 10% (i.e., approximately 10 individuals were approached to identify one person familiar with carsharing). Ultimately, researchers collected 317 surveys from people who were familiar with carsharing and 520 from those who were not. While the total number of participants familiar with carsharing is below the intended target, the authors deem this quantity satisfactory for exploration.

After the intercept survey was completed, researchers conducted a follow-up in-depth interview with 15 respondents who expressed interest in carsharing during the intercept survey. These participants were interviewed more extensively to understand their specific travel patterns and how carsharing might fit into their tripmaking routines. The in-depth interviews also probed for potential challenges that carsharing organizations might encounter in Beijing.

To gain an understanding of carsharing demand, Shaheen designed the intercept survey to examine respondents' familiarity and experience with private autos as well as future plans to acquire a personal vehicle. This included perceptions of the various costs and benefits of auto ownership. Interviewers also queried the basic travel needs of respondents, including daily transportation modes. In addition, the survey explored attitudes toward automobiles and perceptions towards environmental issues associated with urban motorization. This information supplemented questions detailing participant interest and response to carsharing. The questionnaire ended with the collection of demographic traits.

The survey contained several distinguishing questions that enabled the authors to analyze subgroup response (i.e., those familiar/unfamiliar and interested/uninterested in carsharing). The aim of this subgroup comparison was to understand how each subgroup differs. The authors noted a variety of differences among specific subgroups within the entire population, which were concealed in the aggregate analysis. A defining survey question asked whether participants previously had heard of carsharing (e.g., Internet, international media coverage). Since carsharing is a relatively new concept to China, the authors hypothesized that those “familiar with carsharing” had unique characteristics from those “unfamiliar” with it. While distinctions between the two groups existed, they were rather limited. One notable distinction is that individuals previously aware of carsharing were slightly skewed towards higher income and education levels. Attitudinal questions, however, detected little difference in response.

While “familiarity with carsharing” was not found to be a distinguishing market feature in this study, researchers simultaneously sought to gauge interest in future carsharing participation. After answering questions related to possible carsharing concerns and motivations for use, respondents were asked to rate on a scale of one to five, their likelihood of participation. A score of five equaled “highly likely to participate,” while a score of one meant “unlikely to participate.” Out of the total sample, 26.4% of respondents (222 individuals) reported that they were likely or highly likely to use carsharing. Among those participants, 40% (89 individuals) also belonged to the “familiar with carsharing” subgroup. Ultimately, “interest in carsharing” was found to be a more distinguishing feature among all respondents. In the analysis that follows, the authors focus on illustrating differences between the 73.6% (618 respondents) who were

“uninterested in carsharing” and the 26.4% who were “interested” in using it. These groups were mutually exclusive. Interestingly, distinctions found between the two were often amplified in the subgroup that was both “interested” in and “familiar with carsharing.”

5. INTERCEPT SURVEY RESULTS

The gender distribution among the total sample was almost evenly split; this varied slightly within the two subgroups partitioned by “carsharing interest.” Roughly 70 percent of the sample was married, and the remainder was single. The age distribution of the sample was characterized by four categories spanning the ages of 20 to 50 (i.e., 20 to 25, 26 to 35, 36 to 45, and 46 to 50). The sampled age distribution matched closely with the actual age distribution within Beijing (Beijing Municipal Bureau of Statistics, 2007). In general, those “interested in carsharing” were skewed towards younger age categories, and this was more pronounced in the subgroup of individuals both “familiar” with and “interested in carsharing.” It should be noted, however, that “interest in carsharing” was not just consigned to younger adults (20 to 35 years of age); 44% (97 respondents) of this subgroup was between the ages of 36 and 50. In addition, while respondents “interested in carsharing” were more highly educated than those uninterested in carsharing, approximately 40% of interested respondents (88) had a high school diploma or lower. Mobile phone use was nearly ubiquitous at 95% (794 respondents) and even higher for the subpopulation “interested in carsharing.”

The dynamics of per capita income have important implications for car ownership and carsharing. Figure 1 illustrates three main points on income from the survey data.

The bar graph shows the monthly per capita income distribution of those “interested” and “uninterested in carsharing.” Income is presented in per capita terms for two reasons. First, it better reflects the financial constraints faced by households, and it permits a direct comparison to published governmental income distribution data. While the income distribution of the two groups generally follows the same shape, it shows that those “interested in carsharing” were slightly skewed to higher incomes. The table in the upper right hand corner of Figure 1 shows the average per capita monthly income of a 2,000 person sample within Beijing (Beijing Municipal Bureau of Statistics, 2007). The per capita discretionary income of the sample is averaged within quintiles, and the data from the survey used in this study are similarly calculated for comparative purposes. The comparison shows that the middle-income distributions from the survey and the governmental data match rather well, while the incomes within the lower and higher distributions differ by some margin. Thus, given this comparison with governmental data, we find that the sample was fairly representative of the Beijing middle class, but that it also contained a greater representation of income extremes.

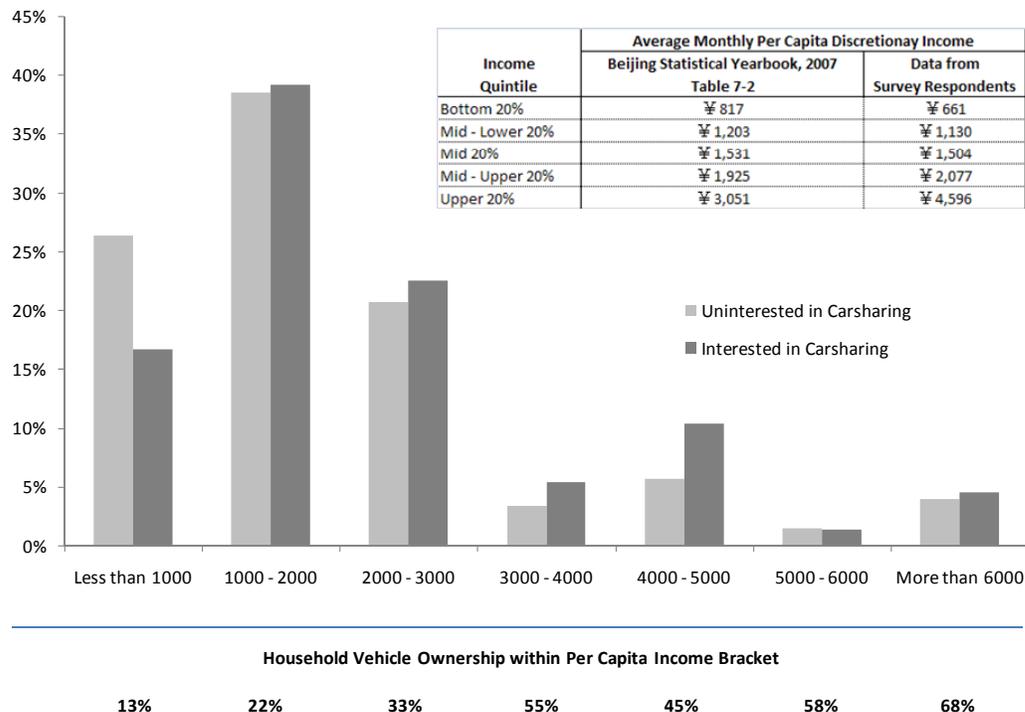


FIGURE 1 Distribution of Per Capita Monthly Income of Respondents (Yuan).

The final point to observe within Figure 1 is the vehicle ownership proportions listed across the bottom. These percentages describe the percent of households within the given per capita income range that owned a vehicle. It illustrates the levels of per capita incomes at which auto ownership began to take hold in large proportions among the households. As expected, car ownership rises with income. Once the per capita income of a household exceeds 3,000 yuan per month, auto ownership starts to become more common.

5.1 Automobile Experience

Between just 2005 and 2006, the total number of motor vehicles within Beijing grew by 12%, adding 293,000 vehicles to the road (Beijing Municipal Bureau of Statistics, 2007). Roughly 92 percent of this growth was fueled strictly by increases in private automobiles. In this context, researchers sought to gain an understanding of respondents' auto experience. Overall, 27% (228 respondents) were members of households that owned a vehicle. Households ranged in size from 1 to 8 people, but the average was 3.1. When considering the population represented by the households in the survey (accounting for household size), the automotive ownership rate was close to 10%, which is in line with aggregate Beijing statistics. However, not all of the respondents drove the vehicles within their household across the entire sample, as only 21% (179 respondents) reported that they could drive. The majority of these respondents (123 individuals) were members of families that owned a car. Half of the remaining drivers (31 respondents) reported that they drove a company car but did not own their own. Analysis of driving frequencies reveals that everyday car use was prevalent among 55% (97 respondents) of the study's driving population. Another quarter of drivers used autos three to four times a week, while the remaining drove a car at most once a week. The results suggest that there were driving individuals that did not need to use a vehicle everyday among the sample. A similar range of behavior exists with respect to driving distances, as 10% of drivers on average drove less than 10 kilometers/day, 31% drove between 11 and 30 kilometers/day, 21% drove between 30 to 50 kilometers/day, and 31% drove more than 50 kilometers per day, with the final 7% unsure. Those drivers "interested in carsharing" expressed a slight preference toward shorter trips as opposed to those "uninterested in carsharing."

5.2 Modal Share

Understanding how people travel is essential to operating a carsharing service that meets customer needs. In the survey, interviewers asked respondents to list the modes they typically use to conduct daily activities. The activity destinations listed include: work, friends and family, child's school, shopping, and leisure travel. Respondents were allowed to select all modes used to access these destinations. Half of respondents (414 individuals) selected at least two modes, and nearly 12% (97) indicated at least three. Figure 2 below illustrates the modal share exhibited by those "interested" and "uninterested in carsharing." Each percentage indicates the proportion of subgroup respondents that reported a particular mode.

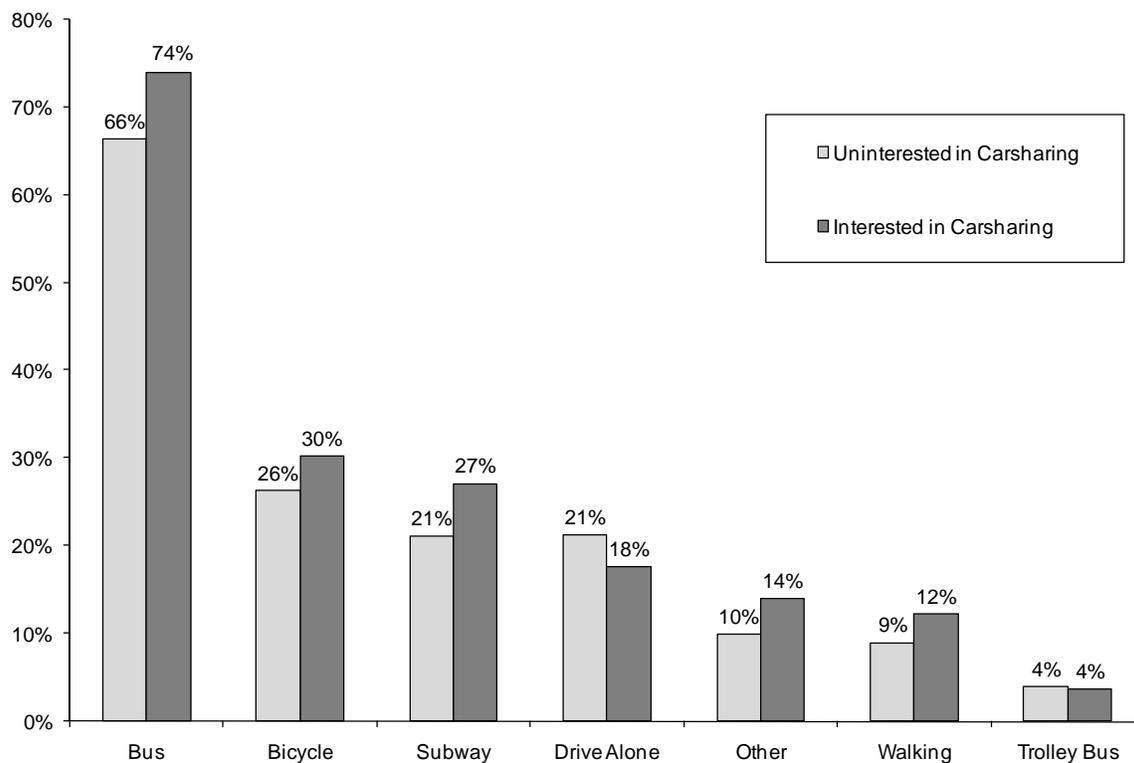


FIGURE 2 Transportation Modes Used by Respondents.

Not surprisingly, the primary mode was public transit. Higher levels of subway and bicycle use also show that transportation is not auto dominated in Beijing. Although the distribution across each carsharing interest subgroup is the same, those “interested in carsharing” dominated nearly all modes except drive alone. The current reliance on transit and cycling found in this survey suggests that carsharing could augment current modes and perhaps limit vehicle growth as opposed to reducing existing vehicle ownership. Nevertheless, further study of these dynamics is recommended.

Next, the authors sought to understand whether participants were actively considering a vehicle purchase. Those who did not already own cars were asked whether they planned to purchase or lease a vehicle within the next six months. Among those who did not own a car, 20% (122 respondents) reported that they were planning to acquire a personal vehicle. Among the “interested in carsharing” subgroup, this figure was 30% (51 respondents). Only 15% (71 respondents) of the “uninterested in carsharing” subgroup was considering a car acquisition. Thus, while the “interested in carsharing” subgroup was less auto-reliant (18% vs. 21% drive alone) than those “uninterested,” a higher proportion of the former group was seeking to expand their mobility options through a vehicle purchase. If carsharing were available in Beijing today, some vehicle purchases among this group might be avoided.

5.3 Auto Ownership Perceptions

As part of the survey, respondents also were asked to indicate the advantages and disadvantages of auto ownership. In addition, respondents who reported that they did not plan to purchase a vehicle in the next six months were asked why. Results from the total population are summarized in Table 1 below.

Auto Ownership Advantages (n = 840)	%	Auto Ownerships Disadvantages (n = 840)	%	Auto Purchase Deterrents (n = 490)	%
Travel convenience	70%	Parking problems	46%	Buying a car is expensive	50%
Increases comfort of travel	35%	Environmental pollution	34%	Public transit is convenient	26%
Increases mobility and scope of activity	17%	High cost	31%	Parking is difficult	25%
Symbol of social status	11%	Financial pressure	16%	Walking or biking is convenient	13%
Makes travel safer	4%	Unsafe	8%	Driving is not safe	10%
Other	1%	Other	2%	Other reasons	5%
				Driving stress	5%

TABLE 1 Positive and Negative Aspects of Auto Ownership

The percent listed above indicates the proportion of participants who responded positively to one or more choices; thus, percentages do not sum to 100. The results presented above illustrate that “convenience” and “comfort” are the dominant auto benefits among the sample.

The authors note the relatively low percentage of respondents who indicated “social status” as a vehicle benefit. This aspect of car ownership is often mentioned as a force that spurs motorization in the developing world (Sperling and Clausen, 2002). In a similar attitudinal question, the majority of the total population also disagreed or indicated indifference to the suggestion that automobiles largely reveal a person’s social status. This factor may be underreported among participants, as another question revealed

more conventional sentiments. When asked: “The car I own or drive can show my social status to a great extent,” nearly 40% disagreed, roughly 27% were neutral, and the remaining 33% agreed. While this illustrates a stronger link between vehicle ownership and social status, it still finds two-thirds of respondents not in agreement with this statement.

With respect to auto ownership, participants ranked parking, pollution, and expense among the highest disadvantages. Respondents also indicated that alternative mode convenience also obviates the automobile. For individuals who did not already own nor planned to purchase/lease a vehicle in the next six months, high costs, transit convenience, and parking constraints factored the highest among deterrents to a future auto purchase.

6. IN-DEPTH INTERVIEW FINDINGS

Because the sample size of the in-depth interview was restricted to 15 respondents, researchers caution against extracting broad generalizations from the following results. Nevertheless, the objective of the in-depth interviews is to obtain special insights that are generally not available by surveys comprised of multiple-choice questions. The interview questions are more detailed and the answers more open ended, they can provide valuable insights into how participants envision themselves using carsharing services and the challenges they might encounter. Eleven of the respondents believed that they would use carsharing for local trips under 50 kilometers, while the remaining four respondents envisioned using carsharing for trips that were 100 kilometers or more. The average one-way trip time for the various trips reported by respondents were: 30 minutes for

shopping, 20 minutes for errands and chores, 65 minutes for visiting friends and family, and 85 minutes for long-distance leisure travel.

Participants were asked their preferred three locations for accessing a carsharing vehicle. The top ranked site was “within my neighborhood;” the second choice was “at my workplace or school,” followed by “at a rail transit station.” Interviewees also were asked how much time they would be willing to spend accessing a shared vehicle. Three indicated that they would not devote more than 10 minutes to accessing one. Another five reported that they would spend 10 to 15 minutes, while the other seven would be willing to dedicate 15 minutes or more. In addition, participants were asked the distance that they would be willing to travel to retrieve a vehicle. The majority (nine) indicated that they would not travel more than one kilometer. Five of the remaining respondents said that they would be willing to travel one to two kilometers.

The in-depth interviewers also asked participants to estimate an affordable rate per hour and mile for carsharing use. The average hourly rate projected by participants was 25 yuan (roughly \$3.18 US at the time of the study) with responses ranging from 5 to 50 yuan (\$.64 to \$6.36 US) per hour, while the average mileage charge was roughly 2 yuan (\$.25 US) per kilometer with a range of .5 to 5 yuan (\$.06 to \$.64 US).

Additionally, interviewees were asked how frequently they thought they would use a carsharing vehicle, assuming affordable rates. The most common answer was once per week. Five respondents, nevertheless, indicated that they would consider using carsharing four to five times per week.

Participants overwhelmingly chose the sedan as the most popular carsharing vehicle model. Out of a wide array of vehicles, four participants selected the “other”

category, indicating a “cross-country jeep” as their preferred carsharing vehicle.

Interviewees thought that the Internet and telephone would be the most convenient ways to make a carsharing reservation. Additionally, participants were asked if there was any information that they would be uncomfortable providing to a carsharing organization. The top response was income, and the second highest choice (seven participants) was family size.

In a series of open-ended questions, interviewees were asked if they had any apprehensions about carsharing. Responses reflected concerns about their responsibility in the case of a carsharing vehicle theft or accident. Overall driving safety and carsharing vehicle safety were even greater concerns among participants. Finally, interviewees were asked to consider general carsharing challenges in China. One individual noted that entrepreneurs had tried to implement carsharing previously, but they were unable to secure convenient access locations. In general, interviewees commented that parking is an enormous challenge for drivers in China and that guaranteed parking spaces for carsharing vehicles would be a considerable benefit.

7. CONCLUSION

In response to increasing concerns over energy security and urban air quality, China’s central government is encouraging public transportation and alternative fuel development, along with investigating innovative mobility strategies, such as carsharing, which has demonstrated social and environmental benefits.

To investigate carsharing’s potential in Beijing, the authors implemented an 840-person intercept survey to better understand the familiarity and response of residents to

this concept. Since carsharing organizations did not exist in Beijing at the time of this study, researchers relied upon a carsharing definition read to participants to convey this concept. While this definition was pre-tested for understanding among Chinese colleagues, results should be considered exploratory and followed with further investigation.

The exploratory study results suggest that citizens may be receptive to carsharing. Over 25% of the total sample expressed a high level of interest in carsharing, suggesting that if properly priced, carsharing would have a base of customer interest at least within Beijing. Furthermore, only 11% viewed the automobile as a status symbol, possibly suggesting that mobility rather than ownership is the priority among the majority of respondents. In spite of this, survey data showed how vehicle ownership rates rise with per capita income and, this might constrain future carsharing markets.

While those “interested in carsharing” are slightly wealthier and more educated than those “uninterested in carsharing,” the differential is small. In general, those “interested in carsharing” were skewed towards younger age categories (20 to 35), and this was more pronounced among individuals both “familiar” with and “interested in carsharing.” Nevertheless, carsharing appears to have appeal across the socio-demographic groups in this study.

As carsharing develops during a time of rapid motorization in Asia, it could help to shape China’s urban mobility by satisfying the growing demand for private vehicles, while perhaps complementing transit and other alternative modes instead of displacing them. If embraced by governmental planning, carsharing may be able to achieve a high degree of integration with the urban form of Chinese cities. Rapidly developing countries

will continue to reshape their urban areas far faster than the developed countries in which carsharing began. As urban China continues to grow, integrating transportation demand management strategies, such as carsharing, within its urban infrastructure may help citizens to achieve automotive mobility while mitigating the significant environmental impacts that accompany widespread auto ownership.

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