ASSESSING EARLY MARKET POTENTIAL FOR CARSHARING IN CHINA: A CASE STUDY OF BEIJING

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ABSTRACT

China's economic expansion is fueling an accelerated demand for private vehicles. While China's growing motorization is similar to that of other developing nations, the scale of this growth is unprecedented. Personal motorization provides numerous benefits to individuals and society; however, roadway congestion, parking inefficiencies, and environmental challenges typically accompany widespread auto use in urban areas. Carsharing is an innovative transportation demand management strategy, which can offer its members the convenience and flexibility of vehicle ownership at lower cost. It has also demonstrated environmental and social benefits.

In Spring 2006, the authors implemented an 840-person intercept survey within Beijing to explore carsharing familiarity and response. The questionnaire assessed respondents' travel patterns and needs, vehicle purchase intentions, and carsharing interest. The results indicate a potential demand for carsharing services. Over 25% of respondents expressed a high level of interest in carsharing. Interestingly, only 40% of this group was previously familiar with the concept. Those "interested in carsharing" are more inclined to take transit, bicycle, and walk and have slightly higher income and education levels. While respondents "interested in carsharing" are less auto-reliant than those who are "uninterested" (18% vs. 21% drive alone), a higher proportion of the former (30% vs. 15%) indicated a planned vehicle purchase/lease. Since only 21% of respondents reported that they are able to drive, driver education may be critical to future carsharing adoption. Despite this finding, survey results indicate a notable interest in carsharing as an alternative to vehicle ownership among urban residents in China.

KEY WORDS: China, Beijing, carsharing, response, market potential

WORD COUNT: 7,481

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. Swelling population density has overwhelmed many of the largest cities. In response, local urban policy decisions have focused on lowering city density by developing specialized towns on the urban fringe (*1*). Historically, Chinese cities developed prior to the age of motorization. After the communist revolution of 1949, motorization was limited and slow to grow. During this period, walking, bicycling, and public transit were the primary transportation modes.

China's transformation began with an economic reform policy in the early 1980s. Collaboration with industry internationally exploded, and China has since become the manufacturing center of the world. China's citizens were also officially encouraged to acquire personal wealth. The central government in Beijing made auto ownership and the development of a domestic auto industry both national priorities (*2*). From 1999 to 2002, the number of cars in China increased by 55% (*3*).

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 consumer after the U.S. and Japan (*3*). 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 and 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, increasing deployment of alternative fuels (*2*), and investigating travel demand management tools, such as carsharing.

Carsharing offers individuals an alternative to private vehicle ownership. It benefits individuals by transferring the fixed costs of ownership into variable costs, allowing users to tailor their auto-use expense to their personal needs. Furthermore, carsharing has documented social and environmental benefits including: reduced auto ownership, miles/kilometers traveled, and emissions; increased transit, walking, and cycling; more efficient land use; and mobility benefits for lower-income populations (*4*). If carsharing is integrated into China's developing motorization strategy, it could provide an attractive alternative to auto ownership, particularly among urban residents.

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.

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. Most developed East Asian nations have high-density urban environments and rich transit networks. Unlike most nations in East Asia, which are spatially confined, China still has numerous sparsely populated regions. In this way, China is distinct from other Asian countries because low-density, auto-oriented development is now possible for many areas. Previously, national policy constraints on wealth prevented this.

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 700, with four of those under 200 (*5*). 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 (*6*). While Beijing is the political and cultural hub of China, Shanghai and Chongqing rival it in population and density.

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 (*7*).

Economic liberalization in the mid-1980s started the gradual modernization of China's transportation systems. The number of buses grew, but taxis and other forms of paratransit developed even faster (*8*). In addition, the early 1980s experienced a 5 to 10% increase in transit ridership per year. However, towards the mid- to late-1980s, transit ridership started to decline (*7*). During and after this period, the government still supported public transportation as the dominant transportation mode in urban areas. This policy soon conflicted, however, with the desire for economic growth and a domestic automotive industry (*2*). As part of its 8th five-year plan (developed for 1991 to 1995), the central government declared its goal of making auto manufacturing a leading domestic industry (*9*). During this period, paratransit growth alone caused bus ridership declines. From 1991 to 1998, the total number of taxicabs quadrupled from 75,000 to over 300,000 nationwide (*7*).

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 (*10*). However, many cities witnessed a decline in total passengers carried, despite a doubling in transit vehicles (*10*). Indeed, China's economic capital of Shanghai witnessed one of the most pronounced drops in transit ridership. From 1986 to 1995, transit modal share fell from 24 to 15%, while personal motorized transport rose from 3 to 7%. During this timeframe, there was an increase in bicycle ridership and a decline in walking (*8*). 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. At present, there are ten urban rail systems in China; about half have just one or two lines. In contrast, South Korea and Japan have at least six and 12 urban rail systems, respectively.

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 (*9*). Today, China's vehicle ownership density is 28 per 1000, while the United States (U.S.) has 785 vehicles per 1000 people (*6*). Another aspect of China's motorization is vehicle technology. A recent joint study of the Chinese Academy of Engineering and the National Academy of Sciences reports that the prevailing automotive technology on Chinese roads today produces emission levels similar to U.S. autos during the 1970s. A recent report states that suspended particulates within the city of Beijing are seven times as high as New York and Tokyo (*7*).

Transportation assessments in China suggest that current road infrastructure is a major factor limiting personal motorization growth. Although highway length has increased by 60% between 1980 and 2000, intercity roadway networks are exceptionally sparse given China's size and geographic area (*11*). During this same period, railway length increased by 30%. A major component of China's transportation strategy is to continue developing a national trunk highway system, which is similar to the U.S. Interstate System. While the overall expansion of paved roads (in aggregate) has kept pace with China's income growth, urban roadway expansion—where most vehicle use is occurring—has proceeded far more slowly (*11*).

Technology and The Future

Internet and telephone use in developing nations, such as China and India, is also increasing. China already has 111 million Internet users (*12*). While this is less than 10% of the population, Internet use will continue to expand rapidly. Thus, integration of carsharing services in China, using Internet-based reservations, should not present a long-term barrier to member use and adoption.

In the future, China will continue to expand roadway infrastructure and personal motorization due to the economic rewards of a national auto industry and the private benefits of vehicle ownership. Despite this trend, the Chinese government is cognizant of the many challenges of motorization including: energy use, parking/land use requirements, congestion, and pollution. Indeed, the government has stated that public transportation and sustainability are part of the solution to a growing auto culture. Thus, it is not surprising that China might consider carsharing as a possible alternative to auto ownership given its flexibility, cost savings, and environmental benefits.

CARSHARING BENEFITS: A BRIEF WORLDWIDE OVERVIEW

Much of the cost of owning and operating a personal auto is fixed. About 77% of private vehicle expenses are paid regardless of how much a car owner drives (*13*). Since the variable costs associated with vehicle ownership are relatively low, there is an economic incentive for owners to drive more frequently. Shared-vehicle services transform the fixed costs of auto ownership into variable costs because a member's use is closely tied to the 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. 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 (*13, 14*, *15*).

Carsharing programs began in Europe during the mid-1980s and later spread to Canada, the U.S., and Japan during the mid- to late-1990s. Shared-vehicle programs have since expanded to other regions including: Australia and Singapore. Malaysia plans to launch carsharing in late-2006 (*16*). Today, carsharing is operating in approximately 600 cities around the world, in 18 nations, and on four continents. Another eight countries are exploring shared-vehicle services. At present, there are approximately 348,000 carsharing participants worldwide (*17*).

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 results across studies.

Carsharing reduces the need for many individuals to own a car. Several countries in Europe are home to successful carsharing programs that have had a measured impact on car ownership. An ongoing review of a program in Denmark suggested that shared cars replaced between 4.6 to 6.2 personal vehicles (18). 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 (19). In the Netherlands, a study in the late-1990s found that carsharing induced a 39% reduction in private vehicle ownership among carsharing users (*20*, *21*). A review of North American carsharing impacts found that up to one third of participants sold a vehicle after joining a carsharing service (*22*, *23*). And, up to nearly two thirds of participants delayed or forwent a vehicle purchase (*24*, *25*). According to European and North American studies, each carsharing vehicle replaces between 4 to 20 vehicles from the road (*24*, *26*, *27*, *28*).

Not surprisingly, reduced vehicle ownership leads to declines in personal vehicle kilometers/miles traveled, energy use, air pollution, and land allocations for parking. Carsharing fosters energy conservation and reduced emissions by lowering the overall number of vehicle kilometers/miles traveled. A review of surveys conducted in Germany found that the annual kilometers driven among members had dropped by 32% (an average reduction of 1,627 kilometers) (*29*). Another German study reported that mileage among members dropped by 58% (*30*). Other European countries, including Denmark and Switzerland, observed reductions in driving among carsharing members (*18*, *26*). In North America, studies have suggested a wide range in driving reduction—from 8 to 80%

(*24*, 27, *31*). 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 (*4*).

Carsharing also lessens the pressure to expand parking facilities by serving many individuals with a single carsharing space and reducing overall vehicle ownership. A case study in Milton Keynes of the United Kingdom found that a local carsharing program reduced parking needs and increased transit use (*32*). Carsharing can also facilitate more efficient and compact urban land-use patterns. In the U.S. and Canada, for instance, municipalities are supporting policies, such as parking reduction (i.e., downgrading number of spaces in a new development) and allowing greater floor area ratios (i.e., developers can build more intensively on the site) (*33*, *34*, *35*). 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 (*36*, *13*). Finally, low-income households and college students can benefit from participating in carsharing (37).

Historically, carsharing has developed in regions where widespread motorization is essentially complete. In these nations, shared-vehicle services have typically spread into urban environments with good transit networks and generally obviated the need for a first or second household vehicle. In contrast, carsharing may be more readily incorporated into developing nations where motorization is still in its early stages, ultimately preventing or lessening the 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, such as China. In the future, carsharing may help to shape Chinese cities just as cycling, walking, and transit did previously.

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 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 population density of 3,500 to 4,500 (*5*).

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 description of carsharing as it is commonly understood in the United States. Participants then answered questions pertaining to carsharing. Following survey completion, each respondent received a gift.

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

carsharing were intentionally over sampled. 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 an 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 China.

INTERCEPT SURVEY RESULTS

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. Next, respondents were read a detailed definition of carsharing; this was followed by a series of questions exploring carsharing familiarity and overall response. The questionnaire ended with a series of demographic questions.

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 is 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. Out of the entire sample, 38% (317 individuals) were familiar with it. 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 exist, they are more limited. One notable distinction is that individuals previously aware of carsharing are slightly skewed towards higher income and education levels. Attitudinal questions, however, detected little difference in response. Thus, the results indicate that "familiarity with carsharing" alone is not the most distinguishing market feature in this study.

Researchers also 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 are likely or highly likely to use carsharing. Among those participants, 40% (89 individuals) also belong to the "familiar with carsharing" subgroup. Ultimately, "interest in carsharing" was found to be a more distinguishing feature among all

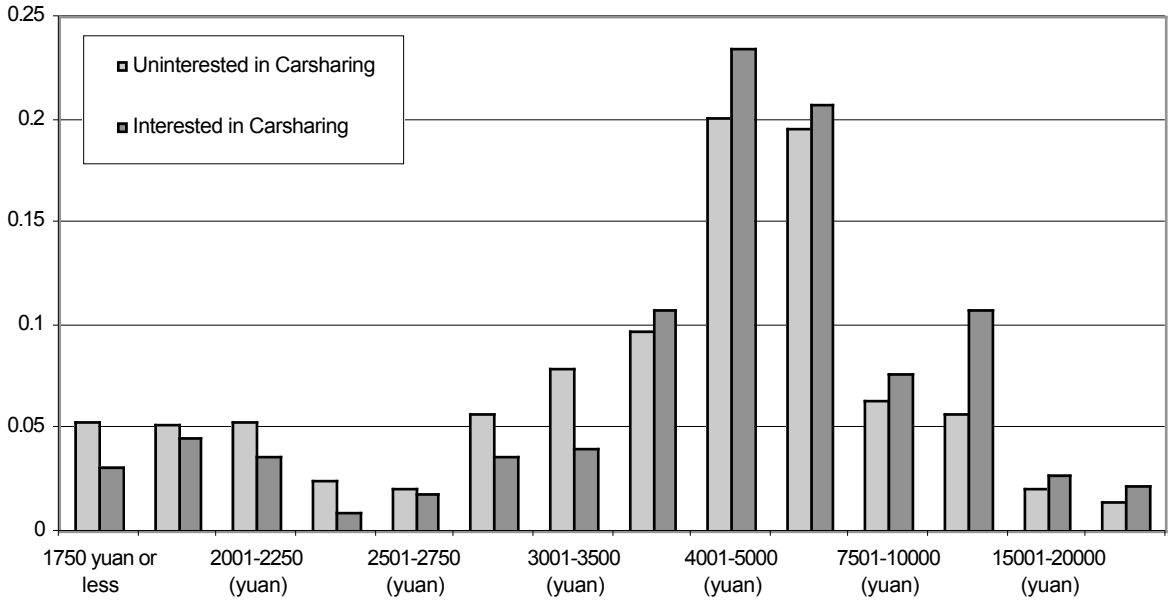
respondents. In the analysis that follows, the authors focus on illustrating differences between the 73.6% (618 respondents) who are "uninterested in carsharing" and the 26.4% who are "interested" in using it. These groups are mutually exclusive. Interestingly, distinctions found between the two were often amplified in the subgroup that is both "interested" in and "familiar with carsharing."

Demographic Analysis

The gender distribution among the total sample is almost evenly split; this varies slightly within the two subgroups partitioned by "carsharing interest." In addition, almost all of the respondents are either married or single, with less than 10 instances of individuals who are divorced or widowed within the study population. The age distribution of the sample is characterized by four categories spanning the ages of 20 to 50 (i.e., 20-25, 26-35, 36-45, 46-50). In general, those "interested in carsharing" are skewed towards younger age categories, and this is more pronounced in the subgroup of individuals both "familiar" with and "interested in carsharing." It should be noted, however, that "interest in carsharing" is not just consigned to younger adults (20-35 years of age); 44% (97 respondents) of this subgroup is between the ages of 36 and 50. In addition, while respondents "interested in carsharing" are more highly educated than those uninterested in carsharing, approximately 40% of interested respondents (88) have a high school diploma or lower. Mobile phone use is another interesting aspect among the total population; it is nearly ubiquitous at 95% (794 respondents) and even higher for the subpopulation "interested in carsharing."

Monthly income is also an important demographic. The following figure illustrates the monthly income distribution of those "interested" and "uninterested in carsharing." The income distribution of the two groups generally follows the same shape. (See Figure 1 below.) While there is a higher concentration of wealth among those "interested in carsharing," this is slight.

FIGURE 1 Monthly Income Distribution of Respondents.



China currently has a fixed exchange rate with the dollar, which is gauged to equal eight yuan. Figure 1 provides an interesting contrast between the income distribution of survey respondents and the general population in Beijing and other parts of China. China's gross domestic product (GDP) per capita in 2005 was $6,800 US, but this varies widely from region to region (*12*). The national GDP per capita falls within the 4,001-5,000 yuan interval, which is most prevalent in the survey. Interestingly, the sample population appears to be slightly wealthier than individuals in China on average, based on the skewed distribution of the income data.

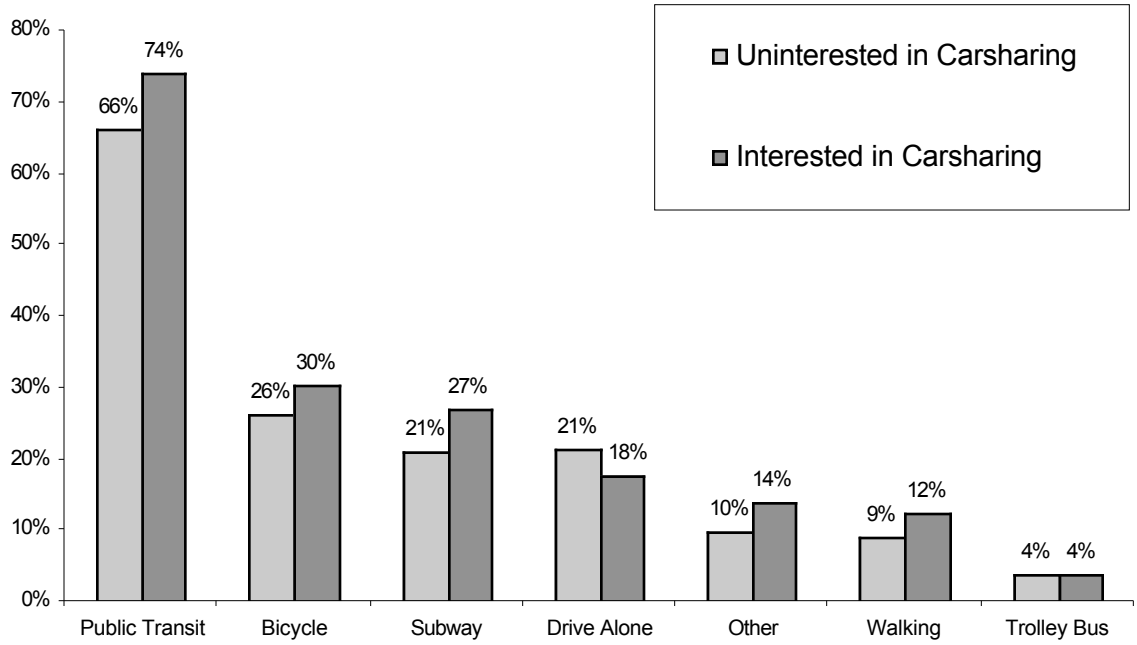
Automobile Experience

Since auto ownership in China is rapidly growing, researchers sought to gain an understanding of respondents' auto experience. Across the entire sample, 21% (179 respondents) reported that they can drive. The majority of these respondents (123 individuals) are members of families that own a car. Half of the remaining drivers (31 respondents) report that they drive a company car but do not own an auto. Analysis of driving frequencies reveals that everyday car use is prevalent among 55% (97 respondents) of the study's driving population. Another quarter of drivers use autos three to four times a week, while the remaining drive a car at most once a week. The results suggest that there are individuals that do not need to use a vehicle everyday. A similar range of behavior exists with respect to driving distances. A majority of drivers travel less than 50 kilometers per day. Those drivers "interested in carsharing" expressed a slight preference toward shorter trips, with 16% (seven respondents) traveling less than 10 kilometers per day.

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 is public transit. Higher levels of subway and bicycle use also indicate that transportation is not auto dominated in Beijing. Although the distribution across each carsharing interest subgroup is the same, those "interested in carsharing" dominate nearly all modes except drive alone. While the modal share of drive alone is small, this is widely documented as growing in China (*9, 38*). Reliance on transit and cycling in this survey confirms that carsharing could augment current modes and perhaps limit vehicle growth.

Next, the authors sought to understand whether participants are 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 are planning to acquire a personal vehicle. Among the "interested in carsharing" subgroup, this figure is 30% (51 respondents). Only 15% (71 respondents) of the "uninterested in carsharing" subgroup is considering a car acquisition. Thus, while the "interested in carsharing" subgroup is less auto-reliant (18% vs. 21% drive alone) than those "uninterested," a higher proportion of the former group is 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.

Auto Ownership Perceptions

As part of the survey, respondents were also requested to indicate the advantages and disadvantages of auto ownership. In addition, respondents who reported that they do 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.

TABLE 1 Positive and Negative Aspects of Auto Ownership

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%

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 (*39*). 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, nevertheless, as respondents may feel less comfortable indicating this.

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.

IN-DEPTH INTERVIEW FINDINGS

Results from the in-depth interviews provided valuable insights into how participants envisioned themselves using carsharing services, if they became available. Nearly all of the interviewees indicated that they would be more likely to use carsharing for relatively long trips (at least 44 kilometers in length on average). They also shared that carsharing would be useful for long distance leisure trips with friends and family. A majority thought that carsharing vehicles would be the most useful for: carrying items, linking trips more efficiently, and traveling faster for daily errands.

Participants were asked their preferred three locations for accessing a carsharing vehicle. The top ranked site is "within my neighborhood;" the second choice is "at my workplace or school," followed by "at a rail transit station." Interviewees were also 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 a vehicle. 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 is 25 yuan ($3.18 US) with responses ranging from 5 to 50 yuan ($.64 to $6.36 US) per hour, while the average mileage charge is roughly 2 yuan ($.25 US) per mile 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 is 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 is income, and the second highest choice (seven participants) is family size.

In a series of open-ended questions, interviewees were asked if they had any carsharing concerns. Responses reflect concerns about responsibility for carsharing vehicles in the case of a theft or accident. Overall driving safety and carsharing vehicle safety are 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.

CONCLUSION

China's economy, urban centers, and vehicle ownership are growing at an impressive rate. While there are many benefits associated with rapid industrialization, there are also negative energy and environmental impacts. China's central government is aware of these consequences and is particularly concerned about the energy security and urban air quality impacts of widespread auto use. In response to these concerns, the 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. At present, carsharing offers an alternative to private vehicle ownership to approximately 348,000 individuals worldwide.

To investigate carsharing's potential in China, the authors implemented an 840-person intercept survey to better understand the familiarity and response of Chinese citizens living in Beijing to this concept. The survey results illustrate that there is a potential for carsharing to play an important role in China's evolving transportation system. Interestingly, only 40% of respondents were familiar with the concept at the time of the survey. "Familiarity with carsharing," nevertheless, is not a key market indicator alone. "Interest in carsharing" is a more distinguishing feature among respondents.

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" are skewed towards younger age categories (20 to 35), and this is 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.

Since understanding how people travel is essential to carsharing operations, the authors also examined mode use. Not surprisingly, transit, cycling, and walking each play an important travel role in urban Beijing. And, those "interested in carsharing" dominate nearly all modes except drive alone in this study. These results are promising for carsharing in China, as users in developed nations traditionally use carsharing to supplement alternative transportation in urban areas.

While private vehicles do not currently dominate travel in Beijing, 20% of total respondents claimed that they are able to drive. Of those, a majority travel less than 50 kilometers per day. Although this appears promising, limited driving knowledge and experience might present a barrier to carsharing adoption in the future. Finally, the authors explored the vehicle purchase/lease plans of respondents. Among those who did not own a car, 20% reported that they are planning to acquire a personal vehicle. Thirty percent of those "interested in carsharing" (in contrast to 15% among those "uninterested in carsharing") indicated that they are planning a purchase. Interestingly, those "interested in carsharing" are less auto-reliant than "uninterested" respondents (18% vs. 21% drive alone).

In the future, carsharing could help to shape China's future urban mobility strategy by helping to satisfy the growing demand for private vehicles, without sacrificing transit and other alternative modes. The study's results suggest that citizens may be receptive to carsharing. Over 25% of the total sample expressed a high level of interest in carsharing, and only 11% viewed the automobile as a status symbol. While Beijing respondents indicate that convenience and comfort are primary auto benefits, they also note high cost, transit convenience, and parking constraints as deterrents to vehicle ownership. In conclusion, the results of this study suggest that carsharing has the potential to gain acceptance in urban areas in China, while preventing some of the negative impacts of widespread motorization.

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