

## Perceptions and aspirations for car ownership among Chinese students attending two universities in the Yangtze Delta, China

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### ABSTRACT

China has recently become the largest auto market in the world due to an explosive growth in private car ownership. On one hand, Chinese policymakers must develop sustainable transportation policies including those of car demand reduction; on the other, they must continue to promote the auto industry in the name of economic growth. Understanding the cultural currents behind car ownership, future car growth, and driver behavior is critical for developing responsive and effective policies. However, little is known regarding the attitudes and socio-cultural context surrounding the explosive growth in car ownership. A survey of Chinese college students – consumers with greater future purchasing power – was conducted to understand student attitudes, social norms, and aspiration for car ownership. A strong desire for car ownership among the participants supports the assertion that rapid car growth is likely to continue, but most likely in smaller cities and rural areas. Moreover, perceived psychosocial values of car ownership such as feelings of freedom and control are more likely to be framed by the students' immediate social environment. The psychosocial valuations dominate the aspiration for car ownership at a level greater than the instrumental valuations of car ownership – for example, speed or convenience of using a private car. Understanding and changing consumers' psychosocial valuation of cars is increasingly critical in curbing future growth in car ownership and use.

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### 1. Introduction

The number of cars in the world will double to 2 billion in the next 15 years, with most of this growth occurring in developing countries (Sperling and Gordon, 2009). China, in particular, has seen an explosion in private car ownership, growing at 37.4% annually since 1985 to reach 28.81 million private cars in 2008 (China Statistical Bureau, 2009). This growth is likely to continue, considering that China had just 38 cars per 1000 people in 2008 (China Statistical Bureau, 2009) while most developed countries and even emerging economies feature over 200 cars per 1000 people (e.g. Brazil: 239; Russia: 245; Denmark: 457; United States: 809) (World Bank, 2011).

While car ownership brings many benefits, widespread car use poses extensive challenges to the sustainability of transportation systems as well as the environment, economy, and health (Gakenheimer, 1999). For instance, Chinese oil consumption alone will exceed the entire world's oil production by 18% if it ap-

proached US car ownership rates (Zhao, 2006). Transportation not only accounts for more than a quarter of global CO<sub>2</sub> emissions (Sperling and Gordon, 2009, p. 5), but also is the fastest growing carbon emission source (Wright and Fulton, 2005). Road congestion led to an estimated \$115 billion loss in 2009 in the US alone (Lomax et al., 2011). Moreover, the expansion of road infrastructure to support the wide-spread use of private cars has contributed to the divestment or even collapse of public transportation systems, thus exacerbating social inequity for those unable to afford a car (e.g. Vigar, 2002).

Recent research has increasingly emphasized the role of psychosocial factors such as social norms, culture, lifestyle, or habit in determining car ownership and choice of transportation mode (Anable, 2005; Handy, 1996; Saelens et al., 2003; Steg et al., 2001). Past studies have also shown that modal choice can be determined by environmental concerns (Loukopoulos et al., 2005), a strong public transportation system (Cullinane, 2002), and differences in attitudes among car owners and non-car owners (Cullinane and Cullinane, 2003; Ibrahim, 2005). For example, Steg (2005) points out that “for a long time, car use was predominantly explained through behavioral models that focus on instrumental factors related to car use, such as its speed, flexibility, and

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convenience...until recently, little empirical evidence was available on the significance of non-instrumental factors.” This is especially the case in developing countries, despite the fact the bulk of the growth in car ownership will occur there (Gakenheimer, 1999). Study of psychosocial perceptions of the car is especially timely in China because the rapid growth in car ownership has occurred simultaneously with a new emphasis on equitable and sustainable transport systems and an awakening environmental ethos.

We surveyed Chinese college students, a group likely to be able to afford car in the future, in order to understand their desire for car ownership and whether the desire was more influenced by its *psychosocial* (symbolic or affective) value or its *instrumental* value such as “speed” or “increased access” (see Dittmar, 1992; Steg, 2005). By examining and quantifying car culture, we also sought to understand ways in which society may foster resistance to car dependence.

## 2. Materials and methods

### 2.1. Study population and sites

In 2009, 21.45 million students were enrolled in 4-year universities fulltime, including 6.39 million freshmen (China Statistical Bureau, 2010). According to independent market research surveys in 2006, the average age of the Chinese car owner dropped to 32 years old, while the 25–29 year old age group accounted for the largest portion of car buyers. As such, the college students will likely take around 4–10 years before purchasing their first car on average (Gomes, 2008).

Surveys were conducted in June 2009 at Fudan University in Shanghai and Jiangsu University in Zhenjiang, Jiangsu Province. Both are located in the Yangtze River delta region in eastern China, an area with a relatively higher level of economic development (see Fig. 1). The two sites were chosen to allow for contrast between Shanghai – the economic and financial center of

China – with Zhenjiang, a second tier regional city with a significantly less gross product and population.

College students were chosen because of their likelihood to be able to afford a car in the future, diverse family demographics, ease in recruitment, and our ability to survey them in a controlled environment. Moreover, since we sought to understand how the car was conceived in consumer imagination and Chinese culture in lieu of an immediate reason for purchasing a car, college students were chosen because the decision to purchase a car likely remained several years away. Finally, because the surveys were conducted at the end of the school year, all students had spent at least 9 months at their respective school and had extensive exposure to the local environment.

Fudan University is one of the premier universities in China and draws students from around the country. Its main campus is within walking distance to a commercial shopping center. Students are exposed to automobiles constantly, though bicycles and public transportation are the primary modes for students. Shanghai also boasts one of the largest public transportation networks in the world with 13 subway lines even as traffic jams continue to worsen in recent years.

Jiangsu University in Zhenjiang – 400 km north-west of Shanghai – is a relatively newer school. A higher proportion of the students are from rural areas or small townships in Jiangsu province. Zhenjiang is the capital of Zhenjiang Prefecture (administrative region consisting of several contiguous counties) with a population of 800,000. Bus lines and taxis are the backbone of public transportation. Relative to Shanghai, Zhenjiang features considerably less traffic congestion in the urban center. Still, the number of private cars has increased noticeably in the past few years.

### 2.2. Survey instruments

Focus group discussions and interviews were conducted primarily with students but also included car owners and urban

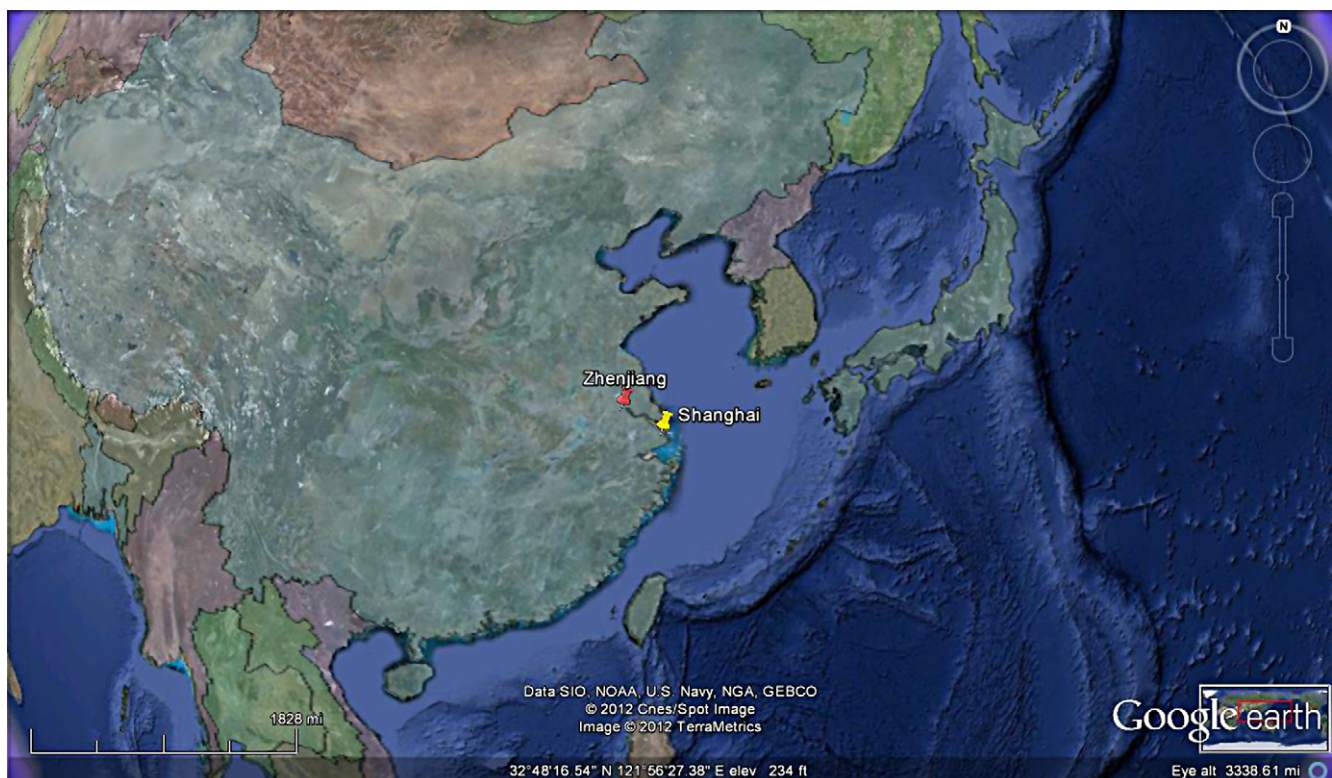


Fig. 1. Locations of Shanghai and Zhenjiang in Yangtze Delta.

planners in order to develop themes for the survey. Two focus group discussions featuring groups of roughly eight students were conducted in Shanghai and Zhenjiang respectively. Another focus group discussion was conducted with car owners and a car salesman in Shanghai. Finally, various urban planners and transportation professionals from host universities and nearby universities were interviewed. Discussion covered several broad topics, including student perceptions of car ownership, reasons as to why car ownership was desirable, student travel patterns, and local traffic conditions.

The questionnaire was drafted in English, translated to Chinese with the aid of native speakers and discussion with the principal investigator, and then pilot-tested among native Chinese speakers. It consists of 41 questions in five sections: demographics, perceived value of car ownership, preference and knowledge of car technology, opinions about widespread car ownership, and preference for transportation modes and policies.

In this paper we use data from the first two sections. Demographics included school (a proxy of current social environment), academic major, hometown (a proxy of previous family social environment), gender, and family car ownership (a proxy of direct experience with cars). Questions about the perceived value of car ownership were developed using a 5-level Likert scale (strongly agree, agree, neutral, disagree, or strongly disagree).

### 2.3. Survey implementation

A classroom-based randomized sampling scheme was employed at both schools. The population was stratified by college, and one class in each college was selected. Because of final examinations, access to certain colleges was restricted. However each university was represented by at least five colleges among humanities, sciences, engineering, medicine, or law.

The survey was approved by respective research oversight board at each school. School administrators helped recruit a team of student liaisons and secure the cooperation of the professors. The professor introduced the student liaison prior to distributing the questionnaire, who explained the background and purpose of the survey. The students completed the questionnaire anonymously either during classes or at college information meetings. A total of 410 and 563 students returned the questionnaires at Fudan and Jiangsu Universities, representing a return rate of 85% and 90%, respectively. Over 95% of returned questionnaires were complete.

## 3. Theory and calculation

### 3.1. Theory of planned behavior and social psychology framework

Our research was informed by two theoretical frameworks: the theory of planned behavior (Ajzen, 1991) and the social psychology framework for material possessions (Dittmar, 1992). Well supported by empirical evidence (Armitage and Conner, 2001), the theory of planned behavior describes how behavior or behavioral intent is strongly responsive to individual behavioral beliefs, normative beliefs, and behavioral control. In turn, behavioral intentions and controls explain actual behaviors. Dittmar's framework classifies an object's value as "instrumental", "symbolic", or "affective". Instrumental value denotes perceived functional uses. Symbolic value denotes the object's use in the signification of a person's identity or status to the outside world. Affective value pertains to how an object affects one's inner state. These uses are not mutually exclusive.

In this paper we adopt Dittmar's framework and combine affective and symbolic uses into "psychosocial" values to draw a

distinction from objectively measurable instrumental uses. The "psychosocial" values echo the fact that affective and symbolic values are determined by individual behavioral beliefs and social norms. The theory of planned behavior then gives empirical justification that the instrumental value and psychosocial value determine the behavioral intention – aspiration for car ownership.

### 3.2. Data analysis and structure

A Microsoft Access database with a pull-down menu for data input was created for data management. Data analysis was done using R version 2.10.1©, a freeware data analysis program. Demographics and beliefs of car ownership were summarized using descriptive statistics.

Four questions were developed to measure a car's instrumental value (e.g. convenience, speed, access). Four additional questions were developed to measure a car's psychosocial value (e.g. success symbol, symbol of modernity, etc.).

In the logistic regression analysis of car ownership aspiration, an instrumental value index was created as the mean summative score of four instrumental questions, and a psychosocial valuation index was created from the mean summative score of the four psychosocial valuation items. Lower scores meant higher valuations. Correlation analysis showed that responses for the each group of questions were highly associative, supporting the use of the average response for each group.

## 4. Results

### 4.1. Demographics of participants

Table 1 summarizes respondents' demographics. Male–female sampling ratio was about 1.08 in Fudan and 0.92 in Jiangsu. Nearly half of the sampled students at Fudan were from metropolitan cities (49%) while only 11% of Fudan students were from rural/township areas. In direct contrast, only 7% of students were from metropolitan areas in Jiangsu and 43% were from rural/township areas. The rate of family car ownership, with family being the same as household under the "hukou" (residence registration) system, was 36% and 22% at Fudan and Jiangsu (Table 2) respectively. These rates are well above the 6.85% national average household car ownership rate or 9.95% in Shanghai, but similar to 35.85% in Beijing – the highest in China (China Statistical Bureau, 2009). It is

**Table 1**  
Students' demographics by school.<sup>a</sup>

	Shanghai, n = 410	Zhenjiang, n = 553
<i>Gender</i>		
Male	210 (52%)	271 (48%)
Female	193 (48%)	292 (52%)
<i>Hometown</i>		
Metropolitan	199 (49%)	38 (7%)
Prefecture-level	110 (27%)	183 (32%)
County level	50 (12%)	99 (18%)
Rural/township	44 (11%)	241 (43%)
<i>Family owns car</i>		
Yes	147 (36%)	121 (22%)
No	257 (64%)	438 (78%)
<i>Year of study<sup>b</sup></i>		
1st	146 (36%)	241 (44%)
2nd	166 (40%)	84 (15%)
3rd	73 (18%)	226 (41%)
4th or more	25 (6%)	6 (1%)

<sup>a</sup> Missing data excluded in computation.

<sup>b</sup> The average age of the students is generally between 18 and 22 years for the university students.



likely that families that can afford to send children to universities are also more likely to be able to afford a car. Finally, because of the clustered random sampling scheme, the number of students from each grade was uneven, though it should not affect the validity of the study.

Altogether the sample represented 17 majors. Student major did not account for any significant variation in the student's opinion regarding car ownership. Hence we omitted the students' major in subsequent analysis.

#### 4.2. Perceived instrumental and psychosocial values of car ownership

Table 3 summarizes students' perceptions of cars' instrumental and psychosocial value. A range of 69–88% of respondents had positive instrumental valuation of cars (agree or strongly agree). However, 25% disagreed or strongly disagreed that a private car allowed them to travel to more places they wished to go.

While opinions about the psychosocial value of car ownership were more diverse, either a plurality or a majority of the students still held positive opinions. Between 22% and 39% of the students disagreed or strongly disagreed with the four statements. Between 15% and 24% of the students remained neutral.

#### 4.3. Variation in perceived instrumental and psychosocial values of car ownership

We investigated how student valuations of a car's psychosocial and instrumental utility were influenced by background factors, including hometown, school, family car ownership, and gender. Table 4 reports groups showing more positive opinions and beliefs about car ownership and the results of chi-squared tests of these associations. We combined "strongly disagree" and "disagree" into one category to avoid small and even near-zero frequencies of "strongly disagree". We also combined "strongly agree" and "agree" into one category for the same reason. School, as a proxy for the students' current social environment, was potentially confounded with their socioeconomic status because a large proportion of students at Jiangsu are from townships and rural areas whereas most students at Fudan are from larger cities.

Results show that (1) Jiangsu students had higher psychosocial valuations of car ownership than Fudan students; (2) family experiences with car ownership generally promoted higher psychosocial and instrumental valuations of car ownership, suggesting a generally positive outcome evaluation; and (3) females had more positive perceptions of a car's instrumental value.

Additionally, students from metropolitan cities were less likely to agree with a car's ability to "travel faster" than those from smaller cities and rural areas, perhaps reflecting their experience with increasing traffic congestion in larger cities.

We note also that students from rural areas had less positive perceptions of a car's value in fostering "more control over life" than students from cities. They otherwise held comparable views.

Table 5 compares the psychosocial valuation of car ownership for students at Jiangsu and Fudan Universities. The percentage of positive perceptions ("strongly agree" or "agree") is higher for

Jiangsu than Fudan for every psychosocial item, while Fudan University students had a high proportion with neutral responses. These specific categorical differences between Zhenjiang and Fudan drove the statistical significance of the Chi-squared tests. Chi-squared tests remained highly significant when "strongly agree" and "agree" or "disagree" and "strongly disagree" were merged.

Table 6 shows that family car ownership, a proxy for experience with cars, was positively associated with perceptions of both instrumental and psychosocial value. The percentage of students from car-owning families who "strongly agreed" to each statement of instrumental value was at least 10 points higher than those from non-car-owning families. While students from non-car-owning families were slightly more likely to "agree", they were equally likely to stay neutral but more likely to "strongly disagree" or "disagree" with the valuation statements. This suggests that positive valuations of a car's instrumental uses could be experientially reinforced.

However, statistical significance lessened when the five-category answer was compressed into positive (A or SA), neutral, and negative (D or SD). This suggests that the perceptual differences on instrumental uses between the students of car-owning families and those of non-car-owning families were more quantitative than opposing opinion.

Car-owning-family students also had higher psychosocial valuations of car ownership than non-car-owning-family students. With the exception of the perception that cars as a "symbol of success", car-owning-family students "agreed" or "strongly agreed" to the other psychosocial valuation statements in percentages that were at least 10 points higher. About 7–14% fewer students from car-owning-family "disagreed" or "strongly disagreed" with the valuation statements than non-family-car-owning students. Unlike instrumental valuations, psychosocial differences appeared to manifest in both intensity and opposing directions.

Finally, females had higher valuations of the instrumental value of cars and males were slightly higher in psychosocial valuation. The difference in scores for both the instrumental and the psychosocial index – summative scores of the four questions in each respective index – between males and females was highly significant. Prior to computing the index we observed positive correlations among these items within each domain (data not shown). The male–female difference yielded a mean difference of –0.58 for instrumental value ( $p$ -value = 0.0004) and 0.39 for psychosocial valuation ( $p$ -value = 0.08).

#### 4.4. Intention for future car ownership

In response to the statement "when I have the financial means, I will definitely buy a car", 65% of respondents agreed (36%) or strongly agreed (29%), 11% were neutral, and 14% disagreed (11%) or strongly disagreed (3%).

To determine the extent to which the students' intention to become a car owner was determined by their perceptions of a car's instrumental and psychosocial values and background factors, we used logistic regression by first dichotomizing aspiration for car ownership into "yes" (strongly agree and agree) vs. "no" (neutral, disagree, and strongly disagree). We also hypothesized that the valuation indices (Section 3.2) were also influenced by the students' previous experience with cars and other background factors, which could mediate the intention for car ownership as antecedent beliefs to behavioral control. In determining the final model, the significance of each term was judged by both the Wald-test and likelihood ratio test. Model fitting was evaluated via residual diagnosis.

The final model (Table 7) revealed that the psychosocial valuation index was the most influential determinant. Specifically, a one

**Table 2**  
Student family car ownership by hometown type.<sup>a</sup>

	Owns car	Does not own car
Metropolitan city	99 (42%)	138 (58%)
Prefecture-level city	117 (40%)	175 (60%)
County-level city	28 (19%)	119 (81%)
Township/rural	23 (8%)	262 (92%)

<sup>a</sup> Missing data excluded in computation. Variation in ownership highly significant ( $p$ -value = 0).

**Table 3**

Students' instrumental and psychosocial valuations of car ownership.

Valuation statement	SA	A	N	D	SD
<i>Instrumental valuations</i>					
"A private car will allow me to travel to more places I wish to go"	193 (20%)	474 (49%)	66 (7%)	206 (21%)	26 (3%)
"A private car will allow me to travel faster"	343 (35%)	517 (53%)	45 (5%)	53 (5%)	9 (0.9%)
"A private car will allow me to transport more items"	329 (34%)	526 (54%)	53 (5%)	55 (6%)	3 (0.3%)
"A private car will allow me to travel more comfortably"	324 (34%)	485 (50%)	80 (8%)	71 (7%)	5 (0.5%)
<i>Instrumental valuations</i>					
"A private car is a symbol of my success in life"	126 (13%)	315 (33%)	145 (15%)	320 (33%)	57 (6%)
"A private car makes me feel more in control of my life"	135 (14%)	361 (37%)	236 (24%)	204 (21%)	28 (3%)
"Having a car will be necessary in the future"	222 (23%)	342 (35%)	184 (19%)	184 (19%)	32 (3%)
"Cars are a symbol of modern life"	82 (9%)	314 (33%)	204 (21%)	309 (32%)	55 (6%)

SA = Strongly agree; A = agree; N = neutral; D = disagree; SD = strongly disagree.

**Table 4**Groups with more positive perceptions of car ownership<sup>a</sup> (statistically non-significant difference denoted by blank).

Valuation statement <sup>b</sup>	School	Hometown <sup>c</sup>	Family car ownership	Gender
<i>Instrumental</i>				
Go to more places			Car Owner <sup>†</sup>	Female <sup>†</sup>
Go fast	Jiangsu <sup>†</sup>	2, 3, 4 <sup>*</sup>		Female <sup>*</sup>
Shipping	Fudan <sup>†</sup>	1, 2 <sup>†</sup>	Car Owner <sup>†</sup>	Female <sup>†</sup>
Comfort			Car Owner <sup>*</sup>	
<i>Psycho-social</i>				
Success	Jiangsu <sup>†</sup>		Car Owner <sup>†</sup>	Males <sup>†</sup>
In control	Jiangsu <sup>†</sup>	1, 2, 3 <sup>†</sup>	Car Owner <sup>†</sup>	
Necessity	Jiangsu <sup>†</sup>	2 <sup>*</sup>	Car Owner <sup>†</sup>	
Symbol			Car Owner <sup>†</sup>	

<sup>a</sup> <sup>†</sup>p-value < 0.05; <sup>†</sup>p-value < 0.01; <sup>\*</sup>p-value < 0.10. The leading groups with more positive perceptions of car valuation likely drove the statistical significance of group difference, and are revealed by further examination of the tabulated data.

<sup>b</sup> Response to valuation statements is categorized into three categories, "strongly agree" or "agree", "neutral", and "disagree" or "strongly disagree". See Table 3 for detailed valuation statements.

<sup>c</sup> 1 = Metropolitan, 2 = prefecture city, 3 = county level city, 4 = township and rural.

**Table 5**Psychosocial valuation<sup>a</sup> of car ownership by school: number (percentage) of students.

Valuation <sup>b</sup>	School	SA	A	N	D	SD	Difference
Symbol of success	Fudan	45 (11.1%)	125 (30.9%)	85 (21.0%)	115 (28.5%)	34 (8.4%)	$X^2 = 31.31, p = 0.00$
	Jiangsu	81 (14.5%)	190 (34.0%)	60 (10.7%)	205 (36.7%)	23 (4.1%)	
In control of own life	Fudan	56 (13.9%)	138 (34.2%)	121 (30.0%)	70 (17.4%)	18 (4.5%)	$X^2 = 21.12, p = 0.0003$
	Jiangsu	79 (14.1%)	223 (39.8%)	115 (20.5%)	134 (23.9%)	10 (1.8%)	
Future necessity	Fudan	84 (20.8%)	132 (32.8%)	89 (22.1%)	81 (20.1%)	17 (4.2%)	$X^2 = 8.20, p = 0.08$
	Jiangsu	138 (24.6%)	210 (37.4%)	95 (16.9%)	103 (18.4%)	15 (2.7%)	
Symbol of modern life	Fudan	42 (10.4%)	109 (27.0%)	94 (23.3%)	131 (32.5%)	27 (6.7%)	$X^2 = 12.25, p = 0.02$
	Jiangsu	40 (7.1%)	205 (36.5%)	110 (19.6%)	178 (31.7%)	28 (5.0%)	

<sup>a</sup> SA = Strongly agree; A = agree; N = neutral; D = disagree; SD = strongly disagree.

<sup>b</sup> See Table 3 for detailed valuation statements.

unit decrease in the level of index, i.e. one unit increase in the positive valuation of car ownership, meant a 21.4% increase in the odds for desiring a car in the future with all else equal. This increase was twice the effect (10.9%) of one unit decrease in the instrumental index (increase in valuation). Combined, these two indices accounted for 93% of the total residual deviations explained by the entire model after first adjusting for other background factors (e.g. school and gender), suggesting a dominant effect of psychosocial index as well as the instrumental index.

School location – a proxy for the current social environment of the students – remained somewhat significant in determining aspiration for car ownership. Fudan students in Shanghai were less likely to desire a car than Jiangsu students in Zhenjiang (OR = 0.91). Males had stronger desire to become a future car owner than females (OR = 1.06). However, family car ownership was no longer a significant factor of the students' aspiration for car ownership once the impact of the valuation indices was accounted for in the final model. This is not surprising given the strong influence of

family car ownership on the instrumental and psychosocial valuation indices (Table 6). It implies that family car ownership as well as other car-related factors impacted the aspiration for cars through shaping up students' attitudes and subjective norms. Similarly, hometown, as an indicator of past social environments that is somewhat distant from the current social environment, had an insignificant role in the model. Interaction between the background factors and the valuation indices did not contribute to the model.

## 5. Discussion

This paper presents evidence that there is a strong, planned intention for car ownership among Chinese college students. The desire for car ownership becomes present at a relatively early age when purchasing power is still absent, indicating that the car has become deeply engrained within the Chinese consumer

**Table 6**Instrumental and psychosocial valuation<sup>a</sup> by family car ownership: number (percentage) of students.

Valuation statement <sup>b</sup>	Owns car	SA	A	N	D/SD	Difference
<i>Instrumental value</i>						
Go to more places	Yes	74 (28%)	130(49%)	18 (7%)	46 (17%)	$X^2 = 19.3, p = 2 \times 10^{-4}$
	No	115 (17%)	343 (50%)	48 (7%)	185 (27%)	
Travel faster	Yes	119 (44%)	128 (48%)	8(3%)	13(5%)	$X^2 = 15.2, p = 1.7 \times 10^{-3}$
	No	219 (32%)	388 (56%)	37 (5%)	49(7%)	
Transport goods	Yes	142 (53%)	108 (40%)	8(3%)	10(4%)	$X^2 = 61.0, p < 10^{-4}$
	No	184(27%)	415(60%)	45(7%)	48 (7%)	
More comfort	Yes	118 (44%)	115 (43%)	22 (8%)	13 (5%)	$X^2 = 21.2, p < 10^{-4}$
	No	202(29%)	368(53%)	58(8%)	63 (9%)	
<i>Psychosocial value</i>						
Symbol of success	Yes	35 (13%)	87 (33%)	54 (20%)	91(34%)	$X^2 = 8.6, p = 0.04$
	No	90(13%)	227(33%)	91(13%)	282(41%)	
In control of life	Yes	52(19%)	105 (39%)	73(27%)	37 (14%)	$X^2 = 26.3, p < 10^{-4}$
	No	81 (12%)	252 (36%)	163(24%)	195(28%)	
Future necessity	Yes	91(34%)	91(34%)	43(16%)	43(16%)	$X^2 = 29.0, p < 10^{-4}$
	No	128(19%)	250(36%)	139(20%)	173(25%)	
Symbol of modern life	Yes	33(12%)	98(37%)	49(18%)	87(33%)	$X^2 = 12.7, p = 0.005$
	No	48(7%)	214 (31%)	154(22%)	275(40%)	

<sup>a</sup> SA = Strongly agree; A = agree; N = neutral; D = disagree; SD = strongly disagree.<sup>b</sup> See Table 3 for detailed valuation statements.**Table 7**

Aspiration for car ownership: determinants via logistic regression.

Variable	Level	Estimate (SE)	Odds ratio (95% CI)	Wald test	Likelihood ratio test
School	Jiangsu	–	1	0.003	0.061
	Fudan	–0.096 (0.027)	0.908 (0.862, 0.975)		
Gender	Female	–	1	0.043	0.373
	Male	0.053 (0.026)	1.055 (1.002, 1.111)		
Instrumental valuation		–0.109 (0.023)	0.897 (0.856, 0.939)	<10 <sup>–5</sup>	<10 <sup>–6</sup>
Psychosocial valuation		–0.241 (0.018)	0.786 (0.760, 0.814)	<10 <sup>–6</sup>	<10 <sup>–6</sup>

imagination. Furthermore, the strong effects of perceived psychosocial values of cars on car ownership suggest a complex socializing process in which the perceived symbolic and affective values may drive growth in car ownership for years to come. In other words, the car's image is dominant. The present social environment, as embodied by the “school” variable, is especially important.

Our results are consistent and supplementary to those found in the study of residents in Puget Sound in the United States (Kuppam et al., 1999) as well as a study of residents in Northampton, Massachusetts, USA (Parkany et al., 2004). Using multinomial logit models to determine the effect of demographic and attitudinal variables on transportation mode choice, Kuppam et al. found that the significance of attitudinal variables was greater than that of demographic variables. Parkany et al. (2004), also using a logit model, found that attitudinal variables had at least as much influence as demographic variables, but not as much influence as travel data such as distance to location. Parkany et al. also suggested that attitudes should not be used to determine current transportation behavior, but rather “latent” or intended behavior if certain other conditions are fulfilled. By surveying college students, we aimed to measure planned behavioral intention in young Chinese consumers, a group representing the next generation of higher-income consumers in China.

### 5.1. Instrumental valuation

In an earlier survey of Hong Kong residents, Cullinane (2003) asked participants to rank reasons for car ownership. She found that comfort, transporting goods, and saving time were the three most important reasons for car ownership. In our survey, we found that a sizable majority of students (84–88%) agreed with these same three statements used by Cullinane (2003), although psychosocial values were ultimately more influential (see Section 5.2).

Although family-car-owning students responded more positively to the four items of instrumental valuation than non-family-car-owning students, it is debatable whether certain perceptions are verifiable. Congestion has slowed motor vehicles in Shanghai to a snail's pace – only 10–18 km per hour (Schipper and Ng, 2006). Moreover, nearly half of the roads are somewhat gridlocked during rush hour. In Beijing, average driving speed on 11 main roads is estimated to only be 12 km/h, about the same speed as a quick cyclist (Zhao, 2006). In comparison, the 420-km long, 11-line Shanghai metro covers most of metropolitan Shanghai, services 2.23 million people daily, and travels at an average speed of 36 km/h with stopping time included (Shanghai City Comprehensive Transportation Planning Institute, 2008). Regardless, 85% of respondents at Fudan University believed that a personal car would allow them to travel faster. There are several explanations for this belief. With walking time included, public transportation may seem slow or actually be slower. Students' experience with family cars may have occurred in areas with much less traffic congestion and a less developed public transportation system. Finally, it is conceivable that perceptions of a car as a much faster mode are attributable to advertisements in various media or interactions with cars as pedestrians.

It is interesting to note that nearly a quarter of the respondents disagreed that a private car would let them go to more places. This may imply that the existing network of public transportation met the travel needs of most residents. As one gains more direct experience with car driving or if public transportation continues to improve, these perceived utility values could continue to change.

### 5.2. Psychosocial valuation of car ownership

Psychosocial valuation of car ownership – success symbols, individual control, necessity, and modernity – is a point of interest, reflecting the meanings of private car ownership as it rises in

popularity among the Chinese middle class. Interestingly, 58% of survey respondents strongly agreed or agreed with the statement that car ownership would “be a necessity in the future”, but the origin of this idea is unclear. Most Chinese do not use a car to travel while public transportation in both Shanghai and Zhenjiang has expanded to cover most of the city in each case. In view of the observation that large numbers of respondents disagreed that car ownership is necessary to “travel to more desired places,” the “future necessity of car ownership” was likely perceived as a normative expectation that in the future everyone should have a car. Social norms have been shown to have strong influences in many different areas (Cialdini and Goldstein, 2004), including environmental behaviors such as recycling (Schultz, 1999) and aversion to littering (Kallgren et al., 2000). The belief of car ownership as a norm indicates that the car has become more than just a transportation tool in the imagination of Chinese consumers, and may well be a driving force behind continued growth in the future.

Our results also showed that family experience with car ownership reinforced positive psychosocial perceptions of car ownership, often at highly statistically significant levels (Table 6). High psychosocial valuation is an important factor in becoming a car owner on one hand; owning a car may enhance the psychosocial value experientially on the other. This is a finding consistent with car-dependence positive feedback loops reported by others (e.g. Cullinane, 2003).

Although differences were generally small between the four hometown strata, careful data analysis revealed that students from prefecture-level cities had the strongest beliefs in the value of a car across all instrumental and psychosocial valuation statements, with the lone exception of the car as a “symbol of success.” Growth in car ownership started in first-tier, higher-income metropolitan cities (e.g. Beijing, Shanghai, or provincial capitals) in the 1990s, spread to second and third-tier cities, and is now reaching rural areas. The higher psychosocial valuation among students at Jiangsu University is consistent with the fast rate of car growth in second tier cities. High valuations by students from smaller cities and rural areas further reflect the existence of this trend.

In contrast, residents in first-tier cities might eventually enter a stage where consumers value the instrumental value more than the psychosocial value of owning cars.

### 5.3. Aspiration for car ownership

#### 5.3.1. Influence of psychosocial valuation and instrumental valuation

Much research has been done about the social significance and psychology behind car ownership. In her study of 185 commuters in the Netherlands, Steg (2005) presented evidence that “symbolic” and “affective” functions were more important than “instrumental” function in the decision to drive to work, although Kamba et al. (2007) found that Malaysians were primarily motivated by travel time and subsidized fares. We have confirmed that psychosocial valuation of cars was a much stronger factor than instrumental valuations in determining Chinese college students’ aspiration for car ownership. This evidence is presented in the logistic model (Table 7) where the index of psychosocial valuation has the strongest and most significant impact even after adjusting for other potential background factors. Moreover, our analysis shows that perceptions of a car’s value can change rapidly with the social environment one lives in, likely because of the tendency to conform to the new environment.

#### 5.3.2. Influence of background factors

While the exact role of other factors including proxies for socioeconomic status, local economic and land development, living standards, culture, and lifestyle deserve to be further explored, our study chose to focus on the impacts of proximal and distant

social environment on student valuations of car ownership. We used school location to reflect the daily social, economic, and cultural environment; and we use hometown and family car ownership to measure distant background and environment.

Our model illustrates that the student’s hometown and family car ownership status are less important than current school location once normative social valuations of car ownership have been incorporated. A proxy for the student’s present social surrounding, “school” is confounded with the student’s past social surrounding as represented by “hometown” and “family car ownership”, but still contributes to the aspiration of car ownership. In contrast, “hometown” and “family car ownership” had little impact once valuation indices were incorporated, indicating that aspiration for car ownership is somewhat divorced from one’s past background. This suggests that the intention for car ownership may not be innately different among people of different socioeconomic background, and an individual’s perceptions of car ownership are not inherited, but created and framed quickly by one’s proximal environment.

Higher aspiration levels for car ownership among students at Jiangsu University – driven in part by their higher psychosocial valuation of cars – supports the thesis that most future car ownership growth in China will be in small cities or even rural areas. According to Table 2, current car ownership level in prefecture-level cities such as Zhenjiang was already comparable to that in metropolitan areas such as Shanghai. Growth in second-, third-tier cities or rural areas may further be promoted by a variety of controlling factors such as less congestion, low-cost, and relatively easily obtainable licenses, as well as a less-developed public transportation system.

Finally, according to our model men had 5% greater odds in desiring car ownership ( $p = .04$ ) *ceteris paribus*. The greater intention for car ownership among men is in line with previous results by Cullinane and Cullinane (2003) and Steg (2005), reflecting perhaps a deep-rooted gender difference in imagining the car.

### 5.4. Changing car culture

Private cars were first introduced to the biggest Chinese cities in the late 1980s and early 1990s, with the opening of a Volkswagen joint venture factory in Shanghai in 1984 and several other factories over the next decade (Campanella, 2008). In the past decade, private cars have proliferated throughout all of China. This study presents evidence that future car ownership has become a latent yet powerful aspiration among young college students, driven by the norms created by a newly wealthy and ever-expanding middle class. Yet as Chinese society continues to change at a rapid pace, will perceptions of the personal car’s instrumental value or psychosocial aura diminish?

As the utility of alternative transportation modes such as subway and inter-city train continues to develop and improve, the relative instrumental value of private cars will decrease especially in view of cost, increasing congestion, and environmental and health consequences. In 2001, for example, a license in Shanghai cost upwards of US\$6000, as determined by public bidding on a monthly quota of 8500 licenses on average. Monthly maintenance and insurance run up to about US\$3000 every year while the price of a new model begins at around US\$10,000. In comparison, the average wage in Shanghai was around US\$600/month as of late 2009 (Zhong et al., 2009). Shanghai has also adopted policies to control the growth of car use; it levies tolls and controls parking capacity as means to control car traffic in the city (Shanghai Municipal Transport and Port Authority, 2002). Although policies towards private car ownership vary significantly between provinces, regional car control measures are rising in both number and strength, and may continue to drive cost up.

Moreover, in Shanghai, government policies have begun prioritizing the provision of fast, safe, and reliable public transportation



systems centered around subway and light rail that are integrated with bus transit systems and taxis (Shanghai Municipal Transport and Port Authority, 2002). Shanghai's metro will expand to 20 lines by 2020. Inter-city trains have also become faster and more comfortable, and train fare is tightly regulated and subsidized by the government. Gakenheimer (1995) points out that increasing congestion will not regulate travel demand in automobiles because other modes will also face congestion; however, train and subway systems which do not face road congestion may subvert this problem.

However, even with rising competitiveness in the instrumental value of other transportation modes, the psychosocial valuation of private car may remain high or even rise, and continue to be a strong motivation for car ownership, as evidenced in this study. Thus curbing the demand for private cars will require policymakers to enact sufficient responses to the psychosocial value of a car as well. To this end, anthropological, sociological, and psychological approaches to studying car ownership would be useful, although they are a relatively new focus developed only in the past decade (e.g. Carrabine and Longhurst, 2002). These approaches emphasize the role of culture and society in curbing the automobile and its associated ways of living. In China, as well as in many other emerging economies, the growth of car ownership is occurring in unique socio-cultural contexts and thus may not follow the same "path dependency" as Western nations (Urry, 2004).

In which direction will transportation culture tip in China? On the surface, it seems obvious that a culture favoring cars is quickly becoming a norm in Chinese society. Ubiquitous advertisements flood magazines, billboards, and the airwaves. One businessman in a focus group interviewed in Zhenjiang stated that he could not show up to a meeting in a taxi because it would cause him to "lose face." However, beneath the perception that "everyone wants a car" in China, attitudes towards transportation remain poorly understood and much more nuanced. Chinese citizens are also becoming increasingly aware of the societal costs caused by widespread car use, as seen in the license quotas and driving restrictions in Beijing and Shanghai during the 2008 Olympics. Indeed, awareness of environmental problems counteracts car use (Loukopoulos et al., 2005; Nilsson and Küller, 2000). Moreover, the national government has adopted the guiding principle of "circular," sustainable development. Finally, a decrease in the novelty of car ownership, especially in large metropolitan areas, may also dull the psychosocial aura of the car (Gakenheimer, 1999). Our study gives evidence of such signs, with students from or living in metropolitan areas less enthusiastic about cars than students from or living in smaller cities or rural areas.

Thus, while certain forces such as advertisements, the novelty effect, or a growing consumer culture heightens the psychosocial value of car ownership, other forces arising out of governmental policy or social transformations may counteract the perceived psychosocial and instrumental values of a car. Most transportation policy recommendations have focused upon improving public transportation or reducing work-travel time through land use policies. Future policies should also aim to change social norms among Chinese. Urging and publicizing the use of public transportation and bicycles by celebrities, politicians, and wealthy businessmen could bolster the psychosocial value of alternative forms of transportation, and change social norms. It would also be interesting to engage in a public campaign to highlight the athleticism and healthfulness associated with biking as obesity becomes increasingly common in Chinese cities.

## 6. Conclusions

This study has provided, to our knowledge, the first empirical evidence on widespread aspiration for car ownership among Chinese college students. The behavioral intent to own a car was

driven primarily by the psychosocial valuation of cars, indicating that car ownership has already become a highly desirable object in the imagination of young Chinese consumers. Our findings needed to be replicated, but likely can be generalized to the entire Chinese university student population and beyond as regional differences in living standards in China are rapidly diminishing.

Traditional approaches to car ownership growth focusing on simple relationships between car ownership and GDP per capita neglect China's social, political, economic, and environmental conditions (e.g. Chamon et al., 2008). China is home to a huge population base and relatively limited supplies of land and energy. At any stage in Chinese economic development, a large portion of the population will be unable to afford a car, instead relying upon public transportation. If car ownership is to be widespread among the growing middle class, China will face crises in road congestion, public health, the environment, and energy supply. In the long run, widespread car ownership and car use should be discouraged even for those who are able to afford a car. Developing public transportation systems should be the centerpiece of China's transportation policies. The Chinese economy remains largely government-directed, yet market-influenced. The Chinese government is still capable of implementing policies to curb car ownership and car use. However, as marketization continues, modal choice in transportation will be increasingly market-directed yet government-influenced. A market-directed economy implies that the proliferation of the car will increasingly be influenced by attitudes and perceptions within Chinese consumer culture.

If curbing private car ownership is part of a transportation policy, policymakers can target two different areas: increasing the relative instrumental value of public transportation systems and decreasing the psychosocial value of private car ownership.

To increase the instrumental value of public transportation systems, the government should continue to invest in public transportation systems in urban centers as well as inter-regional transit while adopting efficient and affordable technologies. Policymakers can also deter car use by increasing car license fees and highway tolls while restricting road access and controlling parking capacity – measures already in place or being experimented upon in major metropolitan cities.

Measures aimed at decreasing psychosocial valuation or changing the social norms surrounding car ownership could have fundamental influences on both the intention to purchase a car as well as the decision to drive a car. Future measures and policies may aim to raise the awareness about the adverse impact of cars on the environment, health, sustainable development. Special emphasis could be put on targeting younger generations through the school systems. Effective ways to increase the psychosocial value of alternative forms of transportation remain to be tested.

## References

- Ajzen, I., 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Process* 50, 179–211.
- Anable, J., 2005. 'Complacent car addicts' or 'aspiring environmentalists'? Identifying travel behaviour segments using attitude theory. *Transport Policy* 12 (1), 65–78.
- Armitage, C.J., Conner, M., 2001. Efficacy of the theory of planned behavior: a meta-analytic review. *British Journal of Social Psychology* 40 (4), 471–499.
- Campanella, T.J., 2008. *The Concrete Dragon: China's Urban Revolution and What It Means for the World*. Princeton Architectural Press, Princeton, New Jersey.
- Carrabine, E., Longhurst, B., 2002. Consuming the car: anticipation, use and meaning in contemporary youth culture. *The Sociological Review* 50 (2), 181–196.
- Chamon, M., Mauro, P., Okawa, Y., 2008. Mass car ownership in the emerging market giants. *Economic Policy* 23 (54), 243–296.
- China Statistical Bureau, 2009. *China Statistical Yearbook*, Beijing.
- China Statistical Bureau, 2010. *China Statistical Yearbook*, Beijing.
- Cialdini, R.B., Goldstein, N.J., 2004. Social influence: compliance and conformity. *Annual Review of Psychology* 55 (1), 591–621.
- Cullinane, S., 2002. The relationship between car ownership and public transport provision: a case study of Hong Kong. *Transport Policy* 9 (1), 29–39.



- Cullinane, S., 2003. Attitudes of Hong Kong residents to cars and public transport: some policy implications. *Transport Reviews: A Transnational Transdisciplinary Journal* 23 (1), 21.
- Cullinane, S., Cullinane, K., 2003. Car dependence in a public transport dominated city: evidence from Hong Kong. *Transportation Research Part D: Transport and Environment* 8 (2), 129–138.
- Dittmar, H., 1992. *The Social Psychology of Material Possessions: To have is to Be*. Harvester Wheatsheaf, New York, New York.
- Gakenheimer, R., 1995. Motorization in China. Discussion Paper, Department of Urban Studies and Planning, MIT.
- Gakenheimer, R., 1999. Urban mobility in the developing world. *Transportation Research Part A: Policy and Practice* 33 (7–8), 671–689.
- Gomes, C., 2008. Emerging Markets Will Continue to Lift Global Auto Sales to Record Highs – China and Brazil Will Lead the Way in 2008. *Global Economic Research*, Scotiabank Group, January 18, 2008.
- Handy, S., 1996. Methodologies for exploring the link between urban form and travel behavior. *Transportation Research Part D: Transport and Environment* 1 (2), 151–165.
- Ibrahim, M.F., 2005. Attitudes to transport modes for shopping purposes in Singapore. *Transport Reviews: A Transnational Transdisciplinary Journal* 25 (2), 221.
- Kallgren, C.A., Reno, R.R., Cialdini, R.B., 2000. A focus theory of normative conduct: when norms do and do not affect behavior. *Personality and Social Psychology Bulletin* 26 (8), 1002–1012.
- Kamba, A., Rahmat, R., Islamil, A., 2007. Why do people use their cars: a case study in Malaysia. *Journal of Social Sciences* 3 (3), 117–122.
- Kuppam, A., Pendyala, R., Rahman, S., 1999. Analysis of the role of traveler attitudes and perceptions in explaining mode-choice behavior. *Transportation Research Record: Journal of the Transportation Research Board* 1676 (1), 68–76.
- Lomax, T., Scrank, D., Turner, S., Geng, L., Li, Y., Koncz, N., 2011. Real-Timing the 2010 Urban Mobility Report. Texas University Transportation Center for Mobility, US Department of Transportation.
- Loukopoulos, P., Jakobsson, C., Gärling, T., Schneider, C.M., Fujii, S., 2005. Public attitudes towards policy measures for reducing private car use: evidence from a study in Sweden. *Environmental Science and Policy* 8 (1), 57–66.
- Nilsson, M., Küller, R., 2000. Travel behavior and environmental concern. *Transportation Research Part D: Transport and Environment* 5 (3), 211–234.
- Parkany, E., Gallagher, R., Viveiros, P., 2004. Are attitudes important in travel choice? *Transportation Research Record: Journal of the Transportation Research Board* 1894 (1), 127–139.
- Saelens, B., Sallis, J., Frank, L., 2003. Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. *Annals of Behavioral Medicine* 25 (2), 80–91.
- Schipper, L., Ng, W.S., 2006. China Motorization Trends: Policy Options in a World of Transport Challenges. World Resources Institute, EMBARQ.
- Schultz, P.W., 1999. Changing behavior with normative feedback interventions: a field experiment on curbside recycling. *Basic and Applied Social Psychology* 21 (1), 25.
- Shanghai Municipal Transport and Port Authority, 2002. Shanghai Metropolitan Transport White Paper. <<http://www.jt.sh.cn/infopub/xxgkml/ghjs/ghjh/info-0007.html>> (accessed 25.12.11).
- Shanghai City Comprehensive Transportation Planning Institute, 2008. 2007 Central City Arterial Roads Driving Sped Survey. <[http://www.sccpti.gov.cn/research.asp?info\\_id=193&info\\_parentid=4&news\\_id=1201](http://www.sccpti.gov.cn/research.asp?info_id=193&info_parentid=4&news_id=1201)> (accessed 25.12.11).
- Sperling, D., Gordon, D., 2009. *Two Billion Cars: Driving Towards Sustainability*. Oxford University Press, New York, New York.
- Steg, L., 2005. Car use: lust and must. Instrumental, symbolic and affective motives for car use. *Transportation Research Part A: Policy and Practice* 39 (2–3), 147–162.
- Steg, L., Vlek, C., Slotegraaf, G., 2001. Instrumental-reasoned and symbolic-affective motives for using a motor car. *Transportation Research Part F: Traffic Psychology and Behaviour* 4 (3), 151–169.
- Urry, J., 2004. The 'system' of automobility. *Theory, Culture and Society* 21 (4–5), 25–39.
- Vigar, G., 2002. *The Politics of Mobility: Transport, the Environment, and Public Policy*. Spon Press, London.
- World Bank, 2011. Motor Vehicles (per 1000 people), World Development Indicators. <<http://data.worldbank.org/indicator/IS.VEH.NVEH.P3>> (accessed 10.10.11).
- Wright, L., Fulton, L., 2005. Climate change mitigation and transport in developing nations. *Transport Reviews* 25 (6), 691–717.
- Zhao, J., 2006. Whither the car? China's automobile industry and cleaner vehicle technologies. *Development and Change* 37 (1), 121–144.
- Zhong, W., Hongyan, L., Lin, H., 2009. Adjustment mechanism of minimum wages in shanghai. In: Paper Presented at the Second International Conference on Intelligent Computation Technology and Automation, 2009, pp. 353–356.