

# Bidding to Drive

## Car License Auction Policy in Shanghai and Its Public Acceptance

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## Highlights

- We survey 524 Shanghainese on acceptance of the car license auction policy
- Moderately positive perception of effectiveness, but still negatively support
- 28 billion CNY collected but details of its usage unknown to the public
- Equity and implementation facets are perceived more negatively than affordability
- License auction and congestion charge are preferred to parking charge and fuel tax

## Abstract

Increased automobile ownership and use in China over the last two decades has increased energy consumption, worsened air pollution, and exacerbated congestion. However, the countrywide growth in car ownership conceals great variation among cities. For example, Shanghai and Beijing each had about 2 million motor vehicles in 2004, but by 2010, Beijing had 4.8 million motor vehicles whereas Shanghai had only 3.1 million. Among the factors contributing to this divergence is Shanghai's vehicle control policy, which uses monthly license auctions to limit the number of new cars. The policy appears to be effective: in addition to dampening growth in car ownership, it generates annual revenues up to 5 billion CNY (800 million USD). But, despite these apparent successes, the degree to which the public accepts this policy is unknown.

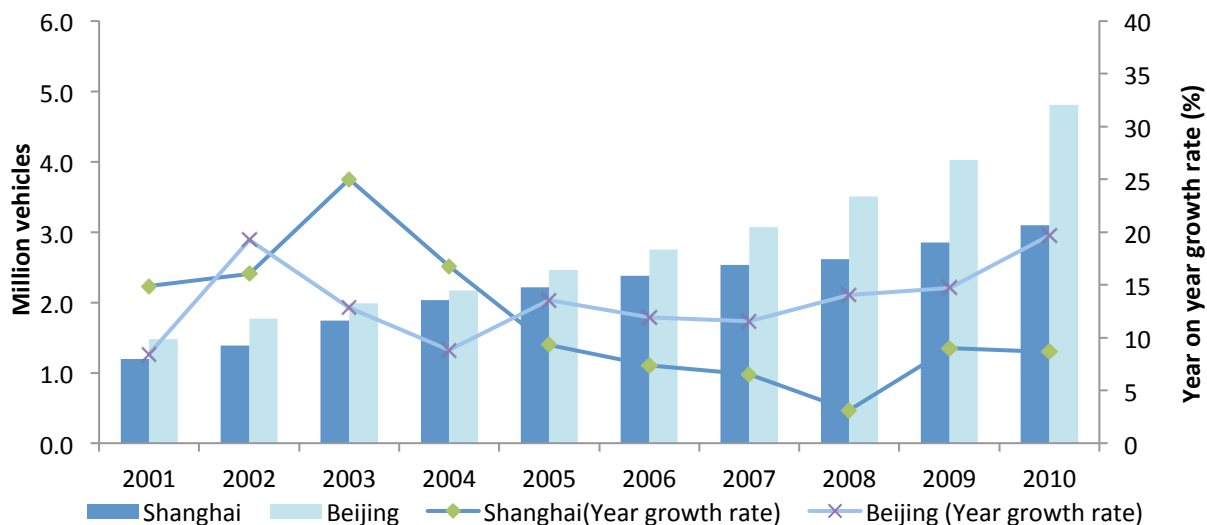
This study surveys 524 employees at nine Shanghai companies to investigate the policy acceptance of Shanghai's license auction by the working population, and the factors that contribute to that acceptance: perceived policy effectiveness, affordability, equity concerns, and implementation. Respondents perceive the policy to be effective, but are moderately negative towards the policy nonetheless. However, they expect that others accept the policy more than they do. Respondents also hold consistently negative perceptions about the affordability of the license, the effects on equity, and the implementation process. Revenue usage is not seen as transparent, which is exacerbated by a perception that government vehicles enjoy advantages in obtaining a license, issues with the bidding process and technology, and difficulties in obtaining information about the auction policy. Nevertheless, respondents believe that license auctions and congestion charges are more effective and acceptable than parking charges and fuel taxes. To improve public acceptability of the policy, we make five recommendations: transparency in revenue usage; transparency in government vehicle licensing and use, categorising licenses by vehicle type, implementation and technology improvements to increase bidding convenience, and policies that restrict vehicle usage in congested locations.

**Key Words:** car ownership policy, public acceptance, vehicle quota control, license auction, Shanghai

# 1 INTRODUCTION

In the first quarter of 2009, in no small part due to government measures to stimulate the automobile industry, China overtook the U.S. to become the largest automobile market in the world. Total automobile sales in China reached 13.8 million in 2009 (Xinhua, 2010). In 2010, both automobile production and automobile sales reached 18 million, including 13.8 million passenger cars, most of which were used domestically. Not surprisingly, Chinese cities now face serious transportation problems such as traffic congestion, high gasoline consumption, severe air pollution, and excessive carbon emissions.

The countrywide growth in car ownership conceals great variation among cities. For example, Shanghai and Beijing each had about 2 million motor vehicles in 2004, but by 2010, as shown in Figure 1, total motor vehicle ownership reached over 3.1 million in Shanghai (Shanghai Statistic Bureau, 2011) and 4.8 million in Beijing in 2010 (Zhongshang Data, 2011). Growth was very fast in both cities, but Shanghai’s growth rate was about half that of Beijing. Among the factors contributing to this divergence is Shanghai’s quota control for passenger cars. In 1994, when private vehicle ownership was still low in China, the Shanghai government referenced Singapore’s car quota policy and began to use monthly auctions to limit the number of vehicle licenses issued (Jin, 2009). As a result of the growing population and economy, the demand for vehicle licenses has continued to increase. The price of a lifetime car license averaged CNY48,600 (\$7,600) in 2011. The policy appears to be effective: in addition to dampening growth in car ownership, it generates annual revenues up to 5 billion CNY - reportedly channelled into support for transportation.



**FIGURE 1: Total motor vehicle ownership and annual growth rate in Shanghai (Shanghai Statistics Bureau, 2011) and Beijing (Beijing Statistics Bureau, 2010) (Zhongshang Data, 2011) from 2001 to 2010**

Despite these apparent successes, the degree to which the public accepts this policy is unknown. Vehicle licenses in Shanghai cost more than 100 times the price of licenses in Beijing, and can be more expensive than the car itself for many smaller models. This has not only led to affordability and equity concerns, but also to speculative activities. Many Shanghai residents are obtaining non-local licenses from other jurisdictions for lesser cost. These responses complicate the situation, exacerbate implementation and trust issues, and thus negatively affect public acceptance of the auction policy. It is this acceptance which must be studied in order to improve the policy and to increase its effectiveness.

This paper presents the findings of a survey designed to investigate public acceptance of Shanghai's car license auction policy. The three primary objectives are: 1) to benchmark license auction policy acceptance levels among Shanghai residents; 2) to investigate key determinants of public acceptance, including perceived policy effectiveness, affordability, equity concerns, trust in the policy and government, and the implementation process; and 3) to evaluate the effectiveness and acceptance of the policy in comparison to other congestion mitigation instruments such as congestion charges, parking charges, and fuel taxes.

## **2 LITERATURE REVIEW**

The literature that follows provides an overview of past research into the car quota policy in Shanghai, with reference to experience elsewhere. Although the works cited vary in context, method, and conclusions, most note that transport policies and public acceptance are location and context specific. However, none of them offers a thorough evaluation of the specific determinants of public acceptance of the license auction policy. The public acceptance of Shanghai's license policy is an empirical issue to be tested in a local setting with local data.

The discussion is organised as follows: 1) the origin of the car quota policy in Singapore, 2) the implementation of the policy in Shanghai, 3) public acceptance of such policies, and 4) the determinants of public acceptance.

### **2.1 Experiences from Singapore**

Singapore implemented its car quota policy in 1990, 4 years prior to Shanghai. Phang et al.'s (1996) review of Singapore's car quota policy and implementation indicates that it achieved its goals: absolute certainty in the numbers of cars; and improving the quality of cars imported. However, Phang notes that the policy suffered from unintended consequences - including speculative activities - that caused significant public concern. Based on their evaluation of policy measures to curb speculation, they suggest that transport policies must be perceived as fair if they are to be acceptable. They also propose the creation of an asset market for vehicle licenses..

### **2.2 Implementation in Shanghai**

Wang (2010) compares Shanghai's car quota policy and Beijing's driving restriction - among other existing and possible policies - with the experiences of each policy in western cities.

He notes that Shanghai's car quota policy failed to address the uncertain relationship between vehicle ownership and vehicle use. Wang also notes that the policy had a distortional impact on the vehicle market, affecting the auto industry. He thus concludes that the local context can significantly influence policy performance and must be carefully considered before any policy is implemented. However, he does not evaluate public acceptability

Hao et al. (2011) also focus on Shanghai and Beijing's auto policies. They model the growth of fuel consumption by passenger vehicles in Shanghai and Beijing with and without the policies then in place. They find that in Beijing the increase in vehicle ownership has offset the fuel consumption savings of limiting vehicle use. In Shanghai, the vehicle ownership policy has significantly reduced aggregate fuel consumption by passenger vehicles, but the average fuel consumption rate and the average vehicle distance travelled has increased. The results suggest that while Beijing's policy provides a short-term energy conservation solution, Shanghai's policy offers a long-term solution. They thus recommend that a balance must be struck between traffic conditions, energy consumption, vehicle markets, and social equity.

Liu's (2008) historical overview of Shanghai's license auction policy finds that it eased traffic congestion to some extent, and generated large amounts of revenue to spend on transportation infrastructure, but that the resulting reductions in automobile sales negatively effected the economy. The high price of licenses in Shanghai led to speculative activities and car owners obtaining non-local licenses. Like Hao et al. (2011), Liu concludes that Shanghai's policy encouraged more vehicle usage, partially offsetting the policy's effect. Liu suggests that Shanghai should restrict vehicle usage rather than continue to restrict ownership through the license auction policy.

### **2.3 Public Acceptance of Car Ownership Policy**

Chen et al. (2008) investigates public perceptions and acceptance of various congestion mitigation policies including congestion pricing, parking charges, and fuel taxes in Shanghai. The responses from a survey of academics, interest groups, and local authorities (187 valid responses) show a common resistance to charging schemes and vehicle restrictions, especially towards congestion pricing. Chen et al. suggest that car restriction policies - such as license auctions - are necessary to generate government revenues, despite low public acceptance. To increase policy effectiveness, they recommend that the government educate the public about the costs and causes of congestion prior to implementation. While their study collected first-hand data on public acceptance, it was limited in size and scope. There was also no detailed assessment of Shanghai's auction policy or the key determinants of public acceptability.

### **2.4 Determinants and Variation of Public Acceptability**

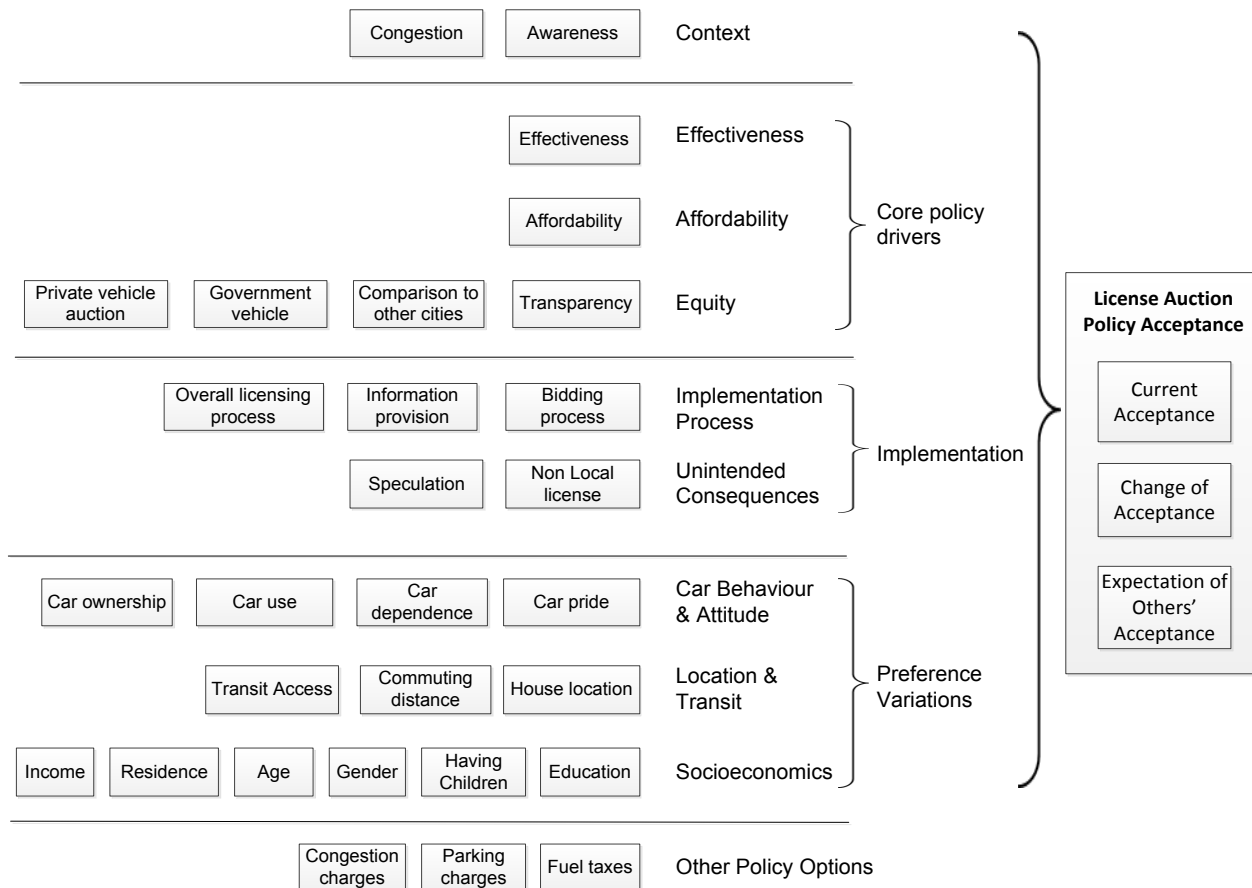
Jakobsson et al. (2000) investigate the factors that determine car users' acceptance of road pricing via a survey of 524 car owners and their spouses living in central Sweden. The study includes an assessment of perceived fairness, infringement on freedom, and expectations of others' car use reduction. The resulting model indicates that road pricing acceptance is

negatively affected by perceived infringement on freedom and unfairness. Lower income is associated with lower acceptance of road pricing. The expectation that others would reduce car use is positively related to a personal intention to reduce car use and further to the acceptance of road pricing. Similar to road pricing, factors such as perceived infringement on freedom, unfairness, and income levels may also influence the acceptance of a license auction policy.

### 3 METHODOLOGY AND DATA

#### 3.1 Framework

We begin by measuring the respondents' perception of congestion in Shanghai and their views on the need for policy intervention. The respondents' awareness of the policy is tested to ensure that they have sufficient understanding of the policy to make a meaningful evaluation. We then investigate the current acceptance level, changes in acceptance, and respondents' expectations of others' acceptance. Using the literature review and firsthand knowledge of Shanghai, we have developed a framework (Figure 2) to organize the possible determinants of public acceptance. These determinants are investigated under three broad topics: core policy specifics, implementation, and preference variations.



**FIGURE 2: A framework for evaluating key determinants of public acceptability**

The core policy determinants of public acceptability in Figure 2 are perceived effectiveness, affordability, and equity concerns. Equity is assessed on four dimensions: equity within private vehicle auction policy, equity regarding government vehicles, equity compared to other Chinese cities, and transparency in government revenue usage.

Three components of the implementation process are measured: convenience of the process of obtaining a Shanghai license, policy information provision, and technical issues in the bidding process. Unintended consequences, including speculation and non-local licenses, are also expected to influence public acceptability.

Preference variations include car behaviour and attitudes, home location and transit accessibility, and typical socioeconomic variables such as income, age, gender and education. Car dependence and car pride (pride in car ownership and use) are included in order to capture the impact of attitudinal factors on public acceptability of the policy.

Shanghai has investigated various other congestion mitigation policies that might replace or supplement the license auction policy such as congestion charges (Tong, 2012) and parking charges (Li, 2012). This study investigates Shanghai residents' attitudes to the license auction policy in comparison to congestion charges, parking charges, and fuel taxes.

## **3.2 Questionnaire Survey**

### **3.2.1 Sampling frame**

This paper focuses on the employed population in Shanghai including both local and migrant workers. The sample represents the middle-class population who are well-off enough to consider having a car, but not too rich to disregard the cost of a license. They are thus likely the group most affected by the car license auction policy. Such focus limits the study from being generalized to represent the acceptance of the whole population - particularly those who are unemployed or very low-income.

We used a two-stage sample: purposeful sampling for the selection of companies in Shanghai and random sampling for the selection of employees in the chosen companies. In the first stage, we selected nine companies varying in business type, location, size, and ownership (government and private). They included four engineering companies, two design companies, one research institute, one trading company, and one chemical plant factory. They were distributed from the central district (within the inner ring road) to the outskirts (outside the outer ring road), and ranged from 20 employees to 500 employees. Five of them are government owned and four are privately owned. Appendix A lists the companies. The second stage randomly sampled employees in each company. In companies with less than 200 employees, all employees were invited to participate. In large companies, 200 employees were randomly selected to participate. Overall we distributed 1,100 questionnaires to employees.

### **3.2.2 Questionnaire design and survey implementation**

The questionnaire design and survey implementation consisted of three stages:

1) After the initial questionnaire design, the authors used email and telephone to interview Shanghai residents and the contact person in each company, and to evaluate the quality and suitability of the questionnaire. The questionnaire was revised as necessary.

2) A pilot survey (March 25, 2011) was then conducted online among 62 employees in one company, with 48 valid responses. The pilot data were analysed to verify the length, language and sequencing of the questionnaire, and the reliability and validity of the attitudinal indicators. The questionnaire was again revised. The pilot data are not included in the reported survey results.

3) The full survey was implemented over three weeks in May 2011. Respondents could choose an online or paper-based questionnaire. A cover letter explaining the study objectives was sent to the company contact person who then distributed the survey to the employees. The contact person explained to employees that the survey was entirely voluntary and anonymous. The letter also explained that no incentives or disincentives were offered, and respondents could end their participation at any time. Respondents who chose the online questionnaire received the web address at their company email address. Paper-based questionnaires were used where Internet access was not available or where employees preferred a paper-based survey. A drop box at the company collected paper responses. Employees at four companies completed the online questionnaire, three completed the paper-based questionnaire, and two used both methods.

### **3.2.3 Questionnaire structure and contents**

The final questionnaire includes seven sections: (1) policy awareness; (2) car ownership and travel behaviour; (3) perceptions of congestion and necessity for policy intervention; (4) attitudes towards the license auction policy; (5) attitudes towards non-local licenses; (6) attitudes towards other congestion mitigation policies; and (7) location and socioeconomic background. Section 4 is the core of the survey. It assesses overall acceptance of Shanghai's auction policy, perceived effectiveness, and attitudes towards affordability, equity, and the implementation process. The questionnaire includes 102 Likert-scale psychometric statements as indicators of people's attitudes and perceptions. Each statement has five response levels: strongly agree, partially agree, neutral, partially disagree, and strongly disagree, coded 2, 1, 0, -1 and -2, respectively. The questionnaire was developed in both English and Chinese, with the Chinese version distributed to the sampled employees.

### **3.3 Survey Data**

The 1,100 questionnaires distributed produced 827 responses (75%). After cleaning the data and removing inconsistent responses and missing values, the number of valid responses was 524 (48%). Table 1 reports the sample characteristics. Compared with Shanghai city-wide statistics, the sample skews to young, male, highly educated, and relatively higher income residents. 42% of the sample own a car and 28% drive as their main mode of travel. The great majority of respondents live within one kilometre of a subway (71%) or bus service (91%).



Commuting distances vary greatly: 28% commute less than 5 kms, 33% commute 5 to 14.9 kms, and 39% commute more 15 kms or more.

**TABLE 1: Survey sample characteristics (demographic, socioeconomic, land use and public transit access) (N = 524)**

Variables of samples	Values	Survey sample (%)	City Statistics (%) <sup>c</sup>
<b>Demographics</b>			
Gender	Male	67	50
	Female	33	50
Age <sup>a</sup>	18–34	69	24
	35–59	30	43
	60+	1	23
Have children	Yes	37	
	No	63	
Household size	1	13	
	2	24	
	3+	63	
	Average household size =	3	2.93
Residence	Born in Shanghai	34	
	Resident for		
	• < 2 years	9	
	• 2–5 years	22	
	• 5–10 years	14	
• > 10 years	21		
<b>Socioeconomic</b>			
Education level	High school or below	7	70
	College/University	79	26
	Masters+	14	4
Household income (monthly)	Low (< ¥ 4k )	14	
	Middle (¥ 4k–10k)	38	
	High (>= ¥10k)	49	
	Monthly household income	¥8,500	¥7,041
Car ownership	Yes	<b>42</b>	14
	• 1 car	37	
	• 2+ cars	6	
	No	<b>58</b>	
<b>Location and public transit access</b>			
House location <sup>b</sup>	Zone 1	31	Zone 1 20
	Zone 2	28	Zone 2&3 34
	Zone 3	39	
	Zone 4	13	Zone 4 46
Public transit access (Subway)	Low (> 1 km)	29	
	Middle (0.25–1 km)	46	
	High (< 0.25 km)	25	
Public transit access (Bus)	Low (> 1 km)	9	
	Middle (0.25–1 km)	39	
	High (< 0.25 km)	52	
<b>Travel behaviour</b>			
Commuting distance	Short	<b>28</b>	<sup>c</sup> Average trip distance (whole city) = 6.5 km
	• <1 km	7	
	• 1–4.9 km	21	
	Middle	<b>33</b>	Average trip distance (central

	<ul style="list-style-type: none"> <li>• 5–9.9 km</li> <li>• 10–14.9 km</li> </ul> <p>Long</p> <ul style="list-style-type: none"> <li>• 15–29.9 km</li> <li>• 30 km+</li> </ul>	18 15 <b>39</b> 19 20	city) = 5.4 km
Commuting time	<p>Short</p> <ul style="list-style-type: none"> <li>• &lt;5 min</li> <li>• 5–15 min</li> </ul> <p>Middle</p> <ul style="list-style-type: none"> <li>• 15–30 min</li> <li>• 30–45 min</li> </ul> <p>Long</p> <ul style="list-style-type: none"> <li>• 45–60 min</li> <li>• 60–90 min</li> <li>• &gt;90 min</li> </ul>	<b>18</b> 4 14 <b>40</b> 22 18 <b>42</b> 24 13 5	<sup>c</sup> Average commuting time (central city) = 40.8 min
Mode share	<p>Driving</p> <p>Car sharing</p> <p>Motorcycle</p> <p>Taxi</p> <p>Bus</p> <p>Subway</p> <p>Bike</p> <p>Walk</p>	28 4 4 2 11 15 9 29	<p><sup>c</sup>Private motor vehicle 20</p> <p>Motorcycle 4.6</p> <p>Taxi 6.6</p> <p>Bus 12.9</p> <p><sup>d</sup>Subway 5.7</p> <p>Bike 13.5</p> <p>Walk 26.2</p> <p>Electric bike 15.2</p>

<sup>a</sup> The age groups used in Table 1 allow comparison with city statistics. The age grouping used in the study analysis (<=30, 30–50, 50+) better reflects the sample characteristics of the survey respondents.

<sup>b</sup> Figure 3 below highlights the ring roads in Shanghai that separate Shanghai regions into four zones. Zone 1 is mapped within the Inner Ring Road; Zone 2 is between the Inner Ring and the Middle Ring Road; Zone 3 is between the Middle Ring and the Outer Ring Road; and Zone 4 is outside the Outer Ring Road.

<sup>c</sup> Data as an average for the whole city obtained from the Fourth Travel Survey conducted in 2009 in Shanghai (Shanghai Municipality, 2010).

<sup>d</sup> City statistics for subway mode share is based on the 2009 Travel Survey. Shanghai metro has undergone dramatic expansion after 2009, and therefore subway mode share in 2011 is expected to be higher.

<sup>e</sup> (Shanghai Statistic Bureau, 2011)

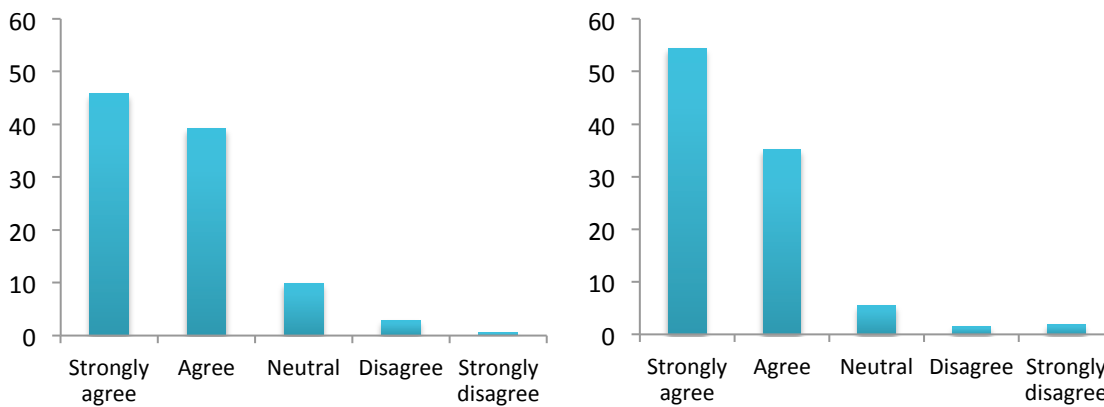


**FIGURE 3: Map of Shanghai ring roads**

## 4 RESULTS

### 4.1 Congestion Level and Need for Policy Intervention

Shanghai’s high level of traffic congestion is clearly recognised by the survey respondents. Figure 4 shows that over 85% of respondents agree/strongly agree that Shanghai is very congested, and 90% agree that the Shanghai government should take further action. These findings suggest a potentially solid basis for public acceptance of the auction policy.



**FIGURE 4: Perception of current congestion levels (left) and need for further government actions on congestion mitigation (right)**

## 4.2 Auction Policy Awareness

Awareness of auction policy is evaluated as a confirmation that respondents' ratings are meaningful, and as preparation for the policy questions. Table 2 shows that awareness of general and specific policy is very high. More than 70% of the respondents know about the policy to a very specific level. For example, 72% are aware of a photographic system recently installed on elevated roads to enforce the non-local license policy (question X4). Overall, it appears that the respondents have enough policy knowledge to answer the attitudinal questions meaningfully.

**Table 2: Policy awareness**

<b>General Policy Statements</b>		<b>Respondents aware of policy (%)</b>
X1 -	Shanghai municipality uses a license quota auction policy to control and limit the number of licenses being released every month.	83
X2 -	The price for the license in February 2011 has increased to more than ¥40,000.	75
<b>Specific Policy Statements</b>		
X3 -	Vehicles with non-local plates are prohibited from driving on elevated roads during rush hours (Monday through Friday between 7:30–9:30 a.m. and 16:30–18:30 p.m.). Vehicles caught violating the rule will be fined ¥ 200.	76
X4 -	Beginning on February 25, 2011, the Shanghai government has installed Traffic Control Photographic Systems on elevated roads to apprehend drivers with non-local plates driving during rush hours.	72
X5 -	Shanghai vehicle licenses include urban plates (Plate A/B/D/E/F) and a suburban plate (Plate C). Car owners who want to register urban plates must go through the public auction; Plate C, however, does not require public auction, though vehicles with Plate C are only allowed to drive outside the Outer Ring Road.	68
X6 -	Shanghai license quota auction takes place on the third Saturday of each month.	46
X7 -	When the vehicle has been scrapped, the car owner can apply to keep the original plate quota for new vehicles, but the car owner needs to operate the vehicle for at least 3 years before it can be scrapped.	43
X8 -	Car owners must apply to keep the license quota within 6 months after the old vehicle has been scrapped; otherwise, the government will put the quota back for auction.	35

## 4.3 Overall Policy Acceptance

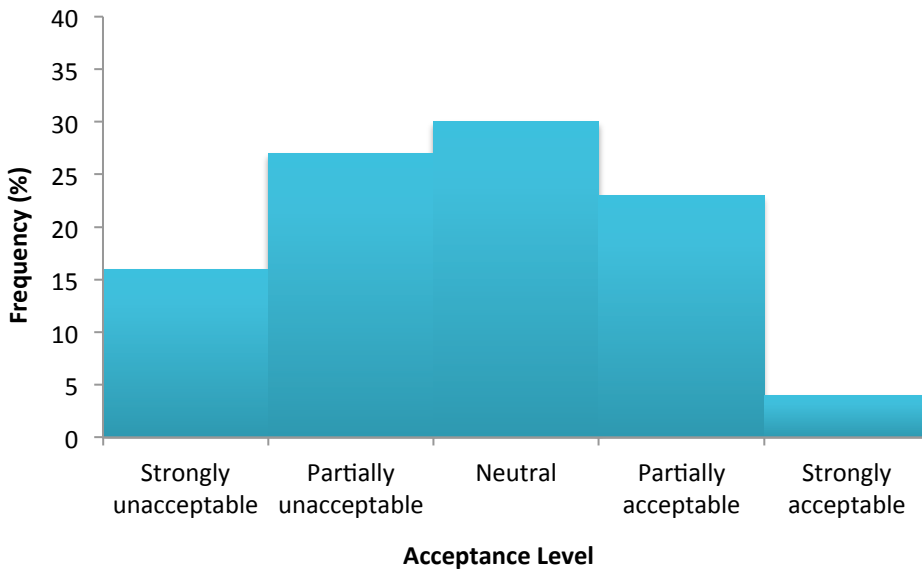
Current public acceptance is measured using the five indicators presented in Table 3 (X9 to X13). The five indicators are highly correlated (Cronbach's alpha is greater than 0.7, indicating a high internal consistency of the data). Figure 5 graphs the distribution of the mean value of the five indicators across the sample. The overall policy acceptance level is low: only 27% are positive; 43% are negative; and 30% are neutral.

Change in acceptance is measured retrospectively by indicators X14 and X15: 39% indicated that they adjusted to the policy over the years; and 44% said that their acceptance had increased considerably. Overall there is a slight positive trend in the public acceptance.

Indicator X16 measures perception of other people’s acceptance of the policy. Whereas 27% of respondents were personally positive about the policy, 47% thought that other people accepted the policy. Jakobsson (2000) interpreted the expectation of others’ intentions as anticipated social pressure on individual behaviour and a higher expectation that others’ views would support the individual’s own view of the policy.

**TABLE 3: Policy acceptance and changes (% of respondents in agreement)**

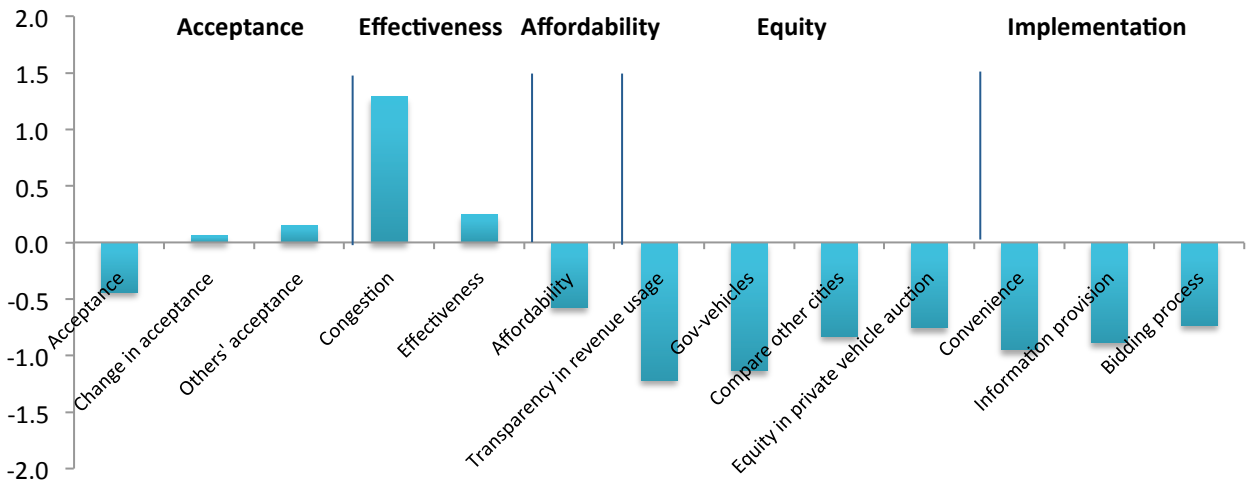
Statement		Strongly/partially agree	Neutral	Strongly/partially disagree
<b>Sign</b>	<b>Acceptance</b>			
+	X9 - I support the quota auction policy in Shanghai.	36%	20%	44%
+	X10 - I hope the auction policy can continue to be implemented in Shanghai.	34%	22%	44%
-	X11 - Shanghai government should not use the quota auction policy to mitigate congestion.	59%	21%	20%
-	X12 - I cannot accept the quota auction policy as there are numerous problems with the existing policy.	58%	27%	15%
-	X13 - If voting, I do not want the quota auction policy to continue to be implemented.	57%	22%	20%
<b>Change of Acceptance</b>				
+	X14 - I have already become used to people obtaining licenses via the auction policy.	44%	21%	35%
+	X15 - My acceptance towards the policy has increased considerably over recent years.	40%	26%	34%
<b>Expectation of others’ acceptance</b>				
+	X16 - Other people do accept the policy.	53%	10%	38%



**FIGURE 5: Distribution of policy acceptance level**

Following the framework in Section 3.1, Figure 6 summarises public acceptance towards Shanghai’s license auction policy and attitudes towards policy specifics that affect acceptance. Each factor is measured by multiple indicators, where the values reported is the mean of the indicators corresponding to the factor. While respondents consider the policy to be moderately

effective in dealing with congestion, most attitudes towards effectiveness, affordability, equity, and implementation are negative, as discussed in subsequent sections.



Note: +2.0 indicates the most positive perception, -2.0 the most negative and 0.0 neutral.

**FIGURE 6: Public acceptance of license auction policy and attitudes towards policy specifics affecting acceptance**

#### 4.4 Core Policy Drivers: Effectiveness, Affordability, and Equity

##### 4.4.1 Effectiveness

Shanghai Metropolitan Transport White Paper (Shanghai Municipality, 2002) suggests that the license auction policy has controlled vehicle ownership growth, reduced congestion, provided time and funds for improving public transit and road infrastructure, and contributed towards transit oriented development in Shanghai. The public's perception of policy effectiveness is positive but less admirable than the official claim, as shown in Table 4. 48% of respondents agree that the policy has solved Shanghai's congestion problem, and 42% believe that, without the auction policy, traffic conditions would be worse. However, perceptions of policy effectiveness are low compared with the perceptions of Shanghai's congestion levels. As noted in Section 4.1, 85% of respondents said that Shanghai is very congested.

**TABLE 4: Policy effectiveness (% of respondents in agreement)**

Statements				
Sign	Policy effectiveness	Strongly/ partially agree	Neutral	Strongly/ partially disagree
+	X17 – The Shanghai government has solved the congestion problem by implementing the license quota auction policy.	47%	29%	24%
+	X18 - Without the auction policy, there will be a rapid growth of car ownership and the traffic condition in Shanghai will worsen.	42%	27%	31%

#### 4.4.2 Affordability

Shanghai license prices have fluctuated significantly. In July 2011, the average bidding price exceeded ¥50,000 - more expensive than a small car (e.g., a Cherry QQ cost ¥33,800). Many residents of Shanghai may be able to afford a small vehicle, but not a car and a license.

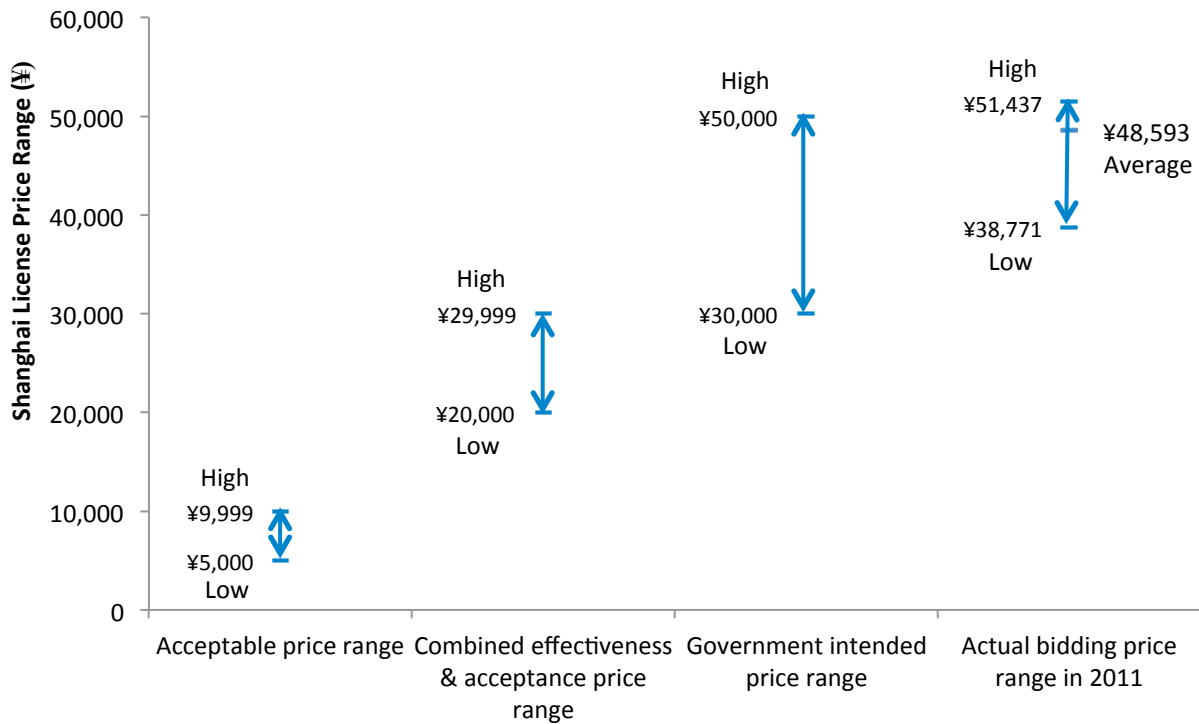
Indicators X19 to X22 (Table 5) measured the public's perception of license affordability. 73% of the respondents said that many people could not afford a license, and 56% said cars were only for rich people. On the other hand, 30% felt that the price was still personally affordable, and 21% did not care about the price as long as they could get a license. Survey respondents had a higher than average income, thus population concerns over affordability are likely higher than the results reported here.

**TABLE 5: Statements on license affordability (% of respondents in agreement)**

Statement		Strongly/partially agree	Neutral	Strongly/partially disagree
-	X19 - Many people cannot afford the high license price.	73%	16%	11%
+	X20 - The price of the Shanghai license is still within my financial affordability.	30%	21%	49%
-	X21 - The high price of the license has resulted in cars being available only for rich people.	56%	21%	23%
+	X22 - I do not really care about the price of the license as long as I can get one and drive my car.	21%	21%	58%

When asked to give an acceptable price for a license, respondents typically said ¥5,000 to ¥9,999, less than one-fifth of the bidding price at the time of the survey. When asked to give a license price that would be acceptable and effective in reducing congestion, respondents increased the price to ¥20,000 to ¥29,999, still far less than the actual bidding price.

In personal communication with the authors, Mr. Yao, a senior police officer who manages traffic in Shanghai and works with transportation planners, explained that the government wanted to keep the license price between ¥30,000 and ¥50,000. Any price over ¥50,000 would be too high and could cause public dissatisfaction, but any price lower than ¥30,000 would not be effective. Mr. Yao indicated that the government adjusted the price by changing the license quota every month: when the price was too high, the next month's quota was increased, and vice versa. This approach contrasts with stated license policy where the quota is set based on road infrastructure and the number of cars that can be accommodated, and then allows the license price to respond. Figure 7 summarises the price ranges discussed.



**FIGURE 7: Shanghai license price range - acceptable price range, combined effectiveness and acceptance price range, government intended price range, and average 2011 ongoing price**

#### 4.4.3 Equity

Four sets of equity concerns are evaluated within the survey instrument: equity in private vehicle auctions, restrictions in government vehicles, fairness compared with other cities, and transparency in revenue usage. Table 6 provides details of the questions and responses.

**TABLE 6: Statements on equity (in % of respondents in agreement)**

Statement		Strongly/partially agree	Neutral	Strongly/partially disagree
<b>Sign</b>	<b>Equity in private vehicle auction</b>			
-	X23 - The auction policy is not fair as it auctions the cars together; thus the car price and car type do not matter.	71%	16%	13%
-	X24 - Shanghai's quota auction policy is not fair as it makes the road that is constructed using revenue collected from all residents only for a small portion of rich people.	67%	19%	14%
-	X21 <sup>c</sup> - The high price of the license has made cars available only for rich people.	56%	21%	23%
	<b>Perception on government vehicles</b>	<b>Strongly/partially agree</b>	<b>Neutral</b>	<b>Strongly/partially disagree</b>
-	X25 - There should be more restrictions on the license quota for government financed vehicles than on private vehicles.	85%	11%	4%
-	X26 - Government should reduce the total quota released per month for government financed vehicles to reduce the ratio of government vehicles on Shanghai's road.	84%	11%	5%
-	X27 - Government should reduce and restrict the quota that each government department and agency can bid.	9%	15%	76%



+	X28 - There should be a relaxation on the quota limit for government vehicles as doing so will make government agencies more convenient and accessible.	17%	18%	65%
<b>Fairness compared with other cities</b>		<b>Strongly/partially agree</b>	<b>Neutral</b>	<b>Strongly/partially disagree</b>
-	X29 - Drivers in cities outside Shanghai have more freedom as they do not need to auction for their licenses.	80%	15%	5%
-	X30 - The auction policy is not fair as it makes people in Shanghai pay more than people in other cities do to enjoy the same freedom of driving.	62%	22%	16%
-	X31 - The lottery policy in Beijing is fairer than Shanghai's auction policy, as no matter how much money you have, you can still join the lottery and have a chance to win a license quota.	59%	23%	18%
<b>Transparency in revenue usage</b>		<b>Strongly/partially agree</b>	<b>Neutral</b>	<b>Strongly/partially disagree</b>
-	X32 - I do not know about the usage of the revenue collected from the auction.	86%	11%	3%
-	X33 - Shanghai should make the revenue usage transparent to the public for auditing.	85%	12%	3%
+	X34 - The revenue collected is for government use, which has no need to be transparent to the public.	17%	12%	71%

<sup>c</sup> The same indicator, X21, is used to measure both affordability and equity in a private vehicle auction.

### *Equity in private vehicle auction policy*

The lack of affordability of the Shanghai license has caused concerns about the policy favouring the rich. Respondents' perceptions of equity in the private vehicle auction are consistently negative: most respondents said that the policy is unfair and makes roads and cars available only to the wealthy. Singapore categorises vehicles by capacity (Phang, 1996), but Shanghai treats all vehicles the same. 71% of respondents indicate that this is unfair because it pits people who can only afford a cheap vehicle against those who can afford a luxury vehicle.

### *Restriction on government vehicles*

In 2004 Shanghai announced that government vehicles would also be subjected to the auction process for the first time, but with a separate quota limit (Zhou, 2004). These government vehicle auctions take place every two months. A base price is established using the previous month's average bidding price at the private vehicle auction. Anecdotally, many car owners complain about the high percentage of government vehicles being driven on Shanghai's roads and particularly the private use of government vehicles. They consider the system unfair because government vehicle licenses are paid with taxpayers' money, but private car users had to pay with their own money. More than 80% of respondents indicate that there should be more restrictions on the total number of government vehicles.

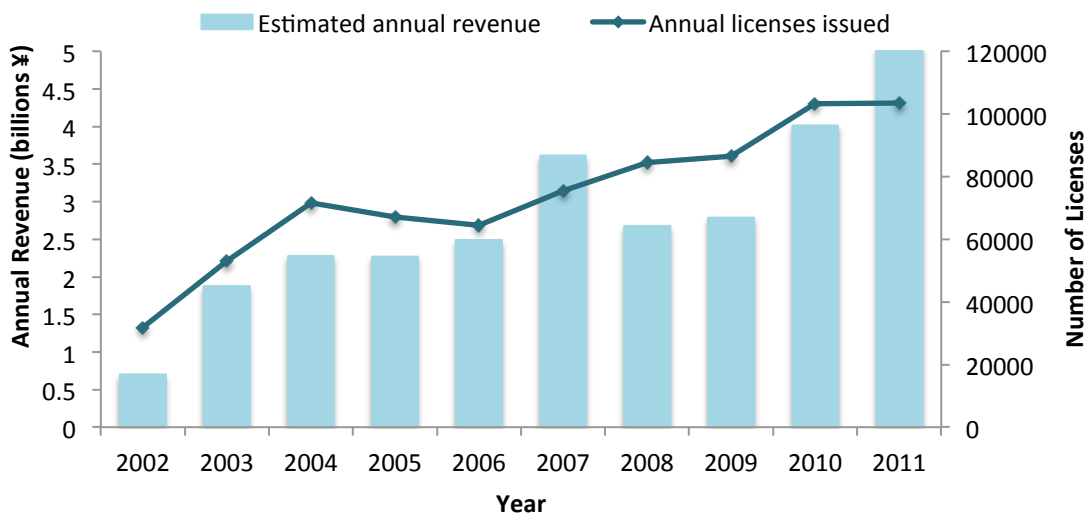
### *Fairness compared with other Chinese cities*

Until 2011 Shanghai was the only city in China that restricts automobile ownership using license quota. Over half of the respondents consider the car ownership policy unfair because it makes Shanghai residents pay more than residents of other cities to enjoy the same freedom of driving. Since 2011 three Chinese cities have also introduced their car ownership control policies:

Beijing started the car license lottery policy in Jan 2011, Guizhou in Aug 2011 and Guangzhou a hybrid model combining license auction and lottery in Aug 2012. These cities following suit may influence Shanghai public's perception of this aspect of fairness.

*Transparency and trust in revenue usage*

Shanghai's license auction policy has generated large amounts of revenue for road infrastructure and public transport. For example, Shanghai did not have a subway until 1995, but the system is now among the most rapidly expanding systems in the world (Shanghai Tour, 2011). Figure 8 shows the annual revenue collected from the auction calculated based on the average price of successful bids and the number of licenses released each month. As a comparison Shanghai municipal subsidy to public transportation operation in 2010 is 2.5 billion CNY, which can be more than offset by the license auction revenue in the same year (4 billion CNY). From 2002 to 2011 Shanghai's license auction generated an estimated 28 billion CNY.



**FIGURE 8: Annual revenue collected from the license auction in Shanghai from 2002 to 2011 (Data: Shanghai Jinwei Automobile, 2011; Calculated by the Authors).**

However, the actual amount of revenue and its specific uses have not been made known to the public. On May 22, 2009, lawyer Yu submitted a request to the government to release detailed information on revenue usage (Wang and Zhou, 2011). In response, only rough estimates and general indications of spending usage were provided. Because specific revenue usage was kept secret, the auction policy appeared to be simply another government funding source.

The survey respondents' attitudes towards transparency in revenue usage is correspondingly consistently negative. Over 80% believe that there is a lack of transparency in revenue usage, and that the Shanghai government should make the detailed usage public for

auditing. 82% believe that auction revenue should be used to improve the public transit system and reduce transit fares.

## 4.5 Implementation Specifics

### 4.5.1 Process of obtaining a Shanghai license

Shanghai’s license auction policy is managed and implemented by the Vehicle Management Department under the Shanghai Traffic Police Bureau. The Shanghai Auction Company manages the license auction, which takes place the third Saturday of every month (China License, 2011). Bidders must register and pay a ¥ 2,000 deposit to obtain a bid auction card for the monthly auction (China License, 2011). The bid auction card expires six months after registration, and unsuccessful bidders can use the card for a maximum of three times. Unsuccessful bidders must wait to join the next month’s auction with no guarantee of a license that month. To bid, an applicant needs a driving license. A temporary driving permit valid for a maximum of 15 days is available. An individual can apply up to three times for the permit.

The time limit for the bid auction card and the limitations on temporary driving permits have raised concerns about the inconvenience of the whole process. More than 70% of the survey respondents indicate that the process of obtaining a Shanghai car or driving license is both time consuming and complicated, as shown in Table 7.

**TABLE 7: Statements on the implementation process (% of respondents in agreement)**

Statement		Strongly/partially agree	Neutral	Strongly/partially disagree
<b>Sign</b>	<b>Process of obtaining a license</b>			
-	X35 - Obtaining a license through auction is very time consuming in Shanghai; there is no guarantee that you will win the bid.	77%	17%	6%
-	X36 - You have to use a temporary license to drive before you win the bid in the auction; it is very inconvenient as one can only apply for a temporary license 3 times and each can be used for a maximum of 15 days.	77%	18%	5%
-	X37 - The whole process of obtaining a license to be able to drive is very complicated and time consuming in Shanghai.	70%	23%	7%
-	X38 - Car owners who cannot immediately obtain a plate must wait another month, as the license bidding takes place only once per month, which is very time consuming.	70%	20%	10%
	<b>Bidding format</b>	<b>Strongly/partially agree</b>	<b>Neutral</b>	<b>Strongly/partially disagree</b>
-	X39 – Using the Internet and phone bidding is not very reliable as sometimes one failed to place a bid successfully due to network paralysis or congestion in the phone lines.	69%	24%	7%
-	X40 - Bidders could not obtain the actual bidding details using the Internet or phone bidding.	62%	30%	8%
-	X41 - There are many loopholes in the bidding process, making it difficult to be fair and transparent.	57%	33%	10%
-	X42 - There might be speculative activities and black casework existing in the bidding process and system.	59%	33%	8%
	<b>Information provision</b>	<b>Strongly/partially agree</b>	<b>Neutral</b>	<b>Strongly/partially disagree</b>

- X43 - Shanghai's auction policy is continually changing, and I cannot find or confirm the most current rules and specifications.	73%	21%	6%
- X44 - I cannot update my knowledge of the changes made in the policy.	73%	21%	6%
- X45 - Car owners often realise the change in policy only after they have been fined.	64%	27%	9%

#### 4.5.2 Bidding format

The auction's bidding technology has also generated complaints. Winning bids are selected first on price and then on time. The system ranks the bidders by bid price. If the month's quota is 8,000 licenses, the system accepts the 8,000 highest bids. Initially, all bids had to be made in the Auction Hall. Phone bids were introduced in 2003. In 2008, bidding in the Auction Hall was cancelled in an attempt to avoid the chaos that arose during the bidding process. The auction system was changed to a two-stage bidding process that allowed for price adjustments to be made after the first stage (China License, 2011). Under the new system, no price limit was set and bidders could bid any price in the first stage. The number of first stage bidders and the lowest winning prices were made known. In the second stage, up to two adjustments were allowed within ¥300 above or below the lowest winning price of the first stage.

Internet and phone bidding options have made the bidding process more convenient, but created room for speculation. There are rumours of “black-case operations”, and many believe that the bidding price is manipulated by car dealers and traders who hoard licenses and by traders who spread rumours of higher prices and/or bid a high price in the first round so the system can report the high price in the second round (Chen, 2008; (Xie, 2010). Public concern has been further increased because of lack of transparency in detailed bidding information, and technical difficulties in the bidding systems. For example, many bidders have lost a bid because of system breakdowns, and the July 2009 auction was cancelled due to network paralysis.

Survey respondents indicate that the bidding technology is not reliable and lacks transparency. Nearly 60% of respondents agree that loopholes in the bidding process make it difficult to be fair, and over half believe that speculative activities exist in the bidding process.

#### 4.5.3 Policy information provision

Public information about the bidding policy is limited. For example, there is no single source online or offline to check the regulations. Participants obtain information from various newspapers, policy notices, or auction guidelines posted ad hoc in public space or online. Survey respondents indicate that policy information is not properly updated and that it is difficult to track policy specifications and changes. Over half believe that car owners only became aware of policy changes after being fined for breaking a rule.

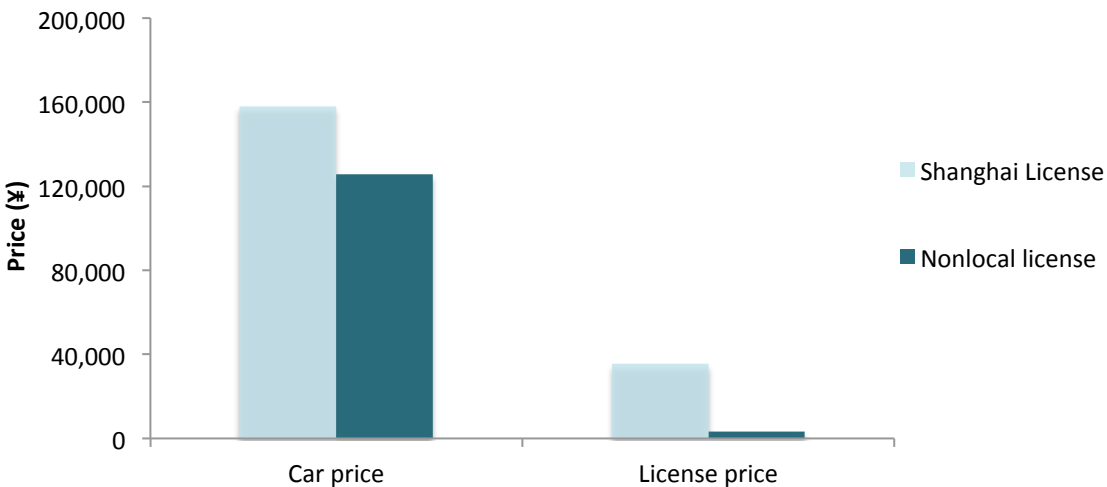
Some people additionally question the legal basis of implementing this auction policy (Xie, 2010). When Shanghai's public auction policy was introduced, it was based on the “Regulations on Shanghai Motor Vehicle Administration” in 2000 (Yu and Hou, 2010). These regulations were replaced by the “Law of the People's Republic of China on Road Traffic Safety”

in 2004. No information about any additional regulations drafted for Shanghai's auction policy is available. As far as the authors can tell from publically available sources, no legal documents currently govern the auction policy.

#### 4.6 Unintended Consequences

High and increasing license prices in Shanghai have seemingly pushed many locals to register their cars in other cities in order to bypass the auction. The average license outside Shanghai costs only 5% of a Shanghai license, but is less convenient to administer. Figure 9 compares the average car and license prices of local licenses with non-local licenses: the Shanghai license price averaged 13% of the car price whereas the non-local license price averaged only 3% of the car price.

Non-local license (NLL) holders who drive on Shanghai's roads without purchasing a local license reduce auction policy effectiveness, resulting in revenue loss, difficulties in traffic management, equity concerns among local car owners, and damage to the trustworthiness of the entire auction policy. However Shanghai must balance these goals with its role as a metropolitan center for the country. It cannot simply impose harsh restriction on non-locally licensed cars. By devising and gradually revising policies to inconvenience vehicles with NLLs, not ban them, the government has successfully compromised between the city's open-ness on the one hand, and compliance with vehicle control policy on the other hand (Zhao, Block-Schachter and Chen 2012).



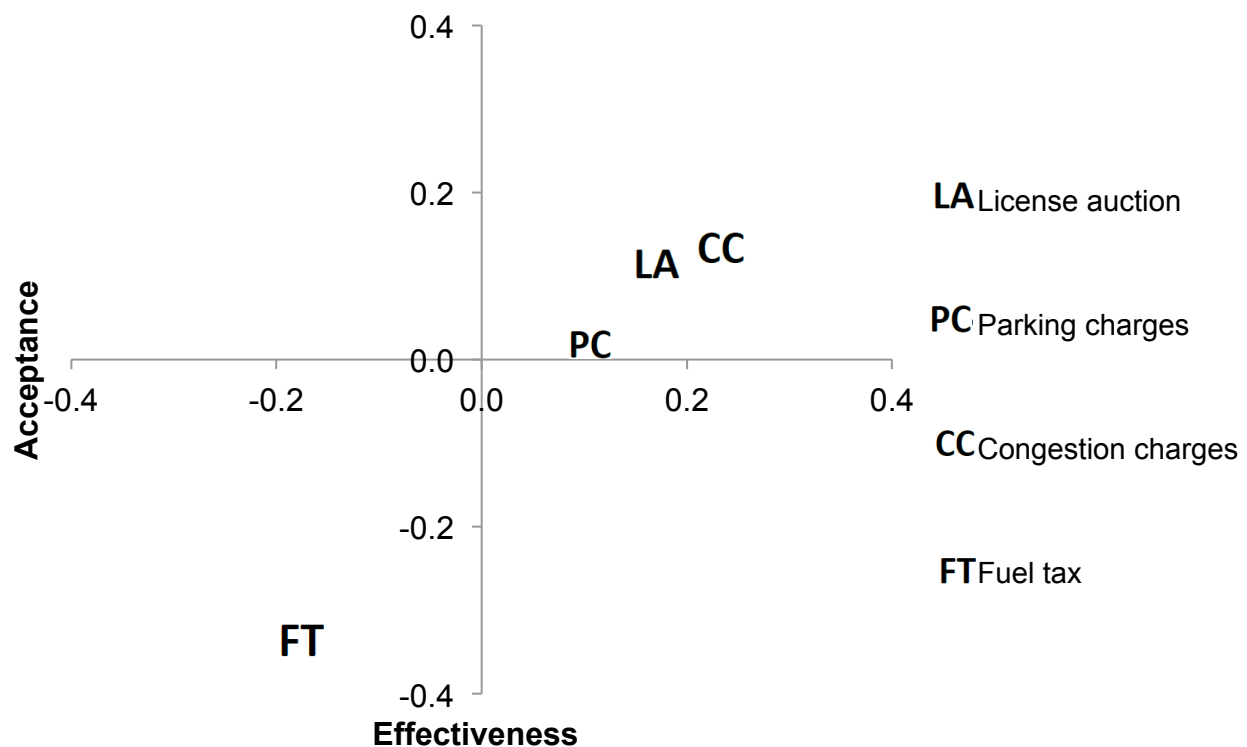
**FIGURE 9: Comparison of car price and license price between Shanghai and non-local car licenses**

#### 4.7 Congestion Mitigation Policy Options

Survey respondents were asked to consider three policy instruments that might replace or supplement the auction policy: parking charges, congestion charges, and fuel taxes. The

questions investigated public acceptance and perceived effectiveness without specifying the details of the policies. Improving public transit was included in the pilot survey but removed in the main survey because it dominated the responses, making it impossible to distinguish between other policy options.

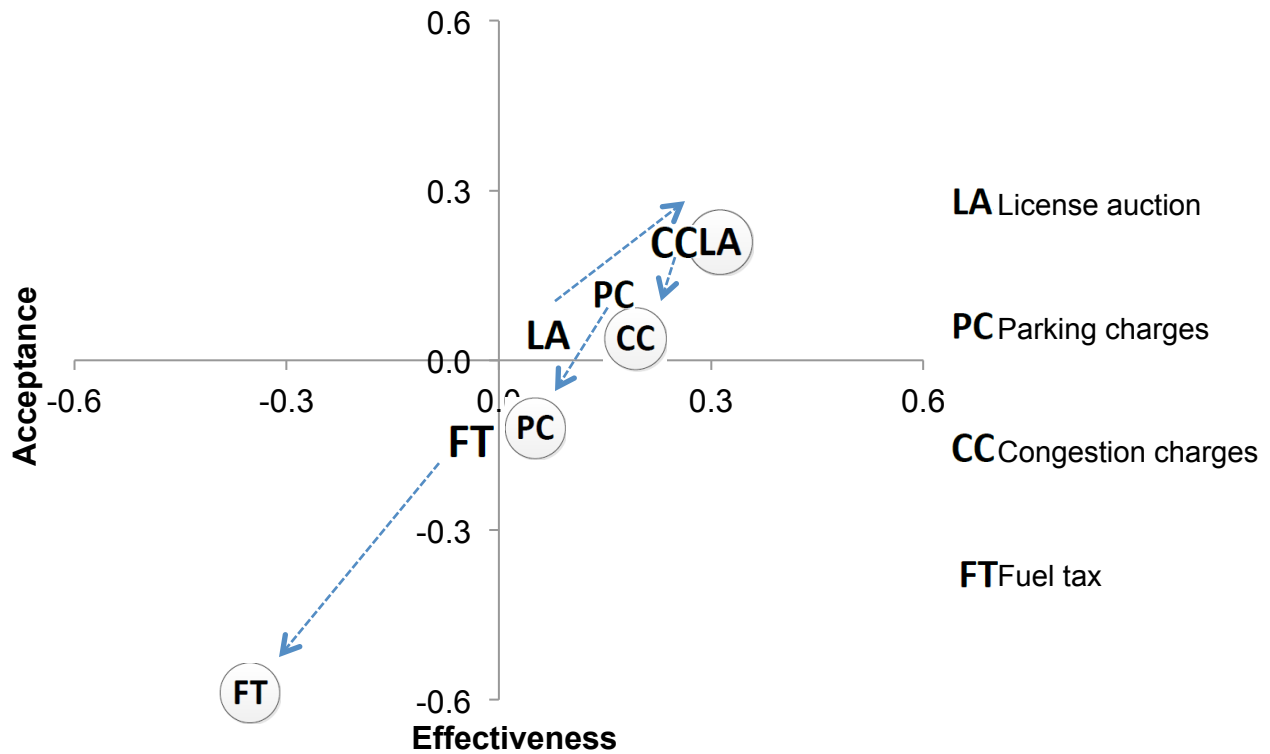
Figure 10 plots the survey respondents' attitudes towards these policies on a five-point numerical scale where 2 indicates very effective and very acceptable, and -2 indicates ineffective and not at all acceptable. Congestion charges and the license auction were the best-perceived policies in both dimensions, followed closely by parking charges. Fuel taxes were by far the worst - perceived as neither acceptable nor effective. When the respondents were asked to rate the four policies combining acceptability and effectiveness, fuel taxes remained the least favourable policy. It is interesting that the respondents gave license auctions poor marks when they evaluated the policy on its own, but higher marks when compared with other policies. It suggests that context within which a policy is evaluated may well influence the result of the evaluation. This is consistent with Tversky and Kahneman (1981), which shows that framing of a problem can affect the outcome in part from the manipulation of the decision options offered.



**FIGURE 10: Acceptability and effectiveness of congestion mitigation policies**

Figure 11 shows how car ownership influences respondents' attitudes towards license auctions, parking charges, congestion charges, and fuel taxes. The attitudes of car owners are circled, and the arrows show the direction of change between non-car owners' and car owners' perceptions of policy acceptability and effectiveness. Car owners were consistently more negative about parking charges, congestion charges, and especially fuel taxes than non-car

owners. But they were more positive about license actions - presumably because they have already paid for the license. Car owners saw the license auction as the best option while non-car owners saw congestion charges as the best.



**FIGURE 11 Acceptability and effectiveness of congestion mitigation instruments between car owners (circled) and non-car owners. (Arrows indicate the change in attitude after obtaining a car.)**

#### 4.8 Results of Disaggregate Analysis

An additional disaggregate analysis based on the Structural Equation Model by the authors (Chen and Zhao 2012) finds that the most important differences between population segments lie between car owners with a Shanghai license (positive attitude towards the policy), car owners with non-local license (significantly negative attitude) and non-car-owners (moderately negative attitude). Because of the license cost, the license auction effectively recruits local car owners as a supporting constituency for the car deterring policy. Fewer cars on the road makes their already paid for licenses more valuable (for example, by less traffic). It creates an interesting dynamic: the more people own cars, the more the policy would be supported, but the less effective it will be.

## 5 DISCUSSION

This paper assesses the acceptance of Shanghai's license auction policy by the working population in Shanghai via a survey of 524 employees at 9 companies. The results suggest that policy acceptance among respondents is moderately low but increasing, and that expectations are that others would support the policy. Respondents mostly perceive the policy as effective, but believe it is neither affordable nor equitable. Equity concerns are focused on transparency in revenue usage and the perception that government vehicles enjoy various license advantages. Respondents also are negatively disposed towards the bidding process and technology, and the amount of information available about the license auction policy.

On the basis of these results, we make five recommendations. First, transparency in revenue usage must be addressed. These findings suggest that if the public knew where their money is spent, it would increase public acceptance of the auction policy. The Shanghai government should publish detailed revenue usage information in order to demonstrate that the revenue is used to improve public transit and reduce public transit fares in Shanghai. This information would reveal both the intent and effectiveness of the current policy regime.

Second, better controls and restrictions on government vehicles would likely mitigate equity concerns about government vehicles. For example, the government could reduce the quota for government vehicles, and increase transparency regarding the total number, purpose and usage of government vehicles. Controlling the private use of government vehicles would also help alleviate public concerns.

Third, categorising vehicles by type and capacity in the auction (so more expensive vehicles would pay more than budget vehicles) would increase policy fairness and acceptability but the specifics such as the quota ratio between various vehicle types need to be carefully thought through.

Fourth, improvements in the implementation process could increase public acceptance. For example, moderately increasing the length of the temporary driving permit period would ease the process of obtaining a license in Shanghai. So too would improving the bidding system technology, and providing necessary bidding information to the public. For example, a website for Shanghai's license auction that maintains and organises policy specification documents and updates would allow more informed bids. Such a website could also maintain current, updated information about license auction procedures and applications, traffic conditions, road construction, and improvements in public transit.

Finally, although Shanghai's license auction policy has effectively controlled growth in the number of vehicles, the demand for cars continues to increase. The car license policy alone may not be sufficient in the future. Supplementing policies aimed at car ownership with those that restrict vehicle usage in congested locations and during peak hours may be more effective. When comparing the license auction policy with other instruments such as congestion charges,



parking charges and gasoline taxes, the respondents rated license auctions and congestion charges as the most effective and acceptable policies.

Building on these results and recommendations, four directions for future research stand out. 1) The paper identifies a plethora of factors that may influence people's acceptance. A structural equation model could be developed to quantify the strength and direction of these factors and their impacts on policy acceptability. 2) Study respondents were all employed and had higher than average education and incomes. A study of the lower income and unemployed Shanghainese may reveal different attitudinal responses. 3) Changes in attitude are examined by cross-sectional retrospective measures. Panel data is necessary to measure the dynamics of attitudinal change over time. 4) Beijing and Shanghai transportation policies have evolved disparately since the early 1990s. Shanghai chose to manage car ownership, while Beijing chose to control car use. Then, in 2011, Beijing adopted a monthly quota for vehicle licenses, but chose a distinctly different allocation mechanism—a license lottery. A comparison of the different paths the two biggest cities in China have taken would be of value.

Innovative policies implemented in Shanghai are often embraced by other Chinese cities - Shanghai acts as a role model (Bezlova, 2007). For example, as mentioned in the fairness comparison between Shanghai and other cities, Guangzhou implemented a hybrid model of car ownership control in 2012, borrowing from both Shanghai and Beijing. Half the vehicle quota is allocated via an auction and half through a lottery. Thus, while this paper focuses on Shanghai, its experience, both positive and negative, can be useful to other Chinese cities seeking suitable solutions to mitigate congestion. The framework developed in this study can be applied to study public acceptance of transportation policies elsewhere.

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<b>Pilot Company</b>	Kaomaikē Marine Technology Ltd.
<b>Industry category</b>	Ship design
<b>Size of the company</b>	62 employees
<b>Survey method</b>	Online
<b>Location</b>	Zone 3
<b>Company 1</b>	China Shipbuilding NDRI Engerring Co., Ltd (CSSC)
<b>Industry category</b>	Shipbuilding, engineering, sales, design
<b>Size of the company</b>	200 employees
<b>Survey method</b>	Paper based
<b>Location</b>	Zone 1
<b>Company 2</b>	Shanghai Petroleum and Chemical Equipment Corporation Ltd.
<b>Industry category</b>	Chemical plant
<b>Size of the company</b>	100 employees
<b>Survey method</b>	Online
<b>Location</b>	Zone 3
<b>Company 3</b>	Ninth Design and Research Institute of CSSC
<b>Industry category</b>	Design and engineering
<b>Size of the company</b>	500 employees
<b>Survey method</b>	Online and paper based
<b>Location</b>	Zone 1
<b>Company 4</b>	Engtek International Trading Ltd.
<b>Industry category</b>	Sales
<b>Size of the company</b>	20 employees
<b>Survey method</b>	Online
<b>Location</b>	Within Inner Ring Road
<b>Company 5</b>	Rongsheng Heavy Industry
<b>Industry category</b>	Engineering, design
<b>Size of the company</b>	150 employees
<b>Survey method</b>	Online and paper based
<b>Location</b>	Within Inner Ring Road
<b>Company 6</b>	Shanghai Maric Marine Design and Research Institute
<b>Industry category</b>	Engineering research institute
<b>Size of the company</b>	100 employees
<b>Survey method</b>	Paper based
<b>Location</b>	Within Inner Ring Road
<b>Company 7</b>	Changxing Island Shipyard
<b>Industry category</b>	Marine engineering, design, and shipbuilding
<b>Size of the company</b>	100 employees
<b>Survey method</b>	Paper based
<b>Location</b>	Outside Outer Ring Road
<b>Company 8</b>	Shanghai Waigaoqiao Shipbuilding Company
<b>Industry category</b>	Marine engineering, design, and shipbuilding
<b>Size of the company</b>	200 employees
<b>Survey method</b>	Paper based
<b>Location</b>	Zone 3
<b>Company 9</b>	Shanghai Zhongjian Architectural Design Institute Co., Ltd
<b>Industry category</b>	Marine engineering, design, and shipbuilding
<b>Size of the company</b>	20 employees
<b>Survey method</b>	Online
<b>Location</b>	Zone 1

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