Understanding Car Pride

by

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Abstract

More than a tool that provides mobility, the car is also a commodity with symbolic values related to the sense of self-regard. To various degrees, people pride themselves on being car owners or users. Based on a literature review primarily of a plethora of psychological theories, this thesis proposes a framework that defines the concept of car pride, examines the process of its formation, and classifies different types of car pride. Car pride is measured using data collected from a survey in Shanghai. Although household income and location are found to be significant predictors, car pride cannot be effectively explained by individual socio-economic characteristics. Car pride and ownership are found to be interdependent. The 2SLS model finds a significant impact of ownership on pride. Conversely, car pride can influence whether someone plans to buy a car, more so for first-time car buyers. In terms of the relationship between car pride and car use, the influence of car use on pride is weak, but car pride significantly stimulates car use. The relationship between car pride and other attitudinal factors is also investigated. A positive correlation between pride and dependence indicates people with high car pride are usually more dependent on cars. Public acceptance of car ownership restriction policies can also be subject to the influence of car pride. People with high car pride, though having strong desire for cars, tend to support policies that restrict car ownership, possibly because such policies make car ownership more exclusive and special. Car pride in Shanghai is compared with Beijing to reveal regional similarities and differences of car pride. It is found although overall car pride is similar in the two cities, car pride in Beijing has much more variation. Overall, this thesis provides a systematic understanding on its psychological structure, and its role in shaping people's behavior (in terms of car ownership and use) and attitudes (in terms of car dependence and acceptance of car ownership restriction policies). It is suggested car pride can have important implications in addressing transportation issues such as traffic congestion and rapid motorization.

Preface

The surveys carried out to collect data used in this study were conducted in accordance with UBC Research Ethics Boards requirements (The University of British Columbia Office of Research Services, Behavioral Research Ethics Board, UBC BREB Number H11-00607).

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Acknowledgements

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My special thanks go to Xiaojie Chen for designing and implementing the surveys to collect data used in this study. Her help made it possible for this thesis to quantify car pride and its relationship with other factors, as presented in Chapters 4 through 8. I also thank Rupert Campbell for permission to use the interview data he collected to illustrate the proposed theoretical framework for car pride, as shown in Chapter 2.

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1 Introduction

"No other man-made device since the shields and lances of ancient knights fulfills a man's ego like an automobile."

—Lord Rootes

1.1 Background

With rising fuel prices, worsening air pollution, and increasing emphasis on public transportation improvement, our world are still very much congested with cars, if not more so. It seems only controlling instrumental factors like travel cost and travel time is not enough to repress people's desire for cars. People want to buy or use cars even when it contradicts conventional wisdom of economics. These seemingly "irrational" behaviors are likely caused by non-instrumental factors like perceptions, attitudes, and emotions. Failure to consider these non-instrumental factors could limit the effectiveness of transportation planning and policy making aiming to deter people from cars.

Car is a mode of transportation, which can substantively improve mobility. Yet, as an important commodity in our life, it is more than just a tool. Like many other commodities (e.g. jewelry), car is commonly considered to have some symbolic meanings that enhance the sense of self-regard. People may look at cars as an indication of self-worth and identity. This is particularly common in the social context, where car is usually regarded as a status symbol. With cars, you wear your status, wealth or even personal values on the road. It can play a role in not only how you evaluate yourself, but also how you are evaluated by others. On one hand, people can express themselves and their social position with their cars. On the other hand, people are also judged and compared based on their cars. If you drive a nice car to work, you would probably get comments from co-workers like, "You must be doing well." Whenever something can represent who we are, we take pride in it. To various degrees, people pride themselves on having a nice car. This is evidenced by car marketing strategies which often emphasize the significance of pride in consumer behavior. One does not need to look far to find a car advertisement trying to convey an image, brand, status or prestige instead of solely concentrate on technological performance.

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Celebrity endorsement is another way to encourage consumer emulation. As car dealers know, people who take pride in cars are more likely to own and use cars. For example, one may choose to buy a fancy car he can barely afford just to feel superior to his neighbors and colleagues. One may choose to drive more because he just wants to show off his newly bought Ferrari.

It is not hard to sense people's pride in cars in everyday life, but more work needs to be done for researchers to understand it systematically. Prior studies from different areas have inspired the study of this topic, but their perspectives are not consistent. Transportation researchers like Steg (2005) have recognized the importance of non-instrumental factors in influencing travel behaviors, and made the distinction between symbolic motives and affective motives. However, pride may be a special case because it is processed based on symbolic values of cars and expressed as an emotion. Psychologists like Tracy and Robins (2004) have extensive conceptual studies on pride and proposed various theories to explain it. Nevertheless, the relationship between pride and people's behaviors is understudied and this makes these theories less relatable in transportation planning and policy making. This study tries to bridge the gap between the two areas, and introduce the concept of *car pride*.

1.2 Objectives

The main aim of this study is to understand the concept of car pride. As one of the first to concentrate on this topic, the study explores a few different issues related to car pride. The specific objectives of this study are following:

1) Build a theoretical framework for car pride.
Studies on car pride are rare. Because of the potential significance of pride in transportation, the necessity for theoretical groundwork on the topic, and lack of relevant studies, this study, for the first time, constructs a theoretical framework to define the concept of car pride, explain its process and structure, and distinguish different aspects within. Although the framework is designed for car pride, it is foreseeable that it can be extended to study other types of pride.

2) Measure car pride.

As suggested by prior studies (e.g. Tracy & Robins, 2007), car pride have more than one facet. Data mining techniques are employed to explore possible underlying facets. To understand the variation of car pride based on individual socio-economic background, population is segmented by car pride, and possible socio-economic factors affecting car pride are analyzed. This would help identify the group of people with high car pride. They are the potential target group if future policy is developed based on car pride

3) Characterize the causal relations between car pride, ownership and use.
The exact causal directions between car pride and behavior are of constant debates. Car pride is often considered to play a part in shaping people's car ownership and car use. However, it is also possible people adapt pride to their behavior. Without knowing causal directions between car pride and behavior, car pride would not be a meaningful policy variable. This study attempts to disentangle the causal relations between car pride, ownership and use, and quantify the behavioral implications of car pride.

4) Explore the relationship between car pride and car dependence
Car dependence is used to describe the extent to which other travel options are excluded from the considered choice set. It represents people's attachment to car usually resulted from personal habit and environmental constraints. Both car pride and car dependence are based on people's perceptions. But car dependence is different from car pride in that car dependence does not necessarily involve symbolic representation and non-instrumental desirability of car. The relationship between car pride and dependence is explored to gain a better understanding on the similarity and uniqueness of the two psychological factors about car.

5) Investigate the impact of car pride on acceptance of car ownership restriction policies
Many large cities have adopted different policies to control the rapid growth of vehicular fleet on road. One example is Shanghai's car license auction policy, which limit car ownership via auction. Since car pride is expected to encourage car ownership, it is interesting to see whether and how car pride influences the public acceptance of this type of car ownership restriction policies. This offers evidence on the role of psychological factors play in explaining people's policy acceptance.

6) Examine the regional difference of car pride.

Developing countries like China are where rapid economic growth and motorization are undergoing. Rapid economic growth brings about divided social classes and rising materialistic values. Rapid motorization may make car ownership a social norm for growing middle class population. This study makes a comparison of car pride between the two largest cities in China – Shanghai and Beijing. These two cities, despite similar demographic and economic characteristics, are different in culture, political structure and transportation policy making. The comparison may help discover the universal and city-specific aspects of car pride.

For a new concept like car pride, many questions need to be answered before it can be regarded as a factor in policy making. The thesis helps answer a few important questions, like "what car pride is", or "whether or how it affects car ownership and use". Although future research is required to understand the predictability and manipulability of car pride, and thus answer the question of "how car pride can be used to address transportation problems", this thesis does shed light on potential policy implications of car pride.

1.3 Data and Methods

The data used in this study was collected via online surveys in Shanghai (in 2012) and Beijing (in 2011). In the surveys, respondents were asked to rate statements related to car pride in terms of the extent to which they agree, in addition to providing information on their demographical and socio-economic background, car ownership and use behaviors, car dependence, and acceptance of the local car ownership policies. Shanghai and Beijing are selected as the cities of interest because both megacities have diverse social classes (with large immigrant populations), face severe congestion problems, provide extensive public transportation services and at the same time undergo rapid motorization. It is expected car pride plays a big role in both cities. It is worth noticing the specific surveys implemented are different in the two cities. The majority of the analysis in the thesis is done using data from Shanghai. Beijing's data is only used in Chapter 8, where a comparison between the two cities is presented.

Various research methods are employed to provide a comprehensive understanding of car pride. The proposed theoretical framework for car pride is built based on a literature review primarily of psychology, and to a less degree philosophy, economics and transportation. Factor analysis and cluster analysis are used to explore the possible underlying factors within car pride. When examining the relationship between car pride and other factors (including socio-economic characteristics, car-related behaviors, car dependence and public acceptance of transportation policies), descriptive analysis, correlation analysis, and regression analysis are adopted. Specifically, in an attempt to disentangle the impact of car ownership and use on car pride, transit access and commuting distance are used as instrumental variables in the two-stage least squares (2SLS) models.

1.4 Thesis Structure

The thesis is organized into 9 chapters (see Figure 1.1). Based on an extensive literature review, Chapter 2 constructs a systematic framework for car pride including its definition, structure and classification, and also discusses issues on data collection. Chapter 3 offers a description of the cities of interest, Shanghai and Beijing, as well as the survey data to be used in later chapters of this thesis. In Chapter 4, data mining techniques are employed to explore the variation of car pride on its own and based on socio-economic factors. Chapter 5 examines the relationship between car pride and two types of car-related behaviors – car ownership and car use, with a particular focus on disentangling casual directions. In Chapter 6, the relationship between the car pride and car dependence is examined. Chapter 7 relates car pride to how people perceive Shanghai's car license auction license, and how people pride themselves in having local car licenses. Following the analytical methods done in Chapters 4 through 7, a comparison Shanghai and Beijing is presented in Chapter 8. In the end, the thesis is concluded in Chapter 9 with a summary of findings, and discussion on policy implications and future research directions.

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FIGURE 1.1 Structure of the thesis

2 Psychological Structure of Car Pride

To the author's knowledge, the concept of car pride has never been defined. This chapter tries to not only define car pride, but also construct a systematic theoretical framework for car pride, based on relevant literature primarily on a plethora of psychological theories, and to a less degree on philosophy, sociology and transportation. Although the framework is developed for car pride, it is felt most of the discussion should be applicable to other types of pride.

2.1 Literature Review

2.1.1 Pride

In order to understand the car pride, we first need to understand the conceptual structure of pride. The literature on pride is scattered and in different places. As a result, pride has been defined and described in a number of different ways.

Historically, the assessment of pride is never uniform. Pride is denounced as one of the seven deadly sins in medieval literature like Chaucer's Canterbury Tales and Dante's Inferno. It is even considered to be the root of all sins (Capps, 1989). Adam Smith (1976) sees pride as typically an inflated opinion of one's own merits. Baruch Spinoza, similarly thinks pride is based on a distorted self-image. However, Aristotle unapologetically applauds pride as a virtue. Richard Taylor (1985) characterizes pride as "justified love for oneself," a summation of the other virtues. In modern psychology, pride is usually thought of as one of the positive emotions (Lawler, 1992).

The first systematic and comprehensive discussion of pride comes from David Hume in Book Two of his Treatise of Human Nature (Hume, 1978). He claims that pride is "that agreeable impression, which arises in the mind, when the view either of our virtue, beauty, riches or power makes us satisfied with ourselves." Accordingly, two key characteristics about pride can be identified. One is that pride involves a positive feeling, which is similar with joy. The other is that the self is the center of pride. To be proud is to be pleased with oneself in some respect. Pride differs from joy in that the sources of pride are things which the subject is responsible for or bears some especially close association to. One can be proud of one's accomplishment or victory, or of one's child or teammate. Psychologists have long noted that pride occurs in

response to internal attributions – that is, when the self is credited as the cause of the pride eliciting event (Ellsworth & Smith, 1988; Lewis, 2000; C. A. Smith & Lazarus, 1993; Weiner, 1985). This possessive element is important. You can only be proud of something you are responsible for. According to Hume (1978), the property we attributed to the subject must be one toward which we had a positive attitude. Davidson (1976) further contends the property the we have a positive attitude toward is not the property we believe the subject has but the property we believe we have.

Pride is often regarded as an achievement-related affect. As Harter (1985) puts it, "pride is an emotional response to an evaluation of one's competence". Weiner (1985) argues that pride depends on a favorable outcome resulting from one's own efforts. Whenever we achieve something, we feel good about ourselves. Therefore, pride can be interpreted as a self-reward or the internal counterpart of praise (Batson, Dyck, Brandt, & Batson, 1988). Furthermore, Williams and DeSteno (2008) argues that the experience of pride can serve as an important incentive for us to pursue success despite short-term losses. When feeling proud about a recognized accomplishment, an individual are encouraged to pursue further action in that valued domain.

Achievement is not the only source of pride. More broadly, pride can also come from team membership, gender, social class, race, and nationality. This broader sense of pride is close to the concept of self-esteem. Rosenblatt (1988) considers pride in another person's achievements as a result of identifying with the other, which in turn is a defence mechanism against the destructive emotion of envy. Like our families and the groups we belong to, our material possessions (e.g. car ownership) are often seen as extensions of ourselves, and can be something we are proud of (Belk, 1988).

A useful distinction is made between "proper pride" and "false pride" (Lea & Webley, 1997). Based on their definitions, proper pride is "pride in genuine achievements (or genuine good qualities) that are genuinely one's own", and false pride is "pride in what is not an achievement, or not admirable, or does not properly belong to oneself". This may to some extent explain the two-sided view on pride. But the distinction between the two types of pride is not absolute,

because self-evaluation is relative and subjective. The typical self-serving bias (Bradley, 1978; Zuckerman, 1979) and actor-observer differences (Jones & Nisbett, 1971) suggest that people have a persistent tendency to evaluate their own behavior more favorably than other people would, and taking more credit for their success than other people would give them. When you see your pride as proper from your own perspective, other people may see it as false.

Like self-esteem, pride tracks the relative position of the self with respect to the evaluation of others (Anthony, Holmes, & Wood, 2007). Mascolo and Fischer (1995) concisely define pride as an emotion "generated by appraisals that one is responsible for a socially valued outcome or for being a socially valued person". Consistent with the view that pride involves public evaluations of the self (i.e. a situation in which one is conscious of one's evaluation by other social beings), Webster et al. (2003) shows that pride is most strongly evoked in situations of publicly praised accomplishment. However, pride does not have to exist in the social context. It is also clear that individuals can feel pride for striving toward self-initiated goals.

2.1.2 Self-Conscious Emotions

Treating pride of as an emotion is not the only possibility. It can also be described as an attitude or a motivation (Lea & Webley, 1997). For example, Rand (1964) characterizes pride as "moral ambitiousness". In this sense, a proud person tends to have high moral standards and feel driven to behave accordingly. However, most commonly, pride is regarded as an emotion. It can be qualified as an "intellectual" emotion (Averill, 1991) or a secondary emotion (Kemper, 1987). According to the framework for Clore et al. (1987), and Ortony et al. (1988), an emotion is a valenced affective reaction to perceptions of situations. Emotion is often the driving force behind motivation, positive or negative (Gaulin & McBurney, 2003).

Many believe that pride is a self-conscious emotion (Lewis, 2000; Tangney & Fischer, 1995; Tracy & Robins, 2004). Self-conscious emotions – including pride, shame, guilt, and embarrassment - play a critical role in motivating and regulating people's thoughts, feelings, and behaviors (Fischer & Tangney, 1995). Self-conscious emotions drive people to work hard in achievement and task domains (Stipek, 1995; Weiner, 1985), and to behave in moral, socially appropriate ways in social interactions and intimate relationships (Baumeister & Stillwell, 1994;

Leith & Baumeister, 1998). They are different from basic emotions – including anger, fear, disgust, sadness, happiness, and surprise – which are biologically based, shared with other animals, pan-culturally experienced, and identifiable via discrete, universally recognized facial expressions (R. J. Davidson, 2001; Ekman, Levenson, & Friesen, 1983; LeDoux, 1996; Panksepp, 1998). In contrast, self-conscious emotions are less universal and show cultural variation in their antecedents, phenomenological experience and consequence differ across cultures (Eid & Diener, 2001; Kitayama, Markus, & Matsumoto, 1995; Menon & Shweder, 1994). There is little evidence that can connect them with pan-culturally recognized facial expressions (Ekman, 1992). Furthermore, in linguistic hierarchical classifications, self-conscious emotions can be subsumed by basic emotions (Shaver, Schwartz, Kirson, & O'Connor, 1987). For example, joy subsumes pride, and sadness subsumes shame.

In the theoretical framework proposed by Tracy and Robins (2004), 5 distinctive features of self-conscious emotions are summarized as following:

- "Self-conscious emotions require self-awareness and self-representations";
- "Self-conscious emotions emerge later in childhood than basic emotions";
- "Self-conscious emotions serve primarily socialized needs";
- "Self-conscious emotions do not have discrete, universally recognized facial expressions";
- "Self-conscious emotions are cognitively complex".

2.1.3 Symbolic-Affective Values of Car

Car, like many other products (for example, jewelry), is often considered to have some symbolic meanings. Generally, distinction can be made between two types of products, symbolic products and substantive products (Khalil, 2000). While symbolic products are diverse, they are valuable generally because they enhance the sense of self-regard. In contrast, substantive products are valuable because they satisfy desires which contribute to welfare in terms of pecuniary benefits. The quest after symbolic utility satisfies the tastes for pride, prestige, and self-identity, while the quest after substantive utility amounts to the standard notion of satisfaction ranging from warmth, aesthetics, food, to medicine, and comfort. Moreover, Khalil (2000) distinguishes among three kinds of symbolic products and proposes that each had a distorted form. "If symbolic products

result from forward-looking evaluation, they act as 'prestige goods' which please admiration or, when distorted, as 'vanity goods' which satiate pretentiousness; when symbolic products originate from forward-looking action, they act as 'pride goods' which satisfy respect or, when distorted, as 'deference goods' which indulge pomposity; when symbolic products arise from backward-looking evaluation, they act as 'identity goods' which enhance dignity or, when distorted, as 'reification goods' which gratify reverence."

According to Dittmar (1992), material possessions, such as cars, represent instrumental values as well as symbolic values. The symbolic values refer to the identity of a person. They are twofold: the expression of the self and a social-categorical expression indicating one's social position or group membership. Moreover, Dittmar contends that the use of material goods fulfils three functions: instrumental, symbolic, and affective. Based on Dittmar's theory, Steg (2005) distinguishes three motives of car use. Instrumental motives refer to the convenience or inconvenience caused by car use, which is related to, among other things, speed, flexibility and safety. Symbolic or social motives refer to the fact that people can express themselves and their social position by means of car use. They can compare their car use with others or social norms. Affective motives refer to emotions evoked by driving a car. Driving may affect people's mood and they may anticipate these feelings when making travel choices. It has been noted that, in addition to the instrumental aspects associated with cars such as availability, comfort, flexibility, load capacity and speed (Jakobsson, 2007), psychosocial aspects involving values (Joireman et al., 2001; Van Lange, Van Vugt, Meerterns, & Ruiter, 1998), identity (Gardner & Abraham, 2007), symbolic processes – such as status and social comparison – and affective or emotional processes, which associate cars with pleasure and the excitement produced by speed (Steg & Tertoolen, 1999; Steg, Vlek, & Slotegraaf, 2001; Steg, 2005) also play a role.

In a review of the relation between these three motivations (instrumental, affective, and symbolic), Gatersleben (2007) concludes that the affective appraisal of a car depends on the instrumental and symbolic aspects. This proposal coincides with the theoretical model proposed by Steg and Tertoolen (1999). They establish that car use depends on instrumental, social (symbolic aspects), and affective motivations, in which the affective aspects are influenced by the instrumental and social motivations (shown in Figure 2.1).
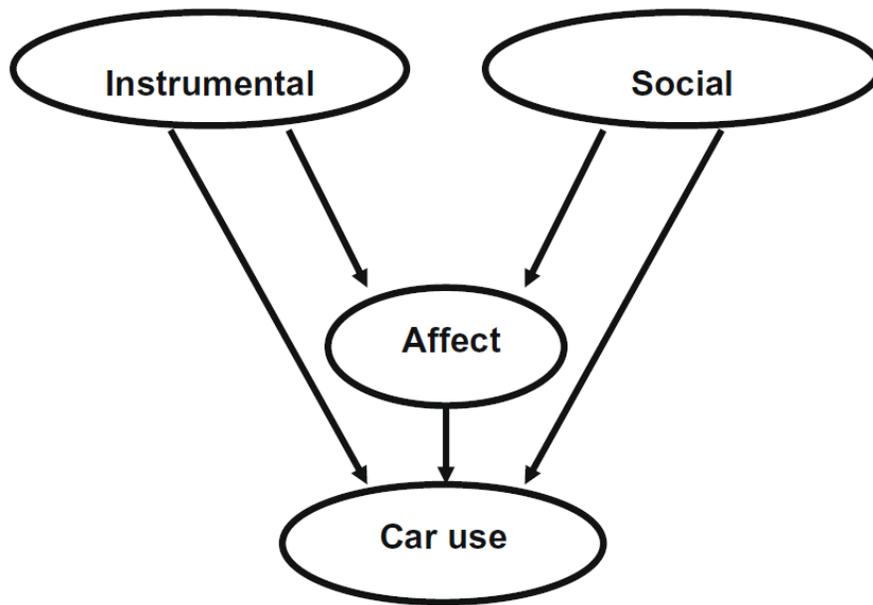
FIGURE 2.1 Motivational model to explain car use
Source: Steg and Tertoolen (1999)

2.2 Framework for Car Pride

2.2.1 Definition

Although pride is widely considered to be an emotion, treating pride as an emotion may not tell the whole story. The emotional part of pride is a result of certain cognitive process. According to the theory of self-emotions (Tracy & Robins, 2004), a key feature that sets self-conscious emotions is the cognitive process of self-representation. The self-representation is evaluated based on people's values and goals. Lea and Webley (1997) also think of pride as a rational mechanism that ensures consistency and helps us to make good long-term decisions. Simply treating pride as an emotion may overlook this crucial cognitive component which is essentially the rationale behind specific affect (pride, shame, etc). In this thesis, the definition of car pride is extended to include both a fundamental cognitive component and a resultant affective component. Car pride is generally defined as "***the cognitive evaluation of and emotional response to the positive self-representation elicited by one's association with cars***".

The affective part of car pride is called ***affective pride*** - the emotional experience evoked when one's actual association with cars is appraised to positively represent the self-regard. Affective

pride needs to be triggered by an event and often involves intense emotional experience. It is a consequence of self-evaluation of car. It can also serve as a motivation of people's behavior as well, since they may anticipate these feelings when making decisions on car purchase or mode choice. Affective pride is usually episodic (and unstable) in nature.

The cognitive part is called *cognitive pride* - the cognitive evaluation of to what extent one's association with cars is appraised to positively represent the self-regard. It essentially derives from one's values system toward the relationship between car and the self. Symbolism of car is the basis for cognitive pride. People with high cognitive car pride tend to think car as an important sign of one's dignity, social status, personal image etc. Cognitive pride develops cumulatively through various experiences and becomes stable over time. It is unlikely to be significantly affected by a specific event, at least in the short term. Therefore, compared with affective pride, cognitive pride is more consistent and stable, and does not require any trigger.

Cognitive pride is the fundamental part of pride, and can be viewed as a determinant of affective pride. For example, an athlete who holds high pride in his performance (cognitive pride) would feel more fulfilled (affective pride) if he wins a competition (trigger). It is worth noticing the impact of cognitive pride on affective pride can work in both directions. The athlete who holds high pride in his performance (cognitive pride) would feel more ashamed (affective shame) if he loses a competition (trigger). Although anticipation of affective pride can be a motive of behavior, cognitive pride may have a stronger motivational role. People with high cognitive pride tend to be more ambitious and more self-regulatory. The same athlete is willing to work hard to compete probably because he thinks his performance represents something important about himself (ability, work ethic, sportsmanship etc.).

The definition of car pride proposed in this thesis is unique. Many may argue that pride is purely an emotion and cognitive pride should not be part of pride at all. There are two reasons we think cognitive pride as an integral part of pride. On one hand, as mentioned above, cognitive pride is the fundamental part of pride that significantly influences how you feel emotionally as a result. On the other hand, cognitive pride is more consistent, reliable, and does not depend on specific event. This makes it not only more useful for transportation professionals but also more usable in

practice. Operationally, it may be challenging to separate the feeling of affective pride from joy. Knowing one's cognitive pride should be a more accurate estimation of car pride as a whole.

The association with cars usually refer to (but is not limited to) one's possession or usage of cars. Occasionally, pride can also occur when one's family members / friends / relatives / colleagues possess or use cars. Intuitively, the pride of having a car and the pride of using a car or more specifically, the pride of driving should be positively correlated, but they are not without differences. The pride of having a car is based on the symbolization of car as an object (e.g. symbol of social status), while the pride of driving appears more related to symbolization of driving as an activity (e.g. symbol of independence). It is felt what car use represents is more personal (less social) than what car ownership represents Two possible reasons for this distinction are (1) buying a good car costs more than becoming a good driver, and thus the former is a more socially recognized indicator of success; and (2) a fancy car is much more visible and comparable than good driving skill, and thus the former is a more socially recognizable indicator of success. Nowadays, driver licenses are easy to obtain for adults in most parts of the world. But for young and senior population, the pride of driving could be a particularly interesting topic. Due to the limited time and data availability, this study mainly focuses on the pride of having a car.

2.2.2 Process of Car Pride

According to Tracy and Robins's theoretical model (shown in Figure 2.2), people feel pride when their attention is focused on themselves, activating public and/or private self-representation; when they appraise events as relevant to and congruent with identity goals; and when they attribute the cause of events to some internal factors and take credit for the situation (Tracy & Robins, 2004). The model was designed to explain the process of pride in general. With some revisions, it can be applied to car pride specifically.
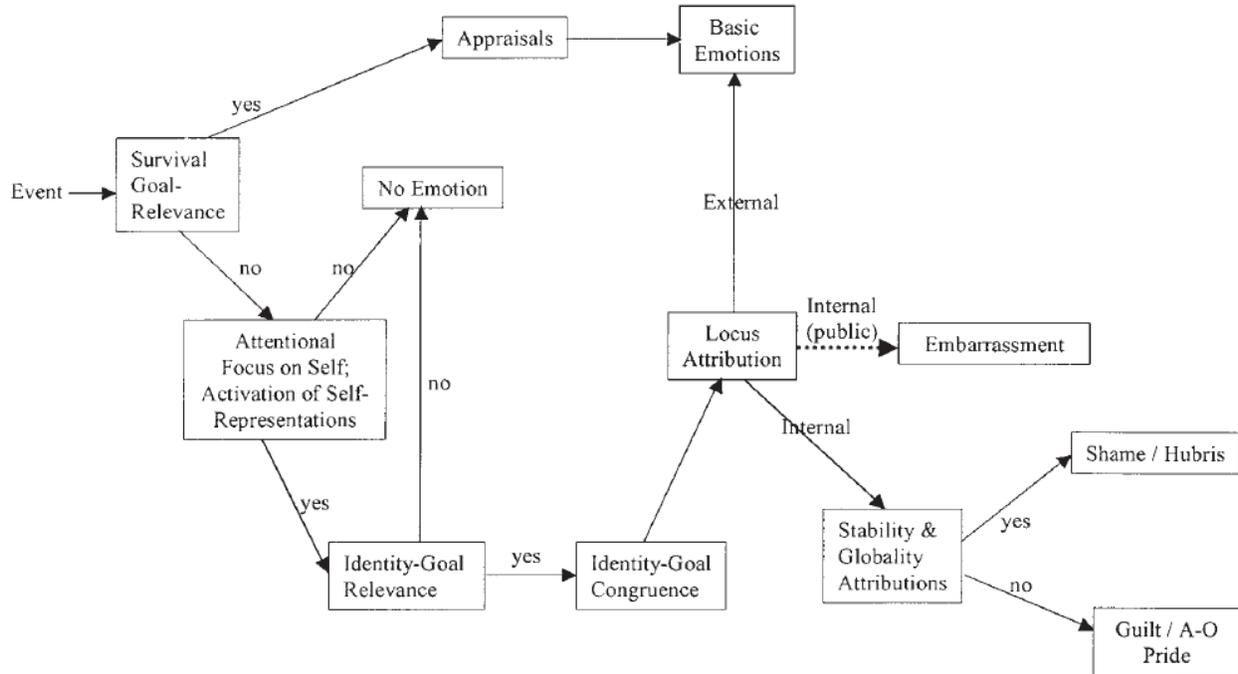
FIGURE 2.2 Process model of self-conscious emotions
Source: Tracy and Robins (2004)

As discussed in Section 2.2.1, one can have various types of association with cars that can elicit car pride. To simplify the process, discussion in this section only concentrates on the pride of having a car. Since one's car ownership is obvious, the internal distribution process is omitted. To enable the framework applicable to everyone (not only car owners), the starting point of the process is the idea of having a car, instead of the actual car ownership status. This expansion is useful because non-car owners may also have car pride and potentially take it into consideration when making car purchase decisions. As a result, the process of self-representation of having a car consists of three stages of evaluation (shown in Figure 2.3):

- *Symbolization*: In this stage, people evaluate whether having a car symbolizes something else. Not everyone acknowledge the symbolic values car ownership. Those total utilitarian people may just look at car as a tool without any symbolic significance.
- *Identity-goal relevance*: In this stage, people evaluate whether the symbolization of having a car matters for how they see themselves. Symbolic values of car ownership can be important for some people but insignificant for others. Even though many recognize men with cars are more attractive to women, this does not matter for married men.

- *Identity-goal congruence*: In this stage, people evaluate whether the symbolization of having a car is congruent with their goals for "who I am" and "who I want to be"? It is common to think having a car can represent something positive or desirable about the owner, for example, social acceptability. However, not everyone share the same values in terms of car ownership. For example, environmentalists tend to despise car ownership since having a car goes against their environmental friendly values.
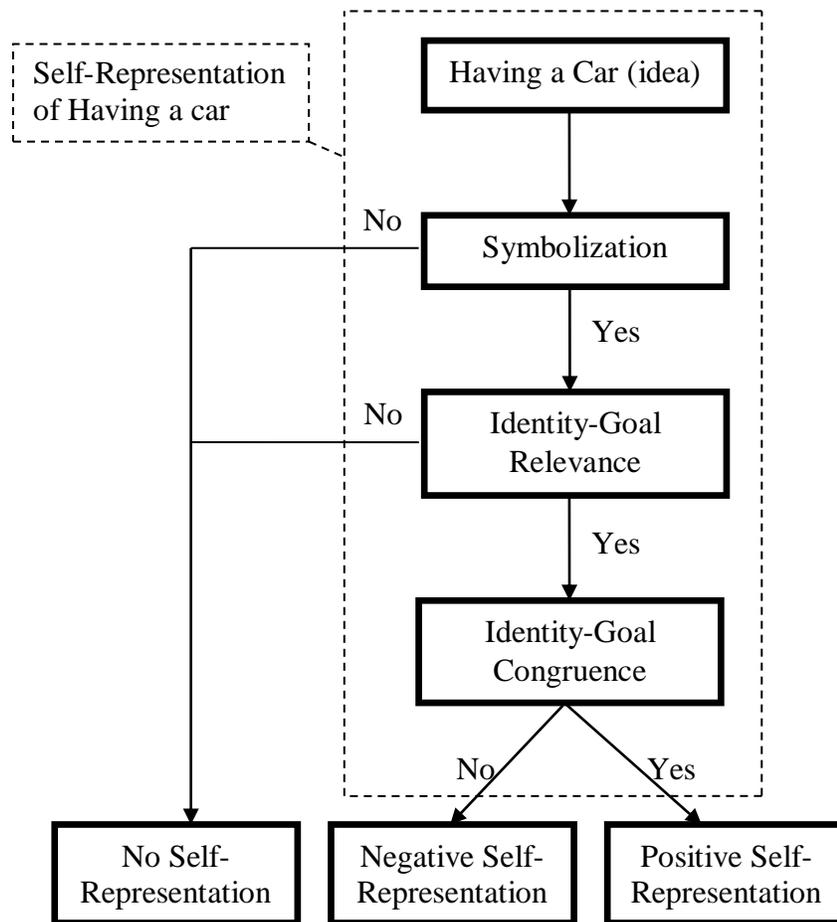
FIGURE 2.3 Process of self-representation of having a car

In the end, based on the direction of the self-representation by having a car, three types of self-representation are formed – positive, negative, or no self-representation. When people think car ownership symbolize something relevant and congruent with their identity goals, they consider having a car as a positive representation of themselves; when people think car ownership symbolize something relevant but incongruent with their identity goals, they consider having a car as a negative representation of themselves; when people do not think car ownership

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symbolizes anything relevant to their identity goals, they consider having a car as no representation of themselves. It is possible that some people find having a car could lead to both positive and negative self-representation, since chances are people may care about their social status and environment at the same time. In this thesis, it is assumed people can weight different sides and determine overall whether having a car represents the self positively or not. Cognitive pride plays an important role in this process. It can be interpreted as the tendency to think having a car as a positive self-representation. People with high cognitive car pride are likely to consider having a car as a positive self-representation. A person with high cognitive car pride would easily feel emotionally proud if he actually has a car, and ashamed if he does not.

The specific types of emotional responses triggered depend on the matching between the self-representation of having a car and the actual ownership (shown in Figure 2.4). For car owners, if having a car is evaluated to be a positive self-representation, affective car pride is elicited; if having a car is evaluated to be a negative self-representation, they will experience shame for having a car; if having a car evaluated to be no self-representation, they will feel indifferent about car ownership. For non-car owners, in the case of positive self-representation, they will experience the shame of not having a car; in the case of negative self-representation, they will feel proud for not having a car; in the case of no self-representation, no emotion toward car ownership is elicited.

Although the pride of having a car and the shame of not having a car have very different emotional experience, both are results of the cognitive pride of having a car. According to the proposed definition, car pride is determined by your evaluation of hypothetical association with cars, with no reference to your actual association with cars. This is a key difference that sets our definition of car pride apart from most psychological theories of pride (as an emotion). For non-car owners, their car pride can be expressed as the shame of not having a car. When a non-car owner purchases a car, his emotional experience will change from of the affective shame of not having a car to the affective pride of having a car. Similarly, for those who acknowledge negative self-representation of having a car, car purchase can lead to the transition from the affective pride of not having a car to the affective shame of having a car.

The relationship between car pride and car ownership is complicated. On one hand, change of car ownership status can change the emotional experience of car pride. It is also possible that strong sense of fulfillment and satisfaction after buying a car can be rationalized into positive attitudes toward car ownership over time. In a way, people can adapt their attitudes of car ownership to their actual ownership status. On the other hand, car ownership can also be influenced by car pride. People with high cognitive pride tend to treat car as a symbol of identity, social status and personal image, and this makes it more attractive to own a car. Affective pride plays a role as well, especially for non-car owners who think car ownership is a positive self-representation. Their affective shame of not having a car is likely to add to their desires to own a car in the future.

For car owners, their car pride is likely to become a stimulus for car use. People often use their cars to not only utilize the symbolic values of having a car (e.g., showing off personal wealth), but also experience the agreeable feeling of affective pride. A person who drives frequently is constantly reminded of the fact of having a car. This prolongs the duration of affective pride and makes it a rewarding feeling of driving. As a result, part of the pride of having a car becomes the motivation for driving.

One may also argue that car brands, price and exterior design are also related to car pride but are not shown in this model. It should be noted that the model only focuses on the pride of having a car, not the pride of having a fancy car. The pride eliciting event is different. One could change the event from having a car to having a fancy car, and the model should work just fine.
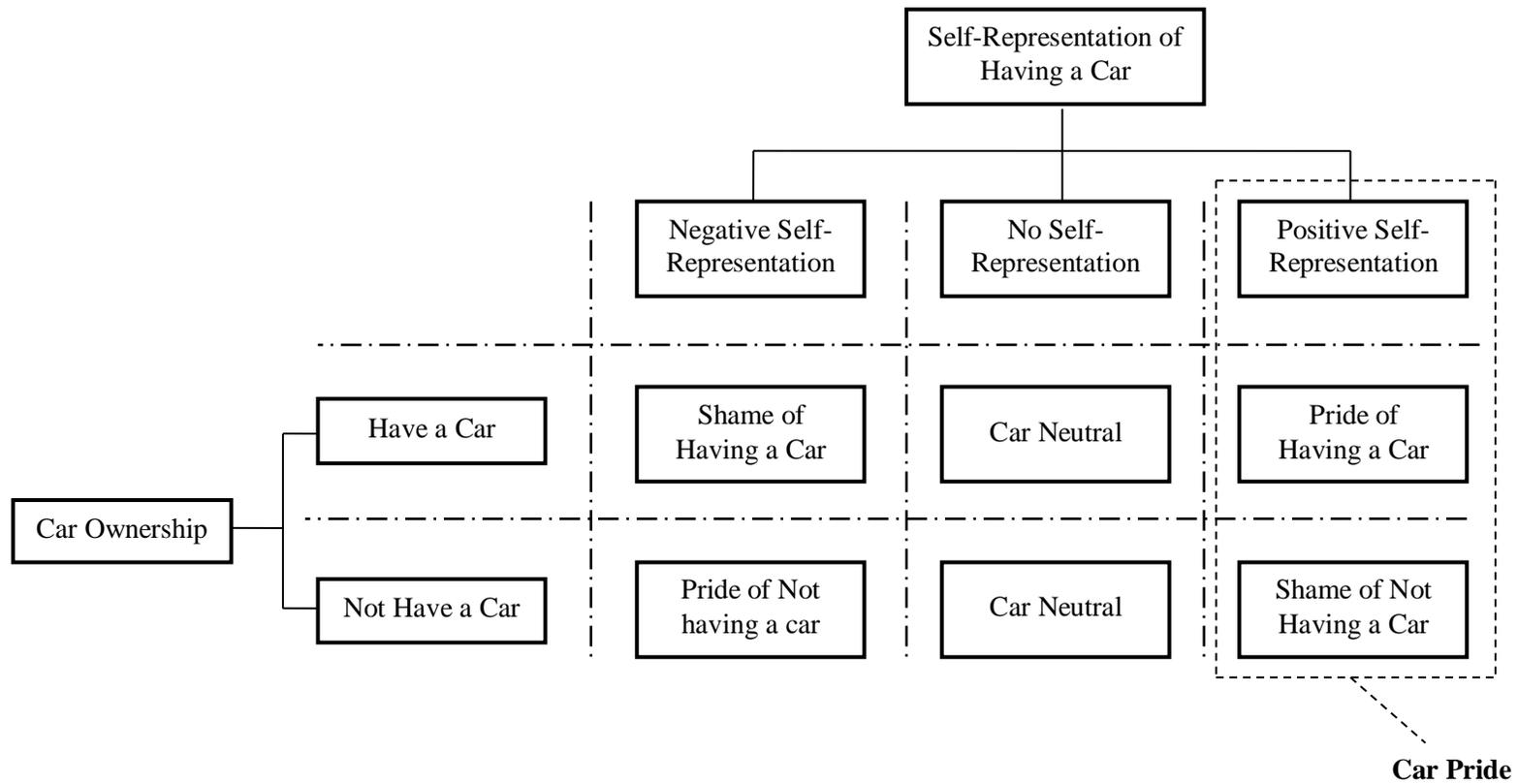
FIGURE 2.4 Emotions triggered by self-representation and car ownership

2.2.3 Classification of Car Pride

There are different ways to categorize pride. In their theoretical model, Tracy and Robins (2004) distinguishes the two types of pride by whether the emotion is generalized and non-targeted or occurs in response to a specific event. Authentic, or beta, pride results from attributions to internal, unstable, controllable causes, where pride in the global self, referred to as hubristic, or alpha, pride (Lewis, 2000), results from attributions to internal, stable, uncontrollable causes. A later empirical study illustrates the two facets are related yet distinct (Tracy & Robins, 2007). This classification may resemble the distinction between affective and cognitive pride. However, there are a few notable differences. First of all, authentic pride and hubristic pride are independent, while affective pride is dependent on cognitive pride. Secondly, hubristic pride is still considered an emotion and requires a trigger, while cognitive pride is a cognitive evaluation with no need for any trigger.

Because of the dependency of affective pride on cognitive pride, it is hard to separate the two. Whenever affective pride is triggered, cognitive pride is involved. However, another way to categorize car pride based on its source is proposed. In this section, car pride is classified based on which aspect of the self is represented by car. Two dimensions of self-representation are examined.

A person's identity consists of various forms of self-representation, based on which cognitive pride can be categorized. An event may be appraised as identity-goal relevant when it activates an actual, ideal, or ought self (Higgins, 1987); a past, present, or future self (Markus & Nurius, 1986); and a private or public aspect of the self (Buss, 1980). These ways of classification show different dimensions of the self, but are partially overlapping. For example, the difference between the actual and ideal self is similar with the difference between past/present and future self. In this study, self-representation is categorized based on two dimensions.

Self-representation may refer to private (personal) and public (relational, social and collective) aspects of the self (Robins, Tracy, & Trzesniewski, 2008). Private self reflects people's personal beliefs about the self, including their traits, values, and abilities, while public self refers to how

people see themselves in social contexts, including social roles and reputation. When people perceive their relationships with cars have a positive representation of the private self, they have personal pride. For public self, it can be further distinguished if considering different perspectives. There are two basic standpoints on the self – your own personal standpoint and the standpoint of others. When we perceive having a car has a positive representation of the public self from our own standpoint ("how I see myself relative to others"), our car pride is classified as comparative pride; when we perceive having a car has a positive representation of the public self from others' standpoint ("how I perceive myself seen by others"), our car pride is classified as exhibitory pride. In terms of comparative pride, people often compare themselves with others and take pride in their comparative performance. In terms of exhibitory pride, people strive to present themselves in ways that create the most favorable impressions on others, thereby enhancing their social status and acceptance. People also target their public performances to different audiences (or constituencies), which place multiple and often conflicting demands and expectations on them. For example, "my parents want me to be a successful student", but "my friends think I should be a fun loving bohemian who doesn't care about school" (Tracy & Robins, 2004). What differentiates comparative and exhibitory pride from personal pride is that comparative/exhibitory pride directly involves agents other than the self (whether it is displaying the self to others or comparing the self with others). Exhibitory pride is more likely to be correlated with behaviors like showing off, while personal and comparative pride is more likely to be correlated with personal satisfaction.

An individual's stable self-representation also include actual self-representation, ideal self-representation, and ought self-representation about fulfilling important obligations and duties (Higgins, 1987). Actual self is one's representation of the attributes that someone believes he actually possess or should possess, ideal self refers to one's representation of the attributes that someone would like him, ideally, to possess (i.e., a representation of someone's hopes, aspirations, or wishes for you), and ought self is one's representation of the attributes that someone believe he should or ought to possess (i.e., a representation of someone's sense of your duty, obligations, or responsibilities). The three types of self have distinct features. Actual self is oriented from the current state of the self, while ideal self indicates preferred state without the constraints of current state. Ought self is different from either because it involves certain

standards or duties. It is questionable whether ought self exists at all in terms of car pride, since car is rarely linked to any form of duty or obligation unless as a social expectation. In this thesis, we assume ought self only exists for public self from others' standpoint, and can be interpreted as responsibility of a social role or expectations from others. As a result, with interactions between these two dimensions of car pride, we can get 7 different aspects of car pride (shown in Table 2.1)

TABLE 2.1 Classification of Cognitive Pride

	Private Self	*Public Self*	
	Personal Pride	**Comparative Pride**	**Exhibitory Pride**
Actual Self	Identity pride	Normative Pride	Reputational Pride
Ideal Self	Aspirational pride	Competitive pride	Presentational Pride
Ought Self	*Not applicable*	*Not applicable*	Expectational Self

Identity pride is the evaluation of the extent to which one appraises his association with cars to be a positive representation of private actual self. Identity is something you have and maintain. If a person feels having a car fits who he is personally, he probably has strong identity pride. Since the actual self is strongly related to people's demographic and socio-economic background, identity pride is expected to have much correlation with personal background. People with identity pride tend to think car ownership as an important indicator of self-esteem and even as an extension of the self.

Aspirational pride is the evaluation of the extent to which one appraises his association with cars to be a positive representation of private ideal self. Different from identity, aspiration is something you probably do not have but want to have. Aspirational pride can be an indicator of the desire for car and what it stands for. It is based on personal preferences and values, regardless of social standards and what other people think. Therefore, it is expected to vary significantly among individuals. People with aspirational pride tend to think of car as an important part of their ideal life and often have a high sense of wanting (or lack) for car. It is to some extent similar with people's ambitiousness for success.

Normative pride is the evaluation of the extent to which one appraises his association with cars to be a positive representation of public actual self from his own standpoint. People's decisions are usually dependent on social norms. Social norms refer to the perceived social pressure to perform the behavior, and are based on perceptions of relevant reference groups concerning the behavior and the motivation to comply with these reference groups. The theory of normative conduct (Cialdini, Kallgren, & Reno, 1991) focuses on the role of social norms, and distinguishes two types of social norms, injunctive norms (i.e. perceptions of expectations of others) and descriptive norms (i.e. perceptions of what other actually do). People with normative pride tend to behave according to the perceived social norms. For example, one who perceives "everyone has a car" will choose to buy a car to comply with the norm.

Competitive pride is the evaluation of the extent to which one appraises his association with cars to be a positive representation of public ideal self from his own standpoint. Social comparison theory asserts that people continuously compare their opinions, behavior and possessions with those of others and that people strive to be better off than others are (Festinger, 1954). It resembles the competitiveness of athletes. However, although athletic competitiveness is considered admirable, competitiveness of material possessions is not. Sometimes it can even be distorted and transformed to vanity.

Reputational pride is the evaluation of the extent to which one appraises his association with cars to be a positive representation of public actual self from others' standpoint. Reputation here refers to who I am in other people's eyes. Some people are heavily affected by how other people see them, and some just do not care. People with reputational pride tend to be sensitive about other people's opinion and emphasize car's role in maintaining their reputation. For example, someone with a reputation of having an extravagant lifestyle would take more pride in owning a luxurious car.

Presentational pride is the evaluation of the extent to which one appraises his association with cars to be a positive representation of public ideal self from others' standpoint. Self-presentation theory proposes that people try to present themselves in a way that is congruent with their self-image. For many people, car is a status symbol, and people can express themselves by means of

their car. People with presentational pride tend to identify strongly with perceived status-symbolism appeal of car, and try to use car ownership to influence the public perception of their image. Presentational pride is similar with reputational pride, but comes from people's ideals and goals. If a person is actually poor but wants to look wealthy and successful, his reputational pride would tell him to not have a car (since his current reputation is being poor, which having a car does not fit), but his presentational pride would motivate him to buy one.

Expectational pride is the evaluation of the extent to which one apprises his association with cars to be a positive representation of public ought self from others' standpoint. People with high expectational pride tend to receive high expectation from others. Expectational pride is a special subset of exhibitory pride because while the audience for reputational and presentational pride can widely range from good friends, colleagues to acquaintances, expectations can only come from your intimate social circle (like family members or intimate friends).

2.3 Discussion on Data Collection

Car pride is such a complex and abstract concept, which can be very confusing for the general public. Even with a sound framework, it remains a big challenge to actually operationalize the theory and collect relevant data. Prior transportation research on non-instrumental factors are generally based on self-reports. Yet, the reliability of self-report data is questionable, since people are inclined to justify and rationalize their behavior. In addition, the tendency to give socially desirable answers might be a problem as well, especially in personal interview studies. To test the influences of different methods on the occurrence of rationalization and justification, and socially desirable response patterns. Steg et al. (2001) tests three methods that differ in the extent to which these rationalizations may occur: similarity sorting of car-use episodes (most intuitive task), Q-sorting following attractiveness of car-use episodes (intermediate task), and a semantic-differential method for evaluating (un)attractive aspects of car use (most explicit task). The results show that the symbolic-affective motives for car use are better expressed when the aim of the research task is not too apparent. If the aim of the task is evident, respondents tend to evaluate car use in terms of instrumental-reasoned motives. In other words, "the more intuitive the task, the less chance there is that people will rationalize their behavior". Because of the explorative nature of this study and limited data availability, only survey data and interview data

is used in the thesis. Nevertheless, future research should strive to collect more accurate and reliable data on car pride.

The theoretical framework for car pride has shown that there are different aspects of car pride. In terms of data collection, special attentions need to be paid to distinguishing different types of car pride. To help understand the differences among the 7 different categories of car pride, 2 statements are designed for each category to demonstrate their meaning in common language. These statements can provide reference for future survey design for data collection.

Identity Pride
- Having a car meets my self-esteem.
- I feel like car is part of me.

Aspirational Pride
- Having a nice car is part of my life goals
- I want to be successful and having a car can help me getting there.

Normative Pride
- I don't like it when I am the only one without a car in my neighbourhood.
- I have to have a car when everyone around me has one.

Competitive Pride
- I admire/envy those with a nice car.
- I care whether my car is better than my neighbors / friends

Reputational Pride
- I need a car to maintain my personal image.
- Car can show people what and who I am.

Presentational Pride
- If I have a fancy car, I would like to drive my car more so people can see it.

- People would respect me more if I have a nice car

Expectational Pride
- If I have a nice car, my parents will be proud of me.
- If my girlfriend/boyfriend likes cars, I will consider buy one.

2.4 Illustration

In a study on life aspirations of the Beijing middle class with a particular focus on transportation implications, people's evaluation of cars is recorded through in-depth semi-structured interviews targeting white collar workers in Beijing born in the 1980s (Campbell, 2013). Using the interview data, we aim to illustrate the existence of different types of car pride in this section.

The interviews last from 45 to 90 minutes and were implemented in 2012 and 2013. They are semi-structured, with eight broad topics to stimulate discussion (satisfaction, success, goals, ideals, values, decisions, happiness and transportation). Interviewees are encouraged to speak their mind and talk freely as much as possible with least amount of interviewer interference. As a result, a total of 25 participants are interviewed, "covering a variety of backgrounds, jobs, ages, and aspirations". 11 of the interviewees are male and 14 are female. Although only 4 are car owners, all of the interviewees expressed the desire to buy cars if possible. However, their motivations are different. While many people attribute their motivations to convenience and poor public transportation services, some acknowledge the symbolic values of cars, like Mr. Liu.

> "Having money, a house, and a car does not at all mean that you are successful, but they are necessary conditions for success." - Mr. Liu, 32, a business manager.

Different people have different standards of success. For Mr. Liu, having a car is an essential part of it. Since he already had a car and is doing well as a business manager, his car pride should be categorized as identity pride. Having a car is part of his identity – as a successful businessman.

> "I want to have authority, I want to have freedom of control over myself, I really don't suit lower level work." - Mr. Lei, 27, a manager at a logistics company

Mr. Lei is also a manager, but has no car and appears not satisfied with his life. Even though he does not explicitly indicate his desire for authority as a motive for his plan to buy a car, it is likely aspirational pride can be a factor in his decision.

With rising income and urban expansion, many Chinese choose to join the group of car owners. As a result, owing a car is no longer the privilege of the wealthy few. Instead, it becomes a descriptive social norm. When people see everyone around them is buying cars, they feel the normative pride to do the same. Ms Wang is one example.

"Everybody has a car. Of course I'm going to buy a car!" - Ms. Wang, 24

This is particular interesting for migrants who move to Beijing for school or job opportunities. They may not only compare themselves with Beijing residents but also feel the pressure from their peer group at their hometowns, as demonstrated by Ms. Xiao.

"Back home (in Southern China) most of my high school friends already have houses and cars…" - Ms. Xiao, 25

One consequence of the prevalence of cars is that car brands become more comparable. Ms. Yan's statement implies the standard for social comparison is changing from whether you have a car or not to what brand your car is.

Anyway these days they don't compare whether you have a car or not, it's what brand your car is." - Ms. Yan, 26

Personal image is an important factor since many interviewees brought up the issue of *mianzi* (a Chinese expression equivalent to face or image). For example,

"Cars do give you *mianzi* … I would say a car for me would be about 50-50 convenience and *mianzi*." - Ms. Yang, 25, an interior designer.

People with high sense of *mianzi* are likely to have exhibitory pride. Based on Ms Yang's comments, people can put a surprisingly high emphasis on personal image. However, linking image to cars alone is not enough to further distinguish between reputational pride and presentational pride. Further details provided in the following two examples can help make the distinction.

> "If I become a lawyer people will not respect you if you turn up on a bike or the bus. There is definitely a *mianzi* problem if I become a lawyer (even if I don't care personally)." - Ms. Ping, 28, working in a law firm.

In this example, Ms. Ping thinks one has to have a car to fulfill the image of being a lawyer. In other words, the purpose of having a car is to maintain the image of being a lawyer. In this case, we can conclude she is likely to have reputational pride. Generally, reputational pride can apply to the cases where people believe car is needed to consolidate the image of their social roles (professional or positional) or social statuses.

> "Women like men with cars … I could get a wife if I had a car, it's just not practical for me." - Mr. Wang, 25, a journalist.

In this example, Mr. Wang also makes the connection between having a car and the image in the pursuit of a mate. Even though he implies his desire to have a car to boost his attractiveness to women, he admits it is not practical, possibly due to economic constraints. While reputational pride is about using cars to maintain the image of the actual self (e.g. a lawyer), presentational pride is about using cars to create the image of the ideal self (e.g. an attractive man). Therefore, this should be classified as an example of presentational pride.

> "My parents put pressure on me to buy a car, because they think that my future girlfriend's parents will expect that … they are concerned for me finding a wife … " - Mr. Xiang, 24, a programmer

A special case of exhibitory pride is expectational pride, stemming from others' expectations. The example above is also about car's role in finding a mate. However, it is Mr. Xiang's parents that pressure him on this issue. Thus this example is a demonstration of expectational pride. Expectational pride is unique in that it is the pride people take in fulfilling the expectations of (significant) others. The desire to buy a car to impress women is different from the desire to buy a car to make your wife happy.

Even though most would agree in our society car is a sign of one's image, not everyone appreciate it personally. For example,

> "I totally accept that having a car makes it easier to get a girlfriend. That is definitely a fact and I accept it, but I don't care." - Mr. Guo, 26, a sports administrator.

Using the interviewed data collected by Campbell (2013), we are able to illustrate the existence of 6 of 7 types of car pride – identity pride, aspirational pride, normative pride, reputational pride, presentational pride and expectational pride. Evidence for competitive pride is not found, possibly because the data size is limited, or interviewees are unable or unwilling to acknowledge their competitiveness in terms of cars. Still, the analysis confirms that 1) car pride has more than one dimension, and 2) car pride can serve as a motivation for car purchase, as many admit.

3 Case Study Cities and Data Description

The data used in this study is collected from surveys done in Shanghai and Beijing. Shanghai and Beijing are selected as the cities of interest because both megacities have diverse social classes (with large immigrant populations), face severe congestion problems, provide extensive public transportation services and at the same time undergo rapid motorization. It is expected car pride plays a big role in both cities. To make readers familiar with the two cities, description of socio-economic background and transportation development for Shanghai and Beijing is presented in Sections 3.1. Section 3.2 examines the estimated cost of owning a car in both cities, before the data is described in Section 3.3.

3.1 A Tale of Two Cities: Shanghai and Beijing

Since the introduction of economic reforms in 1978, China has become the world's fastest-growing major economy. So far, it is the world's second-largest economy by nominal total GDP and purchasing power parity (PPP) (Altucher, 2010). This is largely attributed to the development of major cities in the east coast, the biggest (by urban area and population) of which are Shanghai and Beijing. Shanghai is the dominant commercial center in the South, and Beijing is the political center in the North. On one hand, both cities share many similarities as high population density, large economic growth, rapid vehicle fleet growth, and severe traffic congestion. On the other hand, they are different in culture, political structure and transportation policy making.

3.1.1 Socio-Economic Background

Both Shanghai and Beijing have experienced drastic social and economic changes in recent history, all of which could contribute to changes in how people travel and how they evaluate cars.

Built along the Huangpu River in the lower Yangtze delta, Shanghai is one of the largest cities in the world with a total population of over 23 million and a land area of 6,340.5 km^2 (Shanghai Municipal Bureau of Statistics, 2012a). Once a fishing village, Shanghai was made open to the West by the Treaty of Nanjing in 1843. Due to the inflow of the western technologies and investment, Shanghai became one of the most modern and prosperous cities in Asia in the earlier

20th century until China closed its door to the world in the Cold War. From 1949, Shanghai experienced more than 30 years of neglect and disinvestment (W. Wu, 1999) . Under the socialist ideology, Shanghai was tightly controlled by the central government for industrial production, with little investment capital left for the maintenance and improvement of urban infrastructure. The market reform and the Open Door policy in 1978 marked China's re-entry onto the global stage. Shanghai was bypassed by the first wave of economic take-off in 1980s, which was embraced by cities in South China (Z. Li, 2004). Nevertheless, Shanghai saw a decisive development opportunity in the beginning of the 1990s when the central government announced its intention to develop the Pudong New Area, located along the east side of the Huangpu River, across from the historic city center of Shanghai in Puxi (W. Wu, 1999). Based on the model of China's Special Economic Zones (SEZs), Pudong has grown rapidly since the 1990s to become China's new financial and commercial hub. Its GDP was about 6 billion Yuan in 1990, and exploded to around 400 billion in 2009, increasing from one-twelfth of Shanghai's total economy to a quarter. Driven by the development of Pudong, Shanghai entered a new era. Since the early 1990s, Shanghai managed a double digit growth rate (until the recession in the late 2000s). Meanwhile, rapid urbanization led to dramatic spatial expansion. Overcrowding in the central area forced more and more people to move out to the suburban area. The emergence of the labor market and the disappearance of enterprise-based housing provision further contributed to the separation of residence location and employment location.

Situated in north China, Beijing, also known as Peking, is the capital of the People's Republic of China, and the nation's political, cultural, and educational center. With a population as of more than 20 million, it is the second largest Chinese city by urban population after Shanghai. It is home to the headquarters of most of China's largest state-owned companies, and is a major hub for the national highway, expressway, railway, and high-speed rail networks. Beijing is well known for its historical and cultural richness. It was the capital of China for the last two imperial dynasties, Ming and Qing dynasties, and urban fabric of the city was not much changed from the last imperial dynasty ended in 1911 (Sit, 1996). Spatial pattern in Beijing was similar to a chessboard with the Forbidden City in the middle. After the founding of the People's Republic of China, Beijing was established as the nation's capital and became a city undergoing rapid urbanization and industrialization. The city become an important economic center in China with

heavy industries as its main pillar. Urban expansion in the city started to provide space for major new industrial development and to include rural hinterland for meeting the demand for grains, food and water. Since the early 1980s, the urban area of Beijing has expanded greatly with the completion of the 2nd Ring Road in 1981 and the subsequent addition of the 3rd, 4th, 5th and 6th Ring Roads (L. M. Li, Dray-Novey, & Kong, 2008). Beijing's new spatial organization is mainly a result of the allocation and reallocation of heavy industries to develop new manufacturing and residential areas in outer urban areas to develop new towns (Yang, Cai, Ottens, & Sliuzas, 2013). Wangfujing and Xidian have developed into flourish shopping districts, while Zhongguancun has become a major center of electronics in China. In recent years, the expansion of Beijing has also brought to the forefront some problems of urbanization, such as heavy traffic, poor air quality, the loss of historic neighborhoods, and a significant influx of migrants from less-developed areas of the country.

3.1.2 Travel Demand

Along with the rapid urbanization and economic development in Shanghai and Beijing over the past three decades, travel demand in both cities has been growing significantly. The growth in travel demand usually consists of more and longer trips, greater shares of motorized modes, and a higher proportion of trips relying on personal vehicles (Shen, 1997). How to manage the growth in transportation is a big concern for both Chinese cities as well as many other major cities in the developing world, which requires an investigation of changes in travel demand.

So far, four comprehensive transportation surveys have been conducted in Shanghai, in 1986, 1995, 2004 and 2009 respectively. The overall survey information is summarized in Table 3.1 (Shanghai City Comprehensive Transportation Planning Institute, 1997; Shanghai City Comprehensive Transportation Planning Institute, 2005; Shanghai Urban Construction and Communications Commission, Shanghai City Comprehensive Transportation Planning Institute, & Office of the fourth Comprehensive Transportation Survey of Shanghai, 2010).

TABLE 3.1 Summary of the four Comprehensive Transportation Surveys of Shanghai

Year	Surveyed Area (km2)	Resident Population (in millions)	Surveyed Population (in thousands)	Sample Rate (%)
1986	6180	12.32	240	2
1995	6340	14.15	130	1
2004	6340	17.10	90	0.5
2009	6340	18.88	150	0.8

Source: The fourth comprehensive travel survey of Shanghai, 2009

Beijing has carried out four comprehensive transportation survey in 1986, 2000, 2005 and 2010 respectively. Since the 2010 survey data is not available to the author, only results from the first three surveys are used for analysis in this section (see Table 3.2).

TABLE 3.2 Summary of the three Comprehensive Transportation Surveys of Beijing

Year	Surveyed Area	Resident Population (in millions)	Surveyed Households (in thousands)	Sample Rate (%)
1986	-	5.82	72	5
2000	-	8.31	62	2.1
2005	Within 6th Ring	11.07	82	1.5

Source: The third comprehensive travel survey of Beijing, 2005

As expected, individual travel demand has been constantly growing in Shanghai, featuring increasing trip rate and length. The trip rate of Shanghai's residents increases throughout years. The pace of the increase picked up between 1995 and 2004 but has slowed down afterwards. Residents living inside the central city travel more frequently than residents living outside (2.37 trips/day versus 2.06 trips/day in 2009), probably because people residing inside the central city usually have higher income and enjoy more accessible amenities. A similar increase is also seen in average trip distance, probably due to urban expansion and separation of employment and housing.

Interestingly, in Beijing, the average daily trip rate of local residents decreased from 1.61 trips/day in 2000 to 2.64 trips/day in 2005, after a sharp increase from 1.61 trips/day in 1986. Increase in trip distance is also seen in Beijing, but in a faster pace than in Shanghai. Compared with Shanghai residents, Beijing people tend to make more and longer trips. However, this may not be a fair comparison, since Beijing's travel surveys does not cover the full area of the municipality. Unlike the Shanghai surveys, Beijing's transportation surveys mostly focus on the urban part.

Based on population, trip rate, and trip length, the overall travel demand can be estimated. In Shanghai, increase of the gross population and trip rate made the amount of total person trips traveled rise from 22.1 million person-times per day to 42.1 million person-times per day, an increase of 91% from 1986 to 2009 (see Table 3.3). At the same time, urban expansion and the separation of the workplaces and residences caused the average trip distance to be longer, resulting in the total person-kilometers traveled increased from 94.8 million person-kilometers per day to 273.7 million person-kilometers per day, an increase of 189%. As expected, the travel demand in Shanghai has grown significantly in past 3 decades.

TABLE 3.3 Growth of Travel Demand in Shanghai

Year	Population ($\cdot 10^6$)	Trip Rate (times/day)	Person Trips Traveled ($\cdot 10^6 \cdot$trips/d)	Average Trip Distance (km)	Person Kilometers Traveled ($\cdot 10^6$ km/d)
1986	12.32	1.79	22.1	4.3	94.8
1995	14.15	1.87	26.5	4.5	119.1
2004	17.10	2.21	37.8	6.2	234.3
2009	18.88	2.23	42.1	6.5	273.7

Source: The fourth comprehensive travel survey of Shanghai, 2009; calculations by author

A comparison of survey results over the years in Beijing (shown in Table 3.4) shows that the total trips stood at 29.20 million trips per day in 2005, and the total distance travelled was 271.56 million, rising by 26.9% and 47.5% respectively from 2000, even though trip rate is actually lower in 2005 than in 2000. Increase in travel distance and city population have become the major contributor of the growing travel demand in Beijing.

TABLE 3.4 Growth of Travel Demand in Beijing

Year	Population ($\cdot 10^6$)	Trip Rate (times/day)	Person Trips Traveled ($\cdot 10^6 \cdot$trips/d)	Average Trip Distance (km)	Person Kilometers Traveled ($\cdot 10^6$ km/d)
1986	5.82	1.61	9.39	-	-
2000	8.31	2.77	23.01	8.0	184.08
2005	11.07	2.64	29.20	9.3	271.56

Source: The third comprehensive travel survey of Beijing, 2005; calculations by author

Annual percentage growth rate is an important measure to examine travel demand growth. The annual growth rates of population, economy, and the travel demand indicators are compared between the two cities over the years. The results are shown in Table 3.5. As expected, positive correlations are found among all these indicators. In Shanghai, both the growth of economic variables and travel demand indicators sped up after the early 1990s. The principle drivers of

growth also changed over time. Between 1995 and 2004 the growth was driven by higher trip rate (annual growth rate of 1.9%) and longer trip distance (annual growth rate of 3.6%); but after 2004, the annual trip rate growth dropped to 0.2% and annual trip distance growth dropped to 0.9%. At the individual level, similarly, the growth rate of travel demand slowed down after 2004 while the increase in income level continued to speed up. The "acceleration" of travel demand around 1995 is probably attributed to Shanghai's economic take-off in the early 1990s and rapid urbanization, but the reasons for the "deceleration" around 2004 are more subtle. One contributor could be the latest economic recession happened in 2008-2010. However, it is not the primary cause because the average economic growth rate between 2004 and 2009 is still high. The "deceleration" could be just a natural saturation process. Assuming that the growth of travel demand over time is a sigmoidal (logistic, "S" shaped) curve, the growth pace of travel demand in Shanghai has already begun to slow down.

TABLE 3.5 Annual Growth Rate of Population, Economy and Travel Demand

Periods	Population	GDP*	GDP Per Capita*	Trip Rate	Average Trip Length	Person Trips Traveled	Person Kilometers Traveled
Shanghai							
1986-1995	1.6%	4.5%	3.0%	0.5%	0.5%	2.0%	2.6%
1995-2004	2.1%	11.6%	9.1%	1.9%	3.6%	4.1%	7.8%
2004-2009	2.0%	10.9%	8.8%	0.2%	0.9%	2.2%	3.1%
Beijing							
1986-2000	2.6%	7.5%	5.5%	4.0%	-	6.6%	-
2000-2005	5.9%	16.3%	12.9%	-1.0%	3.0%	4.9%	8.1%

Source: The fourth comprehensive travel survey of Shanghai, 2009; Shanghai Statistical Yearbooks, various years; The third comprehensive travel survey of Beijing, 2005; Beijing Statistical Yearbooks, various years
* It is to be noted that GDP data has already been adjusted with the Consumer Price Index.

In Beijing, both economy and population have been growing in a much faster pace in recent years, and the growth rates are generally higher compared to Shanghai, even though Beijing's economy and population are still smaller. In terms of total number of trips, there is a drop after 2000, suggesting Beijing's travel demand may also have peaked. But because of the lack of data, this cannot be confirmed in terms of total person kilometers traveled. Future research is required with latest travel survey data to examine recent trends of travel demand growth in Beijing.

It is widely recognized that travel demand is derived from the demand to perform activities in different locations. Thus travel purpose is a key feature of travel demand, which can influence on other travel decisions (e.g. mode choice). In Shanghai, it seems that people have growing

demand for participation of activities other than work or school. This is evidenced by the rising proportion of non-commuting travel (neither to nor from one's usual workplace or school), from 32% in 1995, to 49% in 2004, and to 51% in 2009. In Beijing, the percentage of commuting trips was 47.5% (significantly decreased from 73.5% in 1986 and 57.8% in 2000). It is also found that the rise of non-commuting travel demand mainly come from shopping and leisure travel. For example, the percentage of leisure trips in Beijing rose from 16.4% to 24.3% from 2000 to 2005. This is primarily driven by rocketing income and consumption power. Since commuting travel is relative fixed in terms of choice for the destination, travel path, travel duration and time of day, it may be concluded that people' travel demand is more and more diverse. Non-commuting travel is usually more elastic than commuting travel. Rising income and new technologies release the constraint of travel cost both in terms of money and time. Therefore, non-commuting travel demand is growing at a faster pace than commuting travel demand.

In terms of spatial distribution of travel demand, survey data is analyzed by region. In Shanghai, it is found that total travel demand within Inner Ring Road is decreasing while area outside Inner Ring Road shows the sharpest increase. It is also revealed that the increase in travel demand is much more significant in Pudong (east of Huangpu River) than in Puxi (west of Huangpu River). In Beijing, similarly, the growth of travel demand is higher in areas further away from city center. The percentage of trips within the 2nd, 3rd, 4th and 5th Ring Roads were 13.4%, 30.6%, 46.8%, and 62.4%. The shift of travel demand from the high-density city central areas to low-density periphery and suburban areas indicates the diffusion of travel demand.

3.1.3 Motorization

Because of rapid economic growth and land use transformation, trip distance is increasing, and travel demand is more diverse and diffused. All of these trends are favorable to the adoption of private motor vehicles, leading to rapid motorization. With rising personal wealth, technological improvement, and commercialization of private motor vehicles, people not only want to own a car but also can afford it.

Rapid motorization has been going on in both cities, but in different pace and magnitude. The motorization level and its growth rate are higher in Beijing. Although Beijing has a smaller

population, lower personal income, and more affordable public transportation, Beijing's motor vehicle fleet outgrew Shanghai's in most part of last decade (see Figure 3.1). In Beijing, between 2000 and 2005, the annual growth rate for private automobile is 40.8% (Beijing Transportation Research Center, 2007). As of 2011, Beijing had 498 million motor vehicles, while Shanghai only had 329 million. In 2011, the motor vehicle ownership in Beijing reached 246 vehicles per 1000 people, much higher than 140 vehicles per 1000 people in Shanghai. This is largely due to Shanghai's car license auction policy to constrain car ownership growth since 1994.
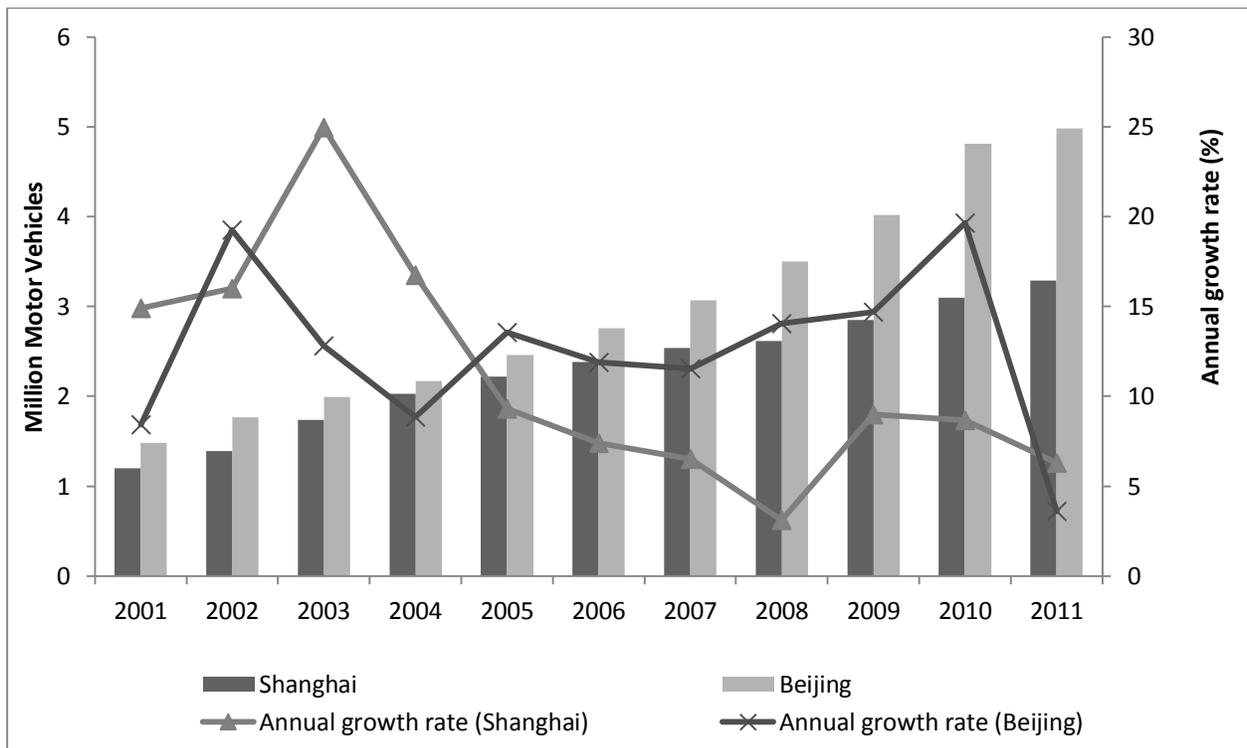
FIGURE 3.1 Comparison of total number of motor vehicles

Motorization can lead to two consequences. One consequence is a clear shift from non-motorized modes to private motorized modes. An analysis of the mode share (walking excluded) change in the past three decades shows, in Shanghai, biking peaked in 1995 with a mode share of 55.6% and declined dramatically to 18.3% in 2009; public transit reached its nadir in 1995 and then slowly recovered to 34.1% mode share in 2009; and private motor vehicle and electric bike increased steadily since 1995 (see Figure 3.2). In Beijing (inside the 6th Ring Road), car trips accounted for 34.2% of all trips in 2010, increasing from 5.0% in 1986 and 23.2% in 2000; mode share for public transit (bus and subway combined) trips steadily increased over the years and reached 46.3% in 2010; the increases in the use of cars and public transit was in the cost of

bicycles, the share of which had been on a continuous downward trend (see Figure 3.3). Not only have cars increased in number, they are used more and more at the same time. For example, in Beijing, a car on average took 3.16 trips per day and travelled 14 kilometers per day in 2005 (compared with 9.7 kilometers per day in 2000). Overall, people are shifting from non-motorized modes to motorized modes. Within motorized modes, the mode share for private motorized modes is growing much faster than that for public transportation.
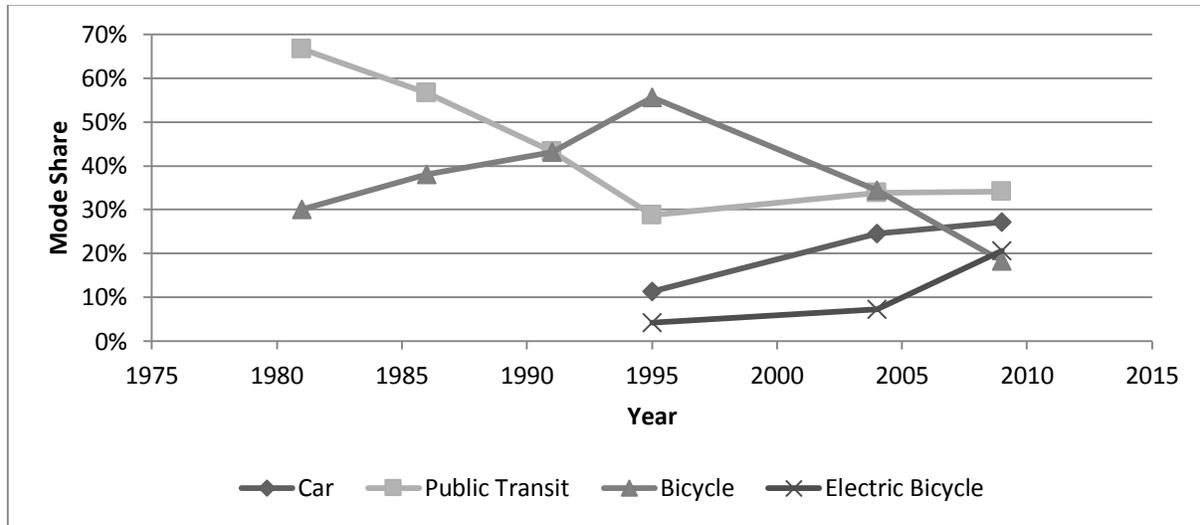
FIGURE 3.2 Mode share comparison across years in Shanghai
Source: The fourth comprehensive travel survey of Shanghai, 2009; Urban Transportation Planning in Shanghai (Shen), 1997
Note: walking trips and trips based on other modes are excluded
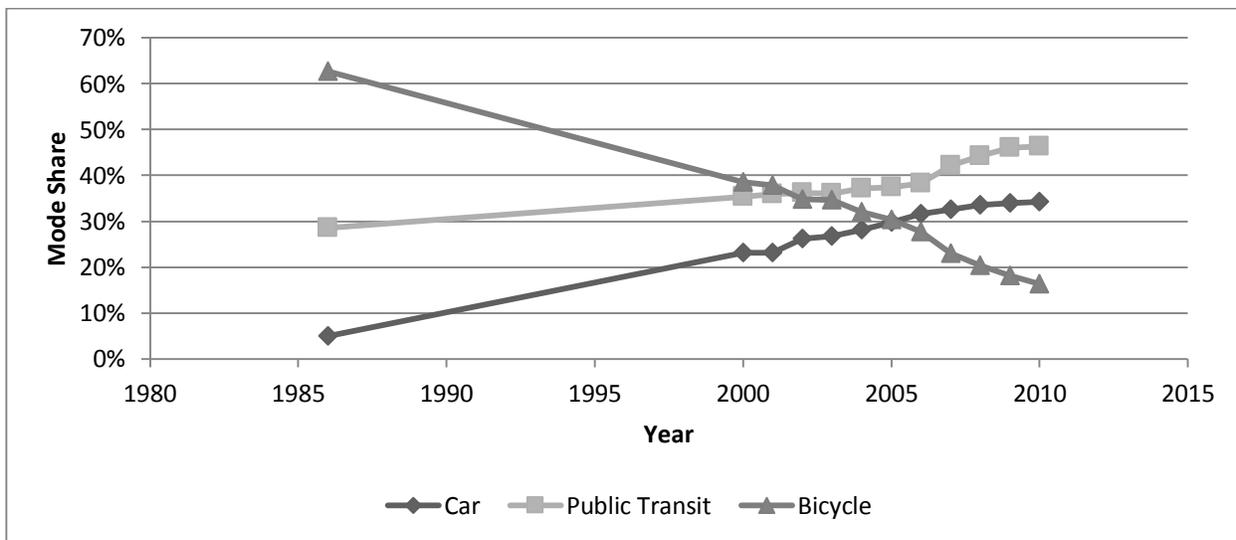
FIGURE 3.3 Mode share comparison across years in Beijing
Source: Beijing Transportation Development Annual Report, 2011
Note: public transit consists of bus and subway

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The other consequence of motorization is decreasing vehicle occupancy. While number of vehicle trips per day for private automobiles in Shanghai only increased by 36% from 2004 to 2009, the corresponding vehicle kilometers traveled rose by 97%. It means average trip distance by car has increased significantly, partly as a result of urban expansion and suburbanization. Average occupancy rate for a car in Shanghai decreased from 2.5 persons/vehicle in 2004 to 1.7 persons/vehicle in 2009, suggesting reducing carpooling and increasing proportion of single occupancy vehicle. It suggests people in Shanghai tend to not only use motor vehicles more, but are also less likely to share them with others. Similarly, occupancy rate in Beijing also dropped from 1.57 persons/car to 1.26 persons/car. Notably, occupancy rate is lower in Beijing, which is understandable considering its higher car ownership.

3.1.4 Transportation Policy

Rapid growth in vehicle ownership in large Chinese cities has caused severe and worsening transportation problems: congestion, air pollution, noise, traffic injuries and fatalities, parking shortages, energy use, and a lack of mobility for the poor (Pucher, Peng, Mittal, & Zhu, 2007). The growing difficulty of moving people and goods around the city and the impacts of traffic on the quality of life have led to many problems in Chinese cities with the situation to be most extreme in Beijing. The average driving speed between 2nd and 3rd Ring Road is reported to be 10 km/hr during peak hour, which is even lower than the speed of bicycle (12 km/hr). The average commuting time in Shanghai was 33.5 minutes according to the Third Transportation Survey in Shanghai in 2004. A study in Beijing finds that over 40% of the residents in Beijing spent more than 1 hour to commute. A global survey conducted in 2010 ties Beijing with Mexico City for the world's worst commute (IBM, 2010).

To mitigate rapid motorization, Shanghai and Beijing are the first two cities to implement policies to control motorization rate and mitigate congestion, but in very different approaches. In Shanghai, the municipal government has implemented, among different measures, a car ownership policy since 1994, requiring purchasers of new cars bid for their car licenses through monthly auction (Hao, Wang, & Ouyang, 2011). The policy has suppressed Shanghai's motorization rate as the total vehicle ownership and growth rate were kept lower than Beijing (Chen & Zhao, 2013). However, it is not without its problems. License auction as an economic

measure is likely to favor the rich, and thus also sparks debate on equity issues. There are also controversies on transparency of the revenue collected from the auction, raising questions about the intention of the policy. Furthermore, car ownership control does not necessarily lead to auto use control to the same extent. For those who manage to get car licenses via auction, they are likely to use car to travel more and longer distance. For example, on average, a car runs 39 kilometers per day in Shanghai, 30% more than that of London and 110% more than that of Tokyo (Shanghai Urban Construction and Communications Commission et al., 2010). Two reasons may help explain this. Firstly, one's willingness-to-pay (for the license plate auction) is usually positively related to one's car-based travel demand. Secondly, once people get the license, the money paid for the auction becomes a sunk cost. Thus those licensed car users tend to use car more to make the most of it. Consequently, the policy's effects on vehicle ownership control could not be fully translated to effects on traffic volume on road.

In Beijing, the first car use control policy was introduced during the 2008 Beijing Olympics and Paralympics Games. Road access was limited based on car license plate numbers which only vehicles with odd (even) license plate tail numbers are allowed to be used on odd (even) days (Hao et al., 2011). An immediate effect was seen during the implementation with an increase in average vehicles speeds of 25% during peak hour (Creutzig, Maximilian, Zhou, & Replogle, 2013). Between 2008 and 2010, the municipal government followed up with a modified driving restriction to ban the use of cars one weekday every week, depending on the plate tail number. But despite its temporary progress in congestion relief and air quality, many Beijing drivers bypass this restriction by buying additional cars. People already with one car may choose to own another one with a different plate number so that they can drive everyday. This offsets the policy effectiveness on usage reduction. With ever-increasing pressure on the urban transportation systems, Beijing later followed Shanghai's path and adopted an annual car license quota to allocate licenses through a monthly lottery process at the beginning of 2011. Beijing's policy, allowing car licenses to be allocated free of charge, seems to be a fairer system in which everyone has the same chance of winning despite their affordability. However, it still raises concerns over equality issues, for different reasons. The qualification requirement for the lottery in Beijing is considered to discriminate against migrant workers. Since unsuccessful applicants are added to the lottery in the following month, many Beijing residents who are not urgent car

buyers also rush into the lottery just to "save a seat". If winning the lottery, some of them may in the end choose not to buy cars, giving rise to "waste quota" (Chen & Zhao, 2013). Other problems have also emerged, such as the extremely low and continuously shrinking odds of winning the lottery, and the loopholes and black case work underneath the system.

3.2 Economics of Owning a Car

Although this study focuses on car pride – a psychological factor related to car ownership, probably economic factors still play a dominate role in shaping people's car purchase decisions. Therefore, in order to gain an understanding of the economic factors associated with car ownership, an estimation of its cost is presented for both cities.

3.2.1 Cost Components

(1) Car License Cost

Average bidding price to get a Shanghai car license was on an upward trend in early 2013 and reached over 90,000 RMB in March. But in April the municipal government has issued a new restriction on the bedding ceiling (Sina, 2013a). The estimated bidding price is 85,000 RMB (Sina, 2013b). To get a Beijing car license through lottery, there is no entry fee. However, one could wait years before getting a license. Since the beginning the car ownership policy, the odds to win the lottery has been on a downward trend. In March 2012, the odds was about 1 in 80 (Daily Newpaper, 2013). Assuming the odds will stay the same, the average waiting time is 80 months (or 6 years and 8 months). However, this is likely to be an overestimate, since it is possible that multiple members from one family join the lottery together to increase their odds of winning. There is a market for license renting if one wants to buy a car immediately before getting his own license via lottery, even though its legitimacy is debatable. The rental price varies widely, and mostly ranges from a few hundreds to thousands RMB per month. We assume the monthly rental price is 1,000 RMB/month for average economic cars.

(2) Vehicle Purchasing Tax

Vehicle purchasing tax is the same across China, usually 10% of the car price (17% value-added tax not included) (State Council of People's Republic of China, 2001).

(3) Vehicle and Vessel Tax

Vehicle and Vessel Tax varies by displacement volume and differs by cities. For a regular private car (with less-than-2L engine), the tax is 450 RMB/year in Shanghai (Yuxin Zhang, 2011) and 480 RMB/year in Beijing (Yi Zhang, 2012). The vehicle and vessel tax is usually added to the insurance later and paid together when the car owners get the insurance.

(4) Insurance

The car insurance includes two parts, (1) Compulsory Traffic Accident Liability Insurance for Motor Vehicles, and (2) commercial insurance. The compulsory insurance is required for all motor vehicles. The fee differs across vehicle types, but for each vehicle type the charge is the same. For a regular private car (with less than 6 seats), the fee is 950 RMB/year (State Council of People's Republic of China, 2006). Commercial insurance is the additional coverage car owners can purchase, and it usually ranges from 950 to over 5,000 RMB depending on the type of insurance and type of vehicles. Since the insurance cost for the two cities are about the same, our assumption is average insurance cost for both cities is 3,000 RMB/year (including the compulsory insurance and commercial insurance).

(5) Vehicle Check

Vehicle check is once every 2 years for vehicles purchased less than 6 years, and once the car has been operated over 6 years, it becomes an annual vehicle check. And for vehicles older than 15 years, it is twice every year. There is a standard charge of 80 RMB for vehicle check in Shanghai, set by the municipal government (Oriental Night News, 2010). However, over charge are frequently reported. In Beijing, the average charge is reported to be around 130 RMB. It is difficult to get an accurate number on average vehicle check cost, but there should be little difference between Shanghai and Beijing. Here we assume the cost is the same for two cities at 130 RMB.

(6) Gasoline Cost

Based on the data published in BitAuto, the average gasoline price for the past year is calculated for Shanghai and Beijing separately (BitAuto, 2013). The calculated cost is 7.78 RMB/Liter for Grade 93 and 8.27 RMB/Liter for Grade 97 in Shanghai; and 7.84 RMB/Liter for Grade 93 and

8.36 RMB/Liter for Grade 97 in Beijing. Overall, Beijing's gasoline price is consistently higher by a small margin than Shanghai's. The specific prices in recent months are shown in Table 3.6.

TABLE 3.6 Gasoline Price in Shanghai and Beijing

Year	Month	#93 Gasoline		#97 Gasoline	
		Shanghai	Beijing	Shanghai	Beijing
2012	02	7.79	7.85	8.3	8.36
2012	03	8.21	8.33	8.69	8.87
2012	05	7.95	8.07	8.41	8.59
2012	06	7.58	7.54	8.07	8.14
2012	07	7.25	7.31	7.71	7.78
2012	08	7.56	7.62	8.04	8.11
2012	09	8	8.06	8.5	8.58
2012	11	7.75	7.81	8.24	8.32
2013	02	7.99	8.05	8.5	8.57
2013	03	7.74	7.8	8.24	8.31
Average		7.782	7.844	8.27	8.363

(7) Parking Cost

Despite the increase of parking price at Beijing in 2011, Shanghai still has higher parking price (Shanghai Municipal Bureau of Tourism, 2011). In Beijing, residential outside parking costs 150 RMB/month (Beijing Municipal Commission of Development and Reform, 2011). The corresponding data is not available for Shanghai. It is assumed the monthly price is the same, but the hourly price in city center is still higher in Shanghai. A comparison of roadside parking price in city center is provided in Table 3.7.

TABLE 3.7 City Center Roadside Parking Cost

	Shanghai	Beijing
1st Hour	15 RMB/hour	10 RMB/hour
Starting from 2nd Hour	20 RMB/hour	15 RMB/hour

(8) Car Maintenance Cost

Maintenance cost also depends on vehicle type. For average economic car, it costs around 200 RMB for small maintenance (for every 5000 km driven), and for every 40,000 km driven, it costs about 3,500 RMB. For annual usage of 20,000 km, the approximate cost for maintenance could range from 1,000 to 2,000 RMB for very basic maintenance and economic vehicle. Again,

maintenance cost should not be significantly different between Shanghai and Beijing. It is assumed the average cost is 1,500 RMB/year.

3.2.2 Cost Estimation

For a person who buys a car at 10,000 RMB, uses Grade 93 gasoline, drives 20,000 km every year, and uses long-term outside residential parking as well as road-side parking at city center two hours each time and two times each month, the estimated cost is shown in Table 3.8. Cost of owning a car in during a two year period is significantly higher in Shanghai, but after six years of ownership the cost is similar.

TABLE 3.8 Estimated Cost of Owning a Car in Shanghai and Beijing

Cost Components	After Two Years		After Six Years	
	Shanghai	**Beijing**	**Shanghai**	**Beijing**
Car License	85000	24000	85000	72000
Purchasing Tax	8547	8547	8547	8547
Vehicle and Vessel Tax	900	960	2700	2880
Insurance	6000	6000	18000	18000
Vehicle Check	130	130	390	390
Gasoline	21784	21952	65352	65856
Parking Cost	5280	4800	15840	14400
Car Maintenance	3000	3000	9000	9000
Total	130641	69389	204829	191073

A comparison of cost over the years is provided in Figure 3.4. It is revealed that the cost of owning a car is much lower in Beijing in the beginning, but 7 years the cost is almost same with that in Shanghai. This is because the estimated cost in Beijing includes a monthly car license rental fee. In the short term, it may seem an economically viable option. But in the long term, it will not give Beijingers much advantage economically. Instead, potential risks and legal issues of license renting may cause uncertainty.
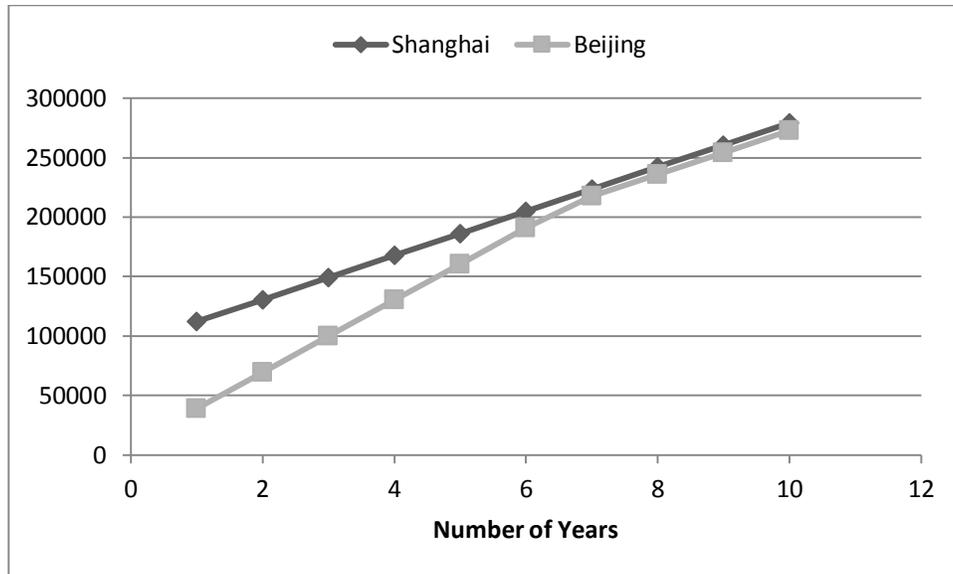
FIGURE 3.4 Cost of owning a car over time

3.3 Data Collection and Description

The data used in this study was collected from online surveys in Shanghai (in 2012) and Beijing (in 2011). In the surveys, respondents were asked to rate statements related to car pride in terms of the extent to which they agree, in addition to providing information on their demographical and socio-economic background, car ownership and use behaviors, car dependence, and acceptance of the local car ownership policies. A detailed description of the survey in Shanghai is provided by Chen and Zhao (2013), and a description of the Beijing survey is provided by Zhao et al. (2013). The surveys are not dedicated for this study, but include statements possibly related to car pride, which are summarized in Tables 3.9. It is worth noticing the specific surveys implemented are different in the two cities. The Shanghai survey, which was conducted more recently, includes more statements that did not exist in the prior Beijing survey. The majority of the analysis in the thesis is done using data from Shanghai. Beijing's data is only used in Chapter 8, where a comparison between the two cities is presented. Also, the surveys were designed before the theoretical framework for car pride presented in Chapter 2 is established. Therefore, the data collected may not be enough to distinguish subtle differences between different types of car pride. Some inconsistency between the theory and the data should be expected.

Because of the nature of the self-report survey, reliability of the data may cause concerns. To partially solve this problem, data filtering was carried out based on number of invalid patterns. In

this thesis, invalid patterns refer to those patterns people tend to follow when purposefully faking answers for a survey questionnaire without actually reading the specific questions/statements. Common invalid patterns include the vertical-line pattern (when people choose the same option for a series of multiple choice questions, e.g. A-A-A-A-A) and diagonal-line pattern (when people answer a series of multiple choice questions in a diagonal fashion, e.g. A-B-C-D-E). Since our surveys are designed section by section, frequency of invalid patterns is counted by section. An observation with frequent invalid patterns is likely to be reported by someone who carelessly chooses random answers to finish the survey quickly. These are unreliable and should be removed. In this particular study, we decide to remove observations with more than 13 invalid patterns. The filtering threshold is determined subjectively based on the distribution of the number of invalid pattern. After data filtering, the final number of observations used for later analysis is 1389 for Shanghai and 1505 for Beijing.

The distribution of final datasets are examined and compared with city statistics, as shown in Table 3.10. It is found that in both cities car owners and college graduates are over sampled. There is also inconsistency in the distribution of household locations between the sample data and city statistics. As a result, weighting techniques are used to improve the representativeness of the data. Weighting is done based on 6 variables – age, gender, education, resident status, household location, and car ownership. The city statistics on these variables are obtained from 2012 Statistical Yearbooks (Shanghai Municipal Bureau of Statistics, 2012b) (Beijing Municipal Bureau of Statistics, 2012). The results suggest that Beijing residents are generally younger and better-educated. This is no surprise considering Beijing, as the education center of China, accommodates large number of schools (particular universities). What is more relevant to the topic of this study is the sharp difference in car ownership. Beijing has a much higher motorization level. This is caused partly by the more car-oriented urban structure (Beijing's roads are generally wider and straighter), and partly by Shanghai's car license auction policy in effect since 1994. It is worth noticing that, because of their different urban forms, Shanghai and Beijing have different ways to categorize household locations. For Shanghai, inner city refers to the area within the Inner Ring, outer city is the area between the Inner Ring and the Outer Ring, and suburb is the area outside the Outer Ring. For Beijing, inner city refers to the 4 districts in the city core (including Chongwen, Dongcheng, Xicheng and Xuanwu), outer city consists of the

4 districts just outside of the city core (including Chaoyang, Fengtai, Haidian, and Shijingshan), and suburb includes the rest 10 districts (including Changping, Daxing, Fangshan, Huairou, Mentougou, Miyun, Pinggu, Tongzhou, Shunyi, and Yanqing).

TABLE 3.9 Possible Statements Related to Car Pride

Index	Statements on Car Pride	Shanghai	Beijing
pride1	I feel proud of owning a car	√	√
self_esteem	Driving meets my self-esteem to some extent.	√	√
accomplishment	I have a sense of accomplishment after buying a car	√	√
tool	Car is only one kind of transportation tool which would not give me any sense of pride	√	√
vanity	Having a car has nothing to do with vanity	√	√
image_fit	Using travel modes other than driving does not suit my personal image	√	√
status	Car is a sign of social status	√	√
social_image	Having a car is connected with one's social image	√	√
non_image	Driving has no influence on my personal image	√	√
telling	When did you last tell someone about your car? (or your dream car if you don't own one)	√	-
washing	How often do you wash your car? (or how often would you like to wash if you don't have a car now)	√	-
accident	If you get in an accident, are you more worried about yourself, and your passengers, or your car?	√	-
auto_show	I have gone to auto shows	√	-
superiority	I care that I have a better car than my neighbors / friends	√	-
spending	I spent more money to have a car better suited my lifestyle.	√	-
cleanliness	I don't like it when my car is dirty.	√	-
display_parking	If I have a fancy car, I would like to park my car where people can see it.	√	-
display_driving	When going out, I like to drive my car, so people can see it if I have a fancy car.	√	-
picture	I have a picture of my car on my phone or in my wallet.	√	-
happiness	I am happier when I am in my car.	√	-
self_estension	I feel like my car is part of me	√	-
must	I would own a car, even if I didn't need to travel	√	-
pride2	Having a car would make me feel proud	√	-
other	Other people would say that I am proud of my car	√	-

Note: "√" means the statement is included in the survey, while "-" means otherwise.

TABLE 3.10 Comparison of Sample Distribution and City Statistics

Parameters	Shanghai		Beijing	
	Sample	**City**	**Sample**	**City**
Age				
18-34	34%	38%	49%	41%
35-59	46%	43%	39%	44%
60 and older	19%	19%	13%	15%
Gender				
Male	50%	52%	55%	52%
Female	50%	48%	45%	48%
Education				
Up to high school	46%	76%	31%	66%
College and above	54%	24%	69%	34%
Resident status				
Local Hukou	60%	61%	57%	63%
Other	40%	39%	43%	37%
Household location				
Inner city	20%	20%	20%	11%
Outer city	38%	34%	60%	49%
Suburb	42%	46%	20%	40%
Car ownership				
Without cars	48%	84%	49%	69%
With cars	52%	16%	51%	31%

Note: Respondents of the surveys are restricted to be 18 years old and above.

4 Measurement of Car Pride

The concept of car pride would not be useful in practice if we cannot measure it. This section uses data collected from surveys to quantify car pride. Possible indicators of car pride are tested using data mining techniques. The variation of car pride based on individual socio-economic characteristics is also investigated.

4.1 Factor Analysis of Car Pride

A theoretical framework for car pride is proposed in Chapter 2. Because the survey was conducted before the theory building, the data collected cannot perfectly reflect the proposed psychological structure. In an attempt to match the data with the theory, the possible car pride indicators are tentatively categorized according to the framework, and the results are presented in Table 4.1. The mapping between the existing indicators and the theoretical structure is done based on the author's subjective judgment of the statements. Since pride itself is an abstract and multi-dimensional concept, the differences between statements are often subtle, some ambiguity is inevitable. It is also worth noticing that only statements that are phrased as indication of positive car pride ("e.g. "I am proud of owning a car") are included here, because preliminary analysis reveals that those statements phrased as indication of no or negative car pride (e.g. "Car is only one kind of transportation tool which would not give me any sense of pride") show relatively low correlation with the pro-car-pride statements. In such questionnaire surveys, the exact wording of the statements can make a difference. It implies people's view on car pride is often indefinite and sometimes conflicting.

It should be noted that the indicators listed in Table 4.1 are not in the same scale. Some are in 5-level likert scale – "totally agree", "partly agree", "neutral", "partly disagree", or "totally disagree" – which are marked with "*" in Table 4.1. Other indicators are in binary format – "yes", or "no". A simple correlation analysis shows that the 5-level likert scale indicators tend to have higher correlation coefficients with each other. For data mining techniques like factor analysis or cluster analysis, the results are heavily dependent on the correlation among indicators. It is thought to be biased without converting them to the same scale. Since it is very difficult to convert binary indicators to 5-level indicators, a method is developed to convert likert scale

indicators to binary indicators. Without any existing technique to apply, a process is designed as follows:

- If a person indicates either "totally agree" or "partly agree" for an originally 5-level statement, the assumed binary response is "yes".
- Similarly, if a person indicates either "totally disagree" or "partly disagree" for an originally 5-level statement, the assumed binary response is "no".
- If a person indicates "neutral" for a statement, a linear regression model is used to estimate whether the person would say "yes" or "no" if he was forced to make a choice. The linear regression model is developed with the statement in question as the dependent variable and all other car pride statements (regardless of its format) as independent variables. Applying the model to a specific person for a specific statement will result in a continuous number between 0 and 1 (with 0 being "totally disagree" and 1 being "totally agree"), which can be interpreted as the tendency to say "yes". Then a random number between 0 and 1 is assigned to this specific person and this specific statement. If this random number is smaller than the tendency to say "yes", then the binary response to this specific statement by this specific person is "yes"; otherwise, it is "no".

The originally 5-level likert scale indicators are converted into binary indicators based on the process explained above. As a result, those converted indicators decreases are less correlated. This conversion method is not perfect, but after the conversion the data is more suitable for factor analysis and cluster analysis. Future data collection should be designed to collect uniformly formatted and comparable indicators to avoid this problem.

TABLE 4.1 Summary of Car Pride Indicators

Indicator	Statements on Car Pride	Overall	Car Owners	Non-car Owners
Personal Pride				
Self_esteem*	Driving meets my self-esteem to some extent.	0.23	0.35	0.21
Self_extension	I feel like my car is part of me	0.21	0.45	0.16
Exhibitory Pride				
Image_fit*	Using travel modes other than driving does not suit my personal image	-0.09	0.14	-0.14
Status*	Car is a status symbol	0.21	0.33	0.18
Social_image*	Having a car is connected with one's social image	0.21	0.36	0.19
Display_parking	If I have a fancy car, I would like to park my car where people can see it	-0.19	0.00	-0.23
Display_driving	When going out, I like to drive my car, so people can see it if I have a fancy car	-0.07	0.11	-0.10
Comparative Pride				
Superiority	I care that I have a better car than my neighbors / friends	-0.24	-0.11	-0.27
Affective Pride				
Achievement*	I have a sense of accomplishment after buying a car	0.27	0.37	0.25
Happiness	I am happier when I am in my car	0.27	0.48	0.23
Pride (general)				
Pride1*	I feel proud of owning a car	0.29	0.47	0.25
Pride2	Having a car would make me feel proud	0.08	0.27	0.05
Other	Other people would say that I am proud of my car	-0.13	0.11	-0.18
Non-instrumental factors (general)				
Spending	I spent more money to have a car better suited my lifestyle	0.10	0.25	0.07
Must	I would own a car, even if I didn't need to travel	-0.13	0.06	-0.17
Auto_show	I have gone to auto shows	0.50	0.67	0.47
Cleanliness	I don't like it when my car is dirty	0.53	0.49	0.54
Picture	I have a picture of my car on my phone or in my wallet	-0.26	-0.14	-0.28

Note: indicators with "*" are in 5-level likert scale, while other indicators are binary; all numbers presented in the table range from -1 to 1, with -1 being totally disagree and 1 being totally agree.

Using the 18 indicators with binary format, an exploratory factor analysis (EFA) is performed to examine the correlation among these indicators and understand the underlying factors. The analysis is done in R, a statistical program, using fa() functions in package "psych". Factor method is set as "pa" (which stands for principal axis), and rotation method as "oblimin" (which allows for correlation between factors). Bartlett factor scores are used because this procedure produces unbiased estimates of the true factor scores (Hershberger, 2005).

The results of the exploratory factor analysis are summarized in Table 4.2. For personal pride, it seems indicator *self_esteem* and indicator *self_extension* are essentially different. Similarly, for exhibitory pride, indicator *image_fit* also shows different pattern from the other two highly-correlated indicators - *status* and *social_image*. One possible explanation is that both *self_esteem* and *image_fit* are related to car usage, while other indicators focus more on car ownership. Also, both indicators are to some extent related to preserving the status quo. To some extent, car can be interpreted as a means to maintain one's self-esteem (privately) or personal image (publicly). Another possibility is the self-esteem is used as a synonym of pride by respondents, because of the term's ambiguity. This may help explain why *self_esteem* has such high correlation with indicators *achievement* and *pride1*. As for comparative pride, only indicator *superiority* falls into this category. With only one available indicator, it is hard to get any meaningful conclusion.

TABLE 4.2 Results of Complete Exploratory Factor Analysis

	Factor1	Factor2	Factor3	Factor4	Factor5	Communality	Uniqueness
self_esteem	**0.71**	0.01	-0.01	0.1	0.02	0.61	0.39
self_extension	0.12	**0.64**	-0.07	0.01	-0.04	0.45	0.55
image_fit	0.06	0.07	0.11	0.23	**0.52**	0.47	0.53
status	0.14	-0.02	-0.02	**0.69**	0.08	0.61	0.39
social_image	-0.05	0.03	0.05	**0.68**	-0.04	0.46	0.54
display_parking	0.01	-0.06	**0.79**	0.01	0.01	0.6	0.4
display_driving	0.03	0.01	**0.67**	0.04	0	0.5	0.5
superiority	-0.01	**0.34**	0.27	0.09	0.2	0.37	0.63
achievement	**0.69**	0.02	-0.01	0.09	-0.06	0.56	0.44
happiness	0.11	**0.54**	-0.07	0.05	-0.09	0.36	0.64
pride1	**0.71**	0	0.07	-0.06	0.11	0.55	0.45
pride2	**0.38**	0.17	0.28	0.06	-0.25	0.53	0.47
other	0.17	0.22	**0.42**	0.03	-0.06	0.48	0.52
spending	-0.09	**0.44**	0.11	0.14	-0.1	0.31	0.69
must	0.03	0.37	0.23	0.04	0.06	0.32	0.68
auto_show	-0.07	**0.5**	-0.02	0.04	0.02	0.23	0.77
cleanliness	-0.1	0.2	0.12	0.04	**-0.52**	0.36	0.64
picture	0.03	**0.4**	0.17	-0.07	0.34	0.36	0.64

Note: Parallel analysis suggests that number of factors is five.

Since affective pride is often episodic and unreliable, it may confound the factor analysis. A simplified factor analysis is done for the 8 indicators that are more related to cognitive pride – *self_esteem*, *self_extension*, *image_fit*, *status*, *social_image*, *display_driving*, *display_parking*

and *superiority*. The factor analysis results and its mapping with the theoretical categorization are shown in Figure 4.1. Similarly, mismatching is found between the factor analysis results and the theoretical categorization. There are several reasons for this. First of all, the survey was not designed for classification of car pride. Therefore, some indicators are ambiguous and hard to relate them to a specific category. Secondly, even though the categorization makes sense in theory, operationally, it is not easy to differentiate one category from another. This is confirmed in the factor analysis results, as all factors are positively correlated, suggesting all indicators are quite positively correlated as well. In terms of the operationalization of the car pride theory, perhaps it is better to use indirect statement survey or behavioral experiment to accurately capture the distinct features of different aspects of car pride.
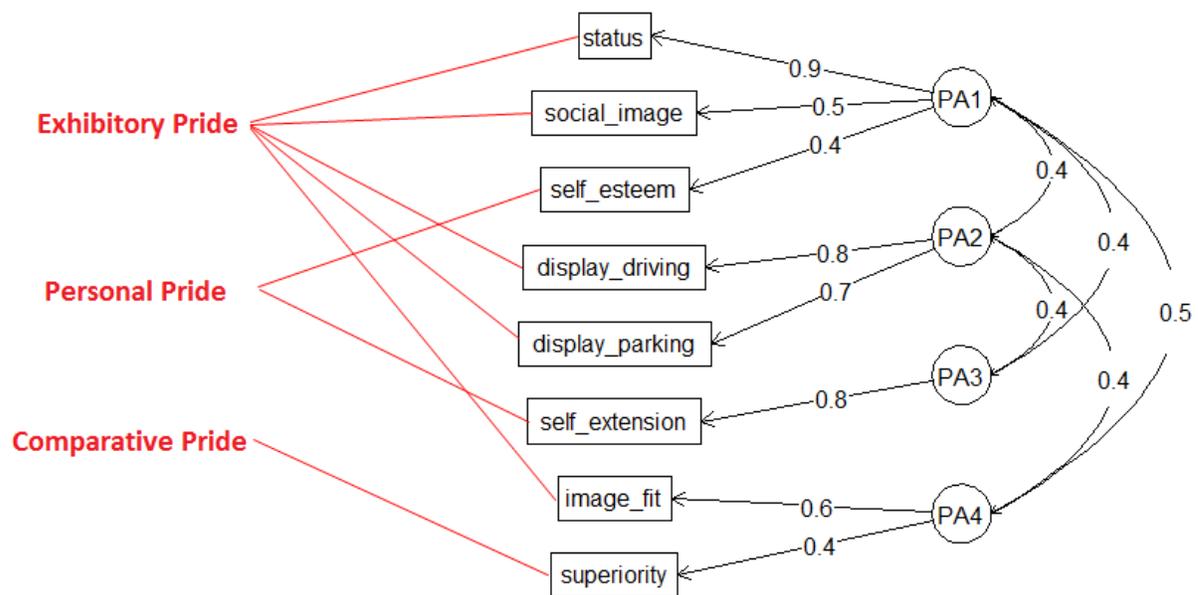
FIGURE 4.1 Mapping between the theoretical categorization and EFA result
Note: Parallel analysis suggests that number of factors is four.

4.2 Cluster Analysis of Car Pride

Different people have different values, perceptions, and attitudes. Car pride varies vastly among individuals. Those with the same level of car pride should share similar socio-economic characteristics. The overall populations can be segmented into groups based on their car pride. A cluster analysis is carried out using the binary indicators in Table 4.2. The analysis is done in R, using the ward hierarchical clustering method (with Euclidean distance). There are different ways to choose the number of clusters *k*. Based on preliminary analysis, three scenarios are

tested in this section: k =2, 3 or 4. The modified clustering dendrogram (with up to 4 clusters) is shown in Figure 4.2. In the figure, the numbers at the bottom represent the size of the 4 lower-level clusters. The height of the upside-down U-shaped lines (connecting two clusters) indicates the distance between them. Two smaller clusters with a shorter distance (or height) between them tend to form a bigger cluster.
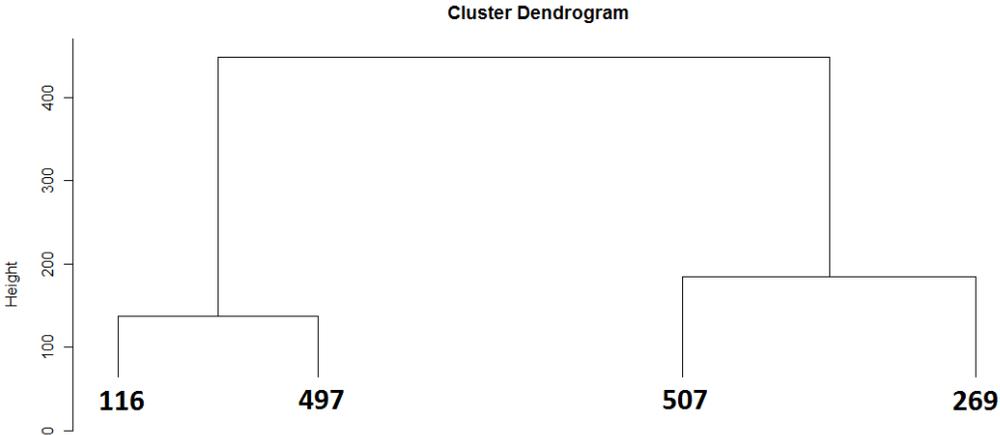
FIGURE 4.2 Ward hierarchical clustering dendogram

4.2.1 High Pride vs. Low Pride

When the sample data is categorized into two clusters, one cluster is characterized by high car pride and the other by low car pride. The high car pride group has a higher percentage of respondents in congruence with each of the survey statements (see Table 4.3). This is the simplest way to segment people by car pride.

TABLE 4.3 Summary of Clustering by Car Pride (*k*=2)

	Low Pride	High Pride
Total	776	613
self_esteem	54%	93%
self_extension	46%	90%
image_fit	38%	61%
status	56%	94%
social_image	64%	93%
display_parking	22%	78%
display_driving	27%	84%
superiority	22%	64%
achievement	58%	92%
happiness	51%	90%
pride1	62%	96%
pride2	33%	91%
other	19%	85%
spending	43%	83%
must	26%	76%
auto_show	67%	95%
cleanliness	69%	93%
picture	25%	58%

Note: the percentage in the table represents the proportion of respondents in agreement with the indicating statements; the percentage is not adjusted by weights; the same notes also apply to Tables 4.6, and 4.8.

An analysis of the socio-economic profiles of the two clusters shows that the two clusters have different socio-economic characteristics. Socio-economic variables tested are summarized in Table 4.4. It is found that people with high car pride tend to be male, highly educated, local (in terms of household registration), have high income, live closer to the city center and far from their workplaces, and own a car (see Table 4.5).

TABLE 4.4 List of Socio-economic Variables

Factor	Variable	Explanation
Age	youth	1 if age < 35, 0 otherwise
	senior	1 if age >= 60, 0 otherwise
Gender	male	1 if male, 0 otherwise
Education	education	1 if education level is college and above, 0 otherwise
Household Location	inner_city	1 if lives within the Inner Ring, 0 otherwise
	outer_city	1 if lives outside the Outer Ring, 0 otherwise
Hukou	local	1 if holds a local Hukou, 0 otherwise
Employment	employment	1 if employed, 0 otherwise
Household Income	low_income	1 if monthly household income < 5,000 RMB, 0 otherwise
	high_income	1 if monthly household income >= 15,000 RMB, 0 otherwise
Transit Accessibility	subway_walk	1 if the closest subway station is within 10 min walking distance, 0 otherwise
	bus_walk	1 if the closest bus stop is within 10 min walking distance, 0 otherwise
Commuting Distance	short_dist	1 if commuting distance < 5 km, 0 otherwise
	long_dist	1 if commuting distance >= 15 km, 0 otherwise
Car ownership	car_ownership	1 if owns at least one car, 0 otherwise

TABLE 4.5 Socio-economic Profiles of Clusters by Car Pride ($k=2$)

	Low Pride	High Pride
Total	776	613
youth	34%	35%
senior	20%	19%
male	45%	56%
education	51%	58%
inner_city	16%	24%
outer_city	45%	38%
local	57%	64%
employment	72%	74%
low_income	21%	18%
high_income	12%	19%
subway_walk	33%	35%
bus_walk	65%	64%
short_dist	33%	26%
long_dist	23%	22%
car_ownership	46%	60%

Note: variables in grey shade are those with statistically difference in the proportions between the two clusters.

4.2.2 High Pride vs. Medium Pride vs. Low Pride

When the sample data is categorized into three clusters, they are characterized by three different levels of car pride – low pride, medium pride, and high pride. The higher car pride group usually has a higher percentage of respondents in congruence with most of the indicators, with a couple of exceptions (see Table 4.6). Compared with people with medium car pride, people with low car pride share similar likelihood to go to auto shows, and are also more likely to care about the cleanliness of their cars. Interestingly, there is no dimensional difference between clusters (e.g. one cluster may have high public pride but low private pride). Again, this suggests all indicators and possibly all categories are indeed highly correlated and hard to differentiate.

An analysis of the socio-economic profiles of the three clusters reveals that 4 of the 18 variables – namely gender, education, income and car ownership - have significantly different proportions between the low and the medium pride groups, and between the medium and the high pride groups. However, except for car ownership which has a close to linear relationship with car pride, the other 3 variables show a U-shape correlation with car pride: people who are male, highly educated, and have higher income tend to have either very high or very low car pride

TABLE 4.6 Summary of Clustering by Car Pride (*k*=3)

	Low Pride	Medium Pride	High Pride
Total	269	507	613
self_esteem	10%	77%	93%
self_extension	33%	53%	90%
image_fit	7%	54%	61%
status	25%	72%	94%
social_image	39%	77%	93%
display_parking	3%	32%	78%
display_driving	9%	37%	84%
superiority	5%	32%	64%
achievement	14%	81%	92%
happiness	39%	57%	90%
pride1	22%	84%	96%
pride2	5%	48%	91%
other	1%	28%	85%
spending	33%	49%	83%
must	12%	34%	76%
auto_show	68%	67%	95%
cleanliness	83%	61%	93%
picture	8%	34%	58%

TABLE 4.7 Socio-economic Profiles of Clusters by Car Pride (*k*=3)

	Low Pride	Medium Pride	High Pride
Total	269	507	613
youth	29%	36%	35%
senior	23%	18%	19%
male	52%	41%	56%
education	56%	48%	58%
inner_city	16%	16%	24%
outer_city	46%	45%	38%
local	60%	56%	64%
employment	71%	72%	74%
low_income	21%	21%	18%
high_income	15%	10%	19%
subway_walk	30%	35%	35%
bus_walk	75%	60%	64%
short_dist	40%	29%	26%
long_dist	21%	25%	22%
car_ownership	38%	50%	60%

Note: variables in grey shade are those with statistically difference in the proportions between the low pride cluster and the medium pride cluster, and between the medium pride cluster and the high pride cluster.

4.2.3 Four-level Car Pride Clustering

When the sample data is categorized into four clusters, they are characterized by four different car pride levels – low pride, high pride, very low pride, and very high pride. The higher car pride group usually has a higher percentage of respondents in congruence with most of the survey statements (see Table 4.8). There are three exceptions: 1) compared with people with high car pride, people with low car pride are more likely to think that driving suits their personal image; 2) compared with people with low car pride, people with very low car pride are more likely to have gone to auto shows, 3) and are also more likely to care about the cleanliness of their cars. Interestingly, all of the 116 people in the very high pride group agree with every one of the 18 indicators.

TABLE 4.8 Summary of Clustering by Car Pride (*k*=4)

	Very Low Pride	Low Pride	High Pride	Very High Pride
Total	269	507	497	116
self_esteem	10%	77%	91%	100%
self_extension	33%	53%	87%	100%
image_fit	7%	54%	52%	100%
status	25%	72%	92%	100%
social_image	39%	77%	92%	100%
display_parking	3%	32%	72%	100%
display_driving	9%	37%	80%	100%
superiority	5%	32%	55%	100%
achievement	14%	81%	90%	100%
happiness	39%	57%	88%	100%
pride1	22%	84%	95%	100%
pride2	5%	48%	89%	100%
other	1%	28%	82%	100%
spending	33%	49%	79%	100%
must	12%	34%	71%	100%
auto_show	68%	67%	94%	100%
cleanliness	83%	61%	91%	100%
picture	8%	34%	48%	100%

An examination of the socio-economic profiles of the four clusters shows that car ownership is the only variable with significantly different proportions between the very low and the low groups, between the low and the high pride groups, and between the high and the very high pride groups. It appears car pride and ownership are highly correlated, and their correlation is the

strongest among all the socio-economic variables examined. Car owners tend to have higher car pride.

TABLE 4.9 Socio-economic Profiles of Clusters by Car Pride (*k*=4)

	Very Low Pride	Low Pride	High Pride	Very High Pride
Total	269	507	497	116
youth	29%	36%	36%	34%
senior	23%	18%	18%	22%
male	52%	41%	56%	58%
education	56%	48%	58%	58%
inner_city	16%	16%	22%	32%
outer_city	46%	45%	38%	35%
local	60%	56%	62%	70%
employment	71%	72%	74%	75%
low_income	21%	21%	18%	16%
high_income	15%	10%	18%	22%
subway_walk	30%	35%	35%	39%
bus_walk	75%	60%	66%	55%
short_dist	40%	29%	26%	27%
long_dist	21%	25%	21%	26%
car_ownership	38%	50%	58%	69%

Note: variables in grey shade are those with statistically difference in the proportions between the very low and the low pride clusters, between the low and the high pride clusters, and between the high and very high pride clusters.

4.3 Effect of Socio-Economic Characteristics on Car Pride

Car pride is assumed to be influenced by people's socio-economic characteristics. A regression analysis is undertaken to examine the impacts of socio-economic variables on different car pride indicators. Each of the 18 variables in Table 4.1 is tested as a dependent variable and modelled separately. The variables *subway_walk*, *bus_walk*, *short_dist*, *long_dist*, and *car_owernship* are not included in the models in this section, because the causal relations between these variables and car pride are more complicated and worth more discussion in Chapter 5.

The impacts of individual socio-economic characteristics on each of the 18 indicators are summarized in Table 4.9. The results show that demographic variables have limited impact on car pride indicators. Being young have a positive influence on car pride, while being old can affect car pride in either way depending on the indicator used. Education level does not

significantly affect car pride. Local people tend to have lower car pride, but employed people have higher car pride. As expected, income tends to have a positive impact on car pride, but its impact is not as important as household location. It seems household location may have a U-shape relationship with car pride. Living in both the inner city and outer city increases one's car pride.

TABLE 4.9 Summary of Coefficients for Individual Car Pride Indicators

	Frequency of significance* (out of 18)	Direction
youth	2	positive
senior	2	both
male	4	positive
education	0	NA
inner_city	5	positive
outer_city	6	positive
local	4	negative
employment	2	positve
low_income	2	negative
high_income	6	positive

Modeling each indicator separately is useful for comparison between them, but it is not the best way to show the overall impacts of these socio-economic variables on car pride. Therefore, an integrated car pride indicator is created as the mean of 13 (out of 18) car pride indicators. It is used to represent car pride in general. The other 5 indicators – *spending*, *must*, *auto_show*, *cleanliness* and *picture* – are excluded because they are too broad or do not directly relate to car pride. The decision is subjective but necessary to avoid mixing car pride with other non-instrumental factors like simple love for car.

The indicator ranges from 0 to 1, with one being highest car pride. The mean is 0.54, suggesting people tend to slightly agree with the statements. However, it should be noted that the absolute value of car pride is not very informative because it can be easily manipulated by rephrasing a few statements. The integrated indicator has a variance of 0.06, and its distribution is demonstrated in Figure 4.3. It seems overall car pride, measured with 13 indicators, has a decent

variation across individuals. We can use car pride to segment population and investigate its relationship with other factors.
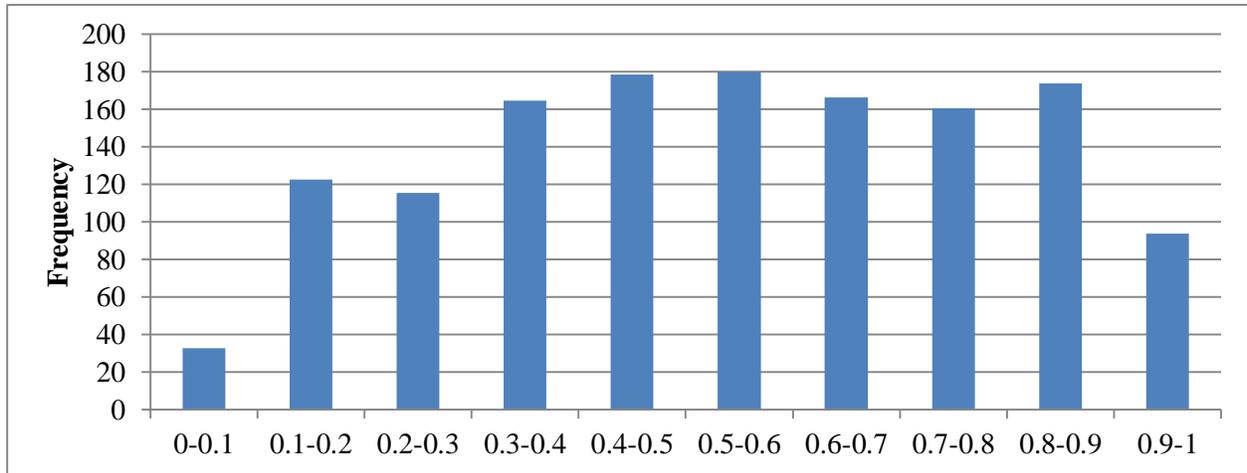
FIGURE 4.3 Frequency distribution of overall car pride

A linear regression is run to examine possible socio-economic characteristics affecting car pride. This can help identify which group of people have high car pride. The low R-squared in Table 4.10 shows that overall socio-economic characteristics have little values in explaining car pride, suggesting car pride is a distinct factor mostly independent from individual socio-economic background. Household income and household location are the only two significant predictors identified in the model. Higher income leads to higher car pride. This is partly because wealthy people usually have less economic constraints and are likely to place more weights on the symbolic values of car. The impact of household location is interesting. The model results show that either living inner city or outer city can have a positive influence on car pride, possibly for different reasons. Considering the high real estate values of residences in central Shanghai, living in inner city may be an indicator of personal wealth. Living in outer city probably means that more of your neighbors have cars (compared to living in between inner and outer city). It may create a higher social pressure that can enhance your pride.

TABLE 4.10 Linear Regression Modelling Results on the Integrated Car Pride Indicator

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.50***	0.03	16.57	0.00
Age < 35	0.01	0.02	0.32	0.75
Senior >= 60	-0.02	0.03	-0.82	0.41
Male	0.02	0.01	1.54	0.12
Education above high school	0.01	0.02	0.36	0.72
Inner city (live inside Inner Ring)	0.04`	0.02	1.78	0.07
Outer city (live inside Outer Ring)	0.04*	0.02	2.33	0.02
Local (household registration)	0.00	0.02	0.21	0.83
Employed	0.02	0.02	0.74	0.46
Household income < 50k RMB/m	-0.04*	0.02	-2.22	0.03
Household income >= 150k RMB/m	0.06*	0.03	2.20	0.03
Goodness of fit	R-Squared = 0.024			

Note: coefficients with "***" are significant at 0.001 level; coefficients with "**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

5 Causal Relations between Car Pride, Ownership and Use

As one important psychological factor in transportation, car pride can play a motivational role on behavior. It is also possible people adapt pride to their behavior. Car pride would not be a meaningful factor in policy making if we do not know its causal directions with behavior. Using survey data from Shanghai, this chapter examines the causal relations between car pride and people's ownership and usage of cars. Car ownership consists of a series of choices, and car use can be measured in different ways. The overall relationship between car pride, ownership and use is shown in Figure 5.1.
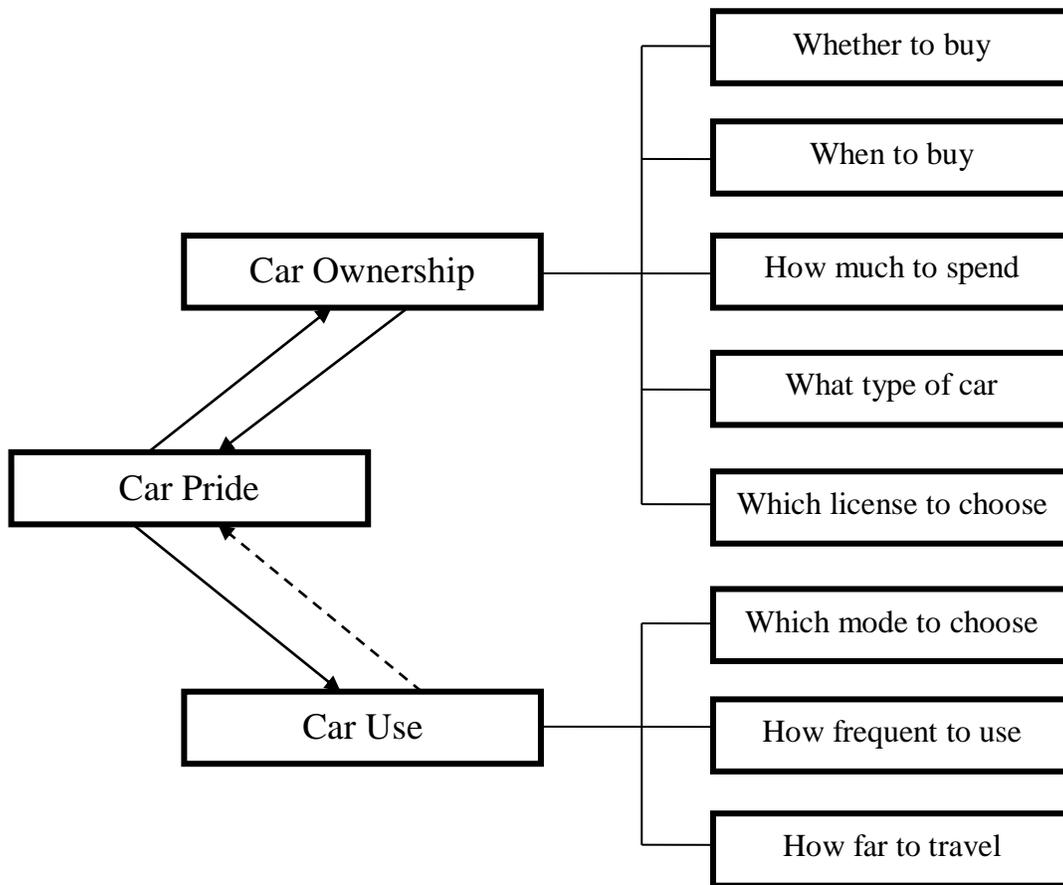
FIGURE 5.1 Relationship between car pride and car related behaviors

5.1 Interdependence between Car Pride and Car Ownership

In this section, the relationship between car pride and car ownership is examined. As mentioned before, the data collected contains multiple indicators for car pride, which are listed in Table 4.1.

To understand the overall correlation between car pride and car ownership, the integrated car pride indicator is used for analysis. This is because when investigating the relationship between car pride and other factors, we see car pride as a whole, without going into details on every aspect of car pride. As expected, high car pride is correlated with the number of cars owned (see Figure 5.2). The distribution of car pride is also different between car owners and non-car owners. According to Figure 5.3, car pride is mostly concentrated on the higher end for car owners, but has a large variation for non-car owners. The average car pride of car owners is 0.63, significant higher than non-car owners' at 0.52. Nevertheless, since 84% of Shanghai's population do not have cars, the weighted average car pride is only 0.54. For car pride to be a meaningful policy variable, it is essential to identify the causal relationship between car pride and car ownership.
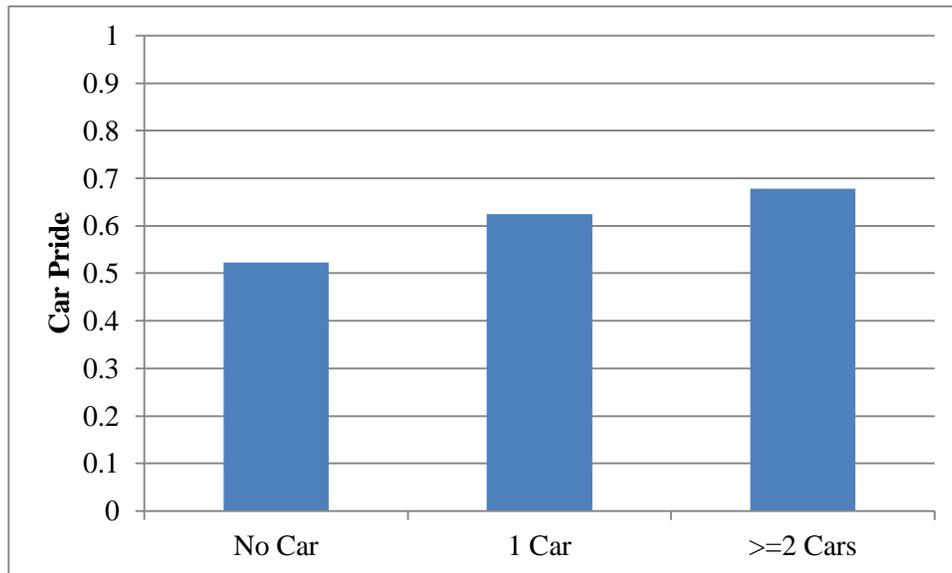
FIGURE 5.2 Variation of the integrated car pride indicator by car ownership
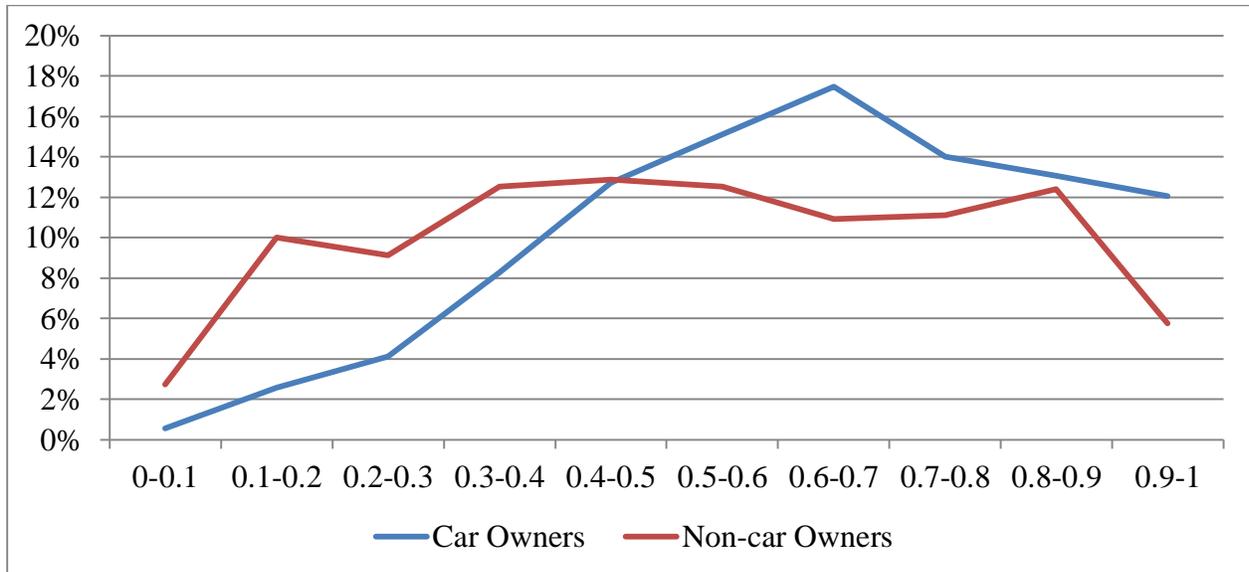
FIGURE 5.3 Distributions of the integrated car pride indicator by car ownership

Although it is recognized that car pride and ownership are highly correlated, the exact causal direction is difficult to determine. On one hand, car pride can influence car ownership. People who think having a car is a positive self-representation are motivated to buy cars. On the other hand, car ownership may also influence car pride. After buying cars, people may adapt their car pride to their ownership (partly to justify their car purchase decision consciously or unconsciously). Perhaps, both causal directions coexist. In this section, the significance and magnitude of both causal directions are tested.

Given the possible interdependence of car pride and car ownership, a simple regression of car pride against car ownership would be inappropriate because the explanatory variable (car ownership) is correlated with the error term (unobserved factors). One way to estimate the effect of car ownership on car pride is to select one or more instrumental variable(s) that are correlated with car ownership but not directly correlated with car pride (unless via car ownership). It is believed that car pride is part of non-instrumental factors, which means it should be exogenous from instrumental variables that affect car ownership, such as transit accessibility and commuting distance. A proposed modeling structure (using transit accessibility and commuting distance as instrumental variables for car ownership) is illustrated in Figure 5.4. Four instrumental variables are selected, two representing transit accessibility and two representing commuting distance.

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- *subway_walk*, dummy variable, 1 if the closest subway station is within 10 min walking distance, 0 otherwise;

- *bus_walk*, dummy variable, 1 if the closest bus stop is within 10 min walking distance, 0 otherwise;

- *short_dist*, dummy variable, 1 if commuting distance is less than 5 km, 0 otherwise;

- *long_dist*, dummy variable, 1 if commuting distance is no less than 15 km, 0 otherwise.

To use these instruments in the regression of car pride against car ownership, a two-stage least squares (2SLS) method is adopted. In the first stage, a new instrument is constructed based on a linear combination of the original instruments. In the second stage, the troublesome variable (car ownership) is replaced with the fitted value from the first stage. Since car ownership is supposed to be binary, the fitted value from the first stage is rounded before being used in the second stage. Given there is an excess of instrumental variables (4 instruments versus 1 endogenous explanatory variable), the regression equation is over identified.
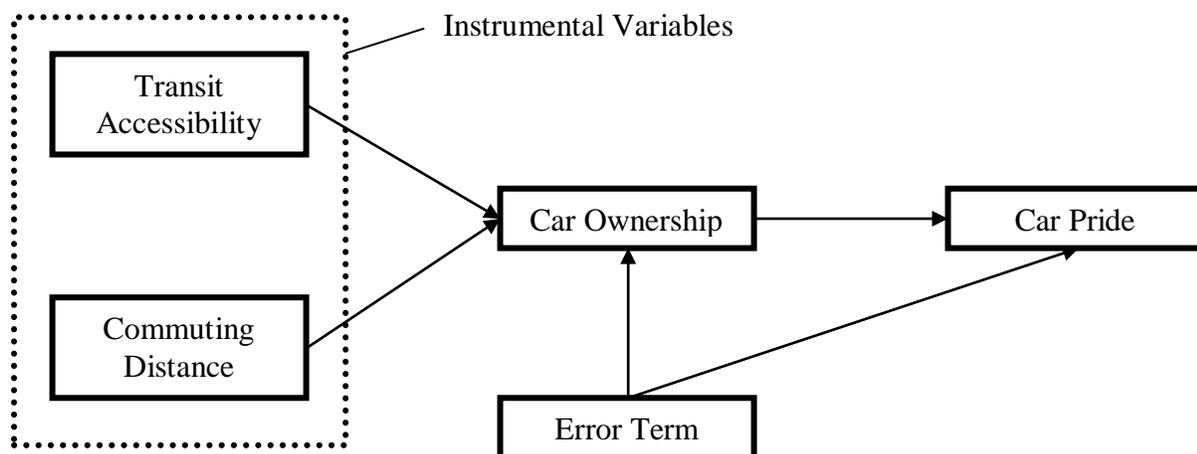
FIGURE 5.4 Illustration of using instrumental variables for car ownership to estimate its effect on car pride

Shown in Table 5.1 are the results of the 2SLS regression as well as a conventional linear regression. With the use of instrumental variables in 2SLS, the coefficient of car ownership shows a slight increase from 0.11 to 0.17, but the level of significance decreases. It suggests that changing car ownership status from not owning a car to owning a car could lead to a 0.17 increase in car pride. The overall model goodness of fit is still below 0.05. Although the positive

coefficient suggest car pride in Shanghai is expected to increase with more people owning cars, car pride is hardly predictable with car ownership and individual socio-economic characteristics. More factors need to be taken into consideration before we can confidently forecast pride.

It is interesting to see living close to a bus stop has a significantly negative impact on car ownership but the influence of proximity to a subway station is insignificant. It should be noted that, in Shanghai, land value around subway stations is significantly higher, while the effect of bus accessibility on land value is much weaker. Thus living next to a subway station has strong implication about personal wealth. It is possible the insignificant coefficient of proximity to subway is a result of the negative impact of transit accessibility on car ownership offset by the positive impact of personal wealth.

TABLE 5.1 Effect of Car Ownership on Car Pride using Instrumental Variables

| | Linear Regression | 2SLS Regression | |
		Stage 1	Stage 2
(Intercept)	0.47***	-0.71*	0.49***
Age < 35	0.00	0.56**	0.00
Senior >= 60	-0.02	-0.19	-0.02
Male	0.02`	-0.26	0.02
Education above high school	0.02	-0.99***	0.01
Inner city (live inside Inner Ring)	0.04*	-0.22	0.04`
Outer city (live inside Outer Ring)	0.05**	-0.78***	0.04*
Local (household registration)	0.00	-0.02	0.00
Employed	0.02	-0.13	0.02
Household income < 50k RMB/m	-0.03`	-0.35`	-0.04*
Household income >= 150k RMB/m	0.05*	0.33	0.05`
Car ownership	**0.11*****	**-**	**0.17***
subway_walk	-	-0.06	-
bus_walk	-	-0.38*	-
short_dist	-	-0.55**	-
long_dist	-	0.83***	-
R-squared	0.047	-	0.028

Note: coefficients with "***" are significant at 0.001 level; coefficients with"**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level; "-" means the coefficient is not applicable.

Given the data limitation, no appropriate instrumental variable is available for the regression of car ownership dependent on car pride. One possible choice for future consideration is the knowledge of other people's car ownership. It is assumed that knowing other people's car

ownership may stimulate comparative car pride, but should not have direct influence on people's car ownership.

We are unable to measure the impact of car pride on actual ownership. However, with available data, it is still possible to investigate the effect of car pride on car purchase plan, by using whether planning to buy a car as the dependent variable. The causal relationship between car pride and car purchase plan is likely to be unidirectional because car purchase plan is a plan for the future and should not affect people's current pride. Two logit models are run separately, one for non-car owners and one for car owners. This is to minimize the effect of actual car ownership, since it is correlated with both intended car ownership and car pride and can complicate the results. In this way, we can also examine the difference between potential first time car buyers and existing car owners

TABLE 5.2 Effect of Car Pride on Car Purchase Plan

	For Non-Car Owners	For Car Owners
(Intercept)	-0.90**	0.48
Age < 35	0.39*	-0.12
Senior >= 60	0.72**	-0.66
Male	0.30*	-0.14
Education above high school	0.02	0.22
Inner city (live inside Inner Ring)	-0.54**	0.12
Outer city (live inside Outer Ring)	-0.66***	-0.63`
Local (household registration)	-0.35*	-0.26
Employed	0.76**	-0.63
Household income < 50k RMB/m	-0.03	0.16
Household income >= 150k RMB/m	1.01**	-0.03
subway_walk	-0.45**	-0.17
bus_walk	-0.12	-1.07**
short_dist	-0.48**	-0.03
long_dist	-0.51*	0.23
Car pride	**2.95***	**2.02**
AIC	1346.1	258.43

Note: coefficients with "***" are significant at 0.001 level; coefficients with"**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

The results in Table 5.2 show that car pride has significant influence on car purchase plan for both non-car owners and car owners. The causal relationship for non-car owners is more significant, suggesting car pride has much more impact on the plan to buy a car for the first time.

If you are deciding whether to buy a second or third car, pride plays a less important role. Based on results in Table 5.1 and Table 5.2, it is suggested car pride and car ownership are indeed dependent on each other, and both causal directions are likely to be significant.

5.2 Car Pride and Other Car Purchase Choices

Car ownership is not only about whether or not to own a car. A series of decisions have to be made when buying a car - when to buy, how much to spend, which type of car to choose, etc. Similar with the interdependent relationship discussed in Section 5.1, car pride can affect and be affected by these choices at the same time. Without necessary variables available to carry out the similar analysis, we only examine the magnitude and direction of the correlation between these factors in this section.

Correlation analysis is carried out (for car owners only) between car pride and other variables related to car ownership - years of ownership (number of years since owning the first car), car price, and car license type. According to Figure 5.5, the correlation between car pride and years of ownership is slightly negative. Contrary to the expectation that people with high car pride are early adopters of cars, the result suggests new car owners may have higher car pride. It could be because pride of early adapters may fade away over time. Or perhaps people with high car pride tend to wait longer to save money to buy a better car. Indeed, car pride and car price are positively correlated, as expected. People tend to spend more money on cars to fulfill their car pride. A strong correlation is found between car pride and car license type. Car license type is represented with a dummy variable, with 1 being local (Shanghai) license and 0 being nonlocal license. This is probably a result of Shanghai's car license auction policy, which restricts car ownership by controlling the number of Shanghai car licenses issued each month through an auction system. Since the policy only controls local car licenses, a Shanghai license has to be obtained through the auction, usually with a bidding price as high as the price of an average economic car. However, only minor restrictions are implemented to control the use of non-local licensed cars (more specifically, non-local cars are restricted from using the elevated roads during peak hours), which makes it possible for a Shanghai resident to obtain a car license in a nearby city with much lower cost and drive in Shanghai with little inconvenience. The survey results suggest nearly 25% of Shanghai car owners have their cars registered elsewhere.

Nevertheless, having a non-local car license may leave others a socially undesirable impression of being "unruly" or "rebellious". On the other hand, only highest bidders can place Shanghai licenses on their cars, making it a privilege to get one. In a way, a local license in Shanghai is similar to a luxurious car brand, something people can take pride in. Thus it is no surprise that people with higher car pride are more likely to choose Shanghai car licenses.
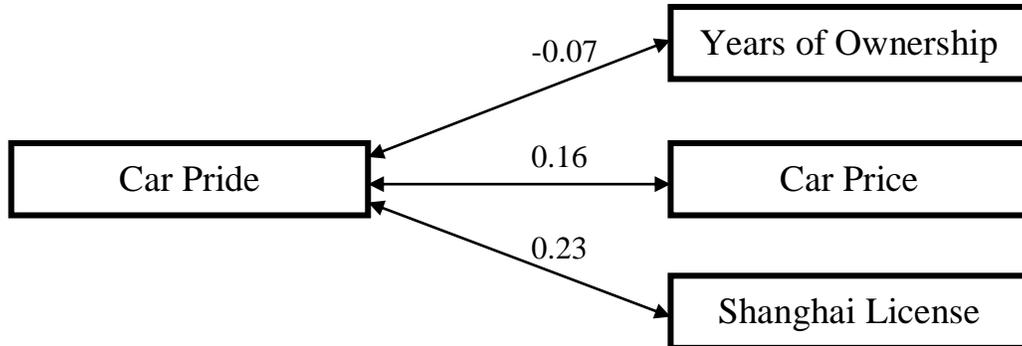
FIGURE 5.5 Correlation between car pride and other car related variables

Car pride can also be reflected through car types, as evidenced in Figure 5.6. All cars reported by respondents in the survey are classified into 5 categories (loosely based on European car segment) – 1) mini and small cars (Segments A and B), 2) medium cars (Segment C), 3) large cars (Segment D), 4) executive and luxury cars (Segments E and F), and 5) multiple purpose vehicles (MPV), crossover utility vehicles (CUV) and sport utility vehicles (SUV) (Segments M and J). As expected, executive and luxury cars are associated with the highest car pride level. Luxury cars are generally featured with luxurious style and extremely high price, and thus are often regarded as being exclusive to successful and wealthy people. Car size also plays a role. People with high car pride generally prefer larger cars.
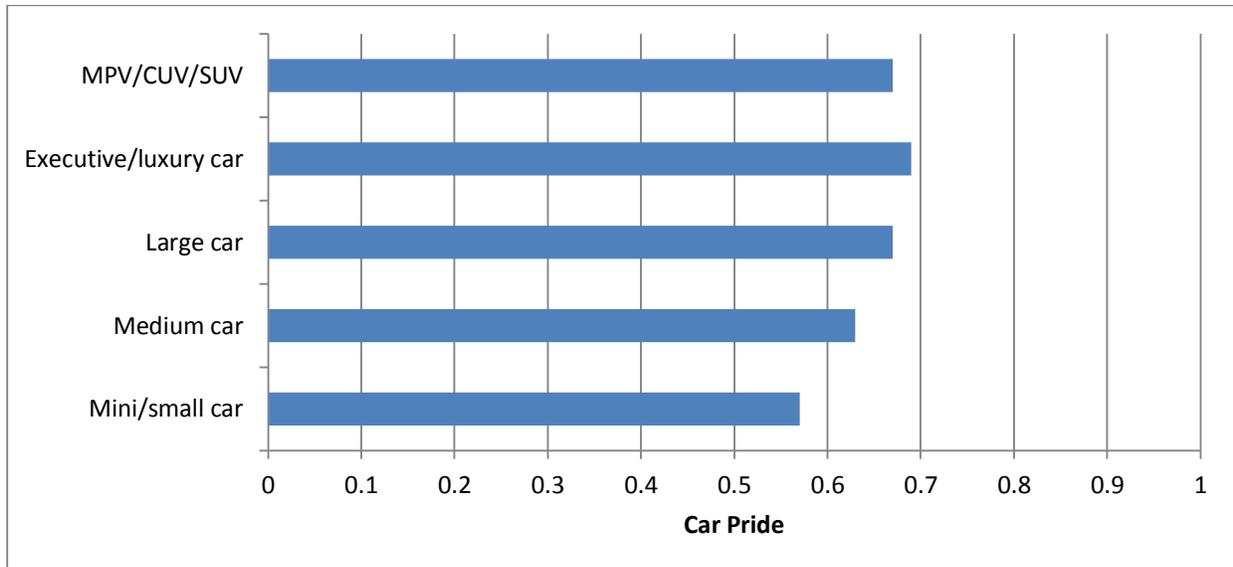
FIGURE 5.6 Relationship between car pride and actual car type

Household income is likely to be a strong economic constraint for actual car ownership. To investigate the car purchase intention without considering socio-economic constraints, a variable related to the intension of buying a car is used. In one question in the survey, respondents were asked "which type of car would you choose if you are planning to buy a car". Respondents could choose one of the five options – mini, economic, business, luxury, and sports. Economic car is the most popular choice, followed by business car. Figure 5.7 shows the car pride level for each intended car type. As expected, luxury cars are associated with the highest car pride level while mini cars with the lowest one. Luxury cars are generally featured with luxurious style and extremely high price, and thus are often regarded as being exclusive to successful and wealthy people. It is interesting that sports cars are not related to high car pride. One possible explanation is that the main purpose of buying a sports car is to experience the sensation of speed, rather than improve status or impress others. Love for speed is an important factor independent from car pride.
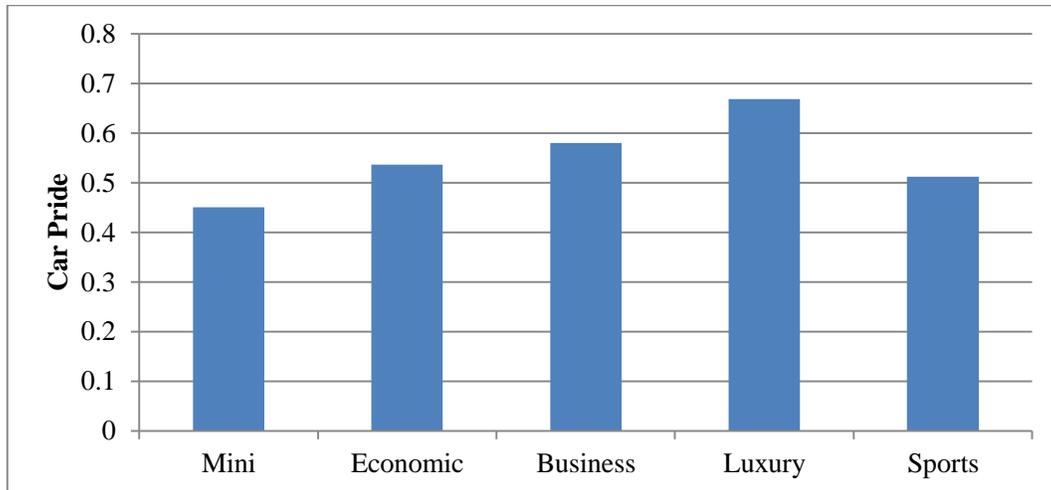
FIGURE 5.7 Variation of the integrated car pride indicator by intended car type

5.3 Car Pride and Car Usage

There are different ways to measure car use. In this study, 4 variables are used to represent car use. The 4 dependent variables are:

- *mode_car* is a dummy variable, referring to whether a person uses car (as a driver or passenger) as the primary mode for commuting.
- *car_share* is a continuous variable, referring to the percentage of trips taken by car.
- *daily_use* is a dummy variable, referring to whether a person uses car (as a driver or passenger) on a daily basis (at least 5 days a week).
- *car_vkt* is a continuous variable, referring to the amount of kilometers a car traveled in the past year (2011 in this case).

Similar with the relationship between car pride and ownership, the causal relation between car pride and use is also debatable. Following similar method illustrated in Figure 1, transit access and commuting distance are used as instrumental variables (IV) for each of the 4 car use indicators and the influence of the car use on pride is examined via the 2SLS model. As shown in Table 5.3, only *car_share* has a significant but small coefficient - 0.004 (with a p-value of 0.027). Overall, it seems that the influence of car use on car pride is weak, and the causal direction in which car pride impacts car use is dominant.

TABLE 5.3 Effect of Car Use on Car Pride using Instrumental Variables

Car Use Variables	Coefficient on Car Pride	Model R-Squared
mode_car	0.021	0.054
car_share	0.004*	0.060
daily_use	0.003	0.053
car_vkt	-0.013	0.054

Note: coefficients with "***" are significant at 0.001 level; coefficients with"**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

Assuming car pride affect car use uni-directionally, a series of models are built to measure the impacts of car pride on each of the 4 car use indicators. The results are summarized in Table 5.4. It is revealed that car pride is the only explanatory variable that has significant impact on all 4 dependent variables (none of the other socio-economic variables show significant coefficients on all of the 4 dependent variables). Higher car pride leads to higher probability of choosing car as the primary commuting mode, more frequent car use, and longer distance traveled by car. Apart from car pride, having a driver's license increases the likelihood of mode choice for car and daily use of car. Living close to transit systems also has a negative influence on mode choice for car and total distance traveled by car. Besides, specifically for the *car_vkt* model, people who are older, employed and own a car for longer time tend to travel longer distance by car. On the other hand, people who live close to their workplaces tend to travel less with car.

Also shown in Table 5.4 is a matrix of coefficients describing the impact of each of the 13 car pride indicators on each of the 4 car use variables. The results suggest different categories of car pride can influence people to use cars in different ways. Personal pride has more impact on mode choice of car (relatively and absolutely) while exhibitory pride has more impact on total vehicle distance traveled. This is a preliminary evidence to show that different aspects of car pride can influence different aspects of car use. Nevertheless, the difference is not easily interpretable. Future studies are needed to further test whether and why different types of car pride have significantly different behavioral implications.

TABLE 5.4 Effect of Car Pride (Overall and in Individual Indicators) on Car Use

	Dependent Variable			
	mode_car	car_share	daily_use	car_vkt
Overall car pride				
car pride	2.106*	17.917***	1.631*	1.036***
Personal pride				
self_esteem	0.900	9.762*	0.632	0.459`
self_extension	0.857*	7.034**	0.939**	0.166
Exhibitory pride				
image_fit	0.783	7.153*	-0.032	0.463*
status	1.343`	6.164	0.752	1.017***
social_image	0.959	3.487	1.153	0.832***
display_parking	0.242	2.009	0.238	0.120
display_driving	0.760*	4.849*	0.033	0.154
Comparative pride				
superiority	0.560	5.872**	0.472	0.196
Affective pride				
achievement	0.789	4.068	1.174	0.633*
happiness	0.499	5.628*	0.539	0.238`
Pride (in general)				
pride1	0.749	2.486	-0.484	-0.124
pride2	0.526	7.488***	0.549`	0.373**
other	0.555	4.296**	0.657*	0.389**

Note: coefficients with "***" are significant at 0.001 level; coefficients with"**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

Travel behavior is often constrained by the real world. Car pride may be better reflected by car use intentions rather than actual car use. Using data collected on people's intent to reduce car use in the future as the dependent variable, the effect of car pride is estimated with linear regression. Table 5.5 shows that car pride has a significantly negative influence on the intent to reduce car use. People with high car pride are reluctant to cut down their car usage. No matter how good transit service is or how bad the congestion is, this group of people are likely to remain attached to cars. Car pride should be considered when designing a policy to control car use, and those with high car pride should be specially targeted.

Again, it is found car owners living close to a bus stop is more likely to reduce car use, while proximity to a subway station has no significant impact. One may argue the results are biased because the variables *subway_walk* and *bus_walk* are highly correlated. However, further test

shows even when the variable *bus_walk* is removed, the coefficient of the variable *subway_walk* is still insignificant. As mentioned before, it is possible proximity to subway is more than an indicator for transit accessibility; it may also has implication on personal wealth (noting the coefficient for income variables are also insignificant). Further studies are required to understand the difference between subways and buses, in terms of their roles in the city and their socio-economic implications.

TABLE 5.5 Effect of Car Pride on Intent to Reduce Car Use

	Estimate	Std. Error	T value	Pr(>|t|)
(Intercept)	0.61***	0.03	17.65	0.00
Age < 35	-0.01	0.01	-0.76	0.45
Senior >= 60	0.05	0.03	1.65	0.10
Male	-0.02	0.01	-1.34	0.18
Education above high school	-0.01	0.02	-0.46	0.64
Inner city (live inside Inner Ring)	-0.04*	0.02	-2.14	0.03
Outer city (live inside Outer Ring)	-0.05**	0.02	-3.20	0.00
Local (household registration)	-0.01	0.01	-0.44	0.66
Employed	0.00	0.02	-0.03	0.97
Household income < 50k RMB/m	0.01	0.02	0.67	0.50
Household income >= 150k RMB/m	0.00	0.02	-0.20	0.84
subway_walk	0.01	0.01	0.42	0.68
bus_walk	0.06***	0.01	4.66	0.00
short_dist	0.01	0.02	0.86	0.39
long_dist	-0.01	0.01	-0.63	0.53
Car pride	**-0.11***	0.03	-3.94	0.00

Note: coefficients with "***" are significant at 0.001 level; coefficients with"**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

6 Relationship between Car Pride and Car Dependence

Car improves accessibility of jobs and released the spatial constraints of residence locations, leading to increased commuting distance. It also allows people to live in low density communities far from the city center and integrated city neighborhoods, contributing to urban expansion and suburbanization. Besides, with higher income, people tend to participate in more activities in different locations (especially non-work activities). All these changes make the speed, convenience and flexibility of car more appealing compared to other modes. This can cause a feeling of dependence on car. In this section, the relationship between car pride and car dependence is discussed.

6.1 Car Dependence

The term car dependence can have various connotations: from trips and people, to activities and communities, and to the society at large. But in this study, the term is only used to refer to car dependent people.

Traditionally, car dependence is usually described from the behavioral aspect. The extent to which a person is dependent on a car can be assessed by a number of indicators, including the absolute ones – how much a person uses the car, and the relative ones – what portion of the total travel are done by car (Stradling, 2002). Goodwin (1997) rejects the notion that treats car dependence simply as synonymous with the amount of use. M. Zhang (2002) interprets car dependence from individuals' mode choice perspective and quantifies car dependence as the extent to which other travel options are excluded from the considered choice set. Zhao (2011) makes the distinction between people's objective car use behavior and the psychological state of feeling dependent on cars, and proposes a subjective measure of car dependence based on people's own assessment of their reliance on cars, which supplements the commonly used behavioral measure based on the actual car use.

Following the subjective measure proposed by Zhao (2011), the data collected from the Shanghai survey includes 4 indicators about car dependence. All of them are in 5-level likert scale, and are described in Table 6.1. It is found that car owners tend to agree with all the car dependence

statements, admitting the existence of car dependence. The 4 car dependence indicators are all positively correlated, as shown in Table 6.2, although the correlation coefficient between indicator *alternative* and indicator *habit* is relatively weak. This makes sense since these two indicators reflect different aspects of car dependence. Like car pride, car dependence also has more than one facet. Car dependence could refer to the sense of captivity people feel when they are stuck with car with no alternative to turn to (which is also described by indicator *lifestyle*, but with an assumed causality), or the behavioral inertia when people choose car based on their behavioral history with no or little conscious decision making. However, the sharp difference between car owners and non-car owners could mean different things. For non-car owners, especially those who want to have a car but cannot afford it, they cannot choose to depend on cars or not. Thus their answers may be biased. For later analysis, only the dependence of car owners is examined.

TABLE 6.1 List of Car Dependence Indicators

Variable	Statements on Car Dependence	Car Owners	Non-car Owners
depend	My lifestyle depends on car.	0.35	-0.05
alternative	I want to drive less, but I cannot find other suitable alternatives.	0.29	-0.04
lifestyle	Because of my lifestyle and my house location, I cannot use other transportation modes except driving.	0.20	-0.14
habit	I don't have time to think about how I travel. I just get in my car and go.	0.22	-0.18

Note: all numbers presented in the table range from -1 to 1, with -1 being totally disagree and 1 being totally agree.

TABLE 6.2 Correlation among Car Dependence Indicators

	depend	alternative	lifestyle	habit
depend	1.00	0.40	0.44	0.44
alternative	0.40	1.00	0.50	0.23
lifestyle	0.44	0.50	1.00	0.42
habit	0.44	0.23	0.42	1.00

The effect of demographic and socio-economic status on car dependence is also examined using linear regression analysis. 4 models are estimated with the 4 indicators of car dependence as the dependent variable separately. In addition, another model is estimated with the integrated indicator of car dependence (i.e. the mean of the 4 indicators) as the dependent variable. All the

results are presented in Table 6.3. It is found that living closer to city center and holding local household registration increase car dependence. The significant positive impact of local household registration is particularly interesting, given that earlier analysis shows the insignificant role of household registration in determining car pride or car use. Another interesting finding is that people living in the inner city tend to have higher car dependence, which seems contrary to common expectation. Although the dense land use in inner city should make the residents less car dependent, psychologically they may feel more so. An examination of the goodness of fit for different models shows that, like car pride, car dependence is not effectively explained based on socio-economic factors alone. It is largely a psychological factor independent from individual socio-economic background.

TABLE 6.3 Effect of Demographics and Socio-economic Status on Car Dependence

	Dependent Variable				
	depend	**alternative**	**lifestyle**	**habit**	**car dependence**
(Intercept)	0.585***	0.627***	0.544***	0.577***	0.583***
Age < 35	0.048*	-0.005	0.001	0.027	0.018
Senior >= 60	0.019	-0.017	0.041	0.040	0.021
Male	0.027	0.010	0.009	0.002	0.012
Education above high school	-0.022	-0.026	-0.008	-0.023	-0.020
Living in inner city	0.075**	0.013	0.006	0.051`	0.036`
Living in outer city	-0.017	-0.027	-0.052*	-0.044`	-0.035*
Local	0.060**	0.044*	0.054*	0.006	0.041**
Employed	0.017	0.004	0.031	0.031	0.021
Income < 50k RMB/m	-0.009	-0.010	0.022	-0.023	-0.005
Income >= 150k RMB/m	0.006	-0.011	-0.003	0.029	0.002
R Squared	0.042	0.018	0.025	0.026	0.039

Note: coefficients with "***" are significant at 0.001 level; coefficients with "**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

6.2 The Relationship between Car Pride and Car Dependence

Both car pride and car dependence are psychological factors with abstract and complicated meanings. It is very difficult to identify the exact causal relationship between the two. Instead, this section focuses on their correlation and possible difference in terms of the effect of socio-demographic characteristics. The correlation coefficient between car pride and car dependence is 0.47, suggesting they are highly correlated. This is not surprising since both factors are in favor

of car. However, when examining possible difference in variation based on socio-economic characteristics, it is found that they are affected by different socio-economic variables. It is worth noticing that the analysis done in this section is only applied to car owners, and thus the results shown in Figure 6.1 is different from prior car pride model results (in Table 4.10) for overall population. When focusing on car owners only, the coefficients of age and gender become significant but the coefficients of household income become insignificant.

In terms of the difference between car pride and dependence, it is found that while gender and age have significant impacts on car pride but not on car dependence, having local household registration significantly increase car dependence but has nothing to do with pride. Residential location influences both car pride and dependence, but in different ways. While the Inner Ring Road in Shanghai makes a big difference for car pride, whether living outside of the Outer Ring Road is a significant determinant for car dependence. This suggests that despite high correlation, there is important difference between car pride and car dependence. A cross-tabulation in Table 6.4 on both measures identifies 38% of people have high (upper 50%) pride and low (lower 50%) dependence, or low pride and high dependence.
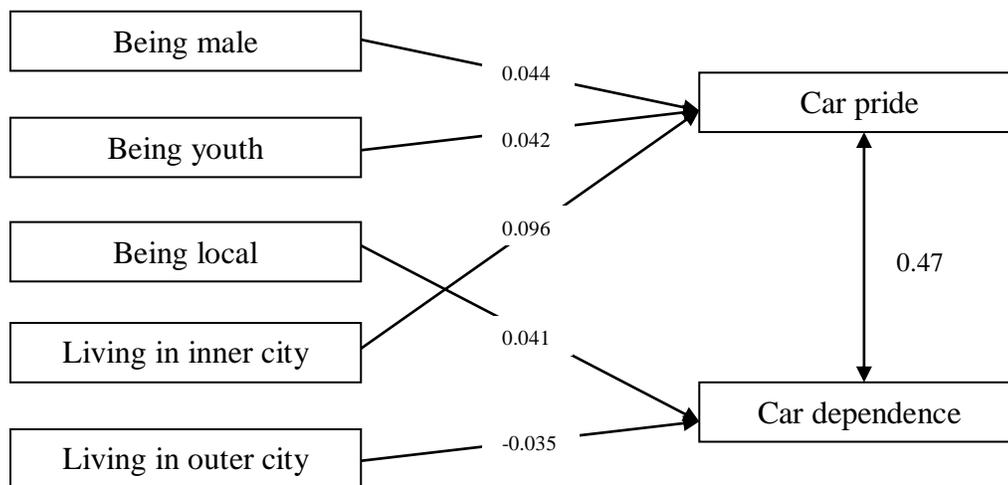

FIGURE 6.1 Correlation of car pride and car dependence

TABLE 6.4 Population Segments based on both Car Pride and Car Dependence

Population Segments		Car Pride		Total
		Low	High	
Car Dependence	Low	31%	19%	50%
	High	19%	31%	50%
Total		50%	50%	100%

The impacts of car pride and car dependence on the intent to reduce car pride are also investigated to reveal possible differences in their behavioral implications. Three linear regression models are tested:

- Model 1 includes car pride as an independent variable;
- Model 2 includes car dependence as an independent variable;
- Model 3 includes both car pride and car dependence as independent variables.

The results shown in Table 6.5 reveal that car dependence has a much stronger influence on behavior intention than car pride. Because even though car pride on its own shows significant impact on the intent, adding car dependence as an independent variable makes car pride irrelevant. One could argue car pride influence car use intentions (or car use) via car dependence. Further work is needed to fully understand the causal directions between car pride, dependence and use.

TABLE 6.5 Effect of Car Pride and Dependence on Intent to Reduce Car Use

	Model 1	Model 2	Model 3
(Intercept)	0.612***	0.697***	0.702***
Age < 35	-0.011	-0.007	-0.007
Senior >= 60	0.049	0.056`	0.056`
Male	-0.016	-0.019	-0.018
Education above high school	-0.007	-0.011	-0.011
Inner city (live inside Inner Ring)	-0.039*	-0.040*	-0.038*
Outer city (live inside Outer Ring)	-0.048**	-0.055***	-0.054***
Local (household registration)	-0.006	0.001	0.001
Employed	-0.001	0.009	0.008
Household income < 50k RMB/m	0.012	0.010	0.010
Household income >= 150k RMB/m	-0.004	0.001	0.001
subway_walk	0.006	0.007	0.007
bus_walk	0.062***	0.045***	0.045***
short_dist	0.014	0.016	0.015
long_dist	-0.009	-0.002	-0.003
car pride	-0.113***	NA	-0.017
car dependence	NA	-0.252***	-0.243***
R Square	0.089	0.141	0.141

Note: coefficients with "***" are significant at 0.001 level; coefficients with "**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

7 Impact of Car Pride on Policy Acceptance

Traffic congestion is a big problem shared by most large cities in the world. The problem may be even more serious for Chinese cities, because of the high population density and the rapid economic growth (which naturally leads to rapid motorization). In order to address traffic congestion and rapid motorization, a plethora of transportation policies have been tested and implemented in different cities. Shanghai followed Singapore's path to control the number of cars by controlling the number of car licenses issued each month through an auction system. Only bidders with the highest bid can obtain a Shanghai license plate. Although this policy has significantly repressed the motorization rate in Shanghai (even though it is still high compared to that in the developed world), it has also given rise to many problems in affordability, equity, revenue transparency, and so on. Considering the heavy government intervention on people's car ownership and the problems it has caused, it is important to understand how the policy is received by the public. Among various factors, car pride may play a part in public acceptance of this policy. This section uses Shanghai's car license auction policy as a case to investigate whether and how car pride influences people's attitudes towards such policies. Furthermore, because the policy creates the discrepancy in the cost of local cars (licensed in Shanghai) and non-local cars (licensed in other cities), possible difference of the pride in Shanghai-licensed cars the pride in non-local cars is also explored.

7.1 Shanghai's License Auction Policy

Rapid growth in car ownership in large cities has caused severe and worsening transportation problems: congestion, air pollution, noise, traffic injuries and fatalities, parking shortages, energy use, and a lack of mobility for the poor (Pucher et al., 2007). To mitigate rapid motorization, Shanghai is the first Chinese city to implement policies on car ownership. Since 1994, the Shanghai municipal government has implemented a car ownership policy requiring purchasers of new cars bid for their car licenses through auction (Hao et al., 2011). The policy has repressed Shanghai's motorization rate. In this sense, the policy is indeed effective in fulfilling its primary purpose - to control the increase of number of cars in Shanghai and thus to alleviate traffic congestion.

However, Shanghai's car license auction policy is not without problems, such as affordability, equity and implementation issues. All of these issues may influence people's acceptance of the policy. By imposing a bidding price for registering a car in addition to market price of buying a car, affordability becomes a big concern. While innovation and market competition has made cars more affordable, the bidding price has risen over the years, and reached over 90.000 RMB in early 2013, which is similar to the cost of buying an average economic car in China. Questions are also raised regarding the equity of the policy. On one hand, the format of auction is likely to favor the rich. On the other hand, people can get around the auction policy by registering their cars in other cities. The only major restriction placed on non-Shanghai cars is banned usage of the elevated ring roads in peak hours, which is considered to be a weak penalty for getting away with the license auction. It does not seem fair when local car owners in Shanghai need to pay much more. There are also controversies on how the policy is implemented, especially on transparency of specific auction information and the usage of revenue collected from the auction. Even the effectiveness of the policy is questionable. Auto ownership control does not necessarily lead to auto use control to the same extent. Those who managed to get car licenses via auction are likely to use car to take more and longer trips. The policy's effects on vehicle ownership control could not be fully translated to effects on traffic volume on road.

Shanghai's car license auction policy imposes strict quota restriction on car purchase and high auction price to deter people from it. It is commonly considered one of the harsh transportation policies considering the heavy government intervention on people's car ownership. A big challenge for implementing such a policy is people's acceptance. It is of great value to understand policy acceptance and factors affecting it, among which may be car pride.

7.2 Car Pride and Policy Acceptance

According to Chen and Zhao (2013), effectiveness, affordability, equity and implementation are identified as four key drivers for people's acceptance of Shanghai's car license auction policy. The dataset used in this study includes indicators describing all these factors, which allows for statistical connection analysis between car pride and people's opinions on the policy. Thus the relationship between car pride, and policy attitudes (including the overall policy acceptance and

the factors driving the accptance) is investigated through correlation analysis, and the results are shown in Figure 7.1.
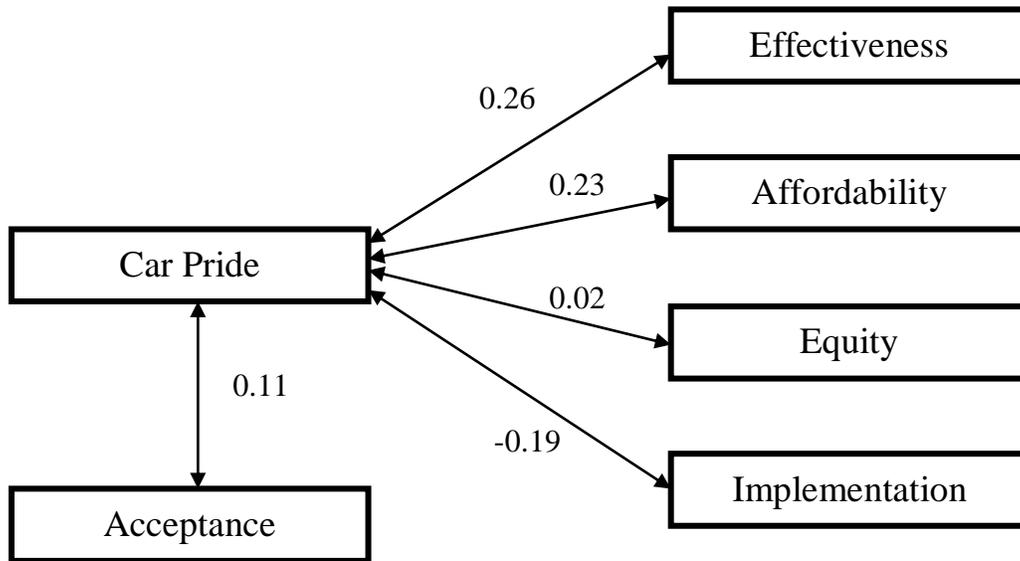
FIGURE 7.1 Correlation among car pride, policy acceptance and its drivers

Before the correlation analysis is done, one may guess that people with high pride in having a car would not appreciate restrictions on car ownership. As plausible as this speculation sounds, the correlation coefficient between car pride and policy acceptance tells a different story. The more pride people take in having a car, the more likely they are to support Shanghai's car license auction policy. This does not come as a total shocker. People with high car pride tend to acknowledge the symbolic meaning of having a car about success, wealth and social status. When a restriction is placed on car ownership, it makes it much harder to have a car, and thus makes car ownership more exclusive and special. Furthermore, since the restriction in Shanghai is auction-based, the symbolism of having a car is solidified by the extra price tag. Having an average economic car registered in Shanghai may take the same sense of premium as having a luxurious car in another city. Probably, making cars more exclusive only makes them more desirable. People with high car pride tend to be supporters for Shanghai's car license auction policy, as is shown in Figure 7.2. It is also revealed that people with high car pride tend to consider the policy to be more effective and more affordable. Evaluation of equity and implementation issues does not show much difference between the high car pride group and low car pride group.
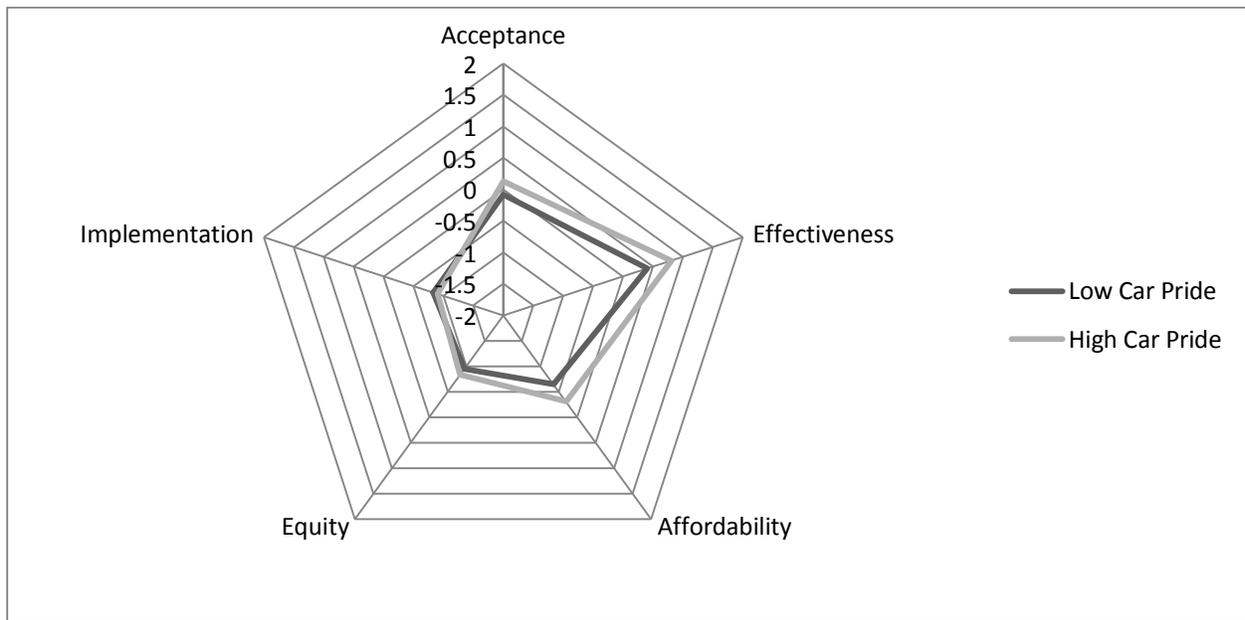
FIGURE 7.2 Variation of policy acceptance and its drivers by car pride

The correlation itself tells a rich story regarding the relationship between car pride and car license policy attitudes, but maybe not an accurate one, since the correlation may be distorted by other factors. For example, given the interdependency between car pride and ownership, the correlation between car pride and acceptance may be just a reflection of the correlation between car ownership and acceptance. To address this problem, linear regression is employed to estimate the impact of both car pride and car ownership on policy acceptance and its four drivers. The model results in Table 7.1 manifests that car pride and car ownership, despite being highly correlated with each other, could have opposite influence in acceptance of the car license auction policy. While people with high car pride tend to accept the policy, actual car owners are reluctant to do so. It may be because car owners are the "victims" of the policy. The revenue collected from the auctions is allegedly spent to improve public transportation. As a result, non-car owners enjoy improved public transportation without sacrificing anything. Thus it is not surprising they are more receptive toward the policy than car owners are. It is also found that car owners tend to think the policy as less effective and more affordable, and are more concerned about implementation. After considering car ownership and other socio-economic factors, the impact of car pride on policy implementation is found to be significantly positive. Neither car pride nor ownership has significant effect on policy equity.

TABLE 7.1 Estimation of the Effect of Car Pride on Policy Acceptance and Its Drivers

	Acceptance	Effectiveness	Affordability	Equity	Implementation
			Dependent Variable		
(Intercept)	1.819***	2.235***	1.323***	1.108***	1.819***
youth	0.268***	0.000	-0.006	0.054`	0.268***
senior	0.316**	0.079	0.050	-0.004	0.316**
male	0.001	-0.010	0.001	-0.030	0.001
education	-0.146*	-0.169**	0.008	-0.011	-0.146*
inner_city	-0.130`	-0.073	-0.108*	0.028	-0.130`
outer_city	-0.067	-0.057	-0.184***	-0.036	-0.067
local	0.128*	0.099`	-0.088*	-0.080**	0.128*
employment	0.020	-0.025	-0.023	0.032	0.020
low_income	-0.081	0.021	-0.105*	0.141***	-0.081
high_income	0.022	0.053	0.067	0.030	0.022
car ownership	**-0.191****	**-0.111`**	**0.124***	**-0.001**	**-0.191****
car pride	**0.300****	**0.911****	**0.604****	**0.051**	**0.300****

Note: coefficients with "***" are significant at 0.001 level; coefficients with "**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

Table 7.2 shows the impact of car pride for each car ownership group. It is found that while car pride has a more significant influence on policy acceptance for non-car owners, the impact is stronger in magnitude for car owners. If further looking into the difference between local car owners and non-local car owners, it is revealed that for non-local car owners car pride has no impact on their policy acceptance at all. It seems there large difference between the car pride of local car owners and the pride of non-local car owners. The impact of each of the 13 car pride indicators is also examined, the results in Table 7.3 show that not a single car pride indicator has a significantly negative influence on policy acceptance.

TABLE 7.2 Impact of Car Pride on Policy Acceptance by Car Ownership Group

	Dependent Variable = acceptance		
	Non-car owners	**Local car owners**	**Non-local car owners**
car pride	0.275**	0.477`	
	0.274**	0.534`	-0.094

Note: coefficients with "***" are significant at 0.001 level; coefficients with "**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

TABLE 7.3 Impact of Individual Car Pride Indicators on Policy Acceptance

Parameters	Coefficient	Parameters	Coefficient
self_esteem	0.335***	superiority	-0.02
self_extension	0.139**	achievement	0.325***
image_fit	0.010	happiness	0.233***
status	0.484***	pride1	0.399***
social_image	0.385***	pride2	0.093`
display_parking	-0.039	other	0.088`
display_driving	-0.026		

Note: coefficients with "***" are significant at 0.001 level; coefficients with"**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

7.3 Car Pride and License Pride

As mentioned previously, it is possible for people to avoid paying money for bidding a Shanghai car license by registering their cars in other cities. Since the penalty for using non-local cars in Shanghai is not very punishing (non-local cars are banned from using elevated roads in peak hours), it seems choosing a non-local car license could be an economically "smart" option. However, pride may change the equation. On one hand, choosing a non-local car license may leave others a socially undesirable impression of being "unruly" or "rebellious". On the other hand, because of its high price and resulting exclusiveness, a Shanghai car license may indicate more wealth or higher social class. Some may believe that getting a Shanghai car license is an essential part of being a "Shanghainese". Therefore, because of the car license auction policy in Shanghai, chances are the pride of having a local car license not only exists, but also plays an important role in people's decision making. We use the term "car license pride" to represent the evaluation and emotion toward the positive self-representation by having a local car license. Car license pride can be viewed as an extended part of car pride since a car license plate is often considered as part of a car. The survey includes a few indicators on the pride of having a Shanghai car license. These indicators are described in Table 7.4. People tend to agree that having a non-local car license is not socially respectable, and has negative influence on one's social status and the identity of being a Shanghai resident. More than half of people would feel proud of owning a Shanghai-licensed car. And more than 40% admit they would take pride into consideration when deciding where to register their car licenses.

Similar with car pride, an integrated indicator for car license pride is created to simplify the analysis process. The integrated indicator is set as the average of 6 indicators - *lic_respect*, *lic_status*, *lic_judging*, *lic_looking*, *lic_identity*, and *lic_pride*. Indicator *lic_image* is not used here because the corresponding statement is phrased in a different direction than the other statements. Using the integrated indicator, comparison can be made between different groups of people on car license pride. According to Figure 7.3, car owners in general take more pride in having a local car license. But further analysis within the car owner group shows striking difference between local car owners and non-local owners. Local car owners have more pride in holding a Shanghai car license than non-local car owners, whose car license pride is even lower than non-car owners.

TABLE 7.4 List of Car License Pride Indicators

Variable	Statements/Questions on Car License Pride	Overall	Car Owners	Non-car Owners
license_face	Would you take your "face" and pride into consideration when choosing a car license?	-0.17	0.21	-0.24
lic_respect*	Having a non-local license sometimes does not receive the same respect from others.	0.23	0.28	0.22
lic_status*	Having a non-local license does not suit my status.	0.03	0.15	0.00
lic_image*	Having a nonlocal license will not have any effect on my personal image.	0.24	0.25	0.24
lic_judging*	I will judge if the car owner is Shanghai citizen by looking at his car license.	0.03	0.13	0.01
lic_looking*	I think driving a nonlocal vehicle in Shanghai doesn't look nice.	-0.09	0.07	-0.12
lic_identity*	Getting a Shanghai car license makes me feel more like a Shanghai citizen.	0.10	0.22	0.08
lic_pride*	I feel driving a car with Shanghai license has more pride.	0.12	0.22	0.10

Note: variables with "*" are in 5-level likert scale, while the other variable is binary; all numbers presented in the table range from -1 to 1, with -1 being totally disagree and 1 being totally agree.
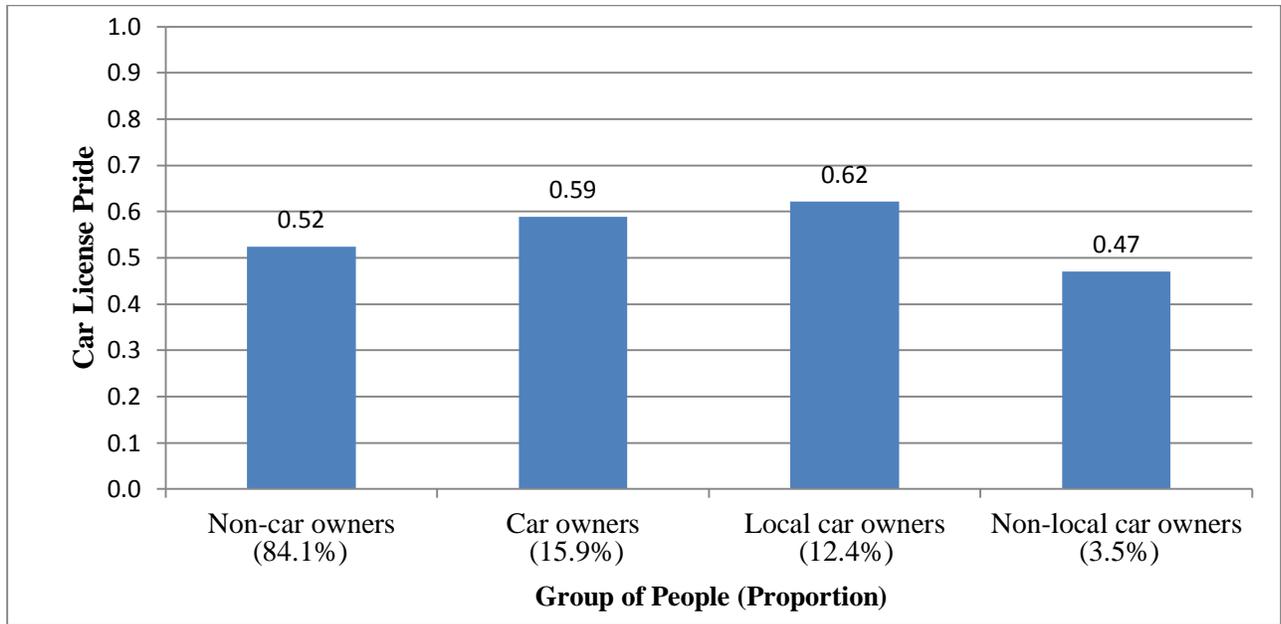
FIGURE 7.3 Comparison of car license pride among different groups of people

Figure 7.4 shows the correlation among car pride, car license pride and license type. It reveals that car pride and car license pride are highly correlated, and both of them have significant positive correlation with the tendency of choosing a Shanghai car license.
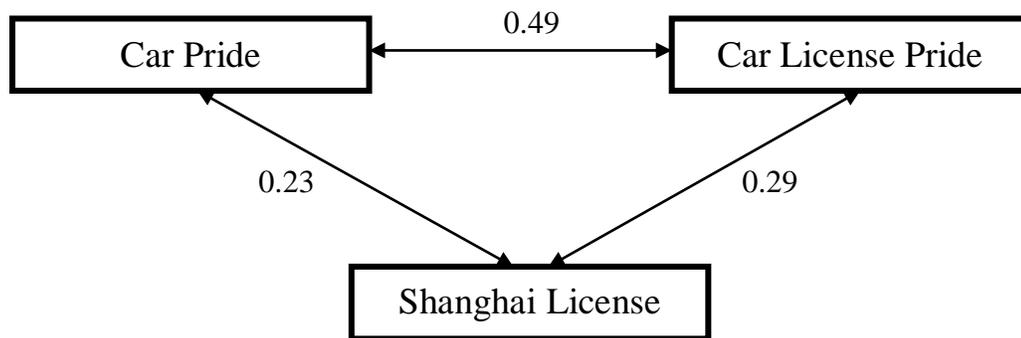
FIGURE 7.4 Correlation among car pride, car license pride and license type

Similar with the relationship between the car pride and ownership, the relationship between car license pride and car license choice is probably interdependent. However, if using intended car license choice instead of actual car license choice as the dependent variable, it is possible to accurately estimate the effect of car license pride. One question included in the survey asked respondents to indicate "which type of car license you would choose if you are planning to buy a

car". The question is converted to a dummy variable, with 1 being choosing a Shanghai car license, and 0 being choosing a non-local car license. The results of the linear regression model with intended car license choice as the dependent variable are shown in Table 7.5. It is found that age, education, employment, and household income all have a positive influence on tendency to choose a local car license. This suggests when people are older, educated, employed and have high income, they are more willing to pay extra money to get a car license through auction and avoid the inconvenience of using a non-local car license. Interestingly, women have a stronger preference for local car license. People who live between the Inner and Outer Ring Roads are more likely to register their cars locally. Shanghai residents with local household registration would prefer to get a local license. As expected, car license pride shows a strong positive impact on the likelihood of choosing a Shanghai local car license. Understandably, people who recognize the positive self-representation of having a local car license are motivated to get one.

TABLE 7.5 Results of Modeling Intended Car License Choice

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.122	0.064	1.911	0.056
Age < 35	-0.057	0.029	-1.973	0.049
Senior >= 60	0.247	0.050	4.935	0.000
Male	-0.052	0.025	-2.062	0.039
Education above high school	0.062	0.032	1.945	0.052
Living in inner city	-0.146	0.035	-4.213	0.000
Living in outer city	-0.088	0.030	-2.968	0.003
Local	0.139	0.028	5.001	0.000
Employed	0.113	0.044	2.589	0.010
Income < 50k RMB/m	-0.075	0.032	-2.336	0.020
Income >= 150k RMB/m	0.007	0.046	0.156	0.876
Car license pride	0.769	0.057	13.501	0.000

8 Comparison between Shanghai and Beijing

Data collected from both a Shanghai survey and a Beijing survey is available to this study, even though the surveys implemented are slightly different. Shanghai and Beijing are the largest cities (in terms of urban area and urban population) in China, and they share many challenges and problems, including traffic congestion and rapid motorization. Nevertheless, the two megacities are significantly different in many areas, such as culture, political structure and the ways to address transportation issues. In this section, car pride, and its relationship with car ownership, car use and public acceptance of their respective car ownership restriction policies are compared between Shanghai and Beijing to identify possible differences and explore explanations.

8.1 Comparison: Car Pride

The Shanghai dataset has more indicators of car pride than the Beijing dataset. For the sake of comparison, only the 6 indicators that exist in both datasets are analyzed in this section. A summary of the indicators is presented in Table 8.1, and an overall comparison in Figure 8.1.

TABLE 8.1 Summary of Car Pride Indicators

	Shanghai			Beijing		
	Overall	Car Owners	Non-car Owners	Overall	Car Owners	Non-car Owners
pride1	0.29	0.47	0.25	0.30	0.50	0.21
self_esteem	0.23	0.35	0.21	0.26	0.42	0.18
achievement	0.27	0.37	0.25	0.26	0.41	0.19
image_fit	-0.09	0.14	-0.14	-0.08	0.13	-0.18
status	0.21	0.33	0.18	0.16	0.36	0.07
social_image	0.21	0.36	0.19	0.24	0.42	0.16

Note: all indicators are in 5-level likert scale; all numbers presented in the table range from -1 to 1, with -1 being totally disagree and 1 being totally agree.

Similarly, the integrated indicator of car pride is then calculated for each city by taking the average of the 6 indicators and converting it to the scale of [0, 1]. It is worth noticing that the results in this section are different from the numbers provided in previous sections, since the number of indicators is reduced to keep the data comparable. The comparison between Shanghai and Beijing shows that overall car pride is almost the same. However, despite similar overall numbers, the variation is different. By dividing the overall population into car owners and non-

car owners, and comparing their car pride separately between the two cities, it is found that even though Shanghai's car owners have lower car pride than Beijing's car owners, Shanghai's non-car owners take more pride in cars than non-car owners do in Beijing. It seems car pride has a stronger positive correlation with car ownership in Beijing, where the motorization level is much higher than Shanghai.

To investigate drivers that lead to the difference in car pride between Shanghai and Beijing, 2-Stage Least Squares (2SLS) models are built to estimate how the socio-economic factors affect car pride. The results, shown in Table 8.2, confirm that the car pride is more strongly affected by car ownership in Beijing than in Shanghai. Household income and location are also found to have stronger impacts on car pride, so are gender and household registration but to a less degree. Overall, it appears Beijing's car pride has more variation based on socio-economic factors. Goodness of fit is poor for both cities, but car pride can be relatively better captured by socio-economic characteristics in Beijing. Further studies are required to understand relevant unobserved factors in effect, especially in Shanghai's case.
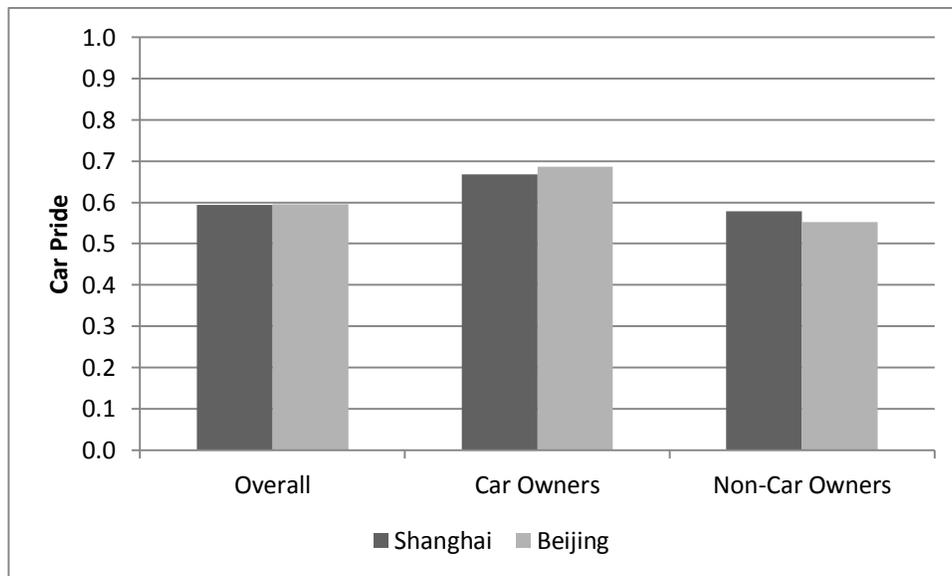

FIGURE 8.1 Comparison of car pride between Shanghai and Beijing

TABLE 8.2 Effect of Socio-Economics on Car Pride in Shanghai and Beijing

	Shanghai		Beijing	
	2SLS Stage 1	2SLS Stage 2	2SLS Stage 1	2SLS Stage 2
(Intercept)	-0.802***	0.609***	-0.008	0.589***
youth	0.602***	-0.004	-0.109	-0.005
senior	-0.074	-0.031`	-0.782***	-0.006
male	-0.269`	-0.012	-0.435***	0.022`
education	-1.007***	0.002	-1.000***	-0.009
inner_city	-0.201	0.030`	0.397*	-0.023
outer_city	-0.769***	0.015	-0.598***	-0.071***
local	-0.032	-0.013	1.030***	0.024`
low_income	-0.338	-0.035*	-0.229	-0.038**
high_income	0.354	0.008	-0.231	0.069***
carownership	-	0.113`	-	0.072***
subway_dist	0.073	-	0.397**	-
bus_dist	-0.510**	-	-0.736***	-
short_dist	-0.552**	-	-0.655***	-
long_dist	0.810***	-	-0.255`	-
R-squared	-	0.016	-	0.094

Note: coefficients with "***" are significant at 0.001 level; coefficients with"**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level; "-" means the coefficient is not applicable.

8.2 Comparison: Car Purchase, Use and Dependence

As shown in Chapter 5, car pride is not only related to whether or not you have a car, but also when the car is bought, how much the car costs, and where the car's license is registered. Figure 8.2 shows the correlation between car pride and these car related variables in Shanghai and Beijing. The most striking difference between the cities is in the correlation between car pride and local car license. In both cities, local car license holders tend to have higher car pride, but the correlation in Shanghai is much higher. This is probably because that the car license auction policy requires a Shanghai car license to be obtained through auction but has no harsh restriction on non-local car licenses. Possession of a Shanghai car license is an indication of capability to pay, and subsequently personal wealth and social status. In comparison, the policy Beijing uses to address rapid motorization rate is car license lottery policy, which sets a quota for car licenses issued each month and allocates them through a monthly lottery process. The chance of obtaining a Beijing car license is almost purely based on luck and thus has a weaker correlation with car pride.
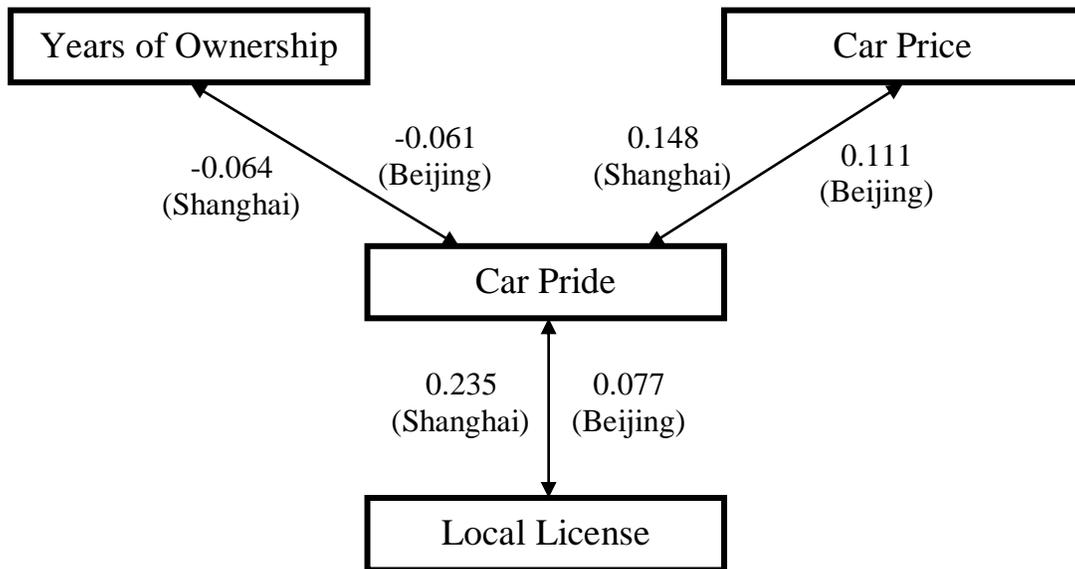
FIGURE 8.2 Correlation between car pride and car purchase choices in Shanghai and Beijing

The impact that car pride has on car use could also be different between the two cities. Table 8.3 summarizes significant differences between Shanghai and Beijing. It is found that car pride affects vehicle distance traveled significantly in Shanghai, while the influence of car pride on car use frequency is more significant in Beijing.

TABLE 8.3 Effect of Car Pride on Car Use in Shanghai and Beijing

	Dependent Variable		
	car_share	daily_use	car_vkt
coefficient of car pride			
(in Shanghai)	8.737	0.855	0.998**
(in Beijing)	2.111	2.869***	-0.251

Note: coefficients with "***" are significant at 0.001 level; coefficients with "**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

TABLE 8.4 Summary of Car Dependence Indicators

	Shanghai Car Owners	Beijing Car Owners
depend	0.35	0.40
alternative	0.29	0.32
lifestyle	0.20	0.24
Average	0.28	0.32

94

Car dependence indicators are only examined for car-owners. As shown in Table 8.4, all 3 car dependence indicators are consistent in suggesting Beijing car owners are more car-dependent.

8.3 Comparison: Car License Policy Acceptance

The car license lottery policy in Beijing was adopted in 2011, when the motorization level is already very high in Beijing. Since then, Beijing residents have to win the lottery to obtain a car license. Different from the auction format Shanghai chooses, allocation of car licenses is free of charge. But the problem with lottery is that car licenses are allocated based on luck regardless of willingness to pay or urgency to buy. With more people accumulating in the lottery over time, the odds to win keeps dropping and the potential waiting time to get a Beijing car license keeps rising. Besides, the qualification requirement for participating in the lottery in Beijing is considered to discriminate against migrant workers, leading to equity concerns between migrants and locals. Compared to Shanghai, non-local cars are less an issue in Beijing, primarily because the restriction put on non-local cars in Beijing is much harsher than that in Shanghai. In Beijing, non-local vehicles are restricted from entering anywhere inside the 5th Ring Road, which causes great inconvenience for using non-local cars. As a result, only 6 percent of Beijing car owners hold a non-local car license, while in Shanghai non-local licenses holders cover 22% of total car owners.

Despite the problems and controversies surrounding Beijing's car license lottery policy, people still accept the policy more than Shanghai residents accept their own car license auction policy (shown in Figure 8.3). While in Shanghai, car ownership is negatively correlated with policy acceptance, car owners are found to support their policy more in Beijing (at least based on simple correlation). This difference may come from different policy formats. In Shanghai, car owners are the ones who pay large amount of money in bidding, and to some extent can be regarded as the "losers" of the auction policy. In Beijing, car owners could be split into two groups. On one hand, for those who got a car license before the lottery policy was implemented in 2011, they are "winners" since they did not need to go through the lottery. For those people who beat the odds to win a car license through lottery, they are also "winners". Those benefitted by a policy are likely to support it while those who pay their price because of the policy tend to be against the policy. However, it is possible policy acceptance for Beijing car owners will drop

over long time, because those who wait a long time before getting a car license through the lottery could potentially become "losers". Luck can be a factor, since those who wait longer to win the lottery pay a higher price than those who win easily.
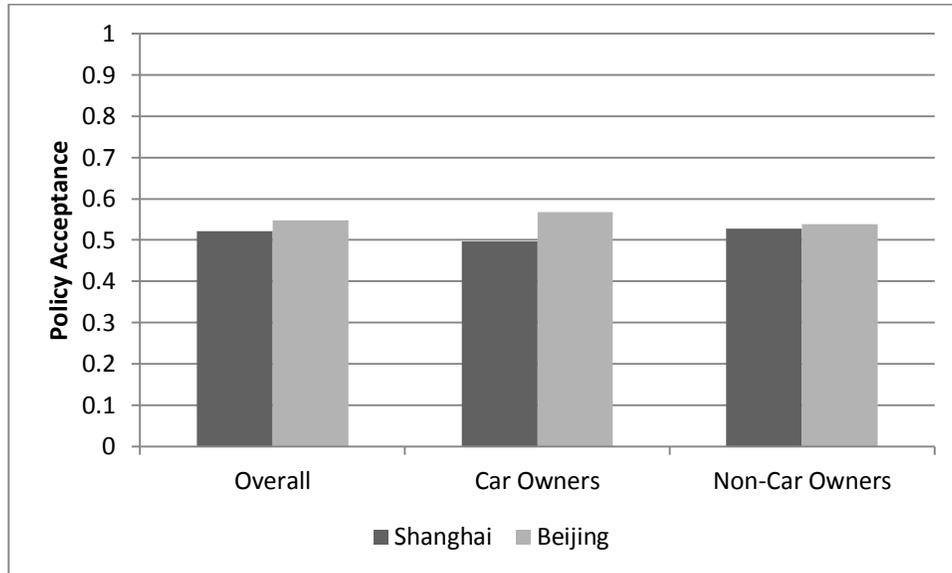

FIGURE 8.3 Comparison of policy acceptance between Shanghai and Beijing

Table 8.5 shows the effect of car pride on policy acceptance in Shanghai and Beijing. Car pride is found to have a significant positive influence on public acceptance of both car ownership restriction policies, regarding the specific policy format (auction or lottery). It suggests although people with high car pride want to have a car, they do not appreciate universal car ownership. This is an interesting paradox. Policies designed to control car ownership may stimulate car pride and make it more attractive to own a car. Increased car pride can then encourage people to be more supportive for exclusive car ownership and accept these policies. Despite the direction of the effect is the same in the two cities, the magnitude may be different. The positive influence is stronger in Shanghai. This is possibly because Shanghai's auction policy officially attaches a price tag to a car license in open market. Having a car could become even more a symbol of personal wealth or social status. In comparison, wealth is basically irrelevant in the chance of getting a car license through Beijing's lottery policy. People with high car pride tend to support the car ownership restriction policies, more so for Shanghai's auction policy than Beijing's lottery policy.

Even though previous analysis has indicated a positive correlation between car ownership and public acceptance of the car license lottery policy in Beijing, the modeling results in Table 8.5 shows the influence of car ownership on policy acceptance is actually significantly negative. The direction of the impact is the same for Shanghai. With the same level of car pride, a non-car owner is more likely to accept the policy than a car owner. While car pride and ownership are positively interdependent, they have opposite effect on acceptance of car ownership restriction policies (auction and lottery). Failing to factor in car pride may not reveal the impact of car ownership on policy acceptance, like in Beijing's case (comparison between Figure 8.3 and Table 8.5).

TABLE 8.5 Effect of Car Pride on Policy Acceptance in Shanghai and Beijing

	Shanghai	Beijing
(Intercept)	1.685***	0.445***
youth	0.271***	-0.038**
senior	0.304***	-0.033`
male	0.016	-0.048***
education	-0.143*	0.030*
inner_city	-0.137`	-0.035`
outer_city	-0.065	0.041**
local	0.137*	0.006
low_income	-0.079	-0.050***
high_income	0.032	-0.031`
car ownership	**-0.204****	**-0.046****
car pride	**0.502****	**0.103****

Note: coefficients with "***" are significant at 0.001 level; coefficients with "**" are significant at 0.01 level; coefficients with "*" are significant at 0.05 level; coefficients with "`" are significant at 0. 1 level.

TABLE 8.6 Summary of Car License Pride Indicators

	Shanghai			Beijing		
	Overall	Car Owners	Non-car Owners	Overall	Car Owners	Non-car Owners
lic_respect	0.23	0.28	0.22	0.30	0.39	0.26
lic_status	0.03	0.15	0.00	0.10	0.27	0.03

Note: all indicators are in 5-level likert scale; all numbers presented in the table range from -1 to 1, with -1 being totally disagree and 1 being totally agree.

Interestingly, Beijing residents have a much higher car license pride, as shown in Table 8.6, even though a Beijing car license does not cost anything. Beijing's stricter restriction on non-local

cars is probably the primary reason. This makes sense given that non-local cars are not as viable an option in Beijing than that in Shanghai, and this may determine people's pride.

9 Conclusion

As one of the first study focusing on car pride, this thesis proposes a framework for car pride and use self-report data to measure car pride and its relationship with people's socio-economic characteristics, car ownership and use, car dependence and public acceptance of car ownership restriction policies. This section summarizes the findings and possible contributions of this thesis, and provides suggestions on how to utilize the findings for policy making. Admittedly, this study has limitations, but it serves useful reference for future research. Several relevant topics that are worth further exploration are discussed in the end.

9.1 Summary of Findings

More than a tool that provides mobility, car is also a commodity with symbolic values related to the sense of self-regard. To various degrees, people pride themselves on being car owners or users. This thesis proposes a theoretical framework for car pride, and examines its relationship with people's socio-economic characteristics, car ownership and use, car dependence and public acceptance of car ownership restriction policies.

Based on a literature review primarily of a plethora of psychological theories, this thesis proposes a framework that defines the concept of car pride, examines the process of its formation, and classifies different types of car pride. In the framework, car pride is defined as "the cognitive evaluation of and emotional response to the positive self-representation elicited by one's association with cars". It consists of a cognitive component and an affective component. The affective part of car pride, called affective car pride, is the positive emotion evoked when one's association with cars is appraised to positively represent the self-regard. It is brief, intense, episodic, and requires a triggering incident. The cognitive part of car pride, called cognitive pride, is defined as the cognitive evaluation of to what extent one's association with cars is appraised to positively represent the self-regard. It is stable, consistent, and could have bidirectional impacts on emotions. Specifically focusing on the pride of having a car, the process of car pride is also explained. In the process, cognitive pride is interpreted as the tendency to appraise having a car as relevant and congruent with one's identity goals, and affective pride is jointly determined by cognitive pride and car ownership. Based on two dimensions of self-representations, car pride

can be classified into 7 categories – identity pride, aspirational pride, normative pride, competitive pride, reputational pride, presentational pride, and expectational pride. To test the theory, this thesis analyses interview data on life aspirations of the Beijing middle class, and illustrates the existence of 6 categories of car pride (except competitive pride) and the impacts they have on people's car purchase plans. Although the framework is designed for car pride, it is possible that it could be extended to study other types of pride.

As one important psychological factor in transportation, car pride can play a motivational role on behavior. It is also possible people adapt pride to their behavior. Without knowing causal directions between car pride and behavior, car pride would not be a meaningful factor in policy making. Uses survey data from Shanghai, this thesis examines the causal relations between car pride and people's ownership and usage of cars. Although household income and location are found to be significant predictors, car pride, measured with 13 indicators from the survey, cannot be effectively explained by individual socio-economic characteristics. The relationship between car pride and ownership is found to be interdependent, with both causal directions suggested to be significant. Transit access and commuting distance are used as instrumental variables (IVs) for car ownership and the 2SLS model finds a significant impact of ownership on pride. Conversely, car pride can influence whether someone plans to buy a car, more significantly for first time buyers rather than for existing car owners. Correlations are also found between car pride and other aspects of car ownership: when to buy, how much to spend, which type of car, and which type of car license to choose (Shanghai license vs. non-Shanghai license). In terms of the relationship between car pride and car use, while the influence of car use on car pride is weak, car pride is found to be a significant determinant for car use. When car pride is broken into subcategories (personal pride, exhibitory pride, comparative pride and affective pride), we find different aspects of car pride may motivate people to use cars in different ways: personal pride more influences car share while exhibitory pride more influence total vehicle-kilometer-travelled. Car pride can also affect people's car use intention. People with high car pride are reluctant to reduce their car use. This thesis contributes to a better understanding on the causal relationship between car pride, ownership and use, and finds that car pride is indeed a unique and significant motivation for people to own and use cars.

The relationship between car pride and other attitudinal factors is also investigated. Two attitudinal factors discussed in this thesis are car dependence and policy acceptance. The concept of car dependence is used to describe the extent to which other travel options are excluded from the considered choice set, willingly or unwillingly. A positive correlation between car pride and dependence indicates people with high car pride are usually more dependent on cars. Nevertheless, the two factors are affected by different socio-economic variables. A population segmentation by both car pride and dependence identifies 38% of people have high pride and low dependence, or low pride and high dependence. Public acceptance of car ownership restriction policies can also be subject to the influence of car pride. Using Shanghai's car license auction policy as an example, the study shows that car pride has a positive influence on the acceptance of the policy, while car ownership has a negative influence. It suggests people with high car pride, though having strong desire for cars, tend to support policies that restrict car ownership, possibly because such policies make car ownership more exclusive and special. Another unintentional consequence of Shanghai's policy is that it gives rise to the pride of having a local car license (i.e. car license pride). People take pride in Shanghai local car licenses because they are harder and more expensive to get. Both car pride ad car license pride can motivate people to choose local car licenses instead of non-local ones.

The thesis also presents a regional comparison of car pride between Shanghai and Beijing. The comparison reveals that although the overall car pride is similar in both cities, car pride in Beijing has much more variation. Shanghai's car owners have lower car pride than Beijing car owners, but non-car owners in Shanghai have higher car pride than Beijing non-car owners. Beijing's car pride also shows more variation based on socio-economic factors like household location, income and household registration. In both cities, car pride increases the acceptance of their respective car ownership restriction policies, evidencing the positive impact of car pride is regardless of policy format (auction or lottery). However, correlation between car pride and the choice of a local car license is much stronger in Shanghai because Shanghai's car license auction policy gives a symbolic value on local car licenses, while Beijing's car license lottery policy does not. Although simple correlation analysis shows that, unlike in Shanghai, car owners in Beijing have higher policy acceptance, linear regression analysis considering car pride indicates, like in Shanghai, car ownership actually has a negative impact on policy acceptance.

9.2 Policy Implications

For a new concept like car pride, many questions need to be answered before it can be regarded as a factor in policy making. The thesis helps answer a few important questions, like "what car pride is", or "whether or how it affects car ownership and use". Although future research is required to understand the predictability and manipulability of car pride and thus answer the question of "how car pride can be used to address transportation problems", this thesis does shed light on potential policy implications of car pride.

Car pride serves as a motivation for people to own and use cars. It is possible to control car ownership and car use through controlling car pride. One way to achieve this is to detach the linkage between car and its desirable symbolic values. Restricting car ownership is likely to raise the pride of having a car. But the magnitude of the effect could be different for different method. For example, Beijing's car license lottery policy may be a better option than Shanghai's auction policy in terms of refraining car pride. In Beijing, the rich and the poor have the same chance to get a car license. It makes having a car less of a status symbol, and thus less desirable. In an extreme scenario, if community service is required to obtain a car license, the role of car as a status symbol would be even more undermined. On the other hand, public depiction of the downsides of car, like traffic congestion and air pollution, can also raise car shame. When having a car is regarded as being environmental unfriendly, it becomes a deterrent of car ownership or use.

For people who are indeed in need of a car, there remains a question of which type of car to choose. Car pride may provide distinct opportunities for new energy cars. Based on performance and economic factors, new energy cars may be less appealing. But psychological factors like pride could give new energy cars an edge. Like traditional internal combustion engine (ICE) cars, new energy cars can bring prestige and status. In fact, new energy cars are much less in number, and this makes owning a new energy car even more special. Unlike ICE cars, new energy cars avoid the negative image of being environmental unfriendly. Take the Toyota Prius, for example. It has become a rolling bumper sticker for the environmental movement. In the near future, new energy cars can be an ideal option for those who want to enjoy the status and convenience of having a car but also want to be supportive to the environmental cause.

If there is car pride, there may also be pride for public transportation. Public transportation is a service for mass public, particularly those who cannot afford a car. Therefore it can never deliver a sense of luxury or premium. If public transportation has any symbolic meaning in terms of social status, it is a negative one. However, this is no excuse to ignore the issue and allow pride giving car an edge over public transportation. There are still ways to create a pleasant and desirable experience for transit users buy improving areas other than performance. Vehicle cleanliness, station design, and customer service can all make a difference. More importantly, transit agencies should learn from the strategies adopted in car marketing for the promotion of public transportation. The key is to convince people that using public transportation can conveys a positive social image. TV advertisement and celebrity endorsement may make using public transportation more fashionable and trending. Environmental campaigns can raise the awareness of the connection between public transportation and environmental protection or energy conservation. There are other non-traditional ways to create the image. For example, public transportation can also be connected to charity. If a policy is designed to donate a certain amount of money to charity for every transit ride, it would make transit users feel proud of being charitable. Social comparison can also be used to promote transit use. For example, by providing information on public transportation usage in Toronto, it could stimulate the competitiveness of Vancouver transit users. Of course, public transportation is not the only alternative for cars. The same strategies can also be used to promote non-motorized modes such as cycling and walking.

9.3 Limitations

The biggest limitation of this study lies in the data collected through self-report online surveys. First of all, self-report survey is not the ideal way to collect data on car pride. Car pride is a complex and abstract concept, which can be very confusing for the general public. The reliability of self-report data is debatable, since people are inclined to justify and rationalize their behavior. In addition, the tendency to give socially desirable answers might also make it questionable whether self-reports truly represents people's thinking. Secondly, the surveys were implemented before the framework for car pride was proposed, and thus the survey design does not reflect the framework. It is not sufficient to test the robustness of the framework using existing survey data. Thirdly, there is also inconsistency in data format. Some car pride indicators are in 5-level likert

scale while others are binary. This adds uncertainty to the results got from factor analysis and cluster analysis, which depend totally on correlation between indicators.

It may also be questionable to assume a causal direction between car pride and other attitudinal factors, like policy acceptance. For example, this study assumes car pride determines policy acceptance. However, the causal relationship can be the other way around. Perhaps people perceive car ownership as a privilege as a result of their acceptance of restrictions on car ownership. The relationship between attitudinal or psychological factors is complicated, and it is operationally challenging to disentangle the pure impact of car pride on policy acceptance.

Due to time and data constraints, this study is unable to build a theoretical framework for car dependence and measure different aspects of car dependence – some people are dependent on cars because of their travel habit while some are dependent as a result of lack of alternative options. It may have deeper psychological explanation (for example, addiction). Future research is needed for a better understanding of car dependence.

9.4 Future Research

As one of the first studies to theorize and analyze the concept of car pride, this thesis is not able to answer all the questions about this topic. There are still plenty of uncharted territories worth further exploration in future research.

9.4.1 Formation of Car Pride based on Experiences

This study is unable to identify the factors affecting car pride except for individual socio-economic characteristics. A better understanding on how car pride forms and factors affecting car pride is critical to predict car pride and use it to address transportation issues. Some preliminary assumptions of car pride formation are discussed here.

It is assumed that car pride develops through various experiences. These experiences may be classified into 2 categories - media exposure and social interaction. Media exposure refers to the exposure to the depiction of car in the media (including advertisements, television programs,

movies, books, etc.). Media plays an important role in shaping people's car pride. In car advertisements, car is usually depicted as something more than a tool. For example, in modern auto shows, cars in display are often accompanied with good-looking models. This has nothing to do with a car's technical performance. But it does make cars more attractive.

Social interaction refers to the car-related interaction between the ego (whose car pride being affected) and alters (those affecting the ego's car pride). Social interaction is expected to have a significant influence on how people see themselves compared to others (comparative self) and how people think they are seen by others (public self). Depending on whether the ego is actively involved in the interaction, social interaction can be further classified into social review and social observation. When the ego is actively involved, the interaction is usually about the ego's ideas or behaviors being reviewed or commented by alters. Take one example of social review. When one drives a nice car to work and receives admiration for his colleagues, it would be likely to raise his car pride. In this case, the ego's relationship with car is the center of the interaction, and alters are the reviewers of the relationship. Because how alters evaluate the ego's association with cars is likely to influence the ego's image, social review can have strong impacts on exhibitory pride. On the other hand, when the ego is not actively involved in the interaction, the interaction is usually about the ego observing or taking in alters' ideas and behaviors. Sometimes social observation takes place in the form of behavior. For incidence, a person who sees most of his peers buying cars could feel the social pressure to buy a car, and thus it contributes to car pride. Sometimes social observation is conversational. An example for this is that if one hears his friends bragging about their cars, his own car pride may be raised as well. Because how the ego sees other's association with cars is likely to influence how the ego sees the self comparatively, social observation can have strong impacts on comparative pride. It is worth noticing that in both social observation and media exposure the ego can be regarded the absorber of information that is not self-related. The difference is that the information for social observation is personal and diverse while the information for media exposure is public and relatively consistent (mainstream). However, the popularity of social media (e.g. twitter) may blur the boundary.

The tentative discussion above is primarily based on the author's own experience subjective judgement. There is no evidence so far that can prove the effect of these experiences on the

formation of car pride. It is challenging to conduct studies on this topic since data is difficult to collect and the change of car pride is not obvious in the short term. However, any future research that can tackle this issue will provide valuable understanding on the formation of car pride, and thus offer more concrete evidences for policy makers on how to predict and manipulate car pride to help solve transportation problems.

9.4.2 Geographical and Cultural Variation of Car Pride

Although this thesis examines the regional difference of car pride between Shanghai and Beijing, it is not able to look into the difference between more diverse regions. A comparison between China and the United States, for example, could provide further understanding on the variation of car pride by cultures, developing stages, and motorization levels. It is felt that when motorization level increases, car pride is less reflected by whether to have a car or not, but by which type of cars to have. Future studies are required to reveal further geographical and cultural variation of car pride.

It is to be considered that car pride can change over time via various experiences like media exposure and social interaction. Thus when people migrate to a different country/region, they are expected to adapt car pride of the local standard. It would be interesting to know how fast and to what extent one can transit from car pride in one environment to car pride in another environment.

9.4.3 Car Pride and Happiness

The relationship between car pride and happiness is another interesting research topic. On one hand, when one's association with cars is appraised to be relevant and congruent with one's identity goals, it can result in affective pride which is similar to happiness or joy in terms of pure emotional experience. On the other hand, car pride can also be an obstacle for the pursuit of happiness. Sometimes car pride comes from external forces (e.g. social pressure) that can lead to anxiety and depression. People may pay too much attention to measuring themselves against everyone else, instead of looking inward and discovering the things that truly make them happy. If distorted, car pride can turn into car vanity. Like pride, happiness also has different facets.

Specifically in the field of transportation, future studies may explore the effect of car pride on commuting happiness.

9.4.4 Car Dependence

Although the thesis explores the relationship between car pride and car dependence in Chapter 6, car dependence is not well defined and theorized. A theoretical framework for car dependence will help our understanding of this concept. Car dependence can refer to the instrumental dependence on car due to external constraints (e.g. lack of alternative modes), the psychological dependence due to people's preference (or possibly car pride), or the habitual dependence due to behavioral inertia without conscious mode choice. In reality, car dependence could be a crossover of all these aspects. But treating car dependence as a whole may be confounding because these three aspects of car dependence are essentially different. For example, while instrumental dependence is a determinant for car use, habitual dependence is a result of long-time car use. A more complete dataset is needed to investigate and differentiate the factors underlying car dependence.

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Appendix

A1 Selected R Syntax

Example 1: Factor analysis on possible car pride indicators

```r
# Load necessary packages

library(psych)
library(GPArotation)

# Measure the Shanghai dataset

myData <- read.table("Shanghai_Data.dat", header = TRUE)

# The originally likert-scale indicators are defined based on their converted
indicators (already done in the .dat data file)

pride1 <- 2 - myData$pride1_binary
self_esteem <- 2 - myData$self_esteem_binary
achievement <- 2 - myData$achievement_binary
image_fit <- 2 - myData$image_fit_binary
status <- 2 - myData$ status _binary
social_image <- 2 - myData$social_image_binary

# For the orignally binary indicators, just define them directly

auto_show <- 2 - myData$auto_show
superiority <- 2- myData$superiority
spending <- 2- myData$spending
cleanliness <- 2- myData$cleanliness
display_parking <- 2 - myData$display_parking
display_driving <- 2 - myData$display_driving
picture <- 2- myData$picture
happiness <- 2 - myData$happiness
self_extension <- 2 - myData$self_extension
must <- 2 - myData$must
pride2 <- 2 - myData$pride2
other <- 2 - myData$other

# Put all variables into a data frame

dataAllFa <- data.frame(pride1, pride2, pride3, image1, image2, image3,
auto_show, superiority, spending, cleanliness, display_parking,
display_driving, picture, happiness, self_extension, must, swagger, other)

# Run factor analysis with four factors

resultAllFa <- fa(dataAllFa, nfactors = 4, scores = "Bartlett", rotate =
"oblimin", max.iter=1000, fm = "pa")

# Show the factor analysis dendrogram

fa.diagram(resultAllFa)
```

Example 2: Estimate the effect of car ownership on car pride using instrumental variables

```r
# Measure car pride with rescaled car pride indicators

pride1 <- (5 - myData$pride1)/4
self_esteem <- (5 - myData$self_esteem)/4
achievement <- (5 - myData$achievement)/4
image_fit <- (5 - myData$image_fit)/4
status <- (5 - myData$status)/4
social_image <- (5 - myData$social_image)/4
auto_show <- 2 - myData$auto_show
superiority <- 2- myData$superiority
spending <- 2- myData$spending
cleanliness <- 2- myData$cleanliness
display_parking <- 2 - myData$display_parking
display_driving <- 2 - myData$display_driving
picture <- 2- myData$picture
happiness <- 2 - myData$happiness
self_extension <- 2 - myData$self_extension
must <- 2 - myData$must
pride2 <- 2 - myData$pride2
other <- 2 - myData$other

pride <- (pride1 + self_esteem + achievement + image_fit + status +
social_image + superiority + display_parking + display_driving + happiness +
self_extension + pride2 + other)/13

# Define socio-economic variables

weight <- myData$weight
youth <- as.numeric(myData$age < 35)
senior <- as.numeric(myData$age >59)
carownership <- as.numeric(myData$carownership > 1)
education <- as.numeric(myData$education > 2)
location <- myData$location
inner_city <- as.numeric(myData$location == 1)
outer_city <- as.numeric(myData$location == 3)
male <- as.numeric(myData$gender == 1)
local <- as.numeric(myData$residence == 1)
employment <- as.numeric(myData$employment == 1)
low_income <- as.numeric(myData$income < 5)
high_income <- as.numeric(myData$income > 7)
subway_walk <- as.numeric(myData$sub_walk < 3)
bus_walk <- as.numeric(myData$bus_walk < 3)
short_dist <- as.numeric(myData$commute_dist < 4)
long_dist <- as.numeric(myData$commute_dist > 5)

# Run a conventional linear regresson model
olsreg <- lm(pride ~ youth + senior + male + education + inner_city +
outer_city + local + employment + low_income + high_income + carownership,
weights = weight)

# Run a 2SLS model
```

```
olsreg1 <- glm(carownership ~ youth + senior + male + education + inner_city
+ outer_city + local + employment + low_income + high_income + subway_walk +
bus_walk + short_dist + long_dist, weights = weight, family = "binomial")

carownership_fitted <- fitted(olsreg1)
carownership_imputed <- round(carownership_fitted, digits = 0)

olsreg2 <- lm(pride ~ youth + senior + male + education + inner_city +
outer_city + local + employment + low_income + high_income +
carownership_imputed, weights = weight)
```

Example 3 Estimate the impact of car pride on policy acceptance

```
# Define policy acceptance and its drivers

acceptance <- myData$acceptance
effectiveness <- myData$effectiveness
affordability <- myData$affordability
equity <- myData$equity
implementation <- myData$implementation

# Estimate the empact of car pride on policy acceptance and its drivers

lm_acceptance <- lm(acceptance ~ youth + senior + male + education +
inner_city + outer_city + local + employment + low_income + high_income +
carownership + pride, weights = weight)
lm_effectiveness <- lm(effectiveness ~ youth + senior + male + education +
inner_city + outer_city + local + employment + low_income + high_income +
carownership + pride, weights = weight)
lm_affordability <- lm(affordability ~ youth + senior + male + education +
inner_city + outer_city + local + employment + low_income + high_income +
carownership + pride, weights = weight)
lm_equity <- lm(equity ~ youth + senior + male + education + inner_city +
outer_city + local + employment + low_income + high_income + carownership +
pride, weights = weight)
lm_implementation <- lm(acceptance ~ youth + senior + male + education +
inner_city + outer_city + local + employment + low_income + high_income +
carownership + pride, weights = weight)

# Define car pride for different car ownership group

nc_pride <- pride * as.numeric(carownership == 0)
co_pride <- pride * as.numeric(carownership == 1)
lc_pride <- pride * as.numeric(carownership == 1 & myData$car_license < 4)
nl_pride <- pride * as.numeric(carownership == 1 & myData$car_license >= 4)

# Estimate the impact of car pride on policy acceptance by car ownership
group

lm_acceptance <- lm(acceptance ~ youth + senior + male + education +
inner_city + outer_city + local + employment + low_income + high_income +
carownership + nc_pride + lc_pride + nl_pride, weights = weight)
lm_acceptance <- lm(acceptance ~ youth + senior + male + education +
inner_city + outer_city + local + employment + low_income + high_income +
carownership + nc_pride + co_pride, weights = weight)
```

A2 Correlation Matrix for Car Pride Indicators

	self_esteem	self_extension	image_fit	status	social_image	display_parking	display_driving	superiority	achievement
self_esteem	1.00	0.30	0.31	0.51	0.36	0.31	0.31	0.33	0.58
self_extension	0.30	1.00	0.12	0.26	0.23	0.25	0.23	0.29	0.28
image_fit	0.31	0.12	1.00	0.37	0.25	0.29	0.21	0.33	0.27
status	0.51	0.26	0.37	1.00	0.51	0.29	0.32	0.30	0.46
social_image	0.36	0.23	0.25	0.51	1.00	0.26	0.29	0.25	0.37
display_parking	0.31	0.25	0.29	0.29	0.26	1.00	0.58	0.37	0.30
display_driving	0.31	0.23	0.21	0.32	0.29	0.58	1.00	0.34	0.30
superiority	0.33	0.29	0.33	0.30	0.25	0.37	0.34	1.00	0.28
achievement	0.58	0.28	0.27	0.46	0.37	0.30	0.30	0.28	1.00
happiness	0.27	0.46	0.08	0.26	0.24	0.18	0.26	0.25	0.28
pride1	0.56	0.26	0.37	0.43	0.29	0.32	0.34	0.27	0.54
pride2	0.47	0.35	0.18	0.36	0.36	0.40	0.37	0.34	0.47
other	0.37	0.34	0.24	0.34	0.32	0.45	0.46	0.39	0.35
spending	0.19	0.34	0.13	0.20	0.23	0.26	0.23	0.30	0.23
must	0.28	0.34	0.24	0.26	0.23	0.32	0.35	0.37	0.26
auto_show	0.13	0.30	0.07	0.14	0.17	0.14	0.18	0.22	0.17
cleanliness	-0.01	0.17	-0.22	0.00	0.07	0.09	0.07	0.03	0.03
picture	0.25	0.27	0.33	0.21	0.18	0.29	0.31	0.33	0.22

	happiness	**pride1**	pride2	other	spending	must	auto_show	cleanliness	picture
self_esteem	0.27	0.56	0.47	0.37	0.19	0.28	0.13	-0.01	0.25
self_extension	0.46	0.26	0.35	0.34	0.34	0.34	0.30	0.17	0.27
image_fit	0.08	0.37	0.18	0.24	0.13	0.24	0.07	-0.22	0.33
status	0.26	0.43	0.36	0.34	0.20	0.26	0.14	0.00	0.21
social_image	0.24	0.29	0.36	0.32	0.23	0.23	0.17	0.07	0.18
display_parking	0.18	0.32	0.40	0.45	0.26	0.32	0.14	0.09	0.29
display_driving	0.26	0.34	0.37	0.46	0.23	0.35	0.18	0.07	0.31
superiority	0.25	0.27	0.34	0.39	0.30	0.37	0.22	0.03	0.33
achievement	0.28	0.54	0.47	0.35	0.23	0.26	0.17	0.03	0.22
happiness	1.00	0.22	0.34	0.32	0.25	0.25	0.27	0.21	0.28
pride1	0.22	1.00	0.41	0.37	0.18	0.29	0.14	-0.06	0.26
pride2	0.34	0.41	1.00	0.54	0.34	0.34	0.23	0.22	0.24
other	0.32	0.37	0.54	1.00	0.30	0.35	0.23	0.16	0.33
spending	0.25	0.18	0.34	0.30	1.00	0.31	0.30	0.25	0.19
must	0.25	0.29	0.34	0.35	0.31	1.00	0.24	0.14	0.27
auto_show	0.27	0.14	0.23	0.23	0.30	0.24	1.00	0.11	0.22
cleanliness	0.21	-0.06	0.22	0.16	0.25	0.14	0.11	1.00	-0.06
picture	0.28	0.26	0.24	0.33	0.19	0.27	0.22	-0.06	1.00

Note: all indicators are binary; indicators that are in bold font are originally in 5-level likert scale