



Consumer preferences for electric vehicles in lower tier cities of China: Evidences from south Jiangsu region

Youlin Huang, Lixian Qian*

International Business School Suzhou, Xi'an Jiaotong-Liverpool University, China



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ABSTRACT

China is the world biggest market of electric vehicles (EVs) in terms of production and sales. Existing studies on consumer preferences for EVs in China have generally focused on first-tier cities, while little attention has been paid to the lower tier cities. This exploratory study investigates consumer preferences for EVs in lower tier cities of China, by collecting stated preference (SP) data in two second-tier cities and three third-tier cities in the south Jiangsu region of China. The discrete choice modeling analysis shows that Chinese consumers in lower-tier cities are generally sensitive to monetary attributes, charging service and driving range of EVs. They also perceive Chinese vehicle brands to be disadvantaged compared with European brands. When comparing the differences in second-tier versus third-tier cities, we find that consumers in third-tier cities are more sensitive to purchase price, subsidy of purchase, and coverage of charging stations than their second-tier counterparts. This study also highlights the role of different psychological effects, such as symbols of car ownership, normative-face influence, and risk aversion, in shaping consumer preferences for EVs in lower-tier cities of China. Our results provide important implications for contextualizing government policies and marketing strategies in line with the different sizes and characteristics of the cities in China.

1. Introduction

The Chinese car market experienced exponential growth in the first decade of the 21st century, and became the world's largest car market in 2009 (Qian and Soopramanien, 2014). This has made the use of automobiles, generally internal combustion engine vehicles (ICEVs), a primary source of air pollution and carbon emissions in China (Wan et al., 2015). Similar to many other economies, China chose to promote the research and development (R&D) and marketization of electric vehicles (EVs) as part of its national sustainable-development strategy because EVs are currently considered one of the most promising green technologies for helping reduce carbon emissions (Sang and Bekhet, 2015). At the end of 2016, China was the world's biggest EV market in production and sales (Ministry of Industry and Information Technology of China, 2017).

China represents a highly diversified market with hundreds of cities at different stages of development. China's megacities or first-tier cities,¹ each with a population of more than 10 million people, are currently leading the EV market in China. Table 1 presents the top seven Chinese cities in EV sales in 2017, and five of them were first-tier ones (Ways, 2018). Existing literature on EV adoption in China is generally based on data collected in first-tier cities. For example, Dagsvik and Liu (2009) analyze Chinese consumers'

* Corresponding author at: 8 Chongwen Road, Dushu Lake Higher Education Town, Suzhou Industrial Park, Suzhou, Jiangsu Province 215123, China.

E-mail address: lixian.qian@xjtlu.edu.cn (L. Qian).

¹ The State Council of China (2014) categorizes Chinese cities into five classes based on urban population: first-tier cities (more than 10 million urban population each); second-tier cities (5 to 10 million urban population each); third-tier cities (1 to 5 million urban population each); fourth-tier cities (0.5 to 1 million urban population each); fifth-tier cities (fewer than 0.5 million urban population).

Table 1
Top Chinese cities in EV sales^a (in 1000).

2017 Rank	City (tier [#])	2017		2016		Annual sale growth
		EV sales	Market share	EV sales	Market share	
1	Beijing (1)	58.7	10.6%	63.0	19.4%	–6.8%
2	Shanghai (1)	55.3	10.0%	42.2	13.0%	30.9%
3	Shenzhen (1)	40.0	7.2%	25.2	7.7%	59.1%
4	Tianjin (1)	31.3	5.7%	17.9	5.5%	75.6%
5	Hangzhou (2)	26.3	4.8%	15.1	4.6%	74.6%
6	Hefei (3)	22.4	4.0%	7.8	2.4%	186.8%
7	Guangzhou (1)	22.1	4.0%	17.7	5.4%	25.2%
National		553.7		325.0		70.4%

Data source: Ways 2016 New Energy Vehicle Market Report (http://www.way-s.cn/news_c2_33.html), Ways 2017 New Energy Passenger Vehicle Market Report (http://mp.weixin.qq.com/s/ErQ_5CP0WrF1jXjQGNS2uQ), and Daas-Auto 2017 New Energy Passenger Vehicle Annual Report (<http://www.daas-auto.com/reportDe/465.html>).

Note:

* EV sales here only include the sales of both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) and exclude the sales of hybrid electric vehicles (HEVs).

[#] The classification of city tiers is based on the urban population of each cities, following the official standard from the State Council of China (2014).

preferences for alternative fuel vehicles (AFVs) over gasoline cars based on data collected in Shanghai, the biggest city in China. Similarly, Helveston et al. (2015) collected survey data in four cities in China (Beijing, Shanghai, Shenzhen and Chengdu), three of which are first-tier cities, to compare consumer preferences on various EV technologies in China and the United States (US). More recently, She et al. (2017) and Wang et al. (2018) examine the factors that influence the consumer EV adoption in two first-tier cities, Tianjin and Shanghai, respectively.

However, future growth in the Chinese automobile market and particularly its EV market will increasingly come from second-tier and smaller cities (Wang et al., 2012; Woetzel et al., 2012). Table 1 shows that the second- and third-tier cities began to demonstrate stronger market-growth potential given their higher growth rates in EV sales in 2017. In comparison, the market shares of most first-tier cities have been decreasing and their annual sales growth rates were typically lower than the national average rate. This effectively means that more sales have been achieved in lower-tier cities, which highlights the importance of investigating consumer preferences for EVs in lower-tier cities of China, a market that has received little attention in the existing literature.

In reviewing the literature, we also note that consumer preferences for EVs may be related to three aspects: product/service attributes (referred to hereafter as “car instrumentality”), government transport policies, and consumer psychology (Lieven, 2015; Schuitema et al., 2013). First, the instrumentalities of EVs (e.g., purchase price and driving range) have been frequently examined in the literature (e.g. Hackbarth and Madlener, 2013; Qian and Soopramanien, 2011) and are usually found to be important, generally because they are directly “associated with users’ experiences derived from owning and using EVs” (Schuitema et al., 2013, p. 39). Second, vehicle adoption is largely influenced by government transport policies (Helveston et al., 2015). Transport policies related to EVs usually include monetary incentives (e.g., purchase subsidies), and non-monetary incentives (e.g., improvement of charging infrastructure), and traffic regulations (e.g. access to bus lanes) (Lieven, 2015). Third, car purchase and use are often related more to psychological motivation than to the car instrumentality (Steg, 2005). In China, consumer researchers have highlighted the importance of “face” influence (Qian and Yin, 2017) and word-of-mouth (WOM) communication (Zhang et al., 2011b), and have found that expensive cars, as socially visible possessions, are valued as essential status symbols that can help gain “face” (Helveston et al., 2015; Zhang, 2012).

This study aims to fill the gap in the literature on consumer preferences for EVs in non-first-tier cities in China, through an exploratory study in south Jiangsu region. We collected stated preference (SP) data in two second-tier and three third-tier cities of this region and identify the key influencing factors for EV adoption in these cities. This study further compares whether the potential adopters of EVs in third-tier cities have different preferences for the attributes compared to those in second-tier ones. This study contributes to literature by providing new understanding of consumer adoption preferences for EVs in the lower tier cities of China. Given that these cities currently have a low adoption level of EVs but represent future market potential, the empirical evidence from this study has practical implications for wider EV adoption in these urban areas of China.

The remainder of the paper is organized as follows. Section 2 introduces the research context of the south Jiangsu region by discussing the key features of five cities in this region, and then we propose a set of research hypotheses in Section 3. Section 4 describes the research method, including SP-experiment design and data collection procedure. Section 5 presents the results of our analysis including the tests of research hypotheses. The final section summarizes the main contributions of this study and discusses the key implications.

2. Research context of south Jiangsu region

To examine consumer preferences for EVs in lower tier cities, we collected empirical evidence from south Jiangsu region, which consists of five cities: Nanjing, Zhenjiang, Changzhou, Wuxi and Suzhou. The five cities in this region are spatially close to each other,

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