



From e-bike to car: A study on factors influencing motorization of e-bike users across China



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ABSTRACT

Household car ownership has risen dramatically in China over the past decade. At the same time a disruptive transportation technology emerged, the electric bike (e-bike). Most studies investigating motorization in China focus on macro-level economic indicators like GDP, with few focusing on household, city-level, environmental, or geographic indicators, and none in the context of high e-bike ownership. This study examines household vehicle purchase decisions across 59 cities in China with broad geographic, environmental, and socio-economic characteristics. We focus on a subset of households who own e-bikes and rely on a telephone survey from an industry customer database. From these responses, we estimate two three-level hierarchical choice models to assess attributes that contribute to (1) recent car purchases and (2) the intention to buy a car in the near future. The results show that the models are dominated by household characteristics including household income, household size, household vehicle ownership, number of licensed drivers and duration of car ownership. Some geographic, environmental and socio-economic factors have significant influences on car purchase decisions. Only two city-level transportation variable have an effect – higher taxi density and higher bus density reducing car purchase. Cold weather, population density gross domestic product per capita positively influence car purchase, while urbanization rate reduces car purchase. Because of supply heterogeneity in the data set, described by publicly available urban transportation data, this is the first study that can include geographic and urban infrastructure differences that influence purchase choice and suggests potential region-specific policy approaches to managing car purchase may be necessary.

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Introduction

China's considerable economic growth over recent decades has been accompanied by a dramatic expansion of its urban transportation systems, with increases in motorization (In this paper, motorization means that households transition from relatively smaller- or non-motorized vehicle to heavier motorized vehicle), and rapid development of road infrastructure and transit. One of the most substantial developments is a surge in ownership of private vehicles – specifically cars, and in the

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past decade, electric bikes (e-bikes). Since 1998, nearly 90 million cars, nearly 200 million e-bikes and nearly 200 million motorcycles (including gasoline-powered scooters) have been sold in China, shown in Fig. 1 (Weinert et al., 2008; National Bureau of Statistics, 2012; Jamerson and Benjamin, 2013). In 2009, China became the largest passenger car market in the world, exceeding sales in the USA for the first time (Huo and Wang, 2012). By 2050 the sales of private light-duty passenger vehicles in China could reach 23–42 million and the total vehicle stock could be as large as 530–623 million (Huo et al., 2012). Hence, China's motorization presents transportation, energy, and environmental challenges on a global scale, and is of great interest to a wide audience of policy-makers and researchers.

E-bikes have grown in popularity over the past decade in China, and are now a substantial portion of the transportation system in most urban areas. About 30 million are sold annually and an estimated 150 million or more are on the road today (Jamerson and Benjamin, 2013). E-bikes constitute a spectrum of designs from bicycle style e-bikes (BSEB) to scooter style e-bikes (SSEB) (Fig. 2); all are semi-motorized two wheel vehicles that operate on human (pedal) and battery-electric power. The rapid adoption of e-bikes across China has been notable, with the earliest market entries occurring in the late 1990s, followed by swift expansion in the early- to mid-2000s, outpacing car growth. The mid-2000s were characterized by hundreds of market entrants as e-bike manufacturers and suppliers attempted to establish themselves in the rapidly growing market (Weinert et al., 2007a,b). The late 2000s and early 2010s saw a stabilized e-bike market with 20–30 million sold yearly and a few larger companies beginning to establish market dominance. The boom of e-bikes was triggered by Chinese government's effort to restrict motorcycles, economic development, and publicity of e-bikes as zero-emission vehicles (Cherry et al., 2009; Yang, 2010). There has been some scrutiny on safety and environmental impacts of e-bikes. The burden of injury of e-bikes has been increasing (Feng et al., 2010) and they experience many conflicts with cars at intersections (Bai et al., 2013). Focusing on e-bike's environmental impacts, Cherry et al. (2009) compared environmental impacts of electric bikes to buses and motorcycles in China pointing out most pollutants are lower than or on the same level of bus emissions except SO₂. From the geographic view, provinces in Southern China have lower emission rates (partial hydro power generation) of electric bikes than provinces in the North (almost solely coal power generation).

An important question that remains unanswered is how the rapid and large adoption of e-bikes may disrupt China's traditional motorization pathway. There are some suggestions that e-bikes could either hasten or delay the transition to private car ownership within households (Cherry et al., in press). Understanding e-bikes' role in the transition through modes of transportation is important for policy-makers seeking a sustainable trajectory for China's motorization, yet there has been little research on this topic. There has been no systematic cross-city comparison of e-bike and car ownership at the individual household level, particularly comparing areas with different cultural, topographic, economic, and environmental geographies. This paper begins to fill an important gap by investigating trans-geographical influences on the decision to purchase a personal car, particularly among e-bike owners who have adopted this semi-motorized personal transportation mode.

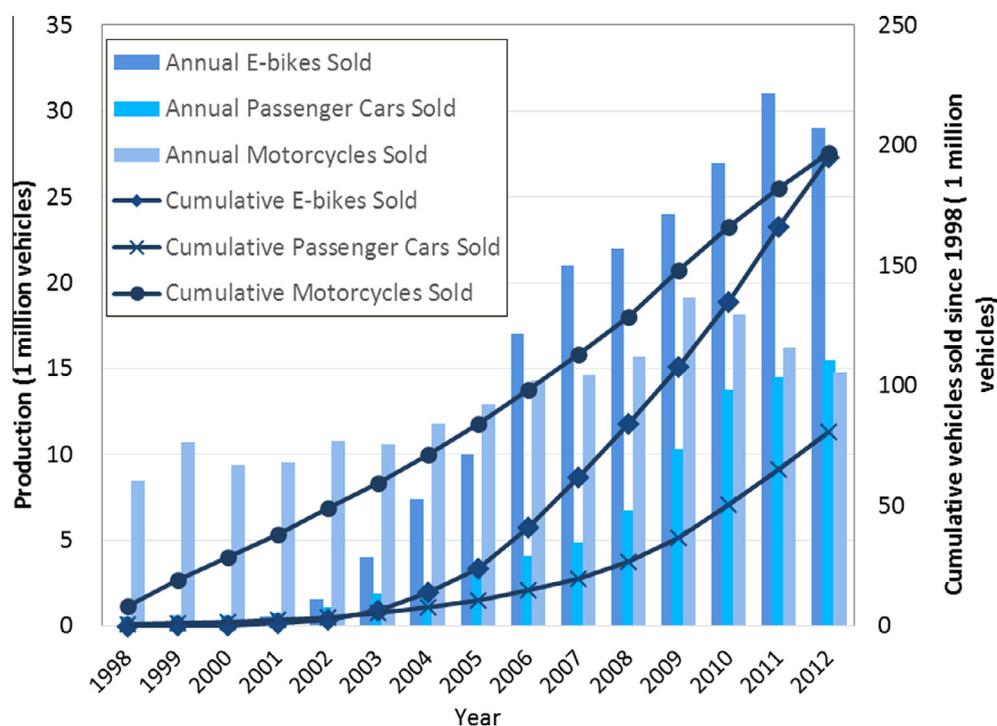


Fig. 1. Vehicles sold since 1998 in China.

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