Car Ownership and Urban Governance: an Empirical Analysis from Chinese Cities

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Abstract. In recent years, China has placed the external diseconomy of car traffic such as automobile pollution as the first priority gradually. The government often restricts the issuance of photographs and the limited number of trips. However, the real reason for the car ownership has not been discussed. This paper uses the data of China's prefecture-level cities to construct a model to empirically analyze the reasons for the number of car ownership in the city. It is found that the degree of development of the urban bus system affects the number of cars in a city. The number of taxis has a certain inhibitory effect on the growth of car ownership. Based on this, this paper provides some corresponding suggestions for urban governance and traffic management.

Introduction

The development of automobile transportation determines the different modes of urban transportation development and restrains the growth of urban vehicle ownership. It must combine the necessary traffic demand management methods and corresponding management measures. Some domestic scholars strongly advocate the development of the automobile industry to stimulate domestic demand. They believe that the popularization of automobiles can not only promote the development of the national economy, but also the suburbanization caused by car is conducive to raising the living standards of the citizens. However, scholars at home and abroad also agree that in large and medium-sized cities, cars should not be the main means of travel for citizens. The solution to the traffic problems in large and medium-sized cities can only rely on the rapid mass transit of urban rail systems.

In recent years, China has gradually put the external diseconomy of car traffic such as automobile pollution into the first place, and no longer advocates private car travel. People often talk about cities that are too congested and need to limit the number of cars. The government's series of actions usually include: limiting the issuance of photos, limiting the number of trips, and so on. However, it is rarely discussed what is the real reason for the car ownership.

Yang et al. (2016) measured the factors affecting the car ownership in China through the panel fixed effect method. The study found that income is not the only factor affecting the growth of car ownership, and the factors affecting car ownership vary with cities of different regions and sizes [1]. WU (2016) explored the determinants of China's private car ownership, and found that both urban characteristics and traffic characteristics affect car ownership [2]. Only a few articles have explored the factors affecting car ownership. A large amount of literature is based on past data to predict future car ownership [3, 4].

This paper will combine the results of previous literatures, use the data of China's prefecture-level cities to empirically analyse the reasons for the number of urban vehicles, and provide some effective suggestions for urban construction.

Methodology

Model settings and variables. The section headings are in boldface capital and lowercase letters. Second level headings are typed as part of the succeeding paragraph (like the subsection heading of this paragraph). This paper mainly considers the factors affecting car ownership, but the growth of

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urban car ownership is related to many factors, and is objectively affected by many factors such as urban population, GDP, public transport service level, road network density, and automobile and fuel prices. Because there are many influencing factors and the relationship between them is complex, and the constructed regression model can not include all the factors at the same time, it is an important link to establish the model to determine its main influencing factors [5].

Previous studies have shown that population and economic indicators are the two most important factors affecting car ownership [6]. In the early stage of the development of private cars, when the level of urban public transport services is equal to the income level of residents, the greater the total population of the city, the greater the car ownership; in developed countries, the per capita car ownership is often used as a measure of car. An important indicator. In China, due to the large absolute value of the population, the entry of cars into the family is just beginning, and the per capita car ownership index is low. However, with the rapid growth of China's economy, it is foreseeable that the absolute value of China's automobile ownership will increase rapidly in the future, and the per capita car ownership will also increase; per capita GDP as an important economic indicator is the level of urban economic development. One of the reflections is also one of the most important factors in determining the amount of car ownership. A study by Joyce (1999, 2001) shows that the higher the per capita GDP, the greater the number of cars in the city [7].

The density of urban public transport networks reflects the level of public transport services in a city. The greater the density of the public transport network, the higher the service level and the greater the suppression of private traffic. When the level of public transport services reaches a certain level, the travel of urban residents will be more inclined to adopt public transportation, and the number of small cars will be reduced accordingly, so that the number of private cars will remain at a low level [8, 9].

Urban road network density is an important indicator for measuring urban transportation infrastructure. Tongda's road network can provide a good driving environment for various transportation vehicles, and the high density of the road network will increase the number of cars.

In addition to the above factors, the car ownership is also affected by many external factors. Finally, the regression model of this paper is set as follows:

$$pcar = \beta_0 + \beta_1 ln\, pgdp + \beta_2 ln\, pbus + \beta_3 pgdp \times pbus + \beta_4 ln\, ptaxi + \beta_5 pgdp \times ptaxi + \beta_6 parea + \beta_7 proad + \varepsilon \quad (1)$$

In this equation, *pcar* is the explanatory variable - per capita car ownership, calculated by dividing the car ownership of each city by the number of permanent residents in each city. *Lnpgdp* is the logarithm of per capita GDP, *pbus* is the number of buses per capita, *ptaxi* is the number of taxis per capita, *parea* is the administrative area, and proad is the per capita urban road area.

$Pgdp \times pbus$ represents the interaction between per capita GDP and the number of per capita buses. It is used to measure the number of buses to hinder or promote per capita car growth with GDP; $pgdp \times ptaxi$ indicates per capita GDP and per capita taxis. The interaction term is used to measure the number of taxis to hinder or promote the per capita car as the GDP grows; ε is the random error term.

Table 1 Descriptive statistics of interpreted and explanatory variables

Variables	max	min	mean	sd
pcar	2384.15	67.66	877.64	497.01
pbus	28.06	0.23	3.04	3.45
ptaxi	40.21	0.38	6.86	7.32
lnpgdp	12.9	9.12	10.54	0.62

Data collection and descriptive statistics. This paper collects data from 2010-2014 in prefecture-level cities in China. The per capita car ownership comes from the City Statistical Yearbook, the National Bureau of Statistics, the city statistics bureaus and statistical bulletins. The data of permanent residents comes from CEIC. Wind, provincial and city statistical yearbooks and

statistical bulletins; per capita GDP data from the Bureau of Statistics website; bus, taxi data from the "City Statistics Yearbook"; bus coverage data from the Beijing City Laboratory[10]. Descriptive statistics for the main data.

Results

In the first column to the fifth column of Table 2, the independent variable is gradually added to the regression equation. In any column, per capita GDP is a significant boost to the per capita car ownership. That is, the higher the per capita GDP, the higher the per capita car ownership. However, from the second column, the more the number of buses per capita, the faster the per capita car ownership will grow with the per capita GDP. A similar conclusion can be drawn from the fourth column. The number of taxis per capita also has an inhibitory effect on the growth of per capita car ownership. As shown in Figure 1, the horizontal axis is the per capita GDP, and the vertical axis is the per capita car ownership. Both straight lines indicate that the car ownership increases with the increase of GDP. However, in cities with more taxis per capita, the per capita car ownership grows more slowly (the line is flatter).

Table 2 The empirical result

Variables	(1)	(2)	(3)	(4)	(5)
pgdp	124.6***	201.5***	102.5***	113.8***	222.18***
	(9.59)	(38.91)	(8.13)	(9.26)	(93.38)
pbus	247.7	686.0**			614.67
	(177.3)	(263.0)			(421.23)
$\boldsymbol{gdp \times pbus}$		-104.5**			-132.92
		(51.93)			(99.32)
ptaxi			20.29***	29.08***	44.68
			(4.82)	(7.79)	(14.13)
$\boldsymbol{gdp \times ptaxi}$				-1.25*	-3.91**
				(0.720)	(1.96)
Parea					-.08
					(1.39)
Proad					-32.69
					(28.94)
Cons.	133.0	-173.8	271.3***	214.2***	-261.97
	(104.2)	(173.2)	(37.43)	(45.52)	(375.19)
Obs.	127	127	126	126	123
R^2	0.68	0.68	0.71	0.72	0.73

In order to verify the robustness of the regression results, the paper makes the following robustness test: (1) Using panel data regression: using the regression of 197 prefecture-level cities in 2010-2014, the results are the same as the 5-year average cross-section data. There are no substantive differences. (2) Excluding the data of big cities such as Beishangguang and Shenzhen: Considering that there are a large number of foreign vehicles in cities such as Beishangguang and Shenzhen, and there are also limited cards and other measures, the samples from this city are rejected, and there is no obvious regression result. influences. (3) Controlling regional dummy variables: The prefecture-level cities are divided into three categories: eastern cities, central cities, and western cities. The virtual variables of the two regions are added, and the regression does not show significant regional differences. Therefore, the results of Table 2 are robust.

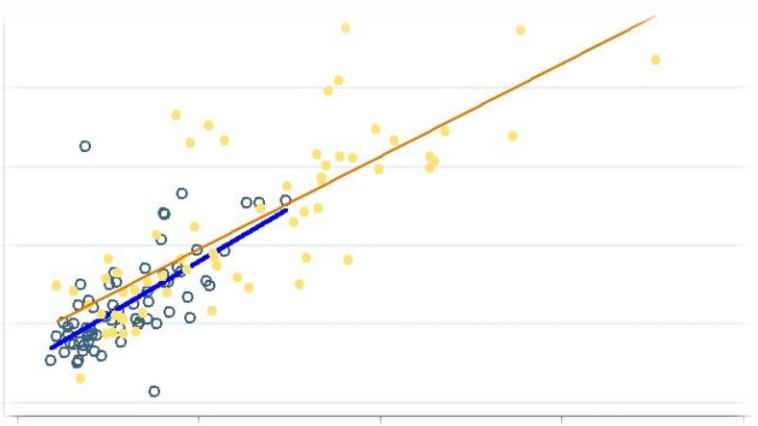

Figure 1. The number of taxis inhibits car growth

Conclusions

This paper uses the data of China's prefecture-level cities to construct a model to empirically analyze the reasons for the number of cars in cities. It is found that the per capita GDP will affect the car ownership of a city. The higher the per capita GDP, the higher the per capita car ownership; The degree of development of the urban public transport system will affect the car ownership of a city; the number of taxis has a certain inhibitory effect on the growth of the car. Based on this, this paper speculates that the per capita car ownership of big cities and small cities is not so big because large cities are more efficient than small cities, public transportation systems are more developed, and the need for car purchases is smaller.

For urban construction and traffic management, blind travel may not be the best way to solve traffic congestion. If there is no alternative way to travel, people will still choose to travel by car. Therefore, city managers need to work hard to build a convenient, low-cost, high-quality public transportation system, and improve the taxi system to reduce the need for people to buy cars, making our city more environmentally friendly and more effective.

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