

Private Car Ownership in China: How Important is the effect of Income?

Xin Deng

Centre of Regulation and Market Analysis
School of Commerce
University of South Australia
70 North Terrace, Adelaide 5001

xin.deng@unisa.edu.au

Abstract: While it is widely accepted that income is the major drive for private car ownership, the car ownership levels do not match the income levels across regions in China. This paper explores this “car ownership divergence” phenomenon from various aspects. It is found that income effect is strong at both national levels and within regions. However, even if per capita income may still be an important factor to explain car ownership difference across the regions, its explanatory power dropped considerably. Further discussion reveals that charges and fees imposed on private car owners by authorities at different levels may have a strong influence on car ownership level. The paper concludes with discussions on implications of this study.

Key Words: Private Car Ownership, Income, China, Government

1. Introduction

Last two decades have witnessed the dramatic increase in motor vehicles in China. Over the last 20 years there has been a tenfold increase in the number of civil motor vehicles in China, rising from 3.2 million vehicles in 1985 to 31.59 million vehicles in 2005 (NBSC 2006).¹ China is now the fourth largest motor vehicle producer and the third largest consumer in the world. A closer inspect on data can easily reveal that passenger vehicles, especially private passenger vehicles, are the major contributor to the growth of vehicle fleet. Indeed, the growth in vehicle fleet in the last two decades is accompanied by a sharp increase in the share of privately owned passenger vehicles among all passenger vehicles, and the share of passenger vehicles among private vehicles.

Back two decades ago, there were hardly any private cars on the street in China. Indeed, China only started to publish statistics on private vehicles in 1985, and there were less than 20,000 private passenger vehicles in the whole nation then (NBSC 2006), most of them are for business instead of household use. As shown in Figure 1, among all passenger vehicles, less than 2.5 per cent was privately owned in 1985, and this proportion jumped to over 60 per cent in 20 years in 2005. In the same period, the proportion of passenger vehicles among private vehicles rises from 6.8 per cent to nearly 75 per cent. The growth of the share of passenger vehicles is outstanding itself, rising from 24.7 per cent to 67 per cent, but is less impressive compared with the growth in the private category (National Bureau of Statistics of China 2006). It is, therefore, not surprising that more than 70 percent of newly registered vehicles are private passenger vehicles.

While it is not difficult to attribute automobile growth in China to the rising income brought by booming economy, it is interesting to observe a disparity in car ownership among regions with similar income levels. For example, the four richest regions in terms of per capita income in 2003 are Shanghai, Beijing, Zhejiang and Guangdong, with per capita annual disposable income of urban residents of RMB 14,867, 13,882, 13,179 and 12,380 respectively. However, the number of automobile per 100 urban

¹ Current statistics only covers civil motor vehicles, that is, military vehicles are excluded.

households is 1.8, 6.6, 2.98 and 4.37 in these regions in the same year (National Bureau of Statistics of China (NBSC) 2004). As shown in Table 1, car ownership ranking is inconsistent with income ranking for many provinces, and such a disparity is even more evident back in 2000, when Shanghai enjoyed the highest per capita income, and also recorded the lowest car ownership level among all regions.

It is well established that income is the primary impetus to automobile ownership, and income is used as the only explanatory variable in many car ownership forecast models (e.g. Button *et al.* 1982; Dargay and Gately 1999; Dargay 2001). As one of the fastest growing automobile markets in the world in the last decade, China also experienced rapid income growth during the same period of time.

It is not unusual to observe different car ownership level among different countries with similar income level. However, such a disparity among regions in the same country is interesting; especially many of these regions share similar economic characteristics, such as Beijing and Shanghai. The difference of car ownership among regions with similar income levels may be explained in a number of ways. Gioliano and Dargay (2006), for example, compared the car ownership level between the US and the Great Britain, and suggested that difference in demographics, income and cost of car ownership and use between the two countries may explain the differences in travel as well as car ownership. Liu and Ingram (1999) observed the strong correlation between growth of vehicle ownership and road infrastructure. Population growth, urbanization along with economic development have also been identified as factors influencing car ownership by other researcher (Riley 2002). However, it is interesting to find out if our observation of such inconsistency between car ownership and income level can be supported by solid statistical evidence, and more importantly, to find out which factors account for the divergence of income impact, why these factors may differ from region to region within the same country, and how they interact to influence car ownership.

The rest of this paper is organised as follows: the next section discusses data and methodology to be employed in this paper; section 3 presents several automobile ownership models, which are followed by a discussion of government's role in private

car ownership. The paper concludes with a brief discussion of implications for both policy makers and automobile marketer.

2. Data and Methodology

To address questions raised in the previous section, the following three hypotheses have been set up.

1. There exists strong income effect associated with private passenger vehicle ownership at national level.
2. Income effect is less evident for private passenger vehicle ownership at the provincial level.
3. Factors that may reduce income effect may include costs and quality of public transport services, taxis, costs of car ownership, quality of road infrastructure.

Time-series and cross-section model will be used to test the above hypotheses by utilising data published by National Bureau of Statistics in China.

2.1 Data

Current statistics published in China classify all motor vehicles into three categories: passenger vehicles, trucks and others. Others account for only 2 per cent of total vehicles. Trucks used to account for majority of vehicle fleet, and they outnumbered passenger vehicles before 1997 (NBSC 2004). Private passenger vehicle is not equivalent to private car, as it includes bus. However, it is the closest proxy for private car.

Per capita disposal income data in urban and rural areas are published separately in China. Since most private cars are owned by urban residents due to higher income and better road facilities, per capita disposable income in urban households will be used.

As private car ownership is still a relative new phenomenon in China; statistics on costs of car ownership are very limited. The costs of car ownership may be measured by actual car ownership cost including purchase price of the car, maintenance costs,

fuel costs, costs of parts, as well as other costs such as tolls and parking fee. The quality of car ownership is mainly affected by the road traffic condition, or the congestion. The costs of public transport are measured by the public transport fare, and the quality of public transport is difficult to measure. The only available official data on car ownership costs is the price index of transport. National Statistical Bureau of China used to publish transport price index that covers all transport services, and it only started to differentiate among transport facilities, fuel and parts, vehicle maintenance costs, public transport fare and intercity transport fare. Since price index can only provide information regarding price change in a certain province over the years, they can not be used as proxy of car ownership costs or public transport fare in different regions. In other words, car ownership costs can not be included in the explanatory variables. Area of paved road per vehicle will be used to evaluate the congestion status of road. However, family size and real interest rate will not included in explanatory variables, as variation of these two variable are not significant from region to region due to unified government policy, and this study aims at exploring factors that may explain car ownership disparity among regions.

The data employed by this study will cover 31 provinces in China dated as early as 1985 when statistics on private vehicles become available. However, the coverage of data may vary from model to model, as some statistics became available only in recent years.

2.2 Methodology

We will first attempt to model private passenger ownership by per capita income at both national and provincial levels to test the significance of income effect. Then we will introduce other variables to evaluate the impact of costs and quality private car trips and trips via public transport. As suggested by economic theory, income is the most important factor to affect private car ownership. Apart from that, other main explanatory variables for private car ownership may include costs of private car, and costs and quality of its substitutes: public transport or taxi. Other variables such as the size of family, and real interest rate may also influence car ownership. Theoretically, we should test all these variables. However, the availability of the date may significantly limit our choice of data, as will be discussed in details in the next section.

3. Models

3.1 Vehicle Ownership and Income

To test the first and second hypotheses, we start with the simplest model: $PPV=f(PCY)$, where PPV is the number of private passenger vehicle per 10000 people and PCY is per capita annual income of urban household.²

We first use the nationwide data, and find that a cubic function models their relationship very well, as shown by Figure 2 and statistics in Table 2. The shortcoming of this model is the limited number of observations, as there are only 19 observations. While this model can not be used as evidence to prove the relationship between private car ownership and income due to such limit, it is a good indication to illustrate the close tie between them.

Since national data is an aggregation of provincial data, it is not unreasonable to expect similar relationship exists at the provincial level. Since per capital disposable income data at the provincial level is not available at provincial level before 1994, we have nine years data covering 31 provinces.³ While cubic function remains to be the best fit model for private passenger vehicle and disposable income at provincial level, it turns out that the relationship between them are much weaker, even if it is still statistically significant. Moreover, the negative sign for disposable income does not make economic sense (Table 3). Though the signs in linear model are consistent with the theory, and the explanatory variable is significant, we found Beta for disposable income is 0.573, in other words, more than 40% of the change of private passenger vehicle ownership can not be explained by income change at the provincial levels. As shown in figure 3, neither of cubic or linear models fit the actual growth well.

² Per Capita Disposable Income is in RMB.

³ Data are missing for Tibet for several years, and Chongqing was separated from Sichuan province in 1996, so statistics on Chongqing are not available before 1997.

It seems that we can conclude from the above models that income is the dominant explanatory variable for private car ownership at the national level, but has less impact at the provincial level. In other words, we can confirm the first and second hypothesis. However, if the same model is applied for each province,⁴ we found very high correlation between income and private car ownership in every province. As shown in Table 4, the adjusted R^2 for majority of the provinces is over 0.9 in the linear regression model. Interesting thing is that the coefficient (b_1) varies a lot across the regions, from as low as 0.0002 in Chongqing to as high as 0.08 in Beijing. The variation of income elasticity across the regions may imply the existence of significant regional difference.

b. A Multiple Regression Model

Given the number of factors that may influence the car ownership decisions, it may be useful to identify factors contributing to different income elasticity across the regions in China. A multiple regression including relevant factors is necessary to achieve such a goal.

The initial model is based on a general specification of the determinants of private car ownership, as well as the availability of data. Generally speaking, cost of car ownership and use, per capita income, infrastructure, availability and quality of substitutes (such as taxi and public transport) may influence private car ownership decision. Since there is no official data on cost of car ownership and use, we use price index of transport services as a proxy. As a result, the following model is formed.

$$PPV=f(PCY, AR, PT, TX)$$

PPV: Private Passenger Vehicles Per 10000 people

PCY: Per capita Disposable Income of Urban Households

PrT: Price Index of Transport Services

AR: Area of Paved Road per 10000 people in urban areas

PT: Number of Public Transport Vehicles per 10000 people

TX: Number of Taxis Per 1000 people

⁴ Tibet was not included because data on disposable income are not available for three years, and there are only 10 years data available.

The outcome of this model is presented in Table 5. At first glance, the overall model fit is acceptable. The adjusted R-squared is 0.61, and income, public transport and the number of taxis turned out to be statistically significant. It is not surprising to find out that “price index of transport services” is not statistically significant, as it covers all types of transport services, and is not a good proxy of private car ownership or use. However, the interesting findings are that the variable “number of taxis per 1000 people” has more explanatory power (Beta: 0.6) than per capita income (Beta: 0.25), and the sign for taxi variable is positive. None of them makes economic sense. On the one hand, taxis are normally considered as a substitute of private cars, so we should expect a negative sign for the coefficient of this independent variable. On the other hand, economic theory can not support the argument that the growth of taxis will contribute to the growth of private cars, and the growth of taxis will have more important role than per capita income on car ownership growth.

A plausible explanation is that collinearity exists between the two independent variables: per capita income and number of taxis. However, VIF for both variables is slightly over 1, and tolerance is well below 1, showing that collinearity is unlikely to be a problem.

The other way to explain such an obvious contradiction is that we have missed some important explanatory variables; therefore, the model is misplaced. As a result, we can neither reject or accept hypothesis three.

As discussed before, there is no information regarding on cost of private car ownership and use. However, people would expect that the costs of ownership and use are unlikely to be significantly different within a country given that pricing and maintenance costs are likely to be the same. In China, however, costs of ownership and use are not limited to purchase price paid to dealer, annual registration and regular mechanical maintenance. Local governments play an important role on the cost structure of private car ownership.

3. Government's Role in Private Car Ownership

In China, governments at all levels have certain power to impose various charges and fees to collect revenue to supplement their limited budget, or simply provide extra revenue for expenditure outside the budget (Deng and Smyth 2000), and private car owners have been considered as a good resource to tap on. This is not only because people who can afford private cars are relatively rich (or super-rich before the late 1990s), but also because government's policy was to restrict private car ownership. Indeed, one of the major objectives of imposing a 10 per cent of vehicle purchase surcharge (tax) was to discourage motor vehicle consumption.

As a result, charges and taxes form an important part of purchase and maintenance costs. Since local governments do not have the right to impose taxes according to China's legislation, there are only a few taxes imposed on motor vehicles. On the other hand, the charges are numerous, most of which are imposed by local governments, with few of them being approved by the central government.

3.1 Taxes

a. Taxes on Production and Sale

According to current tax legislation, taxes levied on production and sale procedures of automobiles include value added tax, excise duty, urban maintenance and construction taxes, education surtaxes and vehicle purchase tax. Imported automobiles are also subject to a tariff.

"Value Added Tax" is a tax on the added values of all products sold and imported, as well as processing and repairing services. The basic rate is 17 per cent, while certain products can be taxed at the lower rate of 13 per cent, or exempted. The 17 per cent rate applies to automotive products and services.

The "Excise Duty" is a tax on the sales value or volume of selected consumer goods. In the ad valorem case, the taxable value is the price paid by the buyer, excluding VAT. The rate varies widely among goods, and even within the one category of the same good. Tyres, motorcycles and automobiles are subject to an excise duty. While both tyres and motorcycles are taxed at the rate of 10 per cent, the rates for

automobiles are set according to the type of the automobile, as well as the size of the engine. Under the car category, three per cent applies to cars with an engine size smaller than one litre, five per cent applies to cars with an engine size greater than or equal to one litre but smaller than 2.2 litres, and an eight per cent rate applies to cars with an engine size larger than or equal to 2.2 litres. Four-wheel drives with engines of 2.4 litres or larger are taxed at five per cent, while engines smaller than 2.4 litres are taxed at three per cent. Vans with less than 22 seats are also taxed at five and three per cent respectively, depending on whether the size of the engine is bigger or smaller than two litres.

The “Urban Maintenance and Construction Tax” and “Education Surtax” are surtaxes of value added tax, excise duty and business tax, as the tax base is the sum of the three taxes paid by the taxpayer. The rate of urban maintenance and construction varies with the size of the urban area: seven per cent applies to cities, five per cent applies to towns, and three per cent applies to other urban areas. The education surtax adopts a unified three per cent rate.

The “Vehicle Purchase Tax” is in fact a replacement of the “Vehicle Purchase Surcharge”. The surcharge, introduced in the late 1980s, was formalised into the “Vehicle Purchase Tax” from January 1st, 2001. The tax is levied at 10 per cent of the sale price, excluding VAT. It is a central tax, collected by the State Tax Bureau, and the revenue is mainly used in road construction.

b. Taxes on Usage

There are two taxes on automobile usage: “Vehicle and Vessel Usage Tax” and “Vehicle and Vessel Usage Licence Levies”. These two taxes have many similarities: they have similar titles, similar tax objectives (both tax vehicles and vessels) and local governments have flexibility in deciding the rate within the range set in the legislation. However, they are also different in two aspects. The first tax is widely levied and applies to all organizations and individuals with vehicles and vessels in China, while the other is levied in limited areas. This is because provinces can decide whether to impose the second tax or not, and many provinces do not impose this tax. Apart from that, the rate for vehicle and vessel usage licence levies is much lower- around one quarter of the first tax (Table 6).

2) Charges

a. Types of Charges

Charges can be classified into two categories in terms of the charging authorities, that is, charges approved by the central government and charges imposed by local government.

Firstly, charges approved by the central government are normally levied nationwide by different provinces. There are only six charges on motor vehicles that have formal approval at the State Government level. Of these, one levy was approved by State Council - the Road Maintenance Fee. The Road Maintenance Fee is imposed and collected by local road administration, and the rate varies from region to region. The other five charges were approved by various governmental departments, with provincial governments being given the right to set the rate. They are the motor vehicle number plate fee, driver's licence fee, fee for dealing with traffic accidents, taxi administration fee and tolls on vehicles.

The next category, charges levied by local authorities, are normally levied within a certain region, such as a province or a county. Usually, they are imposed with the permission of the authority at the higher level. Apart from the six charges discussed above, all other charges can be considered part of this group. It is reported that there are more than 1,500 charges on vehicle purchase and usage (Zhang 2000).

Table 7 provides a summary of charges that may be imposed by local authorities. In general, they can be classified into three categories.

Charges on purchase. Charges payable at the purchase stage are normally non-recurring, but the amount of each item is large. The number plate auction fee in Shanghai, for example, was as high as RMB80,000. The capacity expansion fee, which is also a typical charge imposed at this stage, is as high as RMB15,000 (Chen 2002). Other fees that can be included in this category include local consumption surcharge, temporary number plate fee, notary fee for purchase contract, construction fee of transportation infrastructure, and so on.

Charges on registration. The registration process is very complicated, and the vehicle owner needs to pay at almost every stage of the process. Typical charges at this stage include a new vehicle inspection fee, a camera service fee, a tail gas certificate fee, a number plate fee, and so on. Most of the charges are not as high as the purchase charges. However, they have dramatically increased in some regions. A recent report showed that a car owner in Yangzhou, a medium-sized city on the east coast of China, paid more than RMB40,000 to get his car registered. The items he paid included a re-employment fund (RMB18,000), transportation facility fee (RMB3,200), shares of Huaijian expressway (RMB9,600), and various funds and donations of more than RMB10,000 (Yu 2002).

Charges on usage: Apart from the costs of petrol, parking and penalties, vehicle owners also have to pay for various government charges. These charges are normally recurring, and can be further divided into two categories; these are charges imposed on the usage of the roads, such as tolls; and charges related to the ownership of the vehicle, such as vehicle and licence annual inspection fee, and the road maintenance fee. Other charges that can be included in this category include the pollution test fee, traffic junction safety monitoring fee, and driver safety course fee, to name a few.

4. Conclusion

This study found strong correlation between income and private car ownership both at national level and within each region, but was unable to confirm all of factors that may affect private car ownership across the regions in China. Despite this limit, findings and discussions in this paper may be of interest to both automobile manufactures who want to explore the fast-growing Chinese market, as well as policy makers.

Car manufacturers need to be aware that each region in China can be quite unique in terms of private car ownership and use. While car ownership level will increase with the income growth, each region may react differently. Much of the difference in income elasticity of private car ownership may be explained by the difference in government policies in regard to charges and fees imposed on private car owners. As a result, the regional markets in China can be quite different for automobile

manufacturers, and investigating government's policy on car ownership can be a very important part of normal market research.

A review of government policy also suggests that those charges and fees are likely to impose significant financial and compliance burden on private car owners, and hence discourage private car ownership. However, simply removing those charges and fees completely may not be a feasible solution either. On the one hand, they have already formed a substantial part of government budget, if such budget is justified, other resources should be made available for local authorities before removing those charges. On the other hand, private car ownership should be discouraged given its considerable negative externalities. Rising income will further lead to increase in private car ownership, as can be predicted by our models. The society will have to pay for the external costs associated with motor vehicles one way or the other, and it is more efficient to require the vehicle owners to pay for the external costs. Policy makers need to be aware that current charges and fees on private car owners do not address the issue of externalities. Instead, they are mainly used as a vehicle to collect extra revenue for government at different levels. If new taxes and charges are to be introduced to replace current charges and fees, both efficiency and external effect issues need to be addressed properly.

Table 1 Income Ranking and Private Car Ownership Ranking in China in 2000 and 2003

Region	Ranking in 2003		Ranking in 2000	
	By Per Capita Income in Urban Households	By Private Automobiles Per 100 Urban households	By Per Capita Income in Urban Households	By Private Automobiles Per 100 Urban households
Shanghai	1	9	1	29
Beijing	2	1	2	1
Zhejiang	3	3	4	10
Guangdong	4	2	3	2
Tianjin	5	5	5	21
Fujian	6	19	6	14
Jiangsu	7	10	8	29
Tibet	8	7	7	29
Shandong	9	13	9	23
Chongqing	10	12	11	16
Guangxi	11	17	14	20
Hunan	12	27	12	28
Yunnan	13	6	10	3
Hubei	14	29	17	22
Hainan	15	4	18	6
Liangning	16	20	19	13
Hebei	17	8	15	5
Xingjiang	18	24	16	7
Sichuan	19	16	13	11
Inner Mongolia	20	11	22	4
Jilin	21	21	29	12
Shanxi	22	14	31	8
Henan	23	22	30	27
Jiangxi	24	28	25	15
Shaanxi	25	26	23	26
Anhui	26	30	20	9
Qinghai	27	18	21	25
Heilongjiang	28	15	27	17
Gansu	29	31	26	19
Guizhou	30	25	24	24
Ningxia	31	23	28	18

Source: Calculated from China Statistical Yearbook (2001, 2004)

Table 2 Private Passenger Vehicle Ownership and Disposable Income

R ²	d.f.	F	b0	b1	b2	b3
0.997	15	1908.03	-.7484	.0021	-5.E-07	1.3E-10

Dependent: Private Passenger Vehicles Per 10000 People (units)

Independent: Per Capita Annual Disposable Income of Urban Households (RMB)

Table 3 Private Passenger Vehicle Ownership and Disposable Income by Region

Method	Adj R ²	d.f.	F	Sig	b0	b1	b2	b3
Cubic	0.395	294	64	.000	66.29	-0.03	4.5E-06	-1.E-10
Linear	0.329	297	145	.000	-67.2	0.018		

Dependent: Private Passenger Vehicles Per 10000 People (units)

Independent: Per Capita Annual Disposable Income of Urban Households (RMB)

Table 4: Income and Private Passenger Vehicles by Province

Region	Adjusted R2	B0	B1
Sichuan	0.721736865	-58.8894	0.014557
Shanghai	0.787586863	-126.164	0.015221
Guizhou	0.794580349	-8.97543	0.003806
Zhejiang	0.797179807	-93.1988	0.013831
Hainan	0.834716837	-32.1843	0.007881
Yunnan	0.836399431	-64.5015	0.014519
Jilin	0.847549633	-31.8819	0.013493
Jiangsu	0.876191329	-64.9297	0.012701
Fujian	0.885269355	-15.7725	0.005839
Jiangxi	0.893453862	-9.47978	0.003222
Gansu	0.894236042	-5.98231	0.004472
Chongqing	0.895259023	-13.1391	0.002625
Shaanxi	0.898292132	-32.2059	0.011681
Ningxia	0.911721602	-33.3501	0.013533
Shandong	0.917604318	-64.5117	0.014504
Guangxi	0.922585979	-28.9947	0.006852
Qinghai	0.933389732	-25.7279	0.010357
Beijing	0.934324048	-195.682	0.080476
Anhui	0.936702483	-23.6955	0.006837
Guangdong	0.946887127	-174.827	0.024345
Liaoning	0.950723281	-25.8982	0.012251
Shanxi	0.954242898	-31.4909	0.014498
Henan	0.955610828	-21.8534	0.008643
Heilongjiang	0.955968392	-44.8983	0.01554
Hebei	0.96568763	-93.1399	0.025649
Hubei	0.968244359	-29.1725	0.007752
Hunan	0.970848299	-27.2577	0.007215
Xinjiang	0.972236744	-65.6184	0.019387
Inner Mongolia	0.974550716	-34.4325	0.015578
Tianjin	0.982573025	-189.269	0.041073

Table 5 Multivariate Regression Results

	Coefficient	Std Error	Beta	t
Constant	4.752	47.576		0.1
Per Capita Disposable Income	0.009	0.002	0.248	4.729
Price Index of Transport Services	-0.64	0.469	-0.056	-1.363
Public Transport Vehicles Per 1000 People	0.597	0.208	0.127	2.874
No. of Taxi by Population	4.406	0.349	0.601	12.608
Area of Paved Road	-2.581 E-05	0.001	-0.002	-0.047
Adjusted R2	0.61			

Table 6 Tax Rate on Vehicles- Comparing Vehicle and Vessel Usage Tax and Vehicle and Vessel Usage Licence levy

Types of Vehicles	Unit	Tax Rate (RMB)	
		Vehicle and Vessel Usage Tax	Vehicle and Vessel Usage Licence Levy
Motor Vehicles			
Passenger Car	Per vehicle	60-320	15-80
Truck	Per ton	16-60	4-15
Motorcycle (3 wheels)	Per vehicle	32-80	8-15
Motorcycle (2 wheels)	Per vehicle	20-60	5-15

Source: State Administration of Taxation of China (2006)

Table 7: Selected Charges on Motor Vehicle at Different Stage

Stage	Charge Items
Purchase	Capacity expansion fee, Consumption surcharge, Construction fee of road infrastructure, Documents examining fee, Temporary number plate fee, Contract notary fee, Temporary road maintenance fee, Parking space certificate, Quota allocation fee
Registration	New vehicle examination fee, Number plate and registration fee, Camera service fee, Tail gas certificate fee, Labelling fee, Material fee of plate and frame, New vehicle washing fee, Typing fee for registration form, road construction fee, Key transportation construction fund, Reemployment fund,
Usage	Road maintenance fee, Vehicle annual inspection fee, Annual inspection fee for driver's licence, Parking fee, Toll, Pollution test fee, Safety course fee, Safety monitoring fee, Compensation fee for high grade road construction, Education supporting fee.

Source: Chen (2002)

Figure One: Share of Private Passenger Vehicles

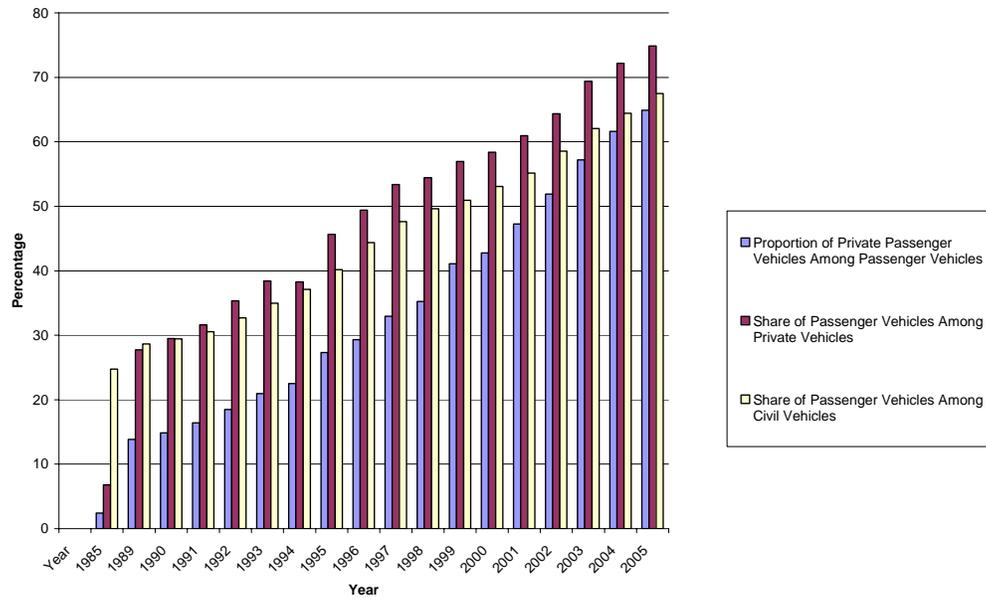


Figure 2: Private Passenger Vehicle and Per Capita Disposable Income

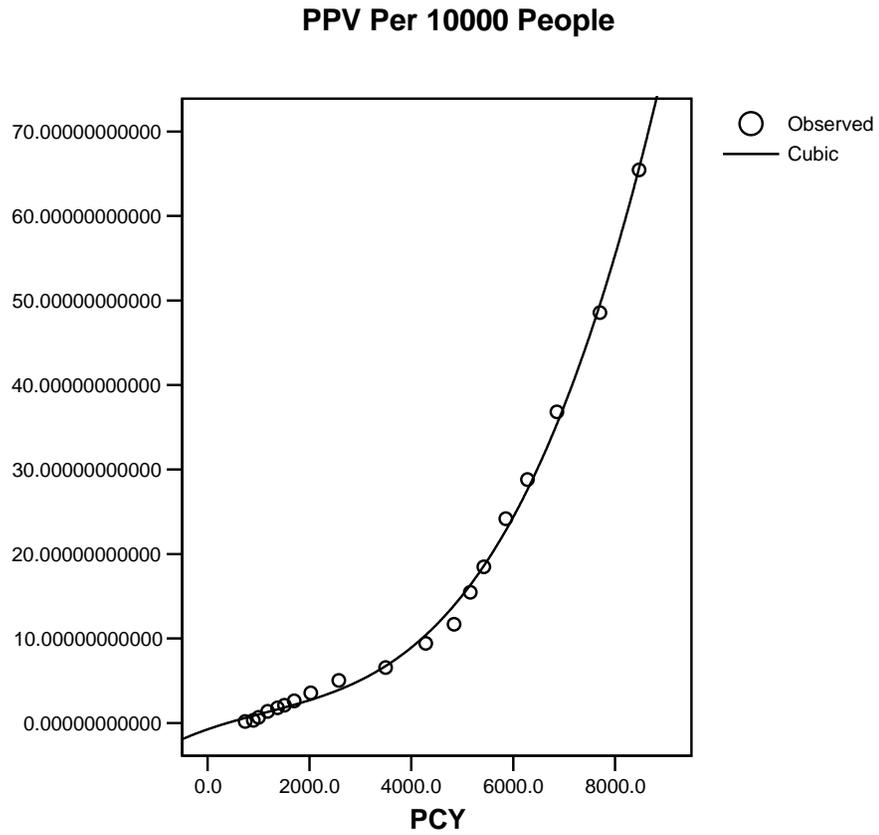
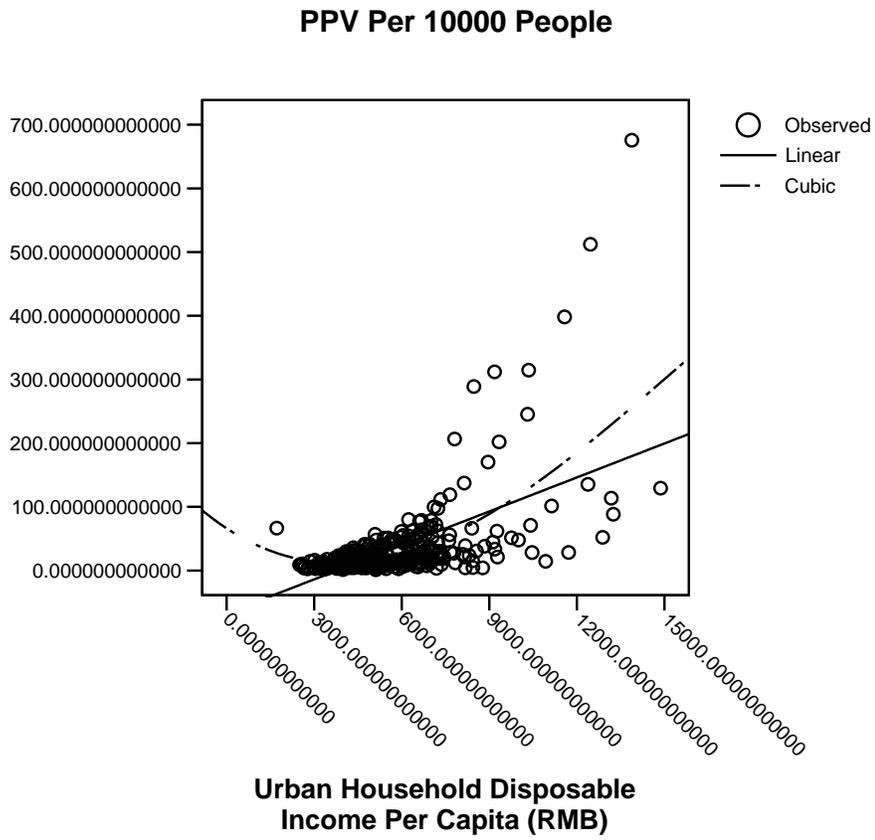


Figure 3 Private Passenger Vehicle and Per Capita Disposable Income by Region



References:

- Button, K. J., Pearman, A. D., and Fowkes, A. S. (1982). *Car Ownership Modelling and Forecasting*. Aldershot, Hampshire, Gower.
- Chen, X. I. (2002). "Numerous Charges and Taxes on Cars (in Chinese)" *China Business*, April 03, 3.
- Dargay, J. and Gately, D. (1999) "Income's Effect on Car and Vehicle Ownership, Worldwide: 1960-2015." *Transportation Research Part A: Policy and Practice*, **33**:2, 101-138.
- Dargay, J. M. (2001) "The Effect of Income on Car Ownership: Evidence of Asymmetry." *Transportation Research Part A: Policy and Practice*, **35**:9, 807-821.
- Deng, X. and Smyth, R. (2000) "Non-Tax Levies in China: Sources, Problems and Suggestion for Reform." *Development Policy Review*, **18**:4, 391-411.
- Giuliano, G. and Dargay, J. (2006) "Car Ownership, Travel and Land Use: A Comparison of the Us and Great Britain." *Transportation Research Part A: Policy and Practice*, **40**:2, 106-124.
- Liu, Z. and Ingram, G. K. (1999) "Determinants of Motorization and Road Provision." The World Bank: Washington.
- National Bureau of Statistics of China (NBSC). (2004). *China Statistical Yearbook*. China Statistical Publishing House, Beijing.
- Riley, K. (2002) "Motor Vehicles in China: The Impact of Demographic and Economic Changes." *Population and Environment*, **23**:5, 479-493.
- State Administration of Taxation. (2006) "Tax Regulations." Accessed. 2007:01/04. Chinatax: Beijing.<http://www.chinatax.gov.cn/n480462/n480513/n480979/n554274/index.html>.
- Yu, Q. M. (2002). "How Many Charges on Automobile (in Chinese)" *Economic Daily*, Febuary 27, p 3.
- Zhang, F. X. (2000) "The Wheel Is Still Blocked, Though Some Charges Are Cancelled (in Chinese)." Accessed. 2001:23/08. DRCNET (Development Research Centre Network).<http://www.drcnet.com.cn>.