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**Mobility of the Chinese Urban Poor – A Case Study of Hefei City**

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**Abstract**

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**JEL Classification:** Urban transportation, poverty, mobility

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## **Mobility of the Chinese Urban Poor – A Case Study of Hefei City**

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## **Mobility of the Chinese Urban Poor – A Case Study of Hefei City**

### **ABSTRACT**

In a rapid economic development environment with rising income, escalating motorization, and growing urbanization, it is natural for government policies to focus on solving congestion related problems caused by the increased car ownership and usage. The mobility needs of the urban poor have been traditionally neglected in policy and in practice, particularly in developing countries. This paper addresses the mobility challenges the urban poor are facing based on a household travel survey in the City of Hefei in China. It first presents travel behaviors, transportation costs and commuting problems of the urban poor. It then discusses the urban transportation policy implications and examines the prevailing trends of urban transportation policies and plans in Chinese cities. Policy recommendations are suggested to improve the mobility needs of the urban poor.

Key words: urban transportation, poverty, mobility

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### **INTRODUCTION**

Facing the ever increasing traffic congestion in large cities, a natural and passive response is to increase the supply of transportation infrastructure by building new roads, expanding existing roads and developing high-speed transit systems (Gakenheimer 1999 and 2003, World Bank 2006). Another response is to limit the usage of non-motorized travel modes such as cycling because the vast amount of bicyclists is considered to interfere with the automobile traffic (Peng 2005). However, what do these instinctive responses do to the accessibility and mobility needs of the urban poor who are too poor to own an automobile and to even ride bus or rail?

The urban poor are not a small number of people in cities, particularly in developing countries like China; they are in the tens of million. By December 2005, there are about 22.32 million urban residents or 9.8 million households living under the poverty line in China (Ministry of Civil Affairs of People's Republic of China 2006), who rely on governmental subsidies to maintain the minimal standard of living. These numbers are growing as more and more rural migrants coming to the city every year. These vast urban poor cannot be simply ignored or neglected. It is important, and in fact the responsibility of the society, to understand their accessibility and mobility challenges and serve their needs. However, how well do we understand their travel needs, challenges and travel behavior?

There are a growing number of studies in the literature on urban poverty in developing countries, from a variety of viewpoints including economics, sociology, geography, politics, and transportation (Gakenheimer 1999 and 2002, Godard and Olvera 2000, Gibson 2003, Gwilliam 2003, Xue and Wei 2003, Pucher et al. 2005, Cai 2006).

There are also many studies on urban transportation issues in China (Stares and Liu 1996, Zhou et al 2001, World Bank 2002 and 2006, China Academy of Engineering and National Research Council 2003, Chinese Academy of Engineering, et al 2004, Ng and Shipper 2005). However, there are very few studies that specifically focus on the travel needs and travel behavior of the urban poor in China (Peng 2005). To the best of our knowledge, there is only one report that discussed the travel behavior of the urban poor and the relationship between the transport and poverty in Chinese cities (Economic Research Institute, 2003). The report summarizes the findings of a study commissioned by the World Bank on the poverty and urban transport in the City of Wuhan, China. In that study, the researchers focused on the poorest quintile of the population and found that the most common transportation methods to work by the urban poor in Wuhan were walking, cycling and public transit. For non-routine travel purposes the travel modes are taxi, public transit and walking. The report also discussed some key problems faced by transit riders, pedestrians and cyclists. However, the main focus of the report is a general demographic analysis rather than an exclusive transportation analysis of the urban poor. Furthermore, the sample of the survey in this study is small, with only 115 participants. In addition, since the study focused exclusively on the urban poor, no comparisons were made between the urban poor and other income groups.

In this paper, we intend to fill the void and complement the current research by using a large-scale citywide travel survey in the City of Hefei. We illustrate the current travel status of the urban poor, discuss the challenges faced by them, and examine the inequality in urban transportation policies.

## **URBAN POVERTY ISSUES IN CHINESE CITIES**

Poverty reduction has long been the fundamental challenge faced by the governments of developing countries (Ravallion and Chen, 2004). Existence of a high proportion of the poor would greatly restrict the economic development and may lead to intense social problems and instability of the whole society.

Although China has made considerable progress in cutting the overall poverty level by almost 220 million from 1979 to 2000, the effects were almost all in rural areas (Liu, 2004). The economic reform and development over the last 25 years has enlarged the gap between the rich and poor (Yao and Liu, 2006). As a result, considerable amount of urban residents who have not benefited much from the economic reform become the urban poor. On the other hand, the process of urbanization has drawn millions of labors and families from rural areas to cities, which further accelerates the growth of urban poor in Chinese cities.

As mentioned above, there are around 22.32 million urban residents or 9.8 million households living under the official poverty line who are receiving subsidies from the government in December 2005 (Ministry of Civil Affairs of People's Republic of China, 2006). This population accounted for 4.1% of the total urban residents in Chinese cities. With the government subsidy out of the social assistance program and other limited sources of income, the average income of these urban poor is about 1,860 Chinese Yuan or 930 PPP (purchasing power parity) US dollars per capita per year (Ministry of Civil

Affairs of People's Republic of China, 2006). The specific poverty line and the level of subsidy vary across the provinces and cities, depending on the cost of living and the financial strength of the local governments and some other considerations like the Engel's coefficient of the local area and that the subsidies should not be higher than the minimal wages (Li 2001).

Over last 10 years, the registered urban poor have grown for more than twenty fold, from 0.85 million in 1996 to 22.32 million in 2005 (Ministry of Civil Affairs of People's Republic of China, 2006). Such a rapid growth of the urban poor was partly due to the increased awareness and expansion of the coverage of the social assistance program, within which more and more people are officially defined as urban poor. It also reflects the shift of the urban poor from the elderly and disabled to the unemployed. It should be noted that these numbers do not include the rural migrants who live in the city but are not registered urban residents.

The composition of the urban poor has changed during the last 10 years. In 1995, the elderly, children, and disabled accounted for 82.27% of the total urban poor while the unemployment was not an issue. However, in 2005, the share of the unemployed and the laid-off workers has risen to 37.31% (the unemployed and the laid-off workers are not the same in official Chinese statistics) (Ministry of Civil Affairs of People's Republic of China 2006). That means the increasing population of unemployment have rapidly become a main source of the urban poor. According to the official data, the registered unemployment rate was only 2.9% in 1995 and the proportion of the labor force in the labor market was as high as 83%. But by 2004, the registered unemployment rate rose to 4.5% and the proportion of the labor force in the labor market declined to 71.6% (Cai 2006). The actual unemployment rate could be much higher than that (Song 2003, Xue and Wei 2003), because these data exclude the rural migrant workers.

In 2005, more than 150 million rural residents swarmed into the cities all across China (Li 2005), and the majority of them entered into large and developed cities in the eastern coast (Liu et al 2003, World Bank 2006). Beijing had around 4 millions workers from rural areas, and Shanghai had over 3 millions. Hefei had around 0.5 million rural workers (Agricultural News, 2006). Because of the China's urban household registration (*Hukou*) system, these rural workers seldom receive the equal treatment as those who were born in the city. For example, in 2004, the average income of the urban workers is 16,020 Chinese *Yuan* which is around \$2000 USD. But the workers from rural areas only got \$800 USD on average (Li 2004). Besides, most of rural workers are deprived of all kinds of benefits like health insurance and employment-related insurance. In addition, these rural workers have to send money back to their families who still live in the rural area. Thus, these rural workers are suffering from poor living conditions, long working hours and tough working environments (Lu and Song, 2006). Yet they are not in the official governmental statistics of the urban poor and are not entitled to receive social assistance from the city government as the urban poor who were born in the city and have the urban *Hukou* status. These rural migrants constitute an ever-increasing yet undocumented urban poor population in Chinese cities. With the rapid urbanization process, more and more rural residents will move to the cities to look for employment

opportunities. As a result, Chinese cities will face an increasingly severe urban poverty problem.

## TRAVEL BEHAVIOR OF THE URBAN POOR

Life is full of challenges for the urban poor – housing issues, health issues, education issues and mobility issues, to name a few. This study focuses only on the mobility issues; there are other studies that focus on other issues (Gibson 2003, Xue and Wei 2003, Cai 2006,). Specifically, we want to find out how the urban poor travel, how often they travel, how much they spend on traveling, and how their travel compares with that of other income groups.

To answer these questions, we use the City of Hefei as a case study. Hefei is a typical Chinese large city with about 1.56 million urban residents and around 150 Sq km developed urban area. It is the capital of Anhui Province located west of Shanghai and Nanjing, adjacent to the most developed area in China – the Yangtse Delta region (Figure



FIGURE 1. The Location of Hefei City

1). The average annual income of the Hefei urban residents is around \$1,210 USD per capita in 2004, slightly higher than the average annual income of \$1,177 USD of the Chinese urban residents as a whole. The income per household in Hefei is \$3,605.8 USD per year in 2004 in comparison with \$3,533.35 USD for urban residents in China as a whole.

In 2003, a comprehensive household travel survey was conducted in Hefei and more than 100,000 records were collected by the city government and China's Southeast University. Income data were collected at the level of household in the survey. Among all the respondents, 34.4% are in the household group with yearly income less than 10,000 *Yuan* or \$1,250, which is regarded as a threshold of low-income household in the survey. Since the average household size is about 3.1 people in Hefei, the corresponding lowest income level in the survey is around \$403 per capita per year. This level of income is similar to the official poverty line of the urban poor in Hefei which is around \$345 per capita per year. More than half (55.2%) are in the next income group with yearly income between \$1,250 and \$3,750 (or 30,000 *Yuan*); 8.9% are in the third income group with income range of from \$3,750 to \$6,250 (or 50,000 *Yuan*). Only 1.2% of households are in the high income group with yearly income of \$6,250 to \$12,500 (or 100,000 *Yuan*); 0.3% of the households are in the highest income group with a yearly income more than \$12,500.

### Modal Split of the Urban Poor

For the urban poor in Chinese cities, the most common means of transportation are walking and cycling, because these two modes bear essentially no monetary costs. Figure 2 shows the different mode split across different income groups. It shows that the poorest households (with income of less than \$1,250 per year) mainly rely on walking (48.76%) and cycling (32.02%) as their means of travel. Bus helps with only 14.19% of the daily trips. In contrast, less than half of the people in the richest households (who earn more than \$12,500 per year) travel by walking (36.92%) or cycling (12.31%). In this high-income group, 21.54% of the trips were completed by private car and 11.28% by motorcycle. Bus has the highest share in the groups with medium to high income (\$3,750 - \$12,500).

In terms of journey to work commuting, the pattern of model splits does not differ much from the overall model splits of all trips by different income groups. For the poorest group, the shares of cycling (36.33%) and bus (14.99%) of commuting trips increased slightly in comparison with overall trips. But the share of walking for commuting trips reduced by about 5%. This may reflect the longer commuting distance that prevents walking and cycling. Those trips were then shifted to buses. Similarly, the shifting to buses for commuting trips happened to the medium- and high-income groups too. More than 30% of commuting trips were by buses in the second highest income group and 25% in the medium income group.

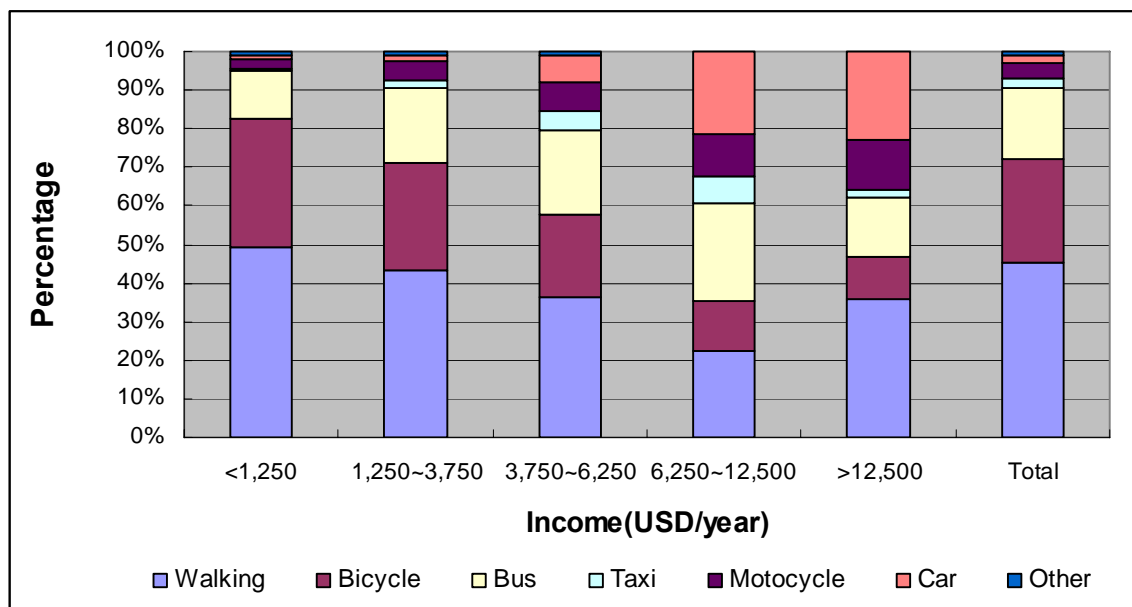


FIGURE 2 Model split share of the households with different level of income

Not surprisingly, the results reveal that the higher-income households rely more on motorized transportation mode, whether for job commuting trips or other trips. Surprisingly (or not surprisingly), the public transportation is used more by middle- to high-income households rather than by the lowest income group. Majority of the urban poor still have to rely on non-motorized modes for their daily travel. This is the case for most other Chinese cities too, large or small, except for Dalian where there are few cyclists due to the steep slopes of the city topography. In addition, it can be seen that

automobile share of the top two income groups has exceeded 20% for all trips and is close to 20% for commuting trips.

### Trip Purposes of the Urban Poor

The number of trips made for different trip purposes help to paint a picture of the different social and economic activities of different income groups. Table 1 presents the trip purposes made by different income groups. In all groups, return home trips, naturally, account for about 50% of all trips. Other important trip purposes include commuting (27.46%), school (10.72%) and shopping (6.84%). Within the lowest-income group, except for the return-home trips, the most frequent trip purpose is commuting, which accounts for 22.66% of all the trips, followed by school trip (11.41%), shopping (8.93%), visiting (2.29%), and recreation (1.54%). In comparison with other groups, the poorest households apparently travel less for commuting, which is reasonable since many urban poor are unemployed and retired. It should be noted that the poorest households take more school trips, indicating there are more school kids in those lowest income group. In addition, the urban poor make more trips for some social activities like shopping, visiting and recreation. The possible explanation for more frequent shopping is that the urban poor are more sensitive to the prices of commodities and hence they usually search for the lowest prices across different shops. They also are more likely to live in small homes without refrigerators, making frequent shopping necessary. In terms of higher visiting and recreation frequencies for low-income urbanites, it is probably because they are likely to be unemployed or retired, thus having more time for these social interaction activities.

**TABLE 1 Trip Purposes of Households with Different Levels of Income**

Trip purposes	Household income (US \$)					Total
	<1,250	1,250~3,750	3,750~6,250	6,250~12,500	>12,500	
Commuter	22.66%	29.72%	31.79%	29.09%	32.65%	27.46%
School	11.41%	10.11%	7.11%	8.98%	3.57%	10.27%
Shopping	8.93%	5.73%	6.02%	3.99%	4.59%	6.84%
Visiting people	2.29%	0.95%	0.93%	1.53%	1.02%	1.42%
Recreation	1.54%	1.45%	1.16%	0.77%	4.08%	1.45%
Errand	1.40%	1.73%	2.63%	7.29%	1.02%	1.76%
Hospital	0.49%	0.32%	0.13%	1.53%	1.53%	0.38%
Return/Home	47.62%	47.78%	47.56%	46.28%	45.41%	47.68%
Other	3.64%	2.15%	2.62%	0.54%	6.12%	2.69%
Not reported	0.02%	0.05%	0.04%	0.00%	0.00%	0.04%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

### Travel Time of the Urban Poor

Travel time is an important indicator of mobility. The average travel time for all five income groups are almost the same. The richest group has the smallest average travel time (21 minutes) and the second richest group has the largest average travel time (24 minutes). All other groups have the average travel time of about 23 minutes. Although the travel time of different groups is similar, if considering the transportation modes chosen



by each group, we can basically conclude that the poorest group of people has the lowest mobility due to their great dependence on low-mobile non-motorized transportation.

### Trip Frequency

The number of trips a household makes per day reveals the mobility of the household and to what extent the household participates in social activities. Table 2 shows the average number of trips of the households with different levels of income. The lowest-income household group made 10.43 trips per day on average. The number of trips increases with the rise of the household income. For example, the richest household group makes an average 19.6 trips a day, which almost doubles that of the poorest household group. An ANOVA test indicates that the difference of household trips among groups is statistically significant, suggesting the urban poor are less active and mobile in participating in the social and economic activities than other income groups.

**TABLE 2 Travel Frequency and Travel Time of the Households With Different Levels of Income**

Household income (US \$)	N	Mean travel time	Mean # of Trips
<1,250	3604	0:23	10.4309
1,250~3,750	4809	0:23	12.4739
3,750 ~ 6,250	692	0:23	13.9277
6,250~12,500	75	0:24	17.2533
>12,500	10	0:21	19.6000
Total	9190	0:23	11.8289

### Travel Expense

Typically, travel expense as a percentage of household income is usually higher for the lower-income households than for the higher-income household. However, this is not the case in most Chinese cities, where the travel expense ratio of the poor households is usually lower than that of the richer households. For example, Table 3 shows the ratios of transportation expense to household income for different income groups in Anhui Province, where the City of Hefei is the capital (the same data are not available for Hefei). It shows that the lowest income households have the lowest percentage of transportation expense to the total household income.

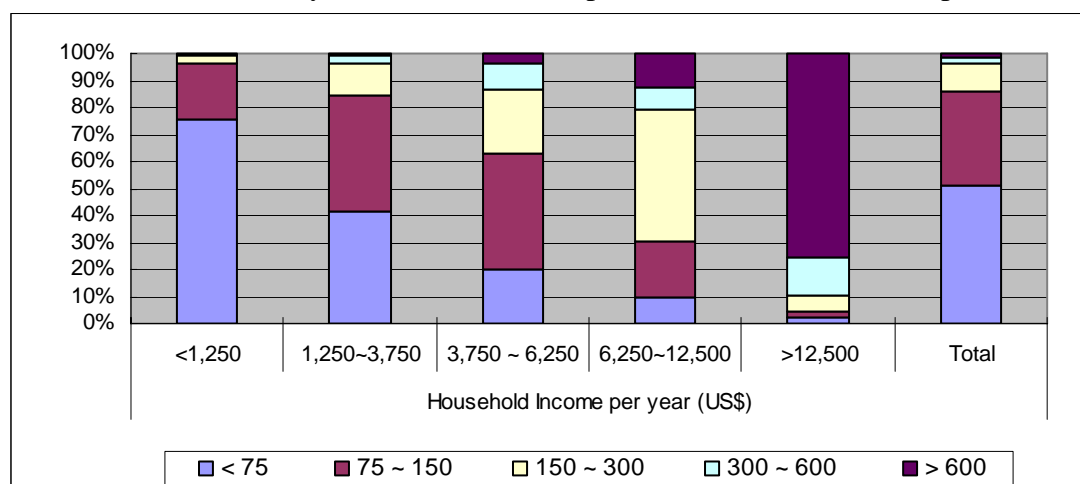
**TABLE 3 Ratios of Transportation Expense to Total Household Income in Anhui Province**

Income Category	Average	The lowest 10%	The second lowest 10%	The second lowest 20%	The third lowest 20%	The second highest 20%	The highest 20%
Transportation expense/income	3.91%	2.43%	2.80%	3.13%	3.53%	5.14%	4.25%

Source: Anhui Statistical Yearbook 2005

In Hefei, like shown in Figure 3, around 75% of the poorest households spend less than \$75 per year on travel, which allows an individual to take bus 600 times at most. That means the household could only take 1.6 trips per day. For an average household of

3.1 people, that would be 0.52 trip per person per day. Considering the average one-way transit trip from the origin to destination requires 1.5 time of transfer, each transfer is considered as a new trip in all Chinese cities, for a daily round trip it would require 3 transit trips per person. For an average household, that would be 9 trips per day. Therefore, even if only considering commuting and/or school trips to take transit, the transport expense must increase significantly (in fact it would increase by almost 3 fold). In the richest group, more than 75% of the total households spend at least \$600 per year on travel, which is nearly 8 times of what the poorest households would spend.



**FIGURE 3 Travel expense per year for households with different level of income (USD)**

A World Bank study found that a reasonable level of household expenditure on public transit travel should not exceed 10% of the household income (Robin et al 2003). Otherwise, the expense will make the public transit unaffordable to the households. If we assume all members in a poor household use buses as their main mode of travel, the estimated travel expense will be at least 27.9% in Beijing and 31% in Shanghai (Peng 2005). That is far beyond the World Bank standard of 10%. Therefore, although transportation expense only accounts for a small percentage of the total income of the urban poor at the moment, it will increase if the urban poor have to use the public transportation in the future as a result of expansion of the city size, and limiting the use of bicycles and sidewalks. The public transit would be hardly affordable for the urban poor.

### **Ownership of Cars, Motorcycles and Bicycles**

There is a strong contrast of ownership of cars, motorcycles and bicycles among different income groups in Chinese cities. As shown in Figure 4, about two thirds of households in the highest-income group (with annual income larger than \$12,500) in Hefei own cars. The car ownership decreases as the income level declines. Although the survey shows that 0.82% of the poorest households own a car, it is most likely due to reporting or data recording errors. Similarly, the ownership of motorcycle is the highest in the highest-income group, and the lowest for the poorest group (Figure 4). In contrast, the poorest group has the highest bicycle ownership while the richest group has the lowest bicycle ownership (Figure 4). Around 70% of the poorest households have at least one bicycle, while only less than 25% of the richest households have any bicycles at all.

Nationally, the poorest 20% of urban households have 0.013 motorcycles and 1.3 bicycles in 2003 (National Bureau of Statistics of China, 2004). These vehicle ownership data show that the high-income households in Chinese cities have been entering the motorized age, but the urban poor have to depend on non-motorized modes for their daily travel.

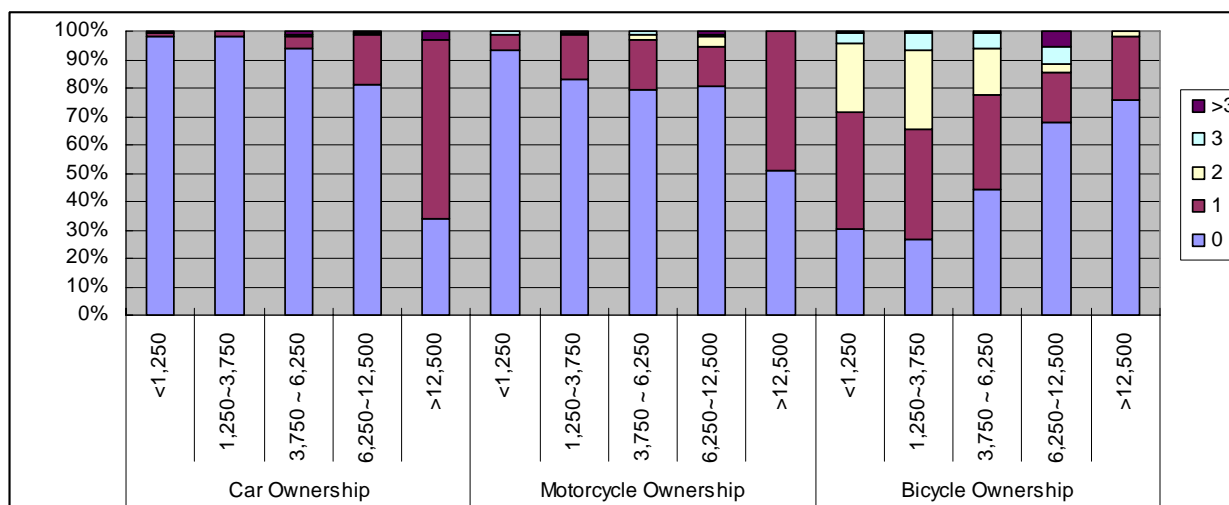


FIGURE 4 Number of cars, motorcycles and bicycles in households with different levels of income

### Travel Safety

The rapid motorization and road expansion have brought more traffic accidents. In 2003, traffic crash caused 104,732 deaths and 494,174 injuries in China (National Bureau of Statistics of China, 2004). The number of traffic fatalities had increased around 9 times since 1971. However, among all the road users, pedestrians and cyclists have suffered the most from the increasing traffic crashes. In 2002, 25.2% of traffic fatalities are pedestrians, 17.8 % bicyclists and other non-motorized vehicle riders, 20.0% motorcyclists, 23.8% car, tractor and other motor vehicle passengers, and 8.5% automobile drivers (Wang 2004). Table 4 displays the traffic accidents happened in Anhui Province in 2003. Obviously, the fatality rate of the non-motorized transport users (0.370 death per accident) is much higher than that of motor vehicles drivers (0.206 death per accident). When pedestrians and cyclists are involved with crashes with motor vehicles, they are generally in a far more dangerous situation than motor vehicle drivers. Since the urban poor mainly rely on walking or cycling for their daily travel, and most of them neither know traffic rules well nor do they strictly follow traffic rules, they are more susceptible to death and injury than other income group of people.

TABLE 4 Traffic Accidents Statistics in Anhui Province in Year 2003

Accident Category	Number	Death (Person)	Injury (Person)	Property Damage (USD)	Fatality Rate (Death/accident)
Total Accidents	28114	4557	21291	11,842,500	0.162
Total Motorized Vehicle	20964	4327	20918	9,125,000	0.206
# Automobile	15276	2925	14548	8,273,750	0.191
# Motorcycle	2760	566	3257	272,500	0.205

Total Non-Motorized	533	197	428	50,000	0.370
# Bicycle	203	47	171	16,250	0.232
# Pedestrian	170	87	112	16,250	0.512

Note: Total Motorized Vehicle accidents include automobile and motorcycle accidents.

Total Non-Motorized Vehicle accidents include bicycle and pedestrian accidents.

## IMPACTS OF THE URBAN TRANSPORTATION POLICIES ON THE URBAN POOR

The prior section demonstrates that in comparison with higher-income groups, the urban poor rely mostly on non-motorized travel modes to complete their essential activities. The mobility of the urban poor is thus greatly restricted.

Moreover, the survey results reflect only the current state (in 2003) of travel behavior. In a rapid changing environment of economic development, urbanization and suburbanization, and motorization, the travel behavior and travel needs of the urban poor will certainly change (World Bank 2006). Unfortunately, these changes will bring more negative impacts on the mobility needs of the urban poor. This section discusses these changing environments and their impacts on the urban poor, and suggests specific urban transportation policies to address the mobility needs of the urban poor in Hefei and other Chinese cities.

### The Growing Gap between the Rich and the Poor

The rapid economic development in China since the 1980s has resulted in escalating income inequality among urban residents. Official data show that the commonly used measure of income inequality Gini coefficient has increased from 0.236 in the 1991 to 0.326 in 1995, 0.351 in 2004, and 0.394 in 2005 (Yue and Liu 2005). However, the United Nation's report suggested that the Gini coefficient in China had reached 0.45 in 2004, which had passed the generally believed alarming threshold of 0.4 and indicated the severity of income inequality in Chinese cities (United Nations Development Program, 2005). It indicates that the urban poor get poorer comparing with the rich over the years.

In addition, the income gap between registered urban residents and migrant rural residents who live in urban areas is also widening. For example, the salary increase from 1994 to 2005 for urban residents is 365% but is very little for rural migrants who work and live in the cities (China Statistical Yearbook 2005, 2005). In the Pearl Delta area, for example, the average income of the rural migrants increased only 68 *Yuan* or 8.5 USD in the last 12 years (Xinhua news, 2005). Furthermore, as we discussed in the beginning of the paper, the number of urban poor has increased over the 20 years. Despite the central government's effort to reduce income inequality, this trend is less likely to be reversed in the near future, which indicates urban poverty will be a long-time issue for Chinese cities. Addressing the mobility needs of the urban poor will remain a long-term challenge for urban transportation policies.

### Rapid Motorization

One of the direct consequences of rapid economic development is the increasing motorization, particularly the rapid increase of cars and motorcycles. From 1981 to 2003, the total number of motorized two-wheelers rose from only 200,000 to nearly 60 million in China—a 300-fold increase (National Bureau of Statistics of China, 2004). Similarly, in Anhui Province, the total number of motorized two-wheelers increased from 11,700 in 1990 to 1,259,200 in 2002, a 107-fold increase (Anhui Statistical Yearbook 2003, 2003).

More importantly, from 1991 to 2003, the number of cars per 1,000 population in China rose from less than 2 to almost 10—a five-fold increase in only 12 years (National Bureau of Statistics of China, 2003). The car ownership is even higher at larger Chinese cities. For example, the car ownership rates were 86 per 1,000 for Beijing, 27 for Shanghai, 20 for Tianjin, and 16 for Nanjing (National Bureau of Statistics of China, 2004; Bureau of Statistics of Tianjin, 2004; Nanjing City Transportation Planning Institute, 2004). This rapid motorization has accelerated in recent years. For example, from 2001 to 2002, the number of cars per 1,000 population in China rose from 7.79 to 9.36. The City of Hefei is no exception, the car ownership rates were 27.7 per 1,000 people in 2005, a 46.5% increase from 2003 (Bureau of Statistics of Hefei, 2004).

### **Transportation Network Expansion**

To accommodate the rising motorization and address ever-increasing traffic congestion problems, Chinese cities, including Hefei, have been focusing their attention on building more roadways and high-speed rail system (World Bank 2006). Most of the mobility needs of the urban poor have been neglected. In China as a whole, the urban roadway network more than doubled in length between 1990 and 2004, from 95,000 km to 223,000 km (National Bureau of Statistics of China, 2005). China's expressway system has now become the second most extensive expressway system in the world after the USA, reaching 34,300 km in length in 2004. Similarly, the roadway network in Hefei has expanded in length by 163% between 1990 and 2005, from 346 km to 911.10 km. The urban arterials in Hefei have increased 131.7 km in length from 1996 to 2005, an 87% increase over the 10 years (Hefei Municipality, 2006). For the coming years, Hefei is planning to construct and reconstruct five additional expressways and 10 arterial roads in the next five years, which will cost around \$1.53 billion (Xinhua News, 2006). At the same time, 12 bus rapid transit (BRT) routes will be built in Hefei as an effort to improve the public transit. However, Hefei's plan didn't mention improving pedestrian and biking environment at all, indicating an imbalance in priorities for different transportation modes, despite walking and biking are still the most dominant modes of transportation for most urban residents.

### **Urbanization and Suburbanization**

Two seemingly opposite processes have been going on in most Chinese cities, urbanizations and suburbanization (World Bank 2006). Urban population has grown rapidly in Chinese cities, rising from 178 million in 1978 to 524 million in 2003 (an average annual increase of 4.4%) (National Bureau of Statistics of China, 2004), largely due to the mass migration from rural areas. For Hefei, the urban population had increased from 710,000 in 1978 to 1,558,700 in 2003. The developed area expanded from 458

square km in 1997 to 596.01 square km in 2003. The distance from the urban fringe to the city center increased from 21 km in 1997 to 25 km in 2003 (Bureau of Statistics of Hefei, 2004), making it more difficult for walking and biking.

On the other hand, many manufacturers have moved to suburbs; many residential areas in the city center have been redeveloped to commercial, office and high-end residential properties, forcing many original residents, many of whom are urban poor, to relocate to urban fringes. Due to the mono-centric urban pattern in most Chinese cities, while residents are relocated to the urban fringe, most jobs still remain at the city center. Therefore, the travel distance naturally increases, causing more problems for the urban poor who rely mostly on non-motorized model for travel.

### **Changes in Public Transportation Policy and Planning**

Affordability is clearly a primary consideration for the urban poor to choose modes of transportation. The survey results from Hefei show that the model share of public transit in the poorest group is the lowest among all income groups, which is primarily due to the cost of riding bus, in spite of the fact that the City of Hefei provides an extensive bus transit system with 106 bus routes and more than 2,400 buses carrying 1.06 million passengers per day.

An affordability index, defined as the fare expenditure made by a household as a percentage of its income, is commonly used to gauge the transit affordability. Robin, Malise and Anuja's (2005) report on affordability addressed the concept and measurement of the affordability index for people with average income and people in the bottom quintile of income distribution. By calculating the indexes, factors including income, quantity of travel, and transport fares, pass and concession should be considered (Robin et al, 2005). Based on this methodology, we calculated the current affordability index in Hefei and got 6.6% for people with an average income and 12.9% for people in the bottom quintile of income distribution. This is in comparison with the affordability index for people in bottom quintile of income distribution for Guangzhou (14%), Beijing (9%) and Shanghai (6%) (Robin et al, 2005). However, these average numbers do not necessarily apply to the poorest urban poor. In addition, the privatization of many public transit companies has put strong pressure on these companies to make profit or at least be self-sufficient, thus forcing the public transportation system to adjust the fare structures and operation strategies.

Similar to the public transportation systems in other Chinese cities, the transit system in Hefei has the obligations to attract more riders and eliminate or decrease government subsidies. Thus, on the one hand, the transit system increased the number of buses from less than 2,000 in 2002 to more than 2,400 in 2005 and introduced new technologies like electronic ticketing to improve services (Hfbus, 2006). On the other hand, the fare structure was adjusted and fare increased. In 2006, a new fare structure was implemented in Hefei. The original monthly pass, which can be used by every citizen, was cancelled. Instead, riders have to pay every time they take buses by using cash or an Integrated Circuit Card (IC card). Although the urban poor who qualify for MLSS (Minimum Living Standard Scheme) support only pay half as much as the regular bus fare (0.5 or 1 *Yuan* per trip) for up to 60 rides per month, their expenses would be more

likely higher than the original 40 *Yuan* pass which is for unlimited trips per month. Besides, a number of old buses have been replaced by new air-conditioned buses which charge higher fares (2 *Yuan*, which doubles the basic bus fare). All these changes indirectly make buses more expensive to ride.

In addition to the fare rise, Hefei transit system also makes efforts to adjust bus routes. In 2006, 17 bus routes were combined into eight routes and another nine routes were replaced by seven new routes (Hfbus, 2006). Although the decrease of bus routes reduces the cost of providing the service, it increases the waiting and walking time for transit riders. The changes experienced in the Hefei transit system are not alone and are also experienced by transit systems in other large Chinese cities.

The combination of increased fare and reduced transit services not only affects the mobility of the urban poor but also sets barriers for them to access jobs and better social services (Economic Research Institute, 2003). As reported in the Wuhan study, many respondents clearly indicated that their employment options were limited because of high costs of commuting (Economic Research Institute, 2003).

In order to improve the accessibility to services and job opportunities for the poor, the city government should consider measures to compensate the urban poor for their travel. These measures reduce the costs of using transit, and provide access to better job opportunities and social services to the urban poor, which would further lead to the reduction of urban poverty.

### **Policies and Practice to Cycling and Walking Facilities**

Notwithstanding bicycling and walking constitute the dominant travel modes in Chinese cities, their importance in the overall transportation systems has been given little attention in the majority of urban transportation development strategies and plans. In some major arterials in Hefei, the motorized vehicle lanes are encroaching upon the original bicycle lanes to meet the growing motorized traffic demand. Bicycles and pedestrians usually share the same right of way of sidewalks. Even on the specified bicycle-only lanes, cyclists still have to be wary of buses and trucks that load and unload everywhere on the roads (Hefei Evening News, 2006). It is also common in Hefei and many other Chinese cities that sidewalks are occupied by all kinds of parked bicycles, motorcycles and cars. The environment of cycling and walking has significantly deteriorated to accommodate motorized traffic over the last few years.

Intersections and crosswalks are particularly dangerous for pedestrians and cyclists. There are several problems. First, pedestrian crosswalk facilities are badly needed at high traffic intersections in Hefei and other cities. But these crosswalk facilities are not given high priority in the city's infrastructure improvement program. Second, traffic rules are not strictly enforced; pedestrians often take the chance to cross the roadway at any time they wish, and automobiles often do not yield to pedestrians. All these put the urban poor in a safety disadvantage.

### **Policy Recommendations**

Many Chinese cities are experiencing an explosive population growth as an enormous number of migrants are leaving their native rural land for the cities. These migrants along with the laid-off workers from the state-owned enterprises constitute the majority of urban poor. Because their low income limits their usage of public transportation, the urban poor rely mostly on walking and biking to get to jobs, schools and other essential social services. This limited mobility of the urban poor will get worse as the income inequality increases, urbanization and suburbanization process accelerates, and motorization and subsequent traffic congestion exacerbate. Governments and decision-makers should make policy changes to improve the mobility of the urban poor.

One way to help the urban poor is to improve the physical environment of walking and biking, making it safer and more convenient for pedestrians and cyclists, and making cycling a viable transportation mode. Build more bicycle lanes on local streets and on bus-only streets (preferably median-separated bicycle lanes), and construct more secure bicycle parking facilities and more park-and-ride facilities for cyclists near major rail stations. In addition, more traffic education should be provided to pedestrians and cyclists and make sure traffic rules are enforced. Hefei municipality is dedicating its effort to bicycling regulation, trying to improve the travel behavior of cyclists to decrease the crashes.

Another way to help the urban poor is to improve transit services and reduce the cost of using transit for urban poor. As the city size grows, urban residents can no longer only rely on walking and biking to access job opportunities and essential social services. Owning a car is not an option for most urban poor in China for the foreseeable future, despite the fact that motorization has been increasing rapidly (World Bank 2006). Therefore, public transportation is the only viable option. Improving transit services and shifting some investment from roadway system improvement to transit services are the ways to improve the mobility and accessibility of the urban residents in general and the urban poor in particular. In addition, public transportation is still not affordable to the urban poor. Therefore, a reduced fare or some forms of transportation subsidy to the urban poor should be provided to help them access job opportunities and social services.

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