Affordability of Public Transport
in Developing Countries

Robin Carruthers, Malise Dick and Anuja Saurkar

To order additional copies of this publication, please send an e-mail to the Transport Help Desk transport@worldbank.org

Transport publications are available on-line at http://www.worldbank.org/transport/

TABLE OF CONTENTS

PREFACE

The analysis reported here was prompted by a realization that there was little reliable and consistent information on what proportion of household income is spent on urban public transport. The information available uses inconsistent definitions of what costs are included and how income is measured, making comparisons between cities difficult.

To address the need for easily available and comprehensive comparative information on affordability of public transport fares, we have developed an Affordability Index that is easy to measure and can be used as a first indication of the affordability of fares in a particular city. The Index is computed for a person on an average income and for someone in the bottom quintile of the income distribution. In developing this Index there has been no intention to indicate a proportion of income that is considered "affordable" as there are many additional factors than income that should be taken into account if such a proportion is to be suggested

Technical Papers are published to communicate the results of The World Bank's work to the development community with the least possible delay. The typescript manuscript of this paper therefore has not been prepared in accordance with the procedures appropriate to formally edited texts. Some sources cited in the paper may be informal documents that are not readily available.

AFFORDABILITY OF PUBLIC TRANSPORT IN DEVELOPING COUNTRIES

1   THE FUNDAMENTAL PARADOX OF URBAN TRANSPORT STRATEGY

In 2002, the World Bank published *Cities on the Move*, an urban transport strategy review that took a broader perspective than an earlier strategy[i] which had focused on economic and financial viability and less on the livability of the cities, which in turn depends on their being competitive, financially sustainable, well governed and well managed. *Cities on the Move* has a strong focus on poverty. It concentrates on the problems of people who are very poor, not only in terms of their income but also in terms of the broader dimensions of social exclusion associated with inaccessibility to jobs, schools, health facilities and social activities. Cities on the Move identified three aspects of urban development that create a fundamental paradox of urban transport strategy.

(i)   Urban transport can contribute to poverty reduction both indirectly through its impact on the city economy and hence on economic growth, and directly through its impact on the daily needs of poor people. But it exhibits a fundamental paradox. How can a sector with such an obvious excess of demand over supply, and with such a heavy involvement of private suppliers of service, fail so badly to meet the aspirations of politicians and citizens alike? Why has it not been possible to mobilize commercial initiative to yield the kind of revolution in service quality and cost which has been achieved in telecommunications, water and energy sectors? And why does increasing affluence seem to have the effect of reducing the quality of travel, at least for poor people?

(ii)   Urban growth increases transport costs. From the viewpoint of efficiency and growth it is not too difficult to characterize the central problem. Economies of agglomeration generate the growth of cities. As cities grow and become richer, vehicle ownership and use grow more rapidly than the available road space, resulting in increased congestion and traffic-generated air pollution.

(iii)   Urban growth often has perverse distributional effects. As cities expand, the price of more accessible land increases. Poor people are forced to live on less expensive land, either in slums or on the periphery of the city. As average incomes grow and car ownership increases, the patronage, financial viability, and eventually quality and quantity of public transport diminishes. Motorization, which is permitted by the growth process, may thus also make some poor people even poorer. In particular, in the absence of efficient congestion pricing for road use, piecemeal investment to eliminate bottlenecks will almost certainly benefit the relatively wealthy at the expense of the poor.

The strategy went on to identify four main ways to address these problems:

- structural change;
- improved operational efficiency of the transport modes;
- *better focusing of interventions to assist the poor, and*
- institutional reform.

The development of an Affordability Index is intended to shed more light on the impact of this paradoxical situation, particularly on the possible perverse distributional effects on the very poor.

2   THE CONTEXT OF AFFORDABILITY

Most studies of the adequacy of urban transport make reference to a set of parameters that, for convenience, all start (at least in English) with the letter "A". Any comprehensive approach to improving public transport from a user's perspective should address all four of these parameters.

"Affordability" refers to the extent to which the financial cost of journeys put an individual or household in the position of having to make sacrifices to travel or the extent to which they can afford to travel when they want to. While a family on a low income (say in the bottom quartile of the income distribution) might be able to afford the necessary journeys to work for the income owners of the family, they might not be able to afford trips to school for their teenage children, or for their children to visit a grandparent in hospital. For such a family, urban transport would, by most standards, be considered unaffordable. So affordability can be considered as the ability to make necessary journeys to work, school,

health and other social services, and make visits to other family members or urgent other journeys without having to curtail other essential activities.

"Availability" of transport is used to refer to route possibilities, timings and frequency. Whatever the purposes of an individual's journey, be it education, work, leisure, personal services, or another, her/his activities are constrained by the route and the time taken traveling. Even if an individual has a bus stop within a reasonable distance, say 400 meters of their home (the most common measure of public transport accessibility), the amount of use it will be to any individual entirely depends on where he/she wants to go, how often, and how long the whole journey is going to take. Furthermore, a bus stop 400 meters away from home, particularly one with no seats or shelter, or one which can only be reached by crossing a major traffic artery, may be of little use to a person with, for example, a weak heart or knees, heavy shopping, or young children. Timings and frequency are included since if there is no service when a person wants to travel, there is no available transport.

"Accessibility" describes the ease with which all categories of passenger can use public transport. For example, buses with high steps are notoriously difficult to board, particularly if they are one-person operated and there is no assistance. They are also difficult to use for those carrying luggage or shopping or with young children. Accessibility is also sometimes used to describe the ease of accessing the bus stop or station, although sometimes these parts of the journey are referred to as part of the "public transport environment". If a walk is intimidating or dangerous, a bus stop at 200 meters distance may be perceived as inaccessible to a fit 14-year old boy because of the risk of mugging. Accessibility also includes ease of finding out about travel possibilities, i.e., the information function.

"Acceptability" is another important quality of public transport, whether because of the transport or because of the standards of the traveler. Even if a bus has all the first three

qualities, potential travelers may be deterred by the state of the vehicles, lack of personal security on buses or trains, particularly at night, drivers' attitudes and driving style, lack of waiting facilities and other attributes of public transport travel.

This report focuses on the first of these characteristics since it is the one that has led to most controversy in the context of restructuring of previously publicly operated urban transport.

The concept of Affordability used here is based on that given above, the ability to undertake transport movements without significantly constraining the ability to undertake other activities of importance. This could be translated into a series of utility functions, in which the marginal level of utility would be equalized across all forms of expenditure. This is analogous to Pareto optimality in expenditure across consumption categories. However, in the non-ideal conditions of urban life, prices for many consumption goods are not determined by market principles, so that consumption patterns cannot be maximized. Particularly for the very poor, if all prices were market determined, there is a risk that their life would be unsustainable. An indication as to whether public transport prices could contribute to such a situation is consideration of an Affordability Index.

There is a widely held belief that potential low income passengers are forced to curtail the number of trips that they make, use modes of transport that do not incur a direct cost, such as walking or cycling, or to live in locations that minimize their transport costs. This is particularly true now, when many urban transport services are provided by private operators who are under pressure to be financially self-supporting, in contrast to the situation common one or two decades ago, when urban passenger transport services were considered as public services and often provided with significant explicit or implicit subsidies. The survey reported in Section 3 undertaken in Mumbai found some evidence of all these impacts.

The form of the Index is relatively simple, and the data for its compilation is relatively easily available:

Affordability Index = $\underline{\text{Number of trips x Average cost per trip}}$ expressed as a percent
Per capita income

3   EXISTING INFORMATION ON AFFORDABILITY

We report here on about a dozen studies that have addressed the issue of affordability. Some of these have been undertaken or commissioned by the World Bank, most of the others have been written contributions to conferences on urban poverty issues. Each of the studies has taken its own perspective on what income measure to use (income or expenditure based, individual or household income, gross or disposable income, etc.) and on what fare measure to use (actual expenditure in most cases, but theoretical or average expenditure in others), and most have use a measure of poverty that is specific to the local circumstances (although about half have used a quintile or decile of the income distribution). These differences make it difficult to compare the results between cities, but from the following summary of studies in South America, South Asia, Eastern and Western Europe, Africa, East Asia and Australasia, it is clear that the affordability of urban transport is considered an issue of importance throughout the developing world. There is also evidence that the high cost of urban transport is having a negative impact on the lives of the urban poor – either through restricting their access to jobs that are within feasible walking or cycling distance, by consuming an unsustainable proportion of their income, or by dramatically curtailing the number of journeys that they make. The problem is possibly most grave in Africa, the continent for which we have least documentation. The first study shown is provided as evidence of a worsening affordability of urban transport for the poor over the last ten to fifteen years.

3.1   Latin America in the Late 1980s

One of the earliest comparative studies of the affordability (and supply) of urban public transport was undertaken by the Economic Commission for Latin America and the Caribbean in 1988[ii] and reported in 1992. This showed what expenditure would be needed to make fifty trips per month, expressed as a percentage of the minimum wage, for ten cities in Latin America. The results (Table 1) showed a wide range of affordability, from a maximum of 33 percent in La Paz, Bolivia to a minimum of 2 percent in Mexico City. These were both significantly lower than the figures from more recent studies (and for those cities that are included in the Affordability Index for 2004, see Table 5).

Table 1. Fare as a Percent of Income, Latin American Cities, 1988	
City	**Fare expressed as percent of the minimum wage**
La Paz, Bolivia	33%
Santiago, Chile	28%
Brasilia, Brazil	26%
Sao Paulo, Brazil	10%
Lima, Peru	9%
Buenos Aires, Argentina	8%
Bogota, Colombia	6%
Quito, Ecuador	5%
Havana, Cuba	3%
Mexico City	2%

Source: The Impacts of Subsidies, Regulation and different forms of ownership on the service quality and operational efficiency of urban bus systems in Latin America. ECLAC, 1992.

3.2   Buenos Aires

The economy of Argentina suffered a dramatic collapse at the beginning of this decade, and with most public utilities having been privatized during the previous decade, there was a concern that the impact of market-based utility tariffs, including those for public transport, would have an inequitable impact on the poor. Even the number of poor increased dramatically, with the poverty rate increasing from an already high of 37 percent in 2001 to a peak of 58 percent at the end of 2002. One measure of the impact of the crisis was a 15 percent reduction in the number of bus passengers, 23 percent in suburban rail passengers, and 10 percent reduction in metro (underground railway) passengers. There was also an increase in fare evasion on the buses, with more passengers paying the minimum fare rather than the one that corresponded to their journey length.

The World Bank, together with the Center for Economic Studies at the Argentina Business University,[iii] undertook household surveys to determine the impact of higher tariffs and lower incomes on people in different income groups. The survey showed that in Buenos Aires the number of one-way work trips per week for families in the bottom quintile of the income distribution reduced from more than

nineteen to about sixteen. Despite families in the bottom quintile of the income distribution walking for more than half their journeys to work (53 percent), the percentage of family income they spent on public transport in journeys to work was about 32 percent. For a family on the average income the percentage of income spent was 13 percent, still quite high but much less than for the lower income group.

Table 2. Expenditure on Travel to Work, Buenos Aires 2002			
Income range	Average household income per week ($)	Average family expenditure on travel to work $ per week	Percentage of income on travel to work
Bottom quintile	211.2	66.8	31.6%
Fourth quintile	449.2	107.8	24.0%
Third quintile	564.1	86.4	15.3%
Second quintile	902.4	96.5	10.7%
Top quintile	1748.7	149.0	8.5%
Average	833.5	106.5	12.8%

Source: Estudio sobre el diseño de una política social para los servicios de infraestructura en Argentina, Banco Mundial y OBOPE, Agosto 2002.

3.3   Sao Paulo

Brazilian urban planners have recently come to a consensus on the problems facing urban centers in the country and agreed that public transport is an essential factor to shape the living conditions of the city's inhabitants.[iv] This is particularly true for the poorer segments of society. Despite improvements in many indicators, poverty and social inequality have remained the same or deteriorated. In addition, the profile of urban poverty is changing, being created by unemployment, low income informal employment, spatial exclusion, lack of mobility and access to more dynamic city centers, and a vicious circle of lack of services and opportunities which is difficult to break.

Not only has the urban population increased, income levels have declined so that now 78

percent of the poor live in cities and urban centers. The poor in the Sao Paulo metropolitan area suffer particularly from low mobility and lack of access to public transport. Long distances and trip times, deficiencies in the supply of public transport in the peripheral area and lack of an integrated fare systems are the main reasons for these problems. Despite the advantages of the "*vale transporte*", a federally mandated subsidy that requires employers to make up the difference between 6 percent of salaries and the cost of home to work travel for formal employees, the proportion of income of the bottom quartile of the income distribution spent on travel is very high. About 40 percent of the employed urban poor are either self employed or work in the informal sector and therefore do not qualify for the *vale transporte.* Unconstrained land speculation had made it almost impossible for the poor to live close to the city centers, and they have been "peripheralized" to the outer suburbs, exacerbating their commuting problem. The latest travel survey data indicates that people in the lowest income group (less than five minimum salaries) make less than one third the number of trips of those in the highest income group (more than thirty times the minimum salary). However, they are spending more than 30 percent of their income on transportation compared to 7 percent for the highest income group.

3.4   Belo Horizonte

Another study was undertaken in Brazil in 2004. This study was aimed at finding measures of Affordability, Availability, Accessibility and Acceptability and proposing a synthetic index which translates those concepts into one measure, and then seeing how these measures varied between income groups. The concepts were applied to Belo Horizonte which had the data required for this application. In the analysis of the results, a direct relationship between the index of adequate transport and access of the poor to transport services was observed, showing the important role played by affordability in the access of the poor to these services. The worst indices were found in the areas where there was a high concentration of low-income populations, and where accessibility was blocked by physical barriers such as motorways, tunnels, viaducts and freight railways. The *vale transporte*, describes above in the case of Sao Paulo also applies to Belo Horizonte, so the recommendations of this study were related to providing directed

subsidies for the unemployed and those employed in the informal sector who do not qualify for the *vale transporte.*

3.5 Mumbai

A study was undertaken in Mumbai in 2003[v] aimed at learning more about the transport behavior of the poor, their residential and work patterns and how these are affected by transport policy. The analysis was based on the results of an extensive household survey that sought data on the socio-economic characteristics, their travel patterns and

choices, and their attitudes towards particular aspects of urban transport, such as the quality and reliability of bus and train services.

In respect of the affordability of public transport, the evidence was that the poorest respondents in the survey spend almost 15 percent of their income on public transport (and almost nothing on personal transport), while the highest income category spent less than 10 percent of their income on transport, and more than half of that on personal (that is, private car) travel and less than 4 percent of their income on public transport.

Table 3. Mumbai: Expenditure and Income Share (percent) on Transportation

Income in Rs/month	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	Total
Bus	43	49	53	67	65	52
Rail	25	31	40	53	72	38
Taxi	27	33	43	78	100	46
School Bus	1	1	3	9	12	4
Fuel	13	33	52	134	378	71
Bicycle Repair	1	5	10	24	79	13
Vehicle Repair	0	0	0	0	1	0
Total (fare & fuel only)	108	148	191	341	628	211
Total (incl. maintenance)	110	153	201	365	707	224
Share(fare & fuel only)	14.7%	9.3%	8.9%	9.6%	8.2%	9.6%
Share(incl. maintenance)	14.9%	9.6%	9.4%	10.3%	9.2%	10.2%

Source: Urban Poverty and Transport: The Case of Mumbai, World Bank, 2004 (draft).

3.6 Delhi

In a paper presented to the Forum on Urban Infrastructure and Public Service Delivery in New Delhi in June, 2004, Badami, Tiwai and Mohan [vi]reported on access and mobility in Indian cities. They observed that motorization is growing even faster than population in Indian cities, and that while the poor benefit lest from increased motorization they bear the brunt of its negative impacts. They see the policy challenge as how to fulfill mass mobility needs while minimizing the negative externalities.

Most of the quantitative information presented in the paper drives from a 1994 household travel survey in Delhi, this being the most extensive recent survey available. This survey, as well as a less detailed survey on Mumbai showed a high proportion of total trips by

public transport, over 40 percent in Delhi and over 80 percent in Mumbai (44 percent bus and 36 percent rail). In Delhi, the lowest income group made more than 50 percent of their trips by walking, about one third by bus and about 9 percent by bicycle. A large part of the explanation for the high walking percentage in Delhi was the short average trip distance. Despite the high proportion of walk trips, the lowest income group (the income ranges were not defined by relation to the average income) spent more than 18 percent of their income on transport. Although the percentage of income spent on travel for the highest of the five income groups was about the same, the actual amount was ten times higher. A note in the report indicates that the survey results only apply to the residential population that included at least one employed person, and so missed the unemployed, homeless, institutional and "floating" popu-

lations that together make up the majority. The authors reported that for a household living in the outskirts of Delhi and with an income of Rp 2000 (not the lowest quintile) would need to spend about 25 percent of their income just on the travel to work for one person. For the lowest quintile the figure would be closer to 50 percent of income.

3.7   Islamabad

Another paper presented at the Forum on Urban Infrastructure and Public Service Delivery reported on the impact of franchised bus services in Pakistan, particularly in the Greater Islamabad Rawalpindi Area (GIRA). The transportation needs of the GIRA are rather unusual in the as a new capital Islamabad is a large employment generator whereas as a longer established city, Rawalpindi has more residential accommodation, so the average journey to work is quite long in terms of time, distance and cost.[vii]

Public transport was deregulated in Pakistan during the 1970's but the government continued to be the main supplier of public transport. By 1998 the quality and quantity of public transport had declined so far that the government decided to shut down the public company and leave the task to the large number of small private operators who were already in business. But by the 1990's this system had also failed to provide a desirable quality and quantity of public transport and was specifically inadequate for the physically disabled, seniors and women, so the government introduced a franchise system. Under this operators were given exclusive rights on a route in return for a guaranteed minimum level o service. A subsidy of between 4 percent and 8 percent was offered on the cost of non-air conditioned and air conditioned buses respectively.

 While there have been many benefits of the franchise system, among its dis-benefits to the poor has been an increase in fares of between 40 percent and 60 percent on most routes. For a household in the bottom quintile of the household expenditure distribution with two employed people (the average number), using the franchised bus services would require more than 40 percent take up more than 40 percent of their total household expenditure, while for a household on an average income it would still require more than 20 percent of their total expenditure. With regular buses these

percentages would have been about 25 percent and 12 percent respectively.

3.8   Eastern Europe

Another World Bank supported study[viii] had among its objectives an analysis of the impact of public transport costs on the working poor in ECA countries and an identification of measures to address affordability issues.

Many poor workers in many East European and Central Asian cities need to make long work trips and depend on the deteriorating public transport system to have access to their jobs. This was confirmed by two small pilot surveys in Sofia and Bucharest. These also showed that despite the relatively low fares, poor workers spend large shares of their income on their work trip. The danger is that for some people the trip to work becomes so expensive that it is no longer worthwhile to do the job.

The study looked at possible ways in which the problems experienced by the poorer parts of the urban population concerning their work trips might be solved. The study looked in more detail at Sofia and Bucharest through undertaking Household Mobility Surveys (HMS), and complemented this work with a desk study review of statistical data for cities in Kiev (Ukraine) and Cheboksary, Chelyabinsk and Khabarovsk (Russian Federation).

The HMS generated data and analysis proved the most useful and revealing. It reviewed expenditures on transport for three groups, defined as Low, Medium and High incomes. The percentage of income which would be absorbed by the number of trips identified (77 per month for Bucharest, 66 for Sofia) and using non-subsidized daily fares would be between 24 percent and 32 percent of income for Bucharest, and 18 percent to 23 percent for Sofia. Monthly passes are available in both cities at deep discounts on the price of a single ticket, so that the percentage of the minimum wage absorbed by using monthly passes for the same number of trips would be only 13 percent in Bucharest and 16 percent in Sofia.

Monthly tickets are not the only form of discounted ticket available in these cities, some passengers continue to have access to preferential passes. For example in Bucharest, while only 7 percent of trips are made with a pass, this increases to 16 percent for the low income group. More detail on the availability of preferential passes in Sofia indicated that most

were for pensioners and students. Also in Sofia the distribution of preferential passes between income groups showed little variation, suggesting that there is no policy of targeting the poor, or if there is one, that it isn't working.

3.9   United Kingdom

The government of the United Kingdom has undertaken and commissioned many studies that deal with the affordability, availability and accessibility of urban public transport. However, there is no national scheme for providing subsidies to people on low incomes to make their urban transport more affordable. Bus pass schemes are limited to students and retired people—and in some cities to the unemployed when they are looking for work. The largest subsidy, a rebate on the tax on fuel consumed by public transport vehicles, bears no relation to income or any other indicator of need.

Some municipal governments enter into Quality Bus Partnerships, which are agreements under which the operator will provide services additional to those commercially justified while the municipality will invest in traffic management schemes that favor buses, bus stations and other passenger facilities. Rarely if ever do these agreements provide specifically for low income passengers.

The Commission for Integrated Transport (CfIT) is an independent body advising the Government on integrated transport policy. CfIT takes a broad view of integrated transport policy and its interface with wider government objectives for economic prosperity, environmental protection, health and social inclusion. Physical integration—the principle of ensuring transport modes operate in conjunction with one another, is just one vital element of the bigger transport picture. The Commission provides expert advice supported by independent research. In March 2002 the CfIT produced a report Obtaining Best Value for Public Subsidy for the Bus Industry[ix]. As part of its analyses, the CfIT assessed the distribution of current subsidies among passengers of different income groups, and found that highest per passenger subsidy went to passengers in the highest rather than the lowest income category. The subsidy per passenger in the lowest category was less than half that in the highest category. The report included an analyses and series of recommendations on how to remedy this and

many other defects in the current pattern of subsidies to bus operations in urban areas.

Table 4. United Kingdom: Large Urban Area Passenger Subsidies			
Income Quintile	Total Subsidy £ million	No. of passengers million	Subsidy per passenger £ pence
Lowest	10	16	58.2
Second	5	7	68.8
Third	8	7	103.2
Fourth	16	14	118.2
Highest	13	11	120.2
Total	52	56	92.6

Source: Obtaining Best Value for Public Subsidy for the Bus Industry, CfIT, March 2002.

Box 1. Affordability

Affordability is clearly an extremely important consideration in most of the areas we have visited. The impression we have is that public transport users are well aware of all the various ticket prices and the ticket differentials between the different services and operators. They are also clear about how it would impinge on their household budget. Those who are having the most difficulty are working people on low incomes who have to travel to work. Their travel costs can be a significant part of their take-home pay and they have no choice but to pay it. They are also financially penalized by restricted hours of service operation, which means that they may sometimes have to take a taxi or walk.

Where there is no concession available for job-seekers, and even, in some instances, where there is, traveling to look for work can take up quite significant proportions of their income. As an example, someone who is on the minimum level of £50 in hand who wanted to spend time seriously job-hunting could easily spend £8 -£10 a week even with a concession; this would be nearly a fifth of his/her income and leaves very little indeed.

Many people who were on extremely low incomes and/or unemployed said that if ticket prices were cheaper, or better deals were available, they would be more likely to use transport more often. They were likely to be spending 10 percent of their very low weekly incomes on transport.

Source: Privatizing British Railways: Lessons for the World Bank and its Borrowers
http://www.dft.gov.uk/stellent/groups/dft_mobility/documents/page/dft_mobility_506795.hcsp

3.10 France

The French approach to urban transport is not to tackle poverty or potential users directly, but rather to implement actions that reduce the exclusion of such people from social life. Using a social objective and a law that establishes a right for public transport (*Loi de' Orientation des transportes intérieurs*) similar to public health and education, various forms of general subsidy are still used in an attempt to make urban public transport affordable to the whole population. Action plans have focused on making affordable transport available to areas with otherwise low accessibility, and where transport operators have experienced security concerns, this being used as an indicator of social unrest in these districts. Financial support to urban public transport in general and to these areas in particular has come from the *versement transport,* a tax paid be companies located in the area served by public transport and with more than nine employees. The level of the tax is set by the local government subject to a maximum established by the central government depending on the city size.

3.11 Kyrgyz Republic

As part of the preparation of an Urban Transport Project for the Kyrgyz Republic, the World Bank undertook an Urban Transport Sector Review *(World Bank Report 18310-KG, 1998)*, part of which included a social assessment of urban transport in three cities (Bishkek, Osh and Jalalabad) undertaken by the Kyrgyz Peace Research Center with funding from the Dutch Government. Among the many conclusions of this study were that despite the heavily subsidized fares, average expenditure on travel was more than 18 percent of income in Bishtek, 14 percent in Jalalabad and 13 percent in Osh. Taking all three cities together, more than 20 percent of households spent more than 25 percent of their income on transport, almost exclusively public transport.

3.12 Beijing and Nanjing, China

Until recently there have been few studies of the condition of the urban poor in China. One study that addresses[x] that deficiency looked at the urban transport strategies in Chinese cities and their impacts on the urban poor. One of the first problems encountered is the definition of a poverty level, which varies between cities in China between about U$200 and U$300 per person per year. Second, the number of urban poor does not include rural residents who live in urban areas, the so-called mobile residents, and whose incomes are even less than those who are included in the formal count. The Asian Development Bank estimates that the poverty rate within the mobile population is 50 percent to 100 percent higher than in the permanent urban population.

Households with the lowest incomes spend less on transportation that others, since they make many more trips on foot and by bicycle. Fare levels also contribute to the low rate of motorized travel for the poor. While the average bus fare is about U$0.12 per trip, the average person trips requires 1.88 transfers and each transfer costs an additional fare. So the average daily expenditure on bus travel is about U$0.46, which represents about 40 percent of the income of a poor person. Rather than spend this amount, they appear to walk and cycle more and make fewer trips in total., and in fact only spend between 3 percent and 8 percent of their income on transport[xi] However, with the changing pattern of residence and employment in China, and the rapid increase in city size, the practicality of walk and cycle trips is reducing. This can be seen from the rapid fall in their share of urban travel, In Beijing for example, cycle trips accounted for about 58 percent of the total but by 2000 this had fallen to 38 percent, and in Nanjing walk trips reduced from 33 percent to 23 percent.

3.13 Wuhan, China

As part of the preparation of an urban transport project in Wuhan China, the World Bank commissioned a study on the how the poor travel around the city[xii]. As in Beijing and Shanhai, the poverty level in Wuhan is determined by the municipality, and it was determined in 2002 to be Y2,520 per year. The 156,000 permanent residents whose income was below this level qualified for an income supplement. This number represents a 27 percent increase in the last two years, a period that also saw a growing income disparity between the rich and poor. Whereas in 2002 the income of the top quintile of the income distribution was three and a half times greater than that of thee bottom quintile, by 2002 the ratio had jumped to five times more.

Box 2. "The job was not worth the bus fare."

"I could have got a job delivering newspapers that paid Y600. But with transit costs of Y3 to Y4 per day (20 percent of gross earnings) it was not worth it."

"Someone found me job for Y500. But I would have had to have taken the bus at a cost of Y5 per day (30 percent of gross earnings). After taking into account having to buy a lunch, it was no better than staying at home."

Source: Household Interview Survey, Wuhan, 2003.

For the bottom quintile, about 48 percent of their travel is by walking, about 27 percent by public transport and about 22 percent by cycle, with the remaining 3 percent by other motorized means (motor cycle, taxi or motor taxi). This modal share is a reminder of the planned economy where urban life was centered on the *danwei*, a collectively owned enterprise that provided employment, housing, education, health care recreation centers and food shops. All these facilities were within walking distance of the housing. Although this system ahs now broken down, the slow development of an alternative means that many services are still close the residential areas, although employment patterns have changed more quickly involving longer trips that cannot so easily be made by walking or even by cycling.

The previously owned public transport system in Wuhan has been privatized and there is now also a foreign owned public transport enterprise. They still operate a fixed fare system, but fares vary by route between Y0.5 and Y2.0 depending on the route length and quality and comfort of the vehicles. There are no inter route transfer tickets, so passengers typically need to pay two or three times. Transit fares were singled out by residents as the main factor that prevents them from seeking better employment opportunities. The jobs they can aspire to pay between Y400 and Y700 per month, and that precludes a commute that involves any transfers or the use of anything more expensive than a bus. So they limit their work options to those that are within walking or cycling distance.

3.14 African Cities

Other studies reviewed in less detail showed that in Lagos (Nigeria), 15 percent to 20 percent of household expenditure in 1997 was spent on transport (public and personal) , while in Doula (Cameroon) in 2000 the equivalent figure was 14 percent of household expenditure, while in Yaounde it was 15 percent on average, but only 11 percent for the highest income quintile. In Dakar in1998, 8 percent of household expenditures are spent on transport in average, and households of the highest income quintile spend 4.5 percent. In these cities it appears that most of the poor simply walk, because they cannot afford public transport fares.

A Poverty Impact Assessment[xiii] was commissioned by the World Bank as part of the preparation of an Urban Transport Project for Lagos, Nigeria in 2002. Although this Assessment did not provide a direct measure of affordability, it did provide data on which it could be estimated for 1992. Taking the Assessment's definition of poor as having one third the average income for the city, and the then average fare, the proportion of a poor working person's income spent on transport would have been over 54 percent and the expenditure of someone on an average income, more than 17 percent. These are both very high and reflect the high fares charges on both private bus modes in Lagos, molues (large "geriatric, clumsy, uncomfortable yellow-painted" buses[xiv]) and danfo's (minibuses—"smaller siblings of the molue"). Fare regulations are not strictly enforced and operators tend to discharge passengers every few kilometers and require that they reboard and pay again—or the effectively bargain the fare with passengers according to the length of the queue.

3.15 Australia

In Australia, as in many other developed countries, the affordability of public transport to two particular social groups with limited financial resources, students and retired people, has received special attention, rather than the affordability to the poor as a social group or to the working poor. As an example, in Perth (Western Australia) fares are kept low with a specific objective of keeping public transport affordable to retired people. For

someone living on the minimum pension, a daily return trip on public transport would cost about 3 percent of their income.

3.16 United States

In the United States, the Census Bureau collects data on the how income is spent , including that spent on commuting. By aggregating the urban population into income ranges it is possible to estimate the proportion of income spent on travel, including that for those employed but earning below the poverty level, defined by the Bureau of Transportation Statistics to be U$8,000 per year. The data for 1999 is reported by the Bureau and shows that the working poor spent nearly 10 percent of their income on commuting, whereas the average expenditure was just under 4 percent of income. With average fares of the order of U$3 for travel of 10km, the poor would need to spend at least 27 percent of their income on daily commuting of this distance.

Table 5. United States: Percent of Personal Income Spent on Commuting.	
Income Range	**Percent Spent on Commuting**
Less than US$8,000	9.5%
US$8,000 to US$414,999	6.0%
US$15,000 to US$21,999	4.6%
US$22,000 to US$29,999	4.1%
US$30,000 to US$44,999	3.5%
Over US$45,000	2.2%
Average	3.9%

4   CONSTRUCTION OF THE AFFORDABILITY INDEX

An Affordability Index requires four pieces of information—a selection of cities for which the values of the index are to be estimated, and the level of incomes, quantity of travel and level of fares in those cities.

4.1   Sample of Cities

Our objective has been to work with a large sample of cities that would give a reliable indication of the distribution of values of the Accessibility Index, and to indicate whether there was any correlation between the value of the Index and city size, income per capita, or

political system under which the city is administered. Although we are particularly interested in affordability of public transport in cities in developing countries, we have included several cities in developed countries as a basis of comparison. The sample was also designed to include a number of cities for which particular difficulties were expected in obtaining the data.

4.2   Level of Income

Most measures of affordability have used average incomes, whether personal or family, and it is only recently that attempts have been made to measure affordability for people in different income groups. There is little reliable and consistent data on the distribution of incomes in **cities**, and not much more on the distribution of per capita incomes at the country level. Even when there is local information, that often comes from user surveys, and therefore can exclude those with the lowest affordability because they cannot afford to travel. So a better source are household surveys, but these tend to categorize income in terms of local parameters. For example, Brazil makes frequent use of the number of multiples of the minimum legal income as the basis of income categorization (for example, the poor might be defined as those earning less than three times the minimum income). Other surveys use simple categorizations of "low", "middle" and "high" incomes, which even when the income ranges are known makes it difficult to translate into the categorization by quintiles of income that are now becoming more standard and used in the World Development Indicators. This source, complied by the World Bank Development Research Group, also uses primary household survey obtained from government statistical agencies and World Bank country departments.

4.3   Quantity of Travel

Most assessments of the use made of urban transport also rely on household expenditure survey data. The greatest constraint on the use of household survey data that uses actual expenditure is that is difficult for them to take account of the impact of any reduction in travel because of the high level of fares. At one extreme, if fares were so high as to frustrate most travel, the actual expenditure could be quite low. This would not be indication of high affordability of fares, but quite the reverse. For use in a comparative index, we need to use a standard measure of income and a more

consistent measure of desired travel that is not influenced by the level of fares.

Very few studies have been made of the desired rather than actual quantity of urban travel. However, an analysis of those few studies that have been made indicated a minimum desirable travel of about sixty one way trips per month per person. For an employed person, this could comprise about forty one way trips to and from work and a further twenty one way trips per month for other reasons—visiting family, seeing a doctor, going to a cinema or undertaking personal business. We have used this average of sixty one way trips per month as the quantity of demand in the Index.

4.4   Level of Fares

There is no simple and generally recognized definition of what fare should be use in compiling a measure of affordability. Since the Index presented here needs to be consistent between many cities, we have used a standard measure of the fare for a single trip, based on a daily or time based ticket where this offers a lower price. We have not taken into account longer period tickets, such as those that give a full week or month of travel, as these require high upfront costs that would be difficult for a low income passenger to afford.

5   DATA USED IN CONSTRUCTION OF THE AFFORDABILITY INDEX

5.1   Sample of Cities

From an initial sample of thirty cities, we managed to construct the index for twenty seven. The database used most extensively in constructing the Index was that provided by the Millennium Cities Database for Sustainable Transport (MCD), created by the International Union of Public Transport (UITP), with technical support from Murdoch University, Perth, Australia. The data collected relates to demographics, economics, urban structure, vehicle ownership, road and public transport networks, personal mobility, choice of transport mode, transport system efficiency and environmental impact of transport, for 100 cities. A total of 66 indicators are provided for the year 1995.

From MCD, we ended up with a sample of twenty seven cities which have characteristics which are broadly representative of developing countries, across all regions. These cities also

have data sufficiently comprehensive data on income and fares for compilation of the Index.

5.2   Income

The most binding constraint in the city selection was the availability of data on per capita income. To provide a consistent definition of income we chose two values, the average per capita income for the city and the average per capita income for those in the bottom quintile of the income distribution. We had intended to use family disposable income for both the average and bottom quintile, but it proved impossible to obtain this information for more than a small number of cities, so we chose the per capita income as an acceptable substitute. But even then, we were unable to find any reliable source of average per capita income and the income of the lower quintile in a large sample of cities. However, we were able to make what we considered reasonable estimates of both from data that was available.

The MCD is one of the few single sources for the average income for people in a number of cities. Although many national population census also provide the data for a selection of cities, we did not have resources to go through all the national census data available on the internet.

We know that the average income level in cities tends to be greater than in rural areas, but except when specific studies are carried out, we do not know what the differences are and thus how to relate data on national income levels, which are produced on a regular basis, and which are compatible across countries, to city income levels. As the relevant fares are those for cities, assumptions have to be made about city income levels for a comparison to be made between expenditure on public transport and available income, on the assumptions above defined.

Information on national income levels is taken from World Bank's World Development Indicators (WDI). This gives three sets of relevant data: (a) per capita income levels in local currency units (LCUs); (b) exchange rates for conversion to US$ and (c) the percentage of total national incomes accruing to five bands of income, ranging from highest to lowest (the five income quintiles). This last measure is based upon various household expenditure surveys, most of which are reasonably current. This enables the current per capita income levels both at the average income level and that for the lowest income quintile, which is

the main focus of this study, to be calculated. This provides the basis for assessment of the percentage of income at these income levels which would be absorbed by public transport needs. The WDI also shows income levels for the poorest 10 percent but we have not employed this for two reasons (a) at a first inspection, some of the data looks unreliable and (b) it is possible that even the lowest decile fails to include the very poor, for which data is often difficult to obtain. We have therefore confined our analyses to the average and lowest quintile income levels.

The MCD average per capita income level, by city, expressed in US$ was compared with that from the WDI data on per capita average national income levels for the same year. This enabled ratios of city to national per capita income levels to be compiled for 1995. We lack similar ratios for 2004, our reference year, so have made the assumption that these ratios have remained constant over the period. There is no reason to believe that city/urban income levels have either risen or fallen with respect to national levels over the period 1995 to 2004.

5.3   Quantity of travel

Our starting point is the assumption that a typical public transport trip is of 10km and 60 such trips are made per month, twelve months per year. The basis for the assumptions of an average distance of 10km is the MCD. Where flat fares or zone fares are used, this distance is generally within the distance covered by the flat fare, and for more than 80 percent of the zone fare cities, even covering two zones would only add 10 to 20 percent to the fare. The 60 trips per month is based on seven return trips per week, which is the typical movement of the working poor, with whom we are concerned.

5.4   Fares

We obtained data on fares from official sources, mainly through websites, but in many cases reinforced by personal contacts (World Bank regional staff). Websites of municipal, and some private, operators often allow fares to be calculated between specific origins and destinations. In these cases, we used sample fares for at least twenty trips of ten kms. We also used travel oriented websites that also give fares information. All fares information is current to August, 2004. These fares were expressed in local currencies and, for comparability, were translated to US$ at the

nominal foreign and Purchasing Power Parity (PPP) exchange rates.

In some cities, fares are based on distance, with individual fare stages being quite short. For the cities included in the sample, some do have this characteristic, but the stage lengths are clearly identified, and we have thus been able to combine stages, to obtain the appropriate 10 km fare, where necessary. Where fares are flat within zones, as is becoming increasingly common, a typical zone is less than 10km in radius, which means that two zones have to be crossed. For zone cities, we have assumed travel that crosses one zone boundary. In some other cities fares are based on the time needed to make a trip. The minimum time in cities with this system is at least one hour, and under normal circumstances, this will be sufficient for 10 km to be traveled.

In those cities where subsidized rail or metro fares are lower than bus fares, we have used the bwest available public transport fares in compiling the Index

Two features which can have an important effect on the incidence of public transport costs on different sectors of the community are **passes and concessions**.

Typically, **passes** can be bought for one month, or in some cities for a week or a few days. A comparison of the costs of 60 single tickets with a typical monthly pass indicates a cost saving of as much as 25 percent. However, this means an "up-front" expenditure of the equivalent of 45 or more single tickets. The recent survey in Sofia, Bulgaria, indicated that while low-income families benefit more from passes than middle or upper income families (which may be a function of family size) the benefit for working poor was little. The survey showed only 3 percent of low-income workers received passes; compared with 14 percent and 8 percent for middle and upper income workers respectively. Since except for a few cases such as that for Sofia, and it is probable that people in the poorest income quintile will have difficulty in making the initial payment for such passes, and will thus be obliged to purchase the more expensive single tickets, we have not taken them into account.

Unlike time period passes that are available to anyone, **concessions** are available only to people in specific categories. The structures and incidence of such concessions varies from

one city to another, and thus the relationship of the fares actually paid to the nominal fares can vary between cities. However, concession fares are mostly targeted at school children, students and retirees. There are very few cities that have concessions that are available to employed people. We have not taken these concessions into account but will do so in the next round of estimation of the Index. This omission is particularly important in Brazil, the country with cities that have the highest values of the Index in its current form.

6   EVIDENCE FROM THE AFFORDABILITY INDEX

The results from application of the above method to data from twenty seven cities is shown in Table 6.

6.1   Income Distributions

For most of the cities included in the Index, the average income is much higher than the national average, so that even for cities in developing countries the average incomes are at levels above what would be considered indicating poverty. But the distribution of those averages between the income groups tells a different story. From the national household expenditure survey data, the poorest 20 percent of the population receive well under half the average income in many cities. In only six of the twenty seven cities for which we calculated the Index does the bottom quintile earn more than 40 percent of the per capita income of the average and in another six they earn less than 20 percent of the average. Even in the cities with the lowest incomes in the bottom quintile range, the average income is close to U$2.50 per day. While this is above the values of U$1.0 or U$2.0 per day often used as broad indicators of poverty, these people are living in large cities where the costs of living are also far above the levels in rural areas for which the poverty indicators are most often applied.

6.2   Fares

There is a high range between the lowest and highest fares to travel 10km. Not surprisingly, most of the cities with high fares are in developed countries. The only developing country cities with fares of over U$1.00 equivalent to travel 10km are in Brazil, Malaysia and India, with the highest fares in Brazil. At the other end of the scale, the lowest

fares are in Cairo and Bangkok at about U$0.30 for 10 km. While a high correlation might be expected between per capita income and bus fare, since a high proportion of the fare is to cover labor costs, the correlation coefficient is only 0.63, not particularly high. However, the correlation between fare and bottom quintile income is much higher at 0.89, perhaps indicating that many public transport employees are paid at closer to the bottom quintile than to the average income.

6.3   Affordability Index for People on an Average Income

The percentage of *average* income spent on public transport varies substantially from city to city. At one extreme are Manila and Bangkok, where only about 1 percent of city average income is required to obtain the public transport services as previously identified (10km trip, 60 trips per month). The reasons are low cost bus systems, combined in the case of Thailand with a comparatively high average income level. At the other extreme is Sao Paulo (Brazil) where some 11 percent of average income would be necessary to achieve the required level of public transport. In addition to the widespread use of concession fares as noted above, this high value is also attributable to the need to pay for more than one ticket for a typical 10km journey as well as the very skewed income distribution in Brazilian cities.

In between are a range of cities where the two factors—fares and income levels—interplay in varying degrees. Although fares vary significantly from city to city, they do so to a lesser extent than per capita incomes. So while there is some evidence, of an inverse relationship between per capita income and the value of the Index, it is not statistically significant.

7   AFFORDABILITY INDEX FOR PEOPLE IN THE BOTTOM QUINTILE OF THE INCOME DISTRIBUTION

For some of the cities in the sample, the values of the Affordability Index for people in the bottom quintile income group are unsustainable at over 30 percent of their income. Either they are having to curtail their amount of public transport travel, and therefore the also curtail the activities that generate the need to travel, or they are not paying the full fare, or their travel to work is much shorter than 10kms.

				Affordability Index	
City	Per Capita Income U$PPP	Bottom Quintile Income as Percent of Average	Fare for 10km Travel (PPP U$cents)	Average	Bottom Quintile
1 Sao Paulo	8,732	10.0%	130.1	11%	107%
2 Rio de Janeiro	14,325	10.0%	125.4	6%	63%
3 Brasilia	12,985	10.0%	106.8	6%	59%
4 Cape Town	14,452	10.0%	75.8	4%	38%
5 B. Aires	15,493	15.5%	87.6	4%	26%
6 Mumbai	8,585	41.0%	112.2	9%	23%
7 Kuala Lumpur	18,351	22.0%	121.6	5%	22%
8 Mexico City	9,820	15.5%	39.3	3%	19%
9 Chennai	3,717	41.0%	39.3	8%	19%
10 Manila	9,757	27.0%	63.0	5%	17%
11 Krakow	15,579	36.5%	130.6	6%	17%
12 Amsterdam	28,170	36.5%	226.6	6%	16%
13 Moscow	16,154	24.5%	84.6	4%	15%
14 Guangzhou	9,165	30.0%	55.1	4%	14%
15 Warsaw	26,024	36.5%	142.5	4%	11%
16 New York	51,739	27.0%	200.0	3%	10%
17 Los Angeles	42,483	27.0%	160.0	3%	10%
18 Chicago	48,300	27.0%	180.0	3%	10%
19 Singapore	38,797	25.0%	130.3	2%	10%
20 Beijing	14,379	30.0%	55.1	3%	9%
21 Seoul	16,784	40.0%	85.5	4%	9%
22 Shanghai	20,814	30.0%	55.1	2%	6%
23 Cairo	7,117	43.0%	26.1	3%	6%
24 Budapest	22,106	50.0%	89.3	3%	6%
25 London	53,057	30.5%	116.4	2%	5%
26 Prague	32,757	52.0%	88.0	2%	4%
27 Bangkok	20,386	31.0%	32.2	1%	4%

Table 6. Affordability Index Values for Twenty-Seven Cities.

Sources: Income derived from Millennium Cities Database, WB country income data; Bottom quintile derived from WB database; Fares for 10km of travel derived from Internet data and World Bank country offices

For the three Brazilian cities included in the sample there is a federally mandated subsidy which requires employers to pay the difference between 6 percent of salary and cost of home to work trips for formal employees (the "*vale transporte*"). But we also know that in Brazil a large number of people, probably mostly in the bottom quintile of the income distribution, are either self employed or are employed in the informal economy and therefore not eligible for the concession fares. The very high proportions of income indicated for the poor to travel in Brazil only confirm what has been learned from several other recent studies. A review of the potential impact of the new Line 4 of the Sao Paulo metro made for the World Bank in 2003[xv]

showed that the poor were spending between 18 percent and 30 percent of their income on travel, while only making one third the number of daily trips of those in the highest income group.

In Cape Town, the suburban rail service is less costly than the bus service but is ignored by many potential passengers because of security concerns. As in many other cities, mini-buses are also available but at a higher fare. Buenos Aires, the other city with a very high Index value for its bottom quintile income earners, at least has a reliable and relatively safe bus system that operates at high frequencies, even into the night. But particularly when

considered together with the tariffs for other utility services, the fare level is probably unsustainable in the long term for this income group.

Even some of the cities in the developed countries have values for the Index, in excess of 10 percent, a consequence of their very high fares and/or relatively skewed income distributions.

A comparison of the Index values for people on average incomes and on bottom quintile incomes is also instructive. The average value of the ratio of the Index values is 4.0, with the highest being over 10.0 and the lowest 2.0. The correlation between the two Indices is 0.73, not as high as might be expected and indication of very skewed income distributions in many of the cities since the value of the ratio is only determined by the income distribution. Brazilian cities have the most skewed distributions in the sample while East European and Indian cities, together with Cairo and Seoul have the least skewed distributions.

The bottom quintile of the income distribution includes a high proportion of adults who are working and therefore not eligible for concession fares that are usually only available for children, students and people of pensionable age. Unless there are other concessions available to them (as for some bus fares in Brazil or other expenditures such as household rent in other countries) the indicated values of the Affordability Index are sufficiently high to raise concerns that the fare levels are unsustainable for them. In the next Section, we include an introduction to our next stage of work, to consider what forms of targeted subsidy would best address these concerns

8   FURTHER WORK ON THE AFFORDABILITY INDEX

8.1   City Income Distribution

The first and most important data is the proportion of total city income received by the poorest section of the population (typically the lowest quintile). This data is not available on a systematic basis. However, surveys are available for some cities, and these suggest that the city income distribution is indeed similar to that at the national level. *We welcome suggestions for sources of city level income distribution that gives quintile data*.

8.2   Passes and Concessions

Passes and concessions are often important. Passes (often monthly) give significant savings to purchasers over purchasing single tickets, but may require up-front payment of the equivalent of some two-thirds to three-quarters of one month's supply of single tickets. The poor may not be able to afford this and, as the cost saving in issuing a monthly pass is probably much less than the discount, the single fare purchaser is effectively subsidizing the monthly pass holder.

Concessions are different. They are normally targeted at certain groups of consumers; typically students and retirees. While there may be a political imperative and a socio-economic justification for student concessions, the case is less evident for retirees. Furthermore, some concessions are extended to employees of transport organizations and even other public sector workers. *We welcome any sources of information on the use made in specific cities of passes and concessions, preferably giving data for the use made by people of different income levels.*

8.3   Changes in Fare Structures and Levels

Another issue that may be worth exploring is how fare levels and structures change over time, particularly in countries experiencing significant rates of inflation. It may be that there is a lagged effect where passenger transport is publicly provided, which might not be the case with private operators.

8.4   Additional and Corrected Index Values

The authors welcome estimates of the Affordability Index calculated for other cities. Such estimates should be based on the average and bottom quintile per capita incomes, and the standard fare for sixty trips per month for an average distance of 10km per trip. It would be useful if the basic data could be provided together with the Index values. We also welcome any revisions to the data presented in Table 5. We will publish additional and corrected values of the Index with our next paper on Affordability, which will look at the use of targeted public transport subsidies for the working poor.

All correspondence should be addressed to rcarruthers@worldbank.org.

Bibliography

1986. Armstrong-Wright, Alan. *Urban Transit Systems: Guidelines for Considering Options.* World Bank Technical Paper 52,. World Bank, Washington, DC.
http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000178830_98101904164939

1986. *Urban Transport.* World Bank, Washington, DC.
http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000178830_98101901455677

1992. *The Impacts Of Subsidies, Regulation And Different Forms Of Ownership on the Service Quality and Operational Efficiency of Urban Bus Systems in Latin America.* ECLAC.

1998. *Kyrgyz Republic: Urban Transport Sector Review.* World Bank Report 18310-KG. World Bank, Washington, DC.
http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000094946_99092506031980

2000. *Poverty and Urban Transport: French Experience in Developing Cities.* Background paper for *Cities on the Move, a World Bank Urban Transport Strategy Review.*

2001. *Millennium Cities Database for Sustainable Mobility.* Union International Transport Public.

Privatizing British Railways -- Lessons for the Bank and its Borrowers.
http://www.dft.gov.uk/stellent/groups/dft_mobility/documents/page/dft_mobility_506795.hcsp

2002. *Cities on the Move, a World Bank Urban Transport Strategy Review.* World Bank, Washington, DC.
http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000094946_02100204022071

2002. *Lagos Urban Transport Project, Poverty Impact Assessment.* TRL for the Lagos State Government.

Barone, Marcia and Jorge Rebelo. 2003. *Potential impact of Metro's Line 4 on poverty in the Sao Paulo metropolitan region.* World Bank, Washington, DC.
http://www.worldbank.org/transport/urbtrans/poverty_14_sp.pdf

2003. *A Lifetime of Walking, Poverty and Transportation in Wuhan.* World Bank, Washington, DC.

Haider, Murtaza and Madhav Badami. *Public Transport for the Urban Poor in Pakistan: Balancing Efficiency and Equity.*
http://wwics.si.edu/index.cfm?topic_id=1410&fuseaction=topics.documents&group_id=61692

2004. *Labor Mobility, Beneficiaries of Public Transport Services.* Ecorys Research and Consulting for the East Europe and Central Asia Department of the World Bank. World Bank, Washington, DC.

Baker, Judy, Rakhi Basu, Maureen Cropper, Somik Lall and Akie Takeuchi. 2004. *Urban Poverty and Transport: The Case of Mumbai.* World Bank Working Paper Draft. World Bank, Washington, DC.

Peng, Zhong-Ren. *Urban Transportation in Chinese Cities and their Impacts on the Urban Poor.*
http://wwics.si.edu/index.cfm?topic_id=1410&fuseaction=topics.documents&group_id=61692

Badami, Madhav, Geetam Tiwari and Dinesh Mohan. *Access and Mobility for the Urban Poor in India: Bridging the Gap between Policy and Need.*
http://wwics.si.edu/index.cfm?topic_id=1410&fuseaction=topics.documents&group_id=61692

2004*.* de Avila Gomide, Alexandre and Sabina Kaurk Leite. *Transporte Público e Pobreza Urbana Um Índice Síntese de Servicico Adecuado.* Draft Report for the World Bank Latin America and Caribbean Department. World Bank, Washington, DC.

2003. *Impacto Social de la Crisis Argentina en los Sectores de Infraestructura.* Vivien Foster con el Centro de Estudios Económicos de la Regulación (CEER) y la Universidad Argentina de la Empresa (UADE). Documento de Trabajo N.1/05. World Bank, Washington, DC. http://www.bancomundial.org.ar/archivos/Impacto_Social_de_la_Crisis_Argentina_en_los_Sectores_de_Infraestructura.pdf#search='.%20Impacto%20Social%20de%20la%20Crisis%20Argentina%20en%20los%20Sectores%20de%20Infraestructura'

ANNEX A
LABOR MOBILITY, BENEFICIARIES OF PUBLIC TRANSPORT SERVICES IN EASTERN EUROPE AND CENTRAL ASIA (ECA)

ECORYS Research and Consulting, for the World Bank, 2004.

This study had as its objectives to a) analyze the impact of public transport costs on the working poor in ECA countries and b) identify measures to address the issues identified.

The study reviewed the situations in two ECA countries, Bulgaria and Romania, in some depth through undertaking Household Mobility Surveys (HMS), and complemented this work with desk study review of statistical data for Bulgaria, Romania and the Ukraine, together with three central Asiatic cities in the Russian Federation.

The HMS generated data and analysis proved the most useful and revealing. It reviewed expenditures on transport for three groups, defined as Low, Medium and High incomes. These groups were not defined in income terms. However, it seems reasonable to assume that the Low group is equivalent to either the lowest quintile, or a combination of the lowest and second lowest quintiles of the income groups. On that basis, the percentage of income that would be absorbed by the number of trips identified (77 per month for Bucharest, 66 for Sofia) and at the unit costs identified, would be between 24 and 32 percent of annual income for Bucharest, and 18 to 23 percent for Sofia. Monthly passes are available in both cities. Because the discount on the price of a single ticket (on the trips noted above) was very steep in Bucharest (-46 percent) but less so in Sofia) (-13 percent), the percentage of the minimum wage absorbed by monthly passes would be 13 percent in Bucharest and 16 percent in Sofia. For comparison, the range for the lowest quintile of the Affordability Index (excluding the Latin American cities) is from 4 to 28 percent.

The study also reviews the availability and incidence of subsidized transport, through passes. In Bucharest 93 percent of trips are made without a pass; this falls to 84 percent for the Low income group. In Sofia, the percentages are 82 percent and 78 percent respectively. For Sofia, the distribution of passes between all household members and workers was also analyzed. While 28 percent of Low income household members had passes, only 3 percent of workers had this privilege. This suggests that the main recipients of passes are students and retirees; this is consistent with pass policy identified in other cities. More worrisome is the finding that 14 percent of Middle Income workers received passes. The report observes that this suggests there is no policy of targeting the poor (or that it wasn't working!).

The main conclusions drawn by the consultants are that:

i)   Transport expenditure is rather high for the Low Income group (between 13 percent and 16 percent);

ii)   Distances for work, at about 6km, are rather long. Actually, they are less than the average for the cities included in the MCD;

iii)   The concessionary fare system is badly targeted. This is based mainly on the Sofia study.

ANNEX B
URBAN POVERTY AND TRANSPORT: THE CASE OF MUMBAI

Judy Baker, Rakhi Basu, Maureen Cropper, Somik Lall and Akie Takeuchi, World Bank Working Paper, Draft, October, 2004.

This paper reports work carried out by the World Bank to analyze the linkages between urban poverty and transport in Mumbai, India. The analysis draws on a household survey and focus group discussions that were carried out between August 2003 and February 2004.

Relatively little is known about the transport behavior of the urban poor in developing countries, their residential patterns, and how these are affected by transport policy. The research that exists characterizes the transport patterns of the poor as a complex tradeoff among residential location, travel distance and travel mode, in an attempt to minimize the social exclusion associated with low earnings potential (Cities on the Move). In accessible parts of the city, the poor can often afford only precarious sites with insecure tenure. Conversely, affordable sites that may have more secure tenure are more likely to be located in the less accessible periphery of the city and involve higher commuting times and costs [xvi].

Empirical studies in individual cities show evidence of differences in the composition, number, and mode of trips between poor and non-poor, but the dynamics of these differences are not well explored. The urban poor make fewer trips per capita than the non-poor, but the differences are not extreme. The travel purposes of the poor are more limited in scope, with journeys to work, education and shopping dominating. Transport mode differs substantially, with the urban poor relying heavily on walking, and the non-poor making many more motorized trips.

The study is specific to Mumbai, one of the world's largest cities, and one with a unique spatial configuration. While some of the findings appear to be similar to other studies of urban transport, there are differences as well.

Spatial Distribution of Households by Income Group

The most salient feature of the spatial distribution of households is its lack of pattern or segregation by income group. There is neither a large predominantly poor or rich area, nor does a large percent of a given income group live in a particular zone. There are, however, some differences across zones. In general, the city center zones have a smaller proportion of poor households than do the suburbs.

Commuting Patterns

In Mumbai, as in other cities, the journey to work constitutes the largest fraction of household trips in terms of distance traveled. Perhaps the most striking feature of commuting behavior in Mumbai is the distribution of commute distances. The modal commute distance is only 1-2 km, and more than 40 percent of workers commute less than 2 km. The distribution, however, has a long tail. Approximately 20 percent of workers commute 10-30 km. The mean commute distance is 5.3 km.
There are significant differences in commuting patterns by income. On average, higher income workers travel significantly longer distances and spend a longer time commuting irrespective of place of residence. The difference in commuting patterns between the rich and the poor is, however, greatest in the suburbs. The percentage of workers who work in the zone in which they live varies little by income group in the city center, but in the suburbs, 55 percent of the poor live in the same zone as they work whereas this applies to only 30 percent of the highest income group. In the further suburbs the percentages are 49 percent v. 16 percent. The fact that a higher percent of the poor living in the suburbs work in the suburbs may be evidence of spatial mismatch: **the cost of commuting may keep the poor in lower-paying jobs in the suburbs.**

Mode Choice

In a city in which 57 percent of works trips are 3 km or less, it is not surprising that over 40 percent of commuters walk to work. The main mode is defined to be the mode that takes the longest time, with

the exception of "on foot" and "bicycle," which are counted as the main mode only if they are the only mode used on the trip. 44 percent of commuters walk to work, 23 percent rely on rail as their main mode, while 16 percent rely on bus as a main mode. ***The respective mode shares are somewhat different for the poorest income group: 61 percent of the poor walk to work, 6 percent ride a bicycle, 16 percent take the train and 15 percent ride the bus.***

It is possible that the cost of commuting from the suburbs to the center results in economic disadvantages to the poor. This is suggested by two facts: (1) wages for unskilled labor are lower in the suburbs than in the center; (2) the unemployment rate among the poor appears to be higher in the suburbs. It may be the case that this is the price that the poor pay for not having to commute long distances. ***An alternate explanation, however, is that the cost of transportation keeps the poor in low-paying jobs in the suburbs.***

Frequency of Travel

The poor take fewer trips than the non-poor, although the differences are not dramatic. Although there is slight increase in the number of trips as income goes up, most wage earners take two trips per day (to and from work). The major source of the difference is the large fraction of people in the lower income categories who take no trips. For example, among households with the lowest monthly incomes, 55 percent of "other" adults didn't travel at all; this number, however, declines to less than 40 percent in the highest income category. Similar differences are observed among youths. ***It is clearly the case that poor people make fewer trips than the non-poor, especially for non-work trips.***

Affordability

Expenditures on transportation increase steadily as income rises, reflecting the shift to more expensive transport modes: from walking to public transport and, eventually, to private cars, as people become richer. The share of transport-related expenses, however, is highest among the poorest households, where it constitutes 15 percent of income. It remains approximately constant at 10 percent of income for the rest of the income categories. ***This suggests that for the very poorest households, access to transportation (in money terms) is expensive and may affect mobility.***

ANNEX C
A FIVE STEP METHOD TO CALCULATE
THE AFFORDABILITY INDEX FOR A CITY

1. From the latest national census of household survey data, find the average per capita monthly income and the average for the bottom quintile of the income distribution, for the city;

2. Update these values to mid-2004 using national per capita income growth rates;

3. Determine the minimum public transport fare to travel 10km using a daily ticket

4. Calculate the cost for 60 trips at this fare;

5. Express this cost as a percent of the average and bottom quintile monthly incomes.

ENDNOTES

[i] Urban Transport, World Bank, 1986.

[ii] The Impacts of Subsidies, Regulation and Different Forms of Ownership on the Service, Quality and Operational Efficiency of Urban Bus Systems in Latin America, ECLAC, 1992.

[iii] Impacto Social de la Crisis Argentina en los Sectores de Infraestructura, Vivien Foster con el Centro de Estudios Económicos de la Regulación (CEER) y la Universidad Argentina de la Empresa (UADE). Documento de Trabajo N.1/05. World Bank, 2004.
http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000012009_20040308155409

[iv] Potential impact of Metro's Line 4 on poverty in the Sao Paulo metropolitan region, Marcia Barone and Jorge Rebelo, World Bank, 2003.
http://www.worldbank.org/transport/urbtrans/poverty_14_sp.pdf

[v] Urban Poverty and Transport: The Case of Mumbai. Judy Baker, Rakhi Basu, Maureen Cropper, Somik Lall and Akie Takeuchi, World Bank Working Paper, Draft October, 2004.

[vi] Access and Mobility for the Urban Poor in India: Bridging the Gap between Policy and Needs, Madhav Badami, Geetam Tiwari and Dinesh Mohan.
http://wwics.si.edu/index.cfm?topic_id=1410&fuseaction=topics.documents&group_id=61692

[vii] Public transport for the urban poor in Pakistan: Balancing efficiency and equity, Haider and Badami
http://wwics.si.edu/index.cfm?topic_id=1410&fuseaction=topics.documents&group_id=61692

[viii] Labor Mobility, Beneficiaries of Public Transport Services in Eastern Europe and Central Asia (ECA). ECORYS Research and Consulting, for the World Bank, 2004.

[ix] Privatizing British Railways -- Lessons for the Bank and its Borrowers.
http://www.dft.gov.uk/stellent/groups/dft_mobility/documents/page/dft_mobility_506795.hcsp

[x] Urban transportation in Chinese cities and their impacts on the urban poor, Zhong-Ren Peng.
http://wwics.si.edu/index.cfm?topic_id=1410&fuseaction=topics.documents&group_id=61692

[xi] Yearbook of Chinese Cities, 2003.

[xii] A Lifetime of Walking, Poverty and Transportation in Wuhan, World Bank December, 2003

[xiii] Lagos Urban Transport Project, Poverty Impact Assessment, TRL for the Lagos State Government, 2002.
[xiv] http://www.nigeriavillagesquare1.com/sufferingandsmiling.htm

[xv] Potential impact of metro's Line 4 on poverty in the Sao Paulo metropolitan region, Marcia Barone and Jorge Rebelo, World Bank, 2003.
http://www.worldbank.org/transport/urbtrans/poverty_14_sp.pdf

[xvi] The Challenge of Slums, Earthscan, London and Sterling VA, 2003.