Transport and the Mobility Needs of the Urban Poor

An Exploratory Study

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Discussion Paper

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This study was prepared by Rachel E. Kranton, Consultant, under the direction and with the assistance of Ian G. Heggie; Principal Economist, INUTD. It forms part of an ongoing project which examines the mobility needs of the urban poor.
# TRANSPORT AND THE MOBILITY NEEDS OF THE URBAN POOR

## AN EXPLORATORY STUDY

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I. INTRODUCTION

1. This paper is an exploratory study of the demand for travel by the urban poor. It is the first step in an effort to understand how changes in the cost and extent of public transport services and infrastructure affect poor urban households. It examines transport as a means for the poor to travel to and from work, search for jobs, and access public services — including schools and health facilities — that are required to increase the productivity of this population. The paper goes beyond the simple modal choice model of transport demand to encompass interpersonal constraints arising from the allocation of tasks among household members and spatial constraints facing the urban poor. It evaluates Bank transport policy from the perspective of the user of transport services, rather than from the perspective of the municipal government or public transport operators. Of particular concern is how rising fares for public transport and deregulation of formal and informal transport affects the mobility of the urban poor.

2. The paper is divided into three sections. To examine the demand for travel to work, Section I begins with a discussion of a traditional modal choice model. These models represent travel choices as decisions by individuals that involve a tradeoff between time and money spent on different modes. In the short-run, the distance between home and work is fixed; in the long-run, housing location is also a choice. An individual's travel decision is nonetheless more complex — individuals form part of a household and are bound by the interpersonal constraints that arise from the allocation of shared time, tasks, and expenditures. A poor individual's travel choice may also be spatially constrained by fixed housing and employment locations, even in the long-run. Land-use patterns and the housing market impose this spatial constraint on the poor if they are unable to locate their housing close to employment centers. The paper argues that the resulting spatial distribution of income in an urban area largely determines the urban poor's demand for transport. The adequacy of supply depends on the state of transport infrastructure, level of motorization, and regulations governing the transport sector. The paper proposes that a study of the transport needs of the urban poor in any city begin with an evaluation of the spatial distribution of income, level of transport services and infrastructure, and the regulations governing private and public transport services.

3. Section II discusses the role of transport in job search and in informal sector production, and the demand for transport to access markets and public facilities, including health clinics and schools. Section III presents limited data on the travel behavior of urban residents, including the urban poor, in developing countries. It then examines the Bank's urban transport policy set forth in the Urban Transport1 policy paper, which recommends private provision of public transport and removal of transport subsidies. The paper concludes with proposals for further research to assess the demand for transport of the urban poor. The ultimate goal of this research is to design policies that will increase the poor's access to job opportunities, health, and education.

Demand for Transport

4. Demand for personal transport is derived: people do not desire transport for its own sake but, as a means to access locales of income generating activities, consume other goods and services — including health care and education — and enjoy leisure and social activities. Housing, markets, clinics, schools, workshops, and factories are in fixed locations. This section describes the demand for travel and how an individual chooses to move from one location to another, given the modes of transport available, financial constraints, time constraints, and interpersonal constraints. Section II looks at the demand for travel for other activities such as visits to health clinics, shopping, and job search.

Analytical Framework

5. Since the available data show that the vast majority of trips made by the urban poor are trips to work or to school, the following section emphasizes the demand for travel from home to work. The discussion begins with a description of a simple, but illustrative, short-run modal choice model for an individual. The model is then extended to the long-run to incorporate the choice of housing and employment location. As individuals make decisions within a household, the demand for travel is then placed in a household context. An individual chooses a transport mode facing not only time and budget constraints, but also interpersonal constraints imposed by a household on its individual members.

6. A modal choice model provides the basic analytical framework to study the demand for transport to work. In the short-run employment location and household location are fixed; the distance an individual must travel each day to work is not a choice variable. A primary assumption of the model is that there are different modes of transport available to the traveler. By switching from one mode to another, a traveler can increase the speed of travel by paying more money. For example, a bus is faster than walking, but costs more. The traveler is assumed to maximize utility which is a function of leisure — time not spent working or traveling — and consumption goods. The traveler maximizes utility subject to a budget and time constraint. When choosing the traveler trades off time and money — choosing a more expensive mode saves time which increases leisure but decreases consumption of goods. This model would predict that, if distance traveled is the same, poor individuals spend more time traveling than wealthier individuals, because poor individuals cannot afford fast transport modes. In choosing a mode, several characteristics other than speed might be considered. While these are not incorporated in this simple model, they could be important. For example, reliability would be

2/ Of course, there is also demand for transport as an input to the production of goods and services. This demand for transport is not the focus of this paper and will only be discussed in the context of income-earning opportunities for the urban poor in informal sector production.

3/ For the analytical model, in the long run, see Angus Deaton, The Demand for Personal Travel in Developing Countries, Infrastructure and Urban Development Department, Report INU 1, August 1987, Chapter 5.
quite important for a traveler who must reach a destination by a specified time. Flexibility would be valuable to a worker whose job or housing is not located along a main route. Travelers, especially women, might be willing to pay for a secure transport mode. Comfort and safety have also been found to influence mode choice.\footnote{See reports of user surveys on informal and formal transport in Margaret Heraty. "Public Transport in Kingston, Jamaica and its Relation to Low-Income Households," TRRL Supplementary Report 546, 1980, p.10-12, and Avishai Gil, Social and Labour Aspects of Urban Passenger Transport in Selected African Cities, International Labour Organization Sectoral Activities Programme Working Papers, SAP 2.13/WP.22, 1989,p. 30-37.}

7. In the long run, household and employment locations can also influence choice; the individual can choose the distance between home and work. If it is assumed all else equal, that the distance between housing location and job location is desirable,\footnote{This is the assumption Deaton makes in his analysis of travel survey data from Jaipur, India.} the individual’s utility becomes a function of distance from workplace, leisure, and consumption goods. Given a job in a fixed location, the individual then maximizes utility, subject to a budget and time constraint by choosing a housing location and travel mode. The trade off is between distance from work, travel time, and money. If distance from work is not considered desirable, an assumption that is perhaps more appropriate for the urban poor in developing country cities,\footnote{See, for example, T. G. McGee’s discussion of expenditure minimizing strategies of the urban poor in McGee, "The Poverty Syndrome: Making Out in the Southeast Asian City," in Bromley and Gerry (eds.), Casual Work and Poverty in Third World Cities (New York: John Wiley & Sons, 1979), p. 56-59.} then an individual would minimize commuting costs by locating their housing close to their jobs.

8. Alternatively, given a fixed housing location, individuals would trade higher earnings from a distant job with the cost of travel. Of course, the location of both household and job may be determined simultaneously. Thus, the way in which an individual adjusts to changes in the transport system in the long run depends on the ease of changing jobs and housing location. In turn, the ease of adjusting location of either job or housing depends on the conditions of local job and housing market. In particular, whether or not an individual can locate his/her housing close to his/her job depends on interventions in the housing market and the pattern of housing prices in the urban area. This is discussed further below.

9. When making a decision on mode of travel and housing location, an individual must also consider the impact of the decision on other household members. The location of the house, of course, has profound effects on all household members, especially those who must travel — to work, to school, to markets, and to public facilities. The travel choice of the individual also affects the social interactions and the sharing of household tasks. For example, women’s tasks traditionally include child care, housework, and community management — especially in
peripheral squatter settlements. Much of women’s "leisure" time is actually time spent on these tasks. The opportunity cost of time therefore cannot be measured as foregone wages, as is implied by the simple modal choice model, but in losses in time spent on these activities and other activities such as job training, education, and "discretionary" travel. A woman’s decision on job location and travel time affects the entire household, especially other females, such as elder daughters who must assume their mother’s tasks. In this way, the allocation of household expenditures and division of tasks within a household are possibly quite important to understanding the demand for personal travel and how transport policies affect the urban poor.

Typology of Cities

10. In the above discussion, it was assumed that an individual could choose from a variety of modes and, in the long-run, could choose housing and job location. In this section, I discuss the external conditions in the housing sector that limit housing choices of the urban poor and shape their demand for transport. I then discuss the determinants of transport supply — the level of motorization, the state of transport infrastructure, and regulations governing the transport sector.

Spatial Distribution of Income and Land-Use Patterns

11. The model of transport demand above indicates that, if distance between housing and workplace is not desirable, a worker or household would choose a house close to a job (or jobs) to minimize expenditure on transport and time spent traveling. The ability to locate close to employment centers, however, depends critically on housing prices, housing regulations, and traditional land-use patterns in the urban area. The spatial distribution of income in a city is crucial to an analysis of the transport demand of the urban poor. The distances the poor must travel to work, to shop, and to hospitals depends on the relative locations of their housing to employment centers, markets, and public facilities. The tendency for poor individuals to spend more time traveling than wealthier individuals, predicted by the modal choice model, would be reinforced if poor households are located further from these locations than wealthier households.


8/ Moser gives the example of women in Guayaquil, Ecuador who work as domestic servants and must leave the house at 6 a.m. to cross the city and return at 8 or 9 p.m. She discusses the social costs on children of the reduction in parental control and supervision. "Adjustment from Below" in Women, Recession, and Adjustment, p. 17-20.

The poor must then travel the longer distances using slower modes of transport — and spend more time traveling.

12. Traditional land-use patterns may determine the current relative locations of residential, commercial, and industrial areas — and the location of poor residential areas. In a 1974 study on income distribution and the urban poor Rakesh Mohan proposes the following categorization of developing country cities: (i) cities that are a mixture of industrial and pre-industrial cities and have two urban nodes — a traditional downtown center and a modern center (such as Ibadan and several north African cities); (ii) large port cities that were colonial importing and exporting centers (such as Singapore, Rio de Janeiro, and Bombay); (iii) newly-established administrative cities, with low population densities that are becoming industrial and commercial centers (such as Brasilia and most African cities). He notes that in colonial cities, in general, residential areas are highly segregated by income and race.  

13. The pattern of housing prices in an urban area might also be a factor in the location of poor residential areas. Differences in land prices in developing country cities generally reflect variations in accessibility to the central business district, and in large cities, to secondary employment centers within the metropolitan area; prices are highest in those areas most accessible to employment centers. Since transport infrastructure and services contribute to the accessibility of an employment center from different residential areas, housing prices might be, in part, determined by the quality of services and transport infrastructure. [This is discussed below in Section II.] Poor families who cannot afford legal housing near employment centers or cannot find space in over-crowded center city slums must either squat illegally in the city near employment centers, or move to settlements in the periphery where housing is less expensive. In Lima, for example, squatter settlements stretch up to forty kilometers outside the city, bypassing unoccupied land that is held off the market for speculative reasons.  

14. In squatter settlements, housing is essentially illegal as it is built on land to which residents might have no legal claim. The structures often do not comply with building regulations. Squatters may have little security of tenure and may live under the threat of eviction. In some cities as squatter areas and slums in the city center become valuable locations for commercial buildings or high-income housing, a cycle of demolition and redevelopment emerges. Social and political exigencies may contribute to this process. Segregation of poor households from middle-class or wealthy neighborhoods may be a goal of policies such as the

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"beautification" program in Manila, which removed low-income slum areas from the downtown.\(^{14}\) Existing housing stock is destroyed and the poor are forced to relocate, often to the urban periphery. This relocation creates a transport problem for the urban poor, as they must travel much further to reach their jobs. They often must use motorized transport or walk long distances.

15. In contrast, in some cities, most notably in India, poor slums and squatters near employment centers are tolerated and even protected by the government. A map of Madras shows that the poor live in all districts and pavement dwellers occupy fixed sites.\(^{15}\) In Jaipur Deaton found some tendency for poorer households to locate at or near the city center while higher-income households lived further from the city center.\(^{16}\) Those who are able to squat close to their employment do not have to travel long distances or pay for public transport to reach their jobs. A study of the Madras pavement dwellers showed that 59% of workers traveled less than 30 minutes to work.\(^{17}\)

16. From casual observation and looking at maps, Mohan lays out a loose pattern of spatial income distribution for developing country cities, consisting of concentric rings around the city center, with rich and poor households most likely to live in residential areas nearest the city center. Next are densely populated middle-class neighborhoods. The high-income neighborhoods fall in the next ring, in areas somewhat equivalent to suburbs in developed countries. Farthest out are squat settlements housing low-income residents. The poorest groups are interspersed in slums all over the metropolitan area, with some sleeping in the streets.\(^{18}\)

17. Empirical analysis of the spatial distribution of income in Cali and Bogota conducted in 1980 found a loose tendency for income to rise when moving from center to periphery, then decline. Mohan concludes that the data partially supports the hypothesis that the urban poor in developing countries are pushed out to peripheral areas.\(^{19}\) A 1984 study showed, however, that radial sectors showed a more distinct income distribution pattern than rings.\(^{20}\) Although the

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15/ *Survey of Pavement Dwellers*, Madras City 1989-90, commissioned by the Madras Metropolitan Development Authority to SPARC.

16/ Deaton, *The Demand for Personal Travel in Developing Countries*, p. 5.16.

17/ *Survey of Pavement Dwellers*, Madras City 1989-90, p. 39A.


spatial distribution of income is information basic to assessing the transport needs of the urban poor, extensive empirical work on the subject has not been performed in other developing country cities.

18. Inability to change housing location can also increase the demand for transport as workers are unable to adjust to job relocation by moving their homes. Regulations such as zoning laws and building codes that control the use of land and the size of housing units can make moving very difficult. Rent control leads to housing shortages and fierce competition for housing. A result could be a decrease or elimination of the ability to move. Once a family obtains housing, there are very high transactions costs to moving and housing location is then essentially fixed. Since housing relocation is so difficult, household members must adjust their travel patterns around the fixed location. Individuals must then adjust to changes in employment location, not by changing housing location, but by changing mode of transport.

State of Transport Infrastructure and Level of Motorization

19. Some cities, many of them in Latin America, have extensive motorized public transport systems that are either privately-owned or owned by the government. In other cities, such as many in Africa, motorized public transport systems are quite limited. The level of motorization in Africa is low and even declining in some cities. The data on buses in developing countries show roughly that South East Asian cities have the highest ratios of buses per 1,000 residents, followed by Latin America, then Africa and South Asia. In 1985 Seoul had 4.6 buses per 1,000 residents, Lima had 1.9, Harare had 0.6, and Algiers had 0.4. Annex 1 gives the ratio of buses per 1,000 people for selected developing country cities.

20. Adjustment programs and trade policies have had a great impact on the level of motorization and the state of transport infrastructure. The lack of foreign exchange and high cost of imported goods has limited the importation of new vehicles and spare parts to maintain old vehicles. In Algeria, for example, where bus companies usually replaced their vehicles about every four years, rather than maintain them, a shortage of foreign exchange has left many vehicles immobilized. The economic crisis of the 1980s has forced many governments to cut back on extension and maintenance of urban road systems, leaving new residential areas on the cities' peripheries without roads. In Africa, where the problem is acute, shortages of foreign exchange have limited the availability of equipment to maintain existing roads. Urban roads that once may have extended to the peripheral residential areas are now in disrepair. In Kenya,

21/ Grimes, p. 85-86.


some of the principal bus routes serving low-income areas are now almost impassible during the rainy season. This lack of infrastructure severely limits the transport modes available to poor residents, as even bicycles require a minimum level of road infrastructure.

**Regulatory Environment**

21. The model of transport demand described earlier assumes that a variety of modes are available, providing the traveler with a choice about how to balance time and money to maximize utility. This availability depends critically on the regulations governing the transport sector. In many Asian cities, all sorts of private transport services are available — taxis, jitneys, minibuses, and non-motorized vehicles such as rickshaws. In Latin America, the major transport modes are buses (privately and publicly-owned), metros, and trains. In Africa regulations are often designed to create a monopoly for a public bus company and prohibit the private provision of public transport, which limits the modes available to the traveler. Restrictions are especially tight in north Africa, where private provision of public transport is not permitted or is highly regulated, making government-owned bus companies the only public transport mode.

22. If routes from low-income neighborhoods are profitable for private operators, deregulation might increase the supply of public transport for the urban poor and increase their mobility. This is discussed further in the evaluation of Bank urban transport policy in Section III. Regulations can also determine the price and quality of private transport services. In Casablanca, for example, the government only recently allowed private bus companies to operate. These new companies, however, provide a higher quality service at a higher price than the government-owned bus companies and serve the middle-class with a guaranteed-seat service. The extent of competition among private operators and between private operators and publicly-owned bus companies can also influence fares.

23. In many cities, although official regulations prohibit or limit private provision of public transport, there are informal, or illegal, privately-owned public transport operations. Sometimes, as in Lima and Nairobi, operators organized into associations "invade" and establish fixed routes. As the usage increases, the government is forced to recognize their existence and

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grant them legal status. The extent to which official regulations determine the number and kind of modes available to the poor traveler depends on how effectively and diligently regulations are enforced. An ILO working paper on urban public transport in Africa divides cities into four categories: (i) cities where governments discourage the development of private public transport (Algiers and Casablanca); (ii) cities where public transport is partially private; (iii) cities where the government established a publicly-owned transport operation to complement a privately run service (Nairobi); and (iv) cities where informal transport has been tolerated, encouraged, and legalized (Abidjan, Dakar, Harare, Lagos, Lusaka, and Nairobi).

24. Three criteria—spatial income distribution, state of transport infrastructure and level of motorization, and the regulatory environment—can be used to evaluate the mobility of the urban poor. While this typology cannot completely characterize the transport problems of the urban poor, because each city has its own cultural and topographical peculiarities, the typology identifies those general factors that must be considered in studying the mobility problems of the poor. In Casablanca, for example, the poor live in bidonvilles on the opposite side of the city from employment centers. The skewed spatial income distribution and land-use pattern creates a great latent demand for transport, yet the level of motorization is very low, 0.2 buses per 1000 people, and private provision of public transport is highly restricted. Categorizing cities using this typology might be a way to select sites for further research on the mobility of the urban poor in developing country cities.


31/ Mitric, Urban Transport Enterprises in Morocco, p. 25.
II. THE LABOR MARKET

25. This sub-section examines how the transport system and accessibility of employment centers to the urban poor affect employment patterns, labor market participation, and job search. The extent to which transport policies affect different household members might depend on the type and security of employment, time constraints imposed by the household and household responsibilities, and the sector in which they are employed.32

26. The transport demand model suggested that in the short-run the demand for transport to work basically depends on the relative locations of a worker’s home and job. As different economic activities are located in different parts of the city, an urban worker's demand for transport would depend on the sector in which he or she is employed. For example, workers in the service sector, most often women in developing country cities,33 would require different transport services than workers in other sectors such as manufacturing or construction, to the extent that the location of their jobs and working hours will differ.

27. In the long-run, the time and money spent commuting to a job might determine the employment patterns of low-income households.34 As discussed in Section I, a worker will trade off the benefits of a distant job with the costs in time and money of reaching the job. Residents of peripheral areas incur high costs to access the same locations that residents of inner city slums or squatter settlements can reach easily and cheaply, and thus might not seek higher paying jobs in the city center. Comparing two poor neighborhoods in Mexico City - one an inner-city slum, the other a shantytown on the periphery - Eckstein found that "center-city residents [were] better situated than residents of the city periphery to adapt to the economic crisis [of the 1980s]."35 While she does not specifically discuss transport and accessibility, Eckstein explains that the success of slum residents in the formal and informal sectors is in part due to their advantageous location. "As formal sector opportunities contracted [during the economic crisis] and the purchasing power of formal sector jobs deteriorated with austerity policies,

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center-city residents may be better placed than shantytown dwellers to adapt to the changed structure of opportunity."36

28. In developing country cities, many workers are employed or earn their living in the informal sector.37 This is particularly true of the urban poor.38 Transport fare policy might affect the viability of informal sector enterprises that employ the poor and are linked to informal occupations, such as hawking. Transport is a critical input in informal sector production as inputs must be transported to workshops and finished goods must be moved from the workshop to the market. A study of the informal sector in Zimbabwe found that transport was the largest single business expenditure, accounting for 26% of the cost of doing business.39 Eckstein concludes, again without mentioning transport, that to the extent that peripheral residents are further away from major commercial markets, they are at a disadvantage in competing in the informal sector.

29. As discussed in Section I, the sharing of tasks and expenses within a household affect the time and budget constraints of individual members and therefore their demand for transport. Since women's tasks in the household include domestic work and child care, in order for them to participate in the labor force, it helps if jobs are close to home. To illustrate, when 700,000 squatters were relocated to the outskirts of Delhi between 1975 and 1977, in one resettlement colony it was found that female employment fell by 27% while male employment fell only by 5%. As housing was further from their former jobs, women could no longer quickly or inexpensively travel to work. Thus, they were unable to work outside of the home and fulfill their domestic responsibilities.40 Household members also demand transport to accomplish their assigned household duties. Inflexible transport systems with limited mode choice can greatly increase the time and money necessary to accomplish these tasks. In a city in Brazil, for example, women used public transport to shop, travel to work, visit health clinics, and take children to and from school. Because buses ran from the periphery to the city center only

36/ Ibid, p. 69. [My emphasis.]


38/ Rodgers, Urban Poverty and the Labour Market, p. 9.


40/ Moser and Peakes, Women, Human Settlements, and Housing, p. 20.
during peak hours, women’s average daily travel time was three times longer than that of men.\textsuperscript{41}

30. Time and money spent traveling might comprise a large part of the costs of job search. Job search costs can be considered a transaction cost. This cost could be quite high in cities with expensive, inefficient public transport and could inhibit the mobility of labor. According to economic theory, an unemployed worker would search for a job as long as the benefits of the search — the expected discounted wages from employment net of transport costs — exceed costs. An employed worker would search for a new job if the difference in expected discounted wages between the current job and the new job exceed the costs of search. The lower bound on job search costs, once a vacancy is located, is the fare of any motorized mode used to reach the job location.\textsuperscript{42} If the worker is unemployed and has no household responsibilities, the time devoted to search is free. Using the lower bound on search costs, sectors where job tenure is secure, expected discounted wages could easily exceed search costs, even when public transport fares reach 25\% of income. This conclusion would be especially true in highly-personalized labor markets where the probability of being hired at a particular job is high.\textsuperscript{43} In casual labor markets, however, where job tenure is very insecure or workers are hired only on a daily basis and the market may not be personalized, the cost of transport to search for a job might be prohibitive. A worker would only search for a job if the probability of being hired on any given day exceeds the percentage of daily income spent on transport, in other words, if expected daily income net of transport costs is positive.

31. The pattern of job search may also depend on the nature of the public transport system. A study of high-school graduates in Britain shows that the type, quality, and availability of public transport is an important factor in job search journeys. Despite a wide spatial distribution of vacancies announced by employment agencies and newspapers, it was found the actual pattern of job search was concentrated in districts highly familiar to the job seeker and limited to a small number of known bus routes.\textsuperscript{44} This tendency to limit job search only to those areas of the city familiar to the job seeker might be greater in developing country cities where job opportunities are discovered only through the network of family and friends or by observation. Thus, a transport system that limits the range of travel would then limit an individual’s personal information network — the network within which he/she can interact socially and gain information about vacancies. Restricted mobility also shrinks the job search area. Restricted physical mobility of labor could spatially segment the labor market, contributing to inefficiencies in the urban economy.

\textsuperscript{41} Ibid, p. 21.
\textsuperscript{42} Of course, locating a vacancy might involve transport. This is discussed below.
\textsuperscript{43} See Annex 2.
Transport as an Intersectoral Issue

Housing

32. The earlier discussion of the spatial distribution of income suggested that shortages and rigidities in the housing market might create transport problems for the urban poor. Poor households may be unable to locate close to their jobs or easily adjust their housing locations. Inversely, shortages of transport infrastructure and services might, in part, be responsible for the high price of housing close, or easily accessible to, employment centers. Dowall, for example, assessed the land market in Jakarta, testing the relative contribution of nine types of infrastructure or services to land price. Of the nine only three — paved roads, sidewalks, and public transportation — were useful predictors of price.\textsuperscript{45} While proximity is one part of accessibility, access to employment centers from different residential areas is enhanced by both transport infrastructure and transport services. The high premiums paid for land close to transport facilities is not payment for land, but actually payment for access. Scarcity of access might be partly responsible for these premiums and variations in housing prices. Such scarcity might be caused not only by limited transport infrastructure, but also by regulations that limit the private provision of public transport and thus the supply of transport services.\textsuperscript{46}

33. Thus far this paper has discussed the transport needs of the urban poor from a static perspective, assuming an unchanging number of urban residents, spatial distribution of income, and population density — all of which determine the aggregate demand for transport. Looking at transport demand from a dynamic perspective, pricing of transport services and the level of transport infrastructure might affect all of the above variables in the long-run. Flat transport fares, which allow the poor who live in the periphery of cities to pay less per mile than higher-income residents who travel shorter distances, might lead to less densely populated cities. Subsidization that lowers the fare for public transport increases the real wages of urban residents and might lead to more migration. In small but rapidly growing urban areas, these possible relationships perhaps should be considered when formulating transport policies. It is important to note, however, that the shape of a city and the spatial distribution of income is not solely determined by free choices made given prevailing prices. For example, as mentioned above, the relocation of the poor from the center of cities to its periphery might not be a choice at all.


\textsuperscript{46} An interesting hypothesis to test would be the relationship between housing prices in different locations and transport regulation. Do you find less dispersion in housing price as more and varied services become available?
Health and Education

34. In *Urban Policy and Economic Development* the World Bank identifies the alleviation of urban poverty as one of the three priorities for urban development in the 1990s.\(^47\) The policy paper recommends reducing poverty, in part, by increasing productivity at all levels, including the household level, by "improving the human capital of the poor through better education, health, and nutrition."\(^48\) While emphasizing the need to improve access to schools, clinics, and other services, the paper does not discuss transport as a means of access. To benefit from investments in health and education, residents must be able to travel to the facility or the facility must be able to travel to them. In Bangkok, for example, 60% of students attending training courses administered through mobile units in slum areas finished their courses. The completion rate at a fixed site, full day course was only 10%.\(^49\) Even if fixed facilities are located within poor neighborhoods, the number of residents that can access the facility depends on the transport infrastructure as even accessibility by walking is increased by building sidewalks, road crossings, and footpaths.

35. Investment in transport infrastructure and improved transport services expands the geographic area accessible to urban residents and thus provides access to more public services and facilities. Inversely, given a level of population density, transport improvements increase the potential number of people a facility in a fixed location can serve. Fostering private, small-scale public transport that could be well-suited for occasional trips to markets, health clinics, or other public centers would make such facilities more accessible. In Harare, for example, emergency taxis that seat 10 deviate from fixed routes to drop off passengers and run on flexible schedules.\(^50\) In developed countries, schools, hospitals, and social service departments operate extensive transport services to accommodate the population they serve. Such tertiary public transport often involves fleets of vehicles.\(^51\) Fewer but larger facilities can be built when the number of people served increases. Health, education, and other service sectors could then take advantage of economies of scale and specialization of services when designing and building their facilities.


\(^48\) Ibid, p. 45.


III. What Do We Know About Transport Demand Of The Urban Poor

36. Data on transport demand — how individuals choose a mode, job location, and housing location — are quite limited, as they require household travel surveys. Slightly more data are available on travel of the urban poor. The studies cited below include Angus Deaton’s analysis of household expenditure data from India, Tunisia, Sri Lanka, and Thailand; a series of reports by the Transport and Road Research Laboratory (TRRL) on travel behavior in developing country cities, mostly in Asia; a recent ILO report on private provision of public transport in Africa; an UNCTADA report on Africa; and various Bank sector reports and other studies. The following sections present data on trip purpose, expenditure on transport, and the modal split for the urban population — differentiating for the urban poor when possible.

37. The data sets used in many of these reports are by now quite dated, as both urban and economic conditions have changed significantly since 1980. Deaton’s research and the TRRL studies use data sets from the late 1970s. In particular, the one transport household survey for an urban area that Deaton uses is from Jaipur, India and was conducted in 1977-78. The UNCTADA reports and ILO reports use data from the mid to late 1980s, but do not include household survey data on transport.

Trip Purpose

38. The vast majority of trips for urban residents in all regions are trips to work or school. Deaton found that, in India, the large majority of trips above one kilometer are either to work or to school and most are made on a daily basis. In urban areas 74.2% of all trips were employment trips and 15.0% were educational trips, for a total of 89.2%. These Indian data, however, excluded trips of less than one kilometer. This creates a bias in the urban data against high-frequency short-distance trips, particularly those to school. In metropolitan regions of

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52/ Deaton, *The Demand for Personal Travel in Developing Countries*, p. 2.20 - 2.27.
54/ Following are the years in which data was collected for the data sets used in Deaton’s study - India: 1977-78, Tunisia: 1979-80, Sri Lanka: 1980-81, Thailand: 1975-76.
55/ Deaton, p. 2.20.
56/ Deaton, p. 4.12.
57/ Deaton, p. 4.46.
Brazil in 1985, school trips accounted for 21% of all trips and work trips 46%. In Morocco, 80% of all trips were trips to work or school.

39. Data from travel and expenditure surveys might be biased against short walking trips. Short, frequent journeys — such as trips to markets and schools — might not be considered "important" by respondents and thus might not be recalled. Daily activity surveys and travel diaries may be the best way to minimize this recall problem and accurately study the transport needs of poor urban residents.

Modal Split

40. In African cities walking is the predominant mode of transport, according to the ILO and UNCTADA reports. In many cities, more than 50% of all trips are on foot. The ILO report points out that this figure drops when only trips to work are considered: It attributes the predominance of walking to the shortage of motorized transport for low-income groups. In 1984 in Addis Ababa, for example, 79% of daily trips made by the poorest income group were on foot, with 77% of those trips over 30 minutes. In contrast, only 16.6% of all trips were on foot for the highest income group. (ILO data showing the distribution of daily trips by mode and income group in Addis Ababa, is reproduced in Annex 3.) A Bank study on Kenya also explains the high percentage of walking trips to a shortage of motorized transport. In 1979 it was estimated that in Nairobi — where bus fares account for 25% of monthly income for some workers — 45% of daily trips were on foot. Workers also walk because they cannot rely on the irregular bus service to get them to work on time. Bicycles are not widely used in Africa because of the lack of infrastructure and high cost — the price of a bicycle is often six to nine times the local monthly wage.

41. Several studies have tested the hypothesis that travel time decreases as income increases, since the poor cannot afford faster transport modes. This tendency would be reinforced if low-


59/ Mitric, Urban Transport Enterprises in Morocco, p. 5.


63/ Ibid, p. 17.


income households were located at a greater distance from employment centers than higher-income households. In Kuala Lampur a TRRL study found no trend for longer travel time for lower income groups. Roth and Zahavi, however, examined data on daily travel times for motorized travelers in Bogota, Salvador, Santiago, and Singapore, and found that in three of the four cities, travel time decreased as income increased. They speculate that the exception — the city of Salvador — might have been due to El Salvador’s unusual topography and spatial distribution of income. They also concluded that the behavior of travelers who do not use motorized modes differs significantly from the behavior of travelers who use a motorized mode at least once a day. Deaton found that in Jaipur workers who lived in higher-income areas spent less time traveling than those in poorer areas, even though poorer household lived closer to the city center than wealthier households.

Expenditure on Transport

42. Three measurements are used in the literature to evaluate the impact of transport expenditures on the budget of a traveler or household: (i) transport costs as a percentage of total income; (ii) transport expenditure as a percentage of total expenditure; and (iii) transport expenditure as a percentage of net income or expenditure — total expenditure or income less rent, food, or other necessary items. All three measurements are usually presented as averages. According to Deaton, because incomes tend to be variable, expenditures provide a more reliable guide to living standards of the urban poor than income. He finds that the two measures paint a very different picture of the burden of transport expenditure on poor urban households: transport shares of income are consistently higher than transport shares of expenditure.

As Percentage of Income

43. The numbers on transport expenditure as share of income vary widely, from 3% to 30%, as would be expected when looking across various cities. The following chart illustrates the range.

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68/ Deaton, The Demand for Personal Travel in Developing Countries, p. 5.35.
69/ Deaton, The Demand for Personal Travel in Developing Countries, p. 2.25.
Table 1. Transport Expenditure as a Percentage of Income

<table>
<thead>
<tr>
<th>City</th>
<th>Low-Income</th>
<th>Middle Income</th>
<th>High Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abidjan</td>
<td>6%</td>
<td>6.8%</td>
<td>11%</td>
</tr>
<tr>
<td>Casablanca</td>
<td>12-15%</td>
<td>12-15%</td>
<td>3-4%</td>
</tr>
<tr>
<td>Dakar</td>
<td>3%</td>
<td>4.8%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Nairobi</td>
<td>14-30%</td>
<td>5-14%</td>
<td>&gt; 5%</td>
</tr>
</tbody>
</table>

The data from a TRRL report comparing a middle and high-income residential area with a low-income resettlement colony in Delhi, both 20-25 kilometers from the city center, show that poor families spent a higher proportion of their income on travel. Poor households in the low-income area spent 20-25% of their income on transport with an area average of 11%, while in the high-income neighborhood, households spent 9% on average on transport. Data from Latin America only give the proportion of income spent on transport for poor households: In Peru, the poorest 30% of the population living in urban areas spent 3.6% of their budget on average on public transport. In Brazil urban households are devoting increasing proportions of their income to transport — up to 20% in metropolitan regions.

As Percentage of Expenditure

44. Deaton found that in India, Tunisia, Sri Lanka, and Thailand, travel expenditure ranged from 2.8% to 5.6% of total expenditure for urban households. Poor households, in general, did not spend over 10% of total expenditures. Many of the poor, however, spent nothing on transport. In Sri Lanka, Tunisia, and Thailand, one-half of the households in the bottom decile of consumption distribution spent nothing on transport. This implies that household members always walk. In most of the surveys, the share of the budget spent on travel rises from poorer to richer families. Total expenditure elasticity for transport is larger than one. A possible

73/ Brazil The Urban Transport Sector, p. 28.
74/ Deaton, The Demand for Personal Travel in Developing Countries, p. 2.30.
75/ Ibid, p. 2.23.
explanation for this, is that at higher expenditure levels, the household have more money to spend on leisure and social activities that involve travel.

As Percentage of Net Income/Expenditure

45. Transport expenditures can also be expressed as a percentage of "net" income or expenditure — income or expenditure less housing, fuel, and food, or other definitions of basic necessities. Most of the data available using this measure show that transport expenditure as a proportion of net income decreases as total income increases. In Delhi, a 1979 TRRL study found that residents of a low-income neighborhood spent 36% of "net" income on transport while residents of a middle-income neighborhood spent only 18% of their "net" income on transport. In 1977 in Kuala Lampur, while the percentage of total income spent on transport remained constant across income levels, the percentage of "net" income spent on transport decreased as total income increased. In Ghana the trend is reversed: the poorest of the poor spent 4.1% of non-food expenditure on public transport on average, the poor spent only 4.7%, while all others spent 5.7%. These figures, however, were not disaggregated for rural and urban areas. In Kingston, an examination of income expenditure patterns of typical households in low-income areas shows that the percentage of "net" income paid to transport was extraordinarily high, ranging from 54% to 77%.

Bank Urban Transport Policy

46. The discussion on demand for travel and the data presented above informs the following evaluation of the current Bank policy on urban transport and its potential impact on the urban poor. The Bank's urban public transport policy is set forth in the World Bank policy study Urban Transport and supported by the World Bank technical paper Urban Transit Systems. Transport systems in developing country cities have not been able to meet the burgeoning demand for transport. The policy study recommends "demand management" to solve this and advocates methods such as road pricing, traffic management, deregulation, and the elimination of subsidies. The last two recommendations concerning public transport would most directly affect the urban poor.


77/ E. Oti Boateng, Kodwo Ewusi, Ravi Kanbur, and Andrew McKay. A Poverty Profile for Ghana, 1987-88, Social Dimensions of Adjustment in Sub-Saharan Africa Working Paper No. 5, The World Bank, 1990, p. 20. This poorest group earned less than 16,491 cedis a year, or 7.4% of the population. The poor had an income below 32,981 cedis per person per annum, defining 35.9% of all Ghanaians as poor. p. 17.


47. The policy paper recommends that the private sector provide public transport. Deregulation of the transport sector may give the urban poor more choices — if affordable service can be provided without operators losing money. In Kingston, Jamaica, although fares of privately-owned minibuses were slightly higher than public bus fares, users of the minibuses were of a lower income than users of the buses. Because public buses in low-income areas were severely over-crowded and irregular, residents paid a higher fare for the reliable minibuses. Note, however, households in these low-income areas spent from 54% to 77% of their "net" income on transport. For the urban poor deregulation might foster the emergence of highly flexible and convenient public transport modes available at a higher price, such as the emergency taxis in Harare, which can provide occasional discretionary trips, such as to health clinics.

48. Private providers, however, might find serving low-income neighborhoods unprofitable. A TRRL study on Delhi found that private providers of public transport tended to gravitate toward high-income areas, leaving low-income areas with the public bus company as the only mode of public transport. Moreover, while deregulation permits the private provision of public transport, it does not necessarily prevent monopolization of routes by associations of private operators. While these associations often successfully organize the running of the route, they might also be able to charge monopoly prices, which could impose a heavy burden on the urban poor, even precluding some of them from using the service at all.

49. While the policy study recognizes that urban households are spending an increasingly larger share of their income on transport, it argues against subsidization. It asserts that subsidies have removed incentives for public transport companies to reduce costs, leading to inefficiency and greater deficits without the anticipated benefits of better services, fewer cars and reduced congestion, and greater patronage leading to improved viability. Only on routes that are not profitable and therefore not attractive to commercial operators, should the government subsidize services. These subsidies, however, must be "provided to users in a form that enables them to choose between services" so that "competition is retained and operators still have an incentive to run cost-effective services at acceptable standards." Moreover, maintaining artificially low fares "may lead to excess demand and consequent pressure to provide greater capacity than


81/ See Gil, Social and Labour Aspects of Urban Passenger Transport, p. 34.


85/ Ibid, p. 28.
would otherwise be required. This notion that subsidies create excess demand is echoed in the Technical Paper: "excess demand may have arisen because of direct or hidden subsidies — for example, low bus fares or low fuel prices." The obvious solution, to the problem of excess demand at a given price is a "rational pricing policy [that] will reduce demand."

50. The conclusion that raising fares will reduce the quantity demanded of transport is based on the implicit assumption that the demand for transport is elastic — i.e. responds to changes in price. An increase in fares is assumed to reduce the quantity demanded of transport, relieving the burden on the transport system. The discussion on the demand for travel above and the available data, however, point to the conclusion that the urban poor's demand for transport is highly inelastic, even in the long-run. For poor travelers, in the short run, the long distances between residence and work or school could leave them with little choice but to pay more when fares increase. In Antananarivo, for example, when the bus fare was increased 100% passenger traffic declined only 2.9%.

51. In the long-run, if the poor are unable to move when fares rise, and no cheaper modes are available, then they either pay the higher fares, use a slower mode of transport, find a job closer to home, or in the extreme, drop out of the labor market. According to the model of demand for travel to work, when fares rise the traveler finds a new balance in the trade-off between money and time, and the trade-off between travel costs and higher wages of a distant job. Several outcomes can result. A household could increase the share of income spent on transport. An individual could find another job closer to home necesitating a decrease in

86/ Ibid, p. 28. [My emphasis.]
87/ Armstrong-Wright, Urban Transport Systems, p. 29.
88/ The evidence on elasticities gathered from studies mostly on developed countries shows that the demand for public transport is highly inelastic. Estimates of elasticity of demand for bus travel in peak periods range from .1 to .7. Estimates of non-peak elasticities for bus ranged from 1.08 to 1.54 with the mode choice elasticity ranging from .01 to .69. The studies from which these elasticity figures were collected were not explicit about the time horizon of their elasticity estimates. Tae H. Oum, W.G. Waters, and Jong Say Yong, A Survey of Recent Estimates of Price Elasticities of Demand for Transport, The World Bank - PPR Working Paper Series, WPS 359, January 1990, p.17.
89/ The elasticity of demand from this one data point in Antananarivo is .029. Madagascar Urban Sector Review, The World Bank, Report No. 8835-MAG, p. 105. This was the only report in FY 1991 that even mentioned the performance of the transport sector with respect to the urban poor.
90/ If the fares of a subsidized service rise, it is possible that fares charged by a competing service would also rise. The evidence on private public transport fares closely follow public bus company fares, setting fares close or slightly higher. See Heraty, "Public Transportation in Kingston, Jamaica," and Gil, Social and Labour Aspects of Urban Passenger Transport, p. 33.
income. Finding a job closer to home, however, could be quite difficult, if not impossible, if the sector in which a worker is employed has centralized or limited work locations and inter-sectoral mobility among workers is low. Another possibility, then, other than dropping out of the labor market, is choosing a slower but cheaper mode of transport, such as walking and increasing time spent traveling. This may mean foregoing job training programs or other after-hours educational opportunities. Other discretionary activities and travel could be curtailed, such as visits to health clinics and social visits. Increased time away from the home by one household member could have severe repercussions on other family members as they assume the tasks of the traveler. For example, a female child who undertakes her mother’s tasks might shorten her education, or another female relative might not be able to work outside the home.

52. The Bank’s policy study dismisses subsidies as a means to keep fares down for the urban poor on the grounds that such subsidies do not actually reach the targeted population. Another argument against subsidies is that the transfer of funds from one segment of the population to another is not necessarily "socially just." The complicated question of the efficiency and equity of transport subsidies has been addressed elsewhere. Here I will limit the discussion to measuring the effectiveness of targeted transport subsidies. Most studies use the transport share of expenditure or income across income groups to evaluate the fare policy of a transport system. For example, the technical paper proposes that fares should be considered discriminatory if costs of travel exceed 10% of income for more than 15% of the population. The study on the impact of structural adjustment programs in Peru concludes the urban poor will be affected by policies that regulate the importation and taxation of oil and oil products since both kerosene and public transportation figure significantly in their budgets. The study reports that the urban poor, on average, spent 3.6% of their income on transport. Obviously there is a difference of opinion, which must be resolved, over the proper interpretation of the data on transport share of income. The impact of a fare adjustment on the household budget also depends on the elasticity of demand. If, as stated above, the urban poor’s demand for public transport for the poor is highly inelastic, then with higher fares, expenditure on transport would certainly increase.

91/ If there had been a higher paying jobs closer to home, the worker would already have been working there, earning higher income and saving transport costs.

92/ Note again that inter-sectoral mobility among workers may be very low.


96/ Glewwe and de Tray, The Poor in Latin American during Adjustment, p. 38. [My emphasis.]

53. Borrowing from the debate on food subsidies, a criteria that could be used to determine the effectiveness of a subsidy on a particular service or mode is the percentage of total expenditure devoted to the targeted income group.\(^9\) Blanket subsidies benefit not only the poor who use motorized transport but also the middle-class or those travelers who cannot afford automobiles. When a subsidized mode exclusively serves a poor population, subsidies may indeed provide low-cost transport for the poor and would translate into an increase in their income. Estimates of the percentage of low-income passengers varies across cities. Deaton concludes that transport subsidies in the countries studied would favor the middle-class, not the very poor, because large fractions of poor people spend nothing on transport.\(^9\) In contrast, the ILO study concludes that, in Africa, the majority of public transport users come from low-income groups with a "sizeable" minority from medium-income groups that cannot afford taxis or cars.\(^1\) In Brazil, users of buses are largely poor.\(^1\) The study on the impact of structural adjustment in Ghana showed that while the poor spend 4.7% of their budget on public transport, their total expenditure accounts for 13.3% of all expenditure on public transport.\(^2\) Again, these figures were not disaggregated between rural and urban areas. The first step in developing a targeted subsidy program would therefore be to study the urban poor’s demand for travel and determine the spatial distribution of income. Once this is known, targeted subsidies can be developed.

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99/ Deaton, *The Demand for Personal Travel in Developing Countries*, p. 230.


101/ *Brazil: The Urban Transport Sector*, p. 11.

IV. CONCLUSION

54. In conclusion, much remains unknown about the demand for transport of the urban poor and how changes in cost and extent of public transport services affects poor urban households. While the existing data show that the majority of trips to work and school, we do not know how transport figures into the daily routines of household members. Such information could aid formulation of policy interventions to reduce travel time and increase accessibility to markets, public facilities, and employment centers.

55. Answering three questions could form the basis of a study of the mobility needs of the urban poor: (i) how does the modal split vary across income groups? What is the elasticity of demand for any mode within a particular group — for example, how elastic is the demand for different modes of transport, such as public bus service, among the poor rather than among the middle-class? Does this elasticity depend on the spatial distribution of income? (ii) how does the time spent traveling and distance traveled vary across income groups and does this depend on the spatial distribution of income? (iii) what is the demand for travel for trips other than to work? How do the poor utilize transport for daily errands such as shopping, visiting health centers, and so on? How does the transport system affect job search?

56. None of these questions can be answered by using data from household expenditure surveys. While we can derive the expenditure on transport, perhaps differentiating between private and public modes of transport, we cannot discern, for example, the time and distance spent traveling. For those who walk, household expenditure data provides no information. This is especially important for the plight of the poor who walk and thus spend little on transport.

57. The next step in the effort to study the demand for transport of the urban poor is, therefore, to design a research program to answer the above three questions. The first step in designing the program would be the selection of cities to be studied — perhaps using the typology proposed in Section I. Obtaining a crude, but useful, overview of the situation of transport and the urban poor could require perhaps a few days of field work in each city. This would involve locating sample poor residential areas, recording the distance to employment centers for different occupations, and surveying the transport modes and fares available to poor travelers. The second task would be determining which survey techniques can best gather data to answer the questions outlined above. I would also suggest conducting a small diagnostic survey to get a sense of importance of the questions outlined above and perhaps identify other issues pertinent to understanding the mobility needs of the urban poor.
ANNEXES
## Annex 1

### Buses per Capita for Selected Cities

<table>
<thead>
<tr>
<th>City</th>
<th>Pop. ’000</th>
<th>GNP/cap.</th>
<th>Urban GNP/Cap.</th>
<th>Buses/*0000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abidjan</td>
<td>1800</td>
<td>630</td>
<td>887</td>
<td>1.2</td>
</tr>
<tr>
<td>Accra</td>
<td>1404</td>
<td>370</td>
<td>561</td>
<td>4.4</td>
</tr>
<tr>
<td>Algiers 87</td>
<td>2300</td>
<td>2630</td>
<td>3678</td>
<td>0.4</td>
</tr>
<tr>
<td>Amman</td>
<td>1185</td>
<td>1530</td>
<td>1866</td>
<td>0.6</td>
</tr>
<tr>
<td>Ankara</td>
<td>2252</td>
<td>1080</td>
<td>1479</td>
<td>2.2</td>
</tr>
<tr>
<td>Bangkok</td>
<td>6700</td>
<td>800</td>
<td>1333</td>
<td>2.6</td>
</tr>
<tr>
<td>Beijing</td>
<td>5550</td>
<td>330</td>
<td>550</td>
<td>1.7</td>
</tr>
<tr>
<td>Bogota</td>
<td>5000</td>
<td>1350</td>
<td>1617</td>
<td>3.6</td>
</tr>
<tr>
<td>Bombay</td>
<td>8790</td>
<td>290</td>
<td>464</td>
<td>0.5</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>11500</td>
<td>2140</td>
<td>2277</td>
<td>1.3</td>
</tr>
<tr>
<td>Cairo</td>
<td>10600</td>
<td>650</td>
<td>890</td>
<td>0.5</td>
</tr>
<tr>
<td>Calcutta</td>
<td>10000</td>
<td>290</td>
<td>464</td>
<td>0.4</td>
</tr>
<tr>
<td>Casablanca 87</td>
<td>2456</td>
<td>610</td>
<td>932</td>
<td>0.2</td>
</tr>
<tr>
<td>Dakar</td>
<td>1456</td>
<td>370</td>
<td>544</td>
<td>0.8</td>
</tr>
<tr>
<td>Guatemala City</td>
<td>1500</td>
<td>1200</td>
<td>1714</td>
<td>2.0</td>
</tr>
<tr>
<td>Harare</td>
<td>1085</td>
<td>640</td>
<td>1024</td>
<td>0.6</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>5467</td>
<td>6080</td>
<td>6333</td>
<td>1.9</td>
</tr>
<tr>
<td>Ibadan</td>
<td>1800</td>
<td>950</td>
<td>1545</td>
<td>5.7</td>
</tr>
<tr>
<td>Jakarta</td>
<td>8000</td>
<td>520</td>
<td>832</td>
<td>0.7</td>
</tr>
<tr>
<td>Karachi</td>
<td>6200</td>
<td>340</td>
<td>523</td>
<td>2.7</td>
</tr>
<tr>
<td>Kuala Lampur</td>
<td>1215</td>
<td>1970</td>
<td>2855</td>
<td>1.6</td>
</tr>
<tr>
<td>Lagos</td>
<td>6739</td>
<td>950</td>
<td>1545</td>
<td>1.2</td>
</tr>
<tr>
<td>Lima</td>
<td>4608</td>
<td>1010</td>
<td>1210</td>
<td>1.9</td>
</tr>
<tr>
<td>Madras</td>
<td>5460</td>
<td>290</td>
<td>464</td>
<td>0.4</td>
</tr>
<tr>
<td>Manila</td>
<td>6822</td>
<td>570</td>
<td>814</td>
<td>4.7</td>
</tr>
<tr>
<td>Mexico City</td>
<td>18000</td>
<td>2180</td>
<td>2565</td>
<td>1.4</td>
</tr>
<tr>
<td>Montevideo</td>
<td>1300</td>
<td>1720</td>
<td>1859</td>
<td>1.1</td>
</tr>
<tr>
<td>Nairobi</td>
<td>2000</td>
<td>310</td>
<td>517</td>
<td>0.8</td>
</tr>
<tr>
<td>Santiago</td>
<td>4300</td>
<td>1450</td>
<td>1576</td>
<td>1.9</td>
</tr>
<tr>
<td>Sao Paulo</td>
<td>15880</td>
<td>1670</td>
<td>1931</td>
<td>1.5</td>
</tr>
<tr>
<td>Seoul</td>
<td>9646</td>
<td>2310</td>
<td>2800</td>
<td>4.6</td>
</tr>
<tr>
<td>Shanghai</td>
<td>7800</td>
<td>330</td>
<td>550</td>
<td>1.0</td>
</tr>
<tr>
<td>Singapore</td>
<td>2558</td>
<td>7610</td>
<td>7610</td>
<td>3.3</td>
</tr>
<tr>
<td>Tianjin</td>
<td>3340</td>
<td>330</td>
<td>550</td>
<td>1.3</td>
</tr>
<tr>
<td>Tunis 87</td>
<td>1394</td>
<td>1180</td>
<td>1494</td>
<td>0.5</td>
</tr>
</tbody>
</table>

All data from 1985 unless otherwise noted.
Sources: Bank reports, World Tables
Prepared by Elizabeth Callan.
Annex 2

Transport Costs and Job Search

A risk-neutral worker will look for a job as long as the expected discounted benefits of the search exceed the costs. The lowest bound on search costs is the cost of motorized transport used to visit a job location where the worker has already located a vacancy. Search costs could also include the costs of finding the job vacancy and the opportunity cost of time spent on job search.

Let \( W \) be the daily wage and \( I = 25W \) be monthly income. Let \( x \) be the percentage of the daily wage spent on transport. Round-trip cost of travel to the job location would then be \( xW \). Assume that the probability of being employed, \( \alpha \in [0,1] \), is independent of the number of job search trips. With monthly interest rate, \( r \), the worker discounts each month's income by \( \delta = \frac{1}{1+r} \) per month.

Let \( N \) be the number of months the worker is employed once hired. The expected benefits of job search are then:

\[
\alpha [I-xI](1+\delta^2+\delta^3+...+\delta^N)
\]

where \( xI \) are the round-trip travel costs to the job site. The cost of job search is the round-trip transport expense: \( xW \). Comparing costs and benefits, a worker will search for a job as long as the following inequality is satisfied:

\[
\frac{x}{25\alpha(1-x)}
\]

Substituting values for \( x \) and \( \alpha \) shows that with job security for at least one month, the benefits of job search easily exceed the costs. For example, with \( x = .25 \) and \( \alpha = .125 \), the right-hand-side of the above inequality equals .03 which is less than the left-hand side of the inequality for all values of \( \delta \).

For day labor \( N=0 \). If the probability of being hired each day is independent of whether or not the worker was hired on the previous day the expected discounted benefits of a job trip are simply \( \alpha W \). The cost of search is the same: \( xW \). The worker will look for a job daily as long as benefits exceeds costs, as long as the probability of being hired, \( \alpha \), exceed the percentage of the wage spent on transport, \( x \). In other words, a worker will look for work as long as the expected wage net transport costs, \((\alpha - x)W\), is positive.
Annex 3

Distribution of Daily Trips by Transport Means and Income
Addis Ababa, 1984

<table>
<thead>
<tr>
<th>Income Group (Birr/Mo.)</th>
<th>Bus %</th>
<th>Mini-Bus %</th>
<th>Taxi %</th>
<th>Car %</th>
<th>Other %</th>
<th>&lt;30 mins %</th>
<th>&gt;30 mins %</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Income *</td>
<td>121,573</td>
<td>10.9</td>
<td>3,754</td>
<td>0.3</td>
<td>69,225</td>
<td>6.2</td>
<td>21,301</td>
<td>1.9</td>
</tr>
<tr>
<td>0 - 50</td>
<td>26,850</td>
<td>11.7</td>
<td>1,140</td>
<td>0.5</td>
<td>13,707</td>
<td>6.0</td>
<td>1,985</td>
<td>0.9</td>
</tr>
<tr>
<td>51 - 100</td>
<td>34,716</td>
<td>14.2</td>
<td>2,815</td>
<td>1.2</td>
<td>19,356</td>
<td>7.9</td>
<td>3,016</td>
<td>1.2</td>
</tr>
<tr>
<td>101 - 200</td>
<td>32,071</td>
<td>15.9</td>
<td>3,016</td>
<td>1.5</td>
<td>29,516</td>
<td>14.7</td>
<td>5,039</td>
<td>2.5</td>
</tr>
<tr>
<td>201 - 400</td>
<td>22,673</td>
<td>13.6</td>
<td>1,877</td>
<td>1.1</td>
<td>41,328</td>
<td>24.8</td>
<td>14,240</td>
<td>8.5</td>
</tr>
<tr>
<td>401 - 600</td>
<td>5,865</td>
<td>9.1</td>
<td>1,404</td>
<td>2.2</td>
<td>18,426</td>
<td>28.7</td>
<td>15,843</td>
<td>24.7</td>
</tr>
<tr>
<td>&gt; 601</td>
<td>1,966</td>
<td>4.4</td>
<td>143</td>
<td>0.3</td>
<td>7,715</td>
<td>17.3</td>
<td>24,701</td>
<td>55.5</td>
</tr>
<tr>
<td>Total</td>
<td>245,714</td>
<td>11.9</td>
<td>14,149</td>
<td>0.7</td>
<td>199,273</td>
<td>9.6</td>
<td>86,125</td>
<td>4.2</td>
</tr>
</tbody>
</table>

* Probably refers to housewives or children.

REFERENCES


Deaton, Angus. *The Demand for Personal Travel in Developing Countries*, Infrastructure and Urban Development Department, Report INU 1, August 1987.


Survey of Pavement Dwellers, Madras City 1989-90, commissioned by the Madras Metropolitan Development Authority to SPARC.


