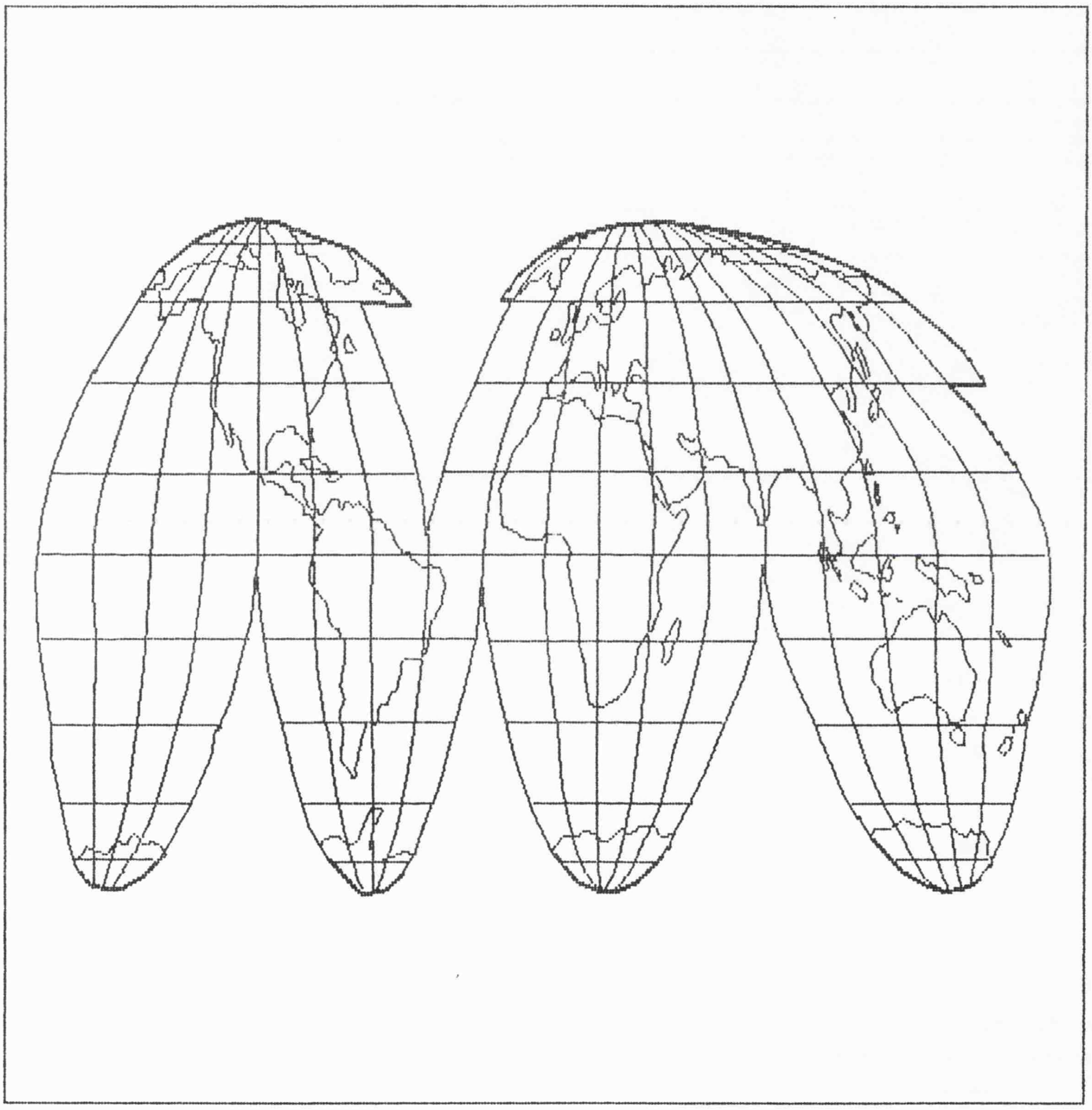
MINIBUS TRANSPORT IN FAR EASTERN CITIES, WITH SPECIAL REFERENCE TO BEIJING



MINIBUS TRANSPORT IN FAR EASTERN CITIES, WITH SPECIAL REFERENCE TO BEIJING

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...ever since the dawn of civilization, people have not been content to see events as unconnected and inexplicable. They have craved an understanding of the underlying order in the world... Humanity`s deepest desire for knowledge is justification enough for our continuing quest. And our goal is nothing less than a complete description of the universe we live in.

Stephen W. Hawking
A Brief History of Time p.13

ABSTRACT

Transport systems employing small sized vehicles and operated under an informal institutional structure are the essence of unconventional wisdom of urban transport planning in the Third World. The minibus is one of the many types of unconventional passenger carriers which primarily originate from indigenous technology. In the Far East, minibuses play a crucial role in moving commuters in large urban areas.

Using minibuses in urban passenger transport services is interesting phenomena in urban transport planning in both developed and developing countries. Being small the minibus can ply along narrow streets often seen in crowded residential quarters and thus provide users with a high level of accessibility to trip ends. Furthermore, providers of minibus transport services are profitable, associated with small scale business and informal organizational structure and, more interestingly, often under private ownership.

The minibus system in Beijing is one of the most recent public transport systems established in the Far East. It is distinctive in that the providers can be financially viable under state ownership and in large fleets. This study examines the system's service style, ownership pattern and organizational structure which are thought to have influenced the undertakings' financial performance. The findings suggest that neither ownership nor institutional structure contributes

directly to profitability. The main factors for financial viability rest upon the self-reliance and entrepreneurship within the industry, which stimulates labour efficiency of the crews. Besides, the 'near-monopolistic' market and the limited total supply serving a huge population, also create opportunities for providers to charge high fares.

On the basis of the findings, the study recommends that, in order to encourage the passenger transport business, a competitive market mechanism should be developed within the industry, with the participation of all sectors. The major outcome of this study is the building of a model of transport planning for developing cities. The essence of the model is that in low-income countries, cheap labour is an important resource which should be utilized fully in substitution for expensive imported technology, and that the use of modern technology should follow the affordability of the citizens and the condition of economic development. In conclusion, the study confirms that the unconventional transport wisdom is an appropriate approach that should be given proper weight, especially in the developing world.

TO THOSE WHO HAVE HELPED ME.

ACKNOWLEDGEMENT

It was several years after I had completed High School that I left my home town to become one of the "boat people" looking for freedom and justice. In a chilly night in January, 1979, together with 57 fellow countrymen and women, including the old and the very young, I reached the Hong Kong waters on a shabby junk; and in the Winter of the same year, a plane brought me to Britain. Since then I began my life in a different world, leaving my elderly parents thousands of miles behind in another land.

I "re-started" my "journey" in this new homeland from a beginners' English class at an adult education centre. Although I must admit that since then I have spent much of my time in the classroom and with dictionaries, trying to learn new subjects through a language other than my mother tongue has never been easy for me. Indeed there have been setbacks and frustrations; and the progress along this journey has been painfully slow. However, with a bit of luck and, above all, the generous help of many kind people, I have finally been able to obtain a studentship in this world famous institution of higher learning.

It was here at the LSE's Geography Department that I began to develop my interest in urban transport planning. Among the Msc. geography students in 1988, Tim and I chose transport planning as one of our optional subjects. From the very beginning Dr. Ken Sealy has given us much encouragement for

working in this field. In the end we both wrote our dissertations on transport; and after that course Tim went back to his native America to work on a doctorate's degree on air transportation at Washington University, Seattle while I carried on to do mine here on minibus service. A mere coincidence perhaps cannot explain the similar routes that we both have followed; it must be said that the inspiration of Dr. Sealy through those many tutorial discussions had been one of the important factors that put us on this track.

Besides, I am also indebted to many other people: My sincerest thanks go first to the Rees Jeffreys Road Fund for its financial award which enabled me to make ends meet and pay for the field-trip to China; and upon this scholarship my appreciation is due, in addition to my supervisors, to the Scholarships officers and the panel of the Award, and particularly to Professor Emeritus M. J. Wise, who wrote a very good letter in support of my application. Second, I would like to express my gratitudes to those who provided me with some essential materials for the literature review earlier: Mr. Fouracre, Professor Rimmer and many others from institutions both in Britain and abroad.

Furthermore, I feel grateful to my friends in China for the hospitality and assistance they gave me during my fieldwork in Beijing in Summer 1990. In order to "observe" the different features of the minibus service, I often had to get up early in the morning and come back late at night. Despite the inconvenience that I must have caused, my host at the residence

of Peking University always remained understanding and helpful. On the other hand, my other friends at the Institute of Economics tried their best to help me contact various institutions, from where most of the "unpublished materials" were collected. In respect of primary information, my thanks are extended to the anonymous passengers whom I managed to talk with at bus-stops and during the many trips that I travelled on the city's public transport system.

It has also been an unforgettable experience for me to work on this project under the supervision of Dr. Sealy and Professor Diamond. Although I did not meet and discuss my work with Professor Diamond on a regular basis, his advice given earlier has proved invaluable to me. What is more, throughout these years my principal supervisor Dr. Sealy has lent me much help in various aspects than I should ever deserve. It was his continuous, and often plainly critical, comments made on my scripts that have been the sole driving force behind my progress in writing this thesis. I now begin to realize that in a research project, the burden placed on supervisors' shoulders is often no less than that on the student's. For this reason I hope that the completion of my thesis can in some sense bring relief to my supervisors, as well as to myself.

Looking back to the past, my thanks go to all my previous teachers of the Msc. geography course here, and those of the Bsc. Human Geography at the University of Reading, for supporting me to move on in my study career. I also acknowledge the help of the language teachers who taught me in the earlier

years of the 1980s, at Brixton College, and the Central School of English, a private institution which kindly offered me a free place. In short, I owe a great deal to a large number of people for their help given to me over the past twelve years. Without them this thesis would have never been possible; though it must be said that whatever standard of quality it may have achieved, any errors are solely mine.

In the past I have dedicated my Bsc. dissertation to "the Place Where I Was Born", and the Msc. one to "Britain -- My New Homeland". Earlier I had the idea of dedicating this Ph. D thesis to the memory of my parents, who, sadly, having seen their youngest son off to an unknown destination, could wait no longer to see him return home. In retrospect, I think this was a price that I paid for what I have been trying to achieve. Nonetheless I am not in any sense bitter. Instead I feel encouraged and hopeful. The friendship and generosity that I received over the past years have confirmed that even in the darkest nights of my life I can always see a streak of light somewhere ahead. For this reason I decide to dedicate this thesis to **all those who have helped me.** I am sure my parents would forgive me on this from the heaven where they now rest in peace, for whom, my mind reads: **I MISS YOU DEARLY.**

T H L

LSE Summer 1992.

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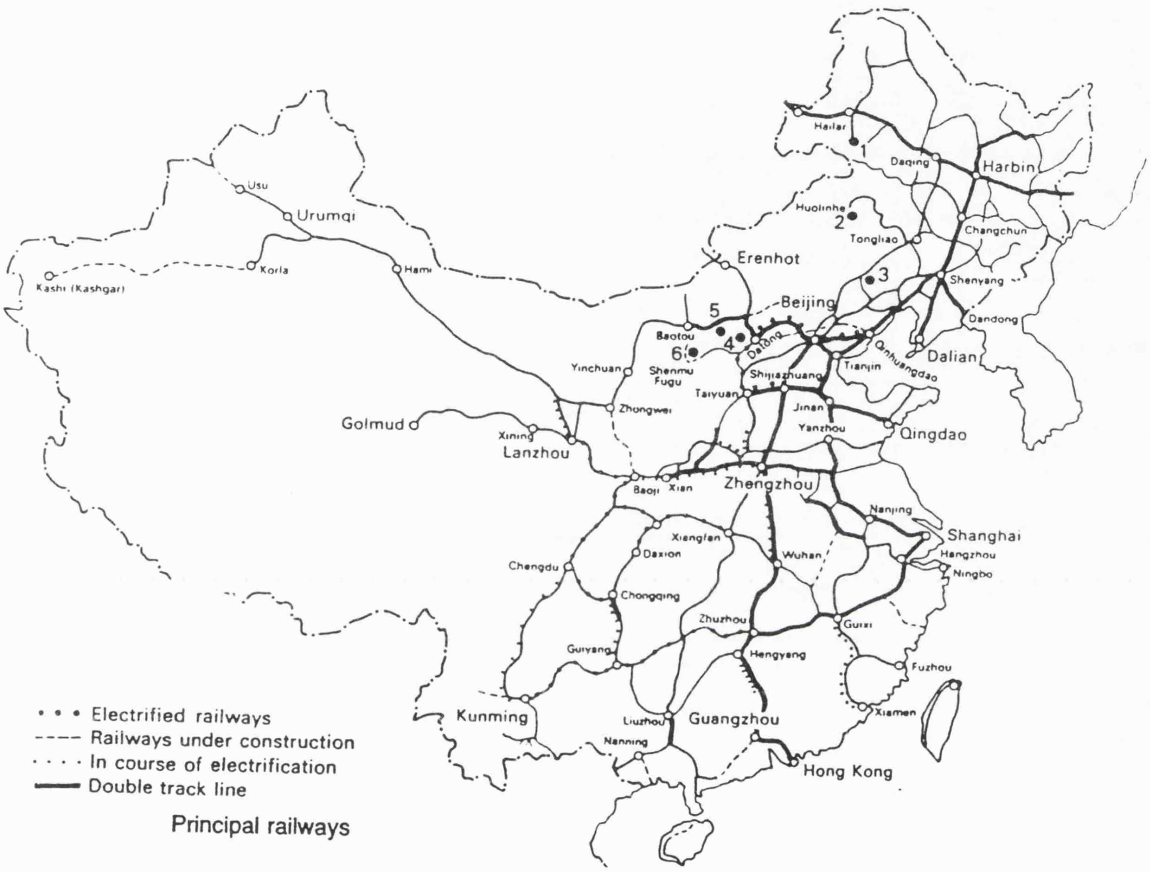
The People's Republic of China



Principal railways

Land area: 9,600,000 square kilometres

Population: 1,100,000 reached in 1989

Population growth rate: average of 1.2 per cent per annum 1981–85

Gross National Product (GNP): RMB 788,000 million in 1985

GNP per capita: RMB 754 in 1985, or approximately US$ 400, putting China towards the top of the poorest third of nations

Land use by topography: mountainous 33 per cent; plateaux 26 per cent; basins 19 per cent; plains 12 per cent; hills 10 per cent – all approximate

Land use by function: cultivated 10 per cent; forests 12.5 per cent; fresh water 1.75 per cent; usable prairie 23.4 per cent

Currency: Renminbi (RMB), translated as The People's Currency, the unit of which is the yuan. In 1988, the official exchange rate against the pound sterling was around 1 = yuan 7. In 1992, the rate is £1≈Y9.

PREFACE

Transport planning as a discipline is rooted in the tradition of engineering problem-solving and had its beginnings in the 1950s as an extension of highway design and traffic engineering. The primary concern of earlier planning was the planning and provision of transportation facilities for the motor car in order to ensure maximum mobility for the anticipated increase in traffic. Problems of investment planning and resource allocation were approached mainly from a mechanistic and non-behavioural perspective. In general, transportation problems were viewed in relative isolation from the more general socio-economic problems and aspects of society. Models, methods, and techniques were adopted, developed and applied because of their descriptive usefulness and without the justification of predictive validity of or behavioural content (Fischer 1987).

In the middle and late 1950s, great strides were made in the techniques for spatial prediction of transportation demands and analysis of transportation system operations. The ability to simulate system behaviour with an acceptable degree of accuracy, combined with the improvement in the economic analysis of system costs and benefits, permitted the generation and evaluation of many alternative transportation systems. The widespread availability of high-speed digital computers made the use of these analytic methods feasible. The elements in this planning process have been listed by Carter (1984) as follows: goals formulation, demand projections, alternative system proposals, system simulation and performance evaluation, and finally, system choice and construction.

Beginning in the late 1960s, disaggregate behaviour models were developed and used, allowing transportation planners to gain new insight into the relationships between travel demand, transport system characteristics, and socio-economic variables. Emphasis on urban transportation planning from the late 1950s to the mid-1970s led to the development of very sophisticated models and computer programme. The early developments followed a general sequential approach with the following forecasting steps that are described in great detail in the literature: trip generation; trip distribution; modal choice; and trip (route) assignment (Carter 1984).

The output of these elements was viewed by some as the primary basis for system evaluation. The techniques of economic analysis permitted the selection of the alternative that involved the lowest total transport cost or the highest ratio of user benefits to total system costs. Minimizing direct transport costs became the most important goal in system planning. Since a major purpose of providing transport services was to maintain the stability and promote the controlled growth of social and economic activities, simple projections of demand put the planner in the position of following the trends rather than leading them (Carter 1984). Hence the fascination with computers became ever greater, as in the tendency to formulate planning problems around what a PC could do, rather than based on the essence of the problems themselves. As a consequence of intensive computation, transport planning has been regarded as an essentially engineering activity.

Since the early 1970s, as a consequence of increasing pressures of the private vehicles and the awareness of landuse limitation, transport planning and policy of transport investment have somewhat changed their orientations. Emphasis now has shifted from the idea of individual motorized mobility for all to a combination of motor-car restraint and public transport priority. In many metropolitan areas serious attempts have been made to regulate and restrain the use of motor cars in general and peak-hour commuter travel in particular, to develop and improve public transport alternatives to the motor-car as well as to co-ordinate the existing transport systems. This change in emphasis was fortified by facing serious environmental, social and economic effects of urban traffic problems such as traffic congestion, increasing air and noise pollution levels, and demographic increases and so forth (Fischer 1987).

In the face of a environment-conscious and always watchful constituency, it has become more and more difficult to implement large scale transport infrastructure projects, such as new motorways, rapid transit lines or airports based on transport studies mainly addressing narrowly defined transport objectives. So in a sense the "crisis" of transport planning was also one of its methodology. Because of the restricted perspective of its analytical tools, transport planning became to be thought of as being "technocratic" and was made responsible for much of the physical and aesthetic degradation of the urban and rural environment. New orientation in transportation and mobility research has emphasised the importance of a strong theoretical base as a foundation for the models and analytical methods used. This requires the adoption of more sophisticated concepts of rationality than that conventionally applied in transport planning.

It is becoming increasingly accepted "descriptive" statistical techniques should as much as possible be replaced by more social-science-based methods offering a richer potential for gaining insights into human preferences and motives, but also into the factual constraints of decisions and their influence on the decision outcome. This is because mobility and transposition have multiple dimensions, of which the physical (or spatial) dimension represents only one aspect. The needs and interests of individuals and groups are clearly reflected in geographical space, but also in alternative "spaces", like social space (focussing on social mobility), economic space (focussing on dynamics in production activities and production factors) or information space (focussing on transfer of ideas and thoughts). This multi-dimensional projection once more emphasizes the main point that analysis and planning of transportation and mobility behaviour will only provide meaningful insights and fruitful results in actual trends, planning problems, models and techniques and policy issues are placed in a coherent broad social context (Nijkamp et al 1987).

Thus, the transport element has to be placed within the wider context of social planning. Transport planning is a relevant component of the design of a regional or national development policy and should therefore be treated together either physical and economic planning, but it is clear that this is no easy task (La Bella 1987).

Chapter I

URBAN TRANSPORT PLANNING IN THE THIRD WORLD: THE "PARATRANSIT WISDOM"

1.1 Introduction

In developing countries the rapid rise in population, increased costs of fuel and limited financial resources have produced the most severe transport problems. For example, average bus speeds in Bankgkok are almost half those in London; the average load factor on buses in Indian cities is over three times greater than cities in the UK (Jacobs et al 1982). At the same time, most public bus companies continue to lose money, which constitutes a drain on national and local budgets. These symptoms of the transport problem underly their effects: constraints on national economic growth and individual prosperity, widespread frustration and diminution of the quality of life, and the failure to deliver the potential benefits of city life (ADB 1989). Research on urban transport planning in the Third World has become an ever stimulating topic.

This opening introduction explains briefly the content structure of the thesis. Chapter I describes mainly the two major transport planning approaches in the contemporary Third World and the theoretical debates over the "Unconventional Wisdom". Chapter II explains recent changes in China's economic system and transport planning; it also explains the hypothesis of this study and the methodology applied. Chapter III explores current passenger transport problems in Beijing, while chapter IV describes the city's minibus system and its characteristics. Chapter V attempts to find out the force behind the system followed by chapter VI which analyses its constraints. Chapter VII suggests tactics for improvements. This is followed by chapter VIII which reaffirms the overall role of paratransit, and upon which the chapter attempts to construct a model of transport planning for Third World cities. Finally the epilogue concludes the ultimate argument.

1.2 The City and its Transport System

Cities are an important component of human settlement in most parts of the world. The role of the city in economic development is significant in both developing and developed countries. There is a growing appreciation of the importance of cities to the national economy -- they typically generate more than 50% of national gross domestic product (GDP) and this is forecast to increase to 67% by the end of the century. Efficient cities are therefore essential to national prosperity (Allport et al 1990).

Cities are made up essentially of buildings and transport. The buildings and the activities within them do not exist independently of the transport that serves them. Transport consists of the transfer of persons and/or goods between geographically separate places. The resulting benefits arise from the linking of human settlements and activities distributed over space. So it is obvious that there will exist a close relationship between transport and spatial structure (La Bella 1987). Transport does not just serve the city: it is also an important part of the city. As Thomson (1979) suggests, transport usually occupies 30 - 40 per cent of the land surface in the city centre and about 20 per cent of the suburbs. Whilst the quality and price of other basic services are usually uniform throughout the city, transport varies greatly in both respects from one part of the city to another. Hence the other activities that make up the life of the city are dependent upon the transport facilities that link them together. The physical structure of the city, its size and spread, its way of life and character, are all dependent upon the nature and quality of its transport system.

Therefore, transport plans cannot be sensibly conceived without land-use plans, and vice versa. As cities grow, congestion spreads, becomes more unpredictable, and the cost is alarmingly high in terms of time, energy and efficiency (Thomson 1983). Time -- being equally available to everybody as a resource and a constraint -- is more easily applicable than money as a common denominator for everything that is going on. Movement, for example, takes time just as do sleeping, eating, working, shopping, playing or merely sitting idle. But the primary purpose of movement is to overcome distance. Distance itself is a friction obstructing mobility. The absolute contrast to immobility is provided by the fantastic means of transport existing in ancient tales -- the flying carpet -- which in no time takes its passenger to any desired destination. Now, assuming that the flying carpet is a real possibility, it would be a wonderful asset as long as only a few people owned one. If it became generally available -- in the way the motor car has become -- the aggregate outcome would be absurd. This would be so even if the limitations of space and energy could be overcome. Mobility beyond a certain limit is in all probability destructive for human society (Hagerstrand 1987).

The real test of a transport system is therefore whether people can obtain access to their activities without undue expenditure of time, money and effort. Accessibility, not mobility, is what matters. Accessibility is a function of three factors: the pattern of land use, the distribution of people in relation to the land use, and the transport system. Each of these factors is influenced by the other two and together they form a triangle of forces that must be balanced if people in a large city are to obtain efficiently the many amenities and opportunities it offers (Thomson 1983). Clearly, the imagined case of maximum mobility is in itself of little interest, since the flying carpet will for ever remain in the world of tales (Hagerstrand 1987). It is not surprising that tackling urban transport problems is a learning process with a long time frame. There are few "quick fixes". Indeed most urban infrastructure projects take ten years from identification to operation and their subsequent benefits accrue over an economic life of at least 20 years (ADB 1989).

1.3 Demand for Travel in Third World Cities

Demand for urban public transport services is growing at a rapid rate throughout the developing world due largely to growth in city area, population and small increases in wealth. Over the last twenty years, the demand for public transport in the Third World has grown rapidly due largely to the considerable rise in population in major cities. In 1960, the UN reported 53 cities in developing countries with a population of more than 1 million: by the year 2000, the UN forecasts that there will be a total of about 300 such cities and by 2025 a total of about 500. By the end of the century it is forecast that there will be 144 cities in the world with populations in excess of 4 million, with 123 (85%) of these in the developing world (Jacobs et al 1987). Of the 57 cities expected to have population in excess of 5 million by the year 2000, 41 will be in the Less Developed Regions (LDRs) and 18 will be in the poorest countries, where income per capita is below $360 per annum (Fouracre 1984).

Currently the 340 million urban dwellers in cities of over 1 million population in Less Developed Countries (LDCs) undertake something like 400 - 500 million trips per day, of which perhaps 30 - 40 percent will be by some form of public transport. The additional 600 million inhabitants expected to settle in these, and similar size emerging cities by the end of the century will add not only proportionately to total trip making (assuming that present rates of trip making per capita do not change appreciably) but more than proportionately to the total person-kilometres generated. As cities expand in size and area, so trip lengths will undoubtedly increase and as a consequence, person-kilometres, which for transport operators is a more relevant expression of transport demand, will increase at a faster rate than person trips (Fouracre 1984). It has been suggested that for every additional 1,000 people in Third World cities, an extra 350 - 400 public transport trips per day will be generated. Similarly, for every additional square kilometre of city growth, an extra 500 public transport trips per day will be generated (Jacobs et al 1987).

Relationships have also been found to exist between income and public transport usage. In contrast to what is found in the developed world, in developing countries an increase in income leads to a marked increase in bus patronage. And overall the personal motorized vehicle ownership is likely to increase with real incomes, and continue to be concentrated in urban areas. Despite continued high growth in private motor vehicle ownership (cars and motor-cycles), together with walking and cycling, public transport remains the backbone of urban travel in the Third World. With increasing city size the burden of commuter trips will increasingly fall upon public transport as longer trip lengths will discourage walking and cycling as convenient alternatives (Fouracre 1984).

Meanwhile, the urban public transport sector in developing countries is broadly characterized by its high growth rate, its diversity and in many cases its poor financial performance (See, for example, table 1). Typically there are 10 to 30 buses per 100,000 population in Third World cities as compared to 50 to 80 per 100,000 population in European cities (Fouracre 1984). The estimated half-million buses operating in cities of over 100,000 are unable to meet the total demands of the travelling public (Jacobs et al 1986). It has been estimated that there were on average about 40 percent fewer buses per head of population in Third World cities even though the levels of car and motor cycle ownership were much lower than in the industrialized countries. Similarly, the number of route kilometres per head of population was about half that in Europe and North America (Jacobs et al 1987). While 80% of cities in the developed world of more than 2 million population have metros, only one quarter of similar sized cities in the developing world have such a facility (Fouracre 1984). (See fig. 1) (This will be discussed further in the next section).

One of the greatest challenges to financing urban development in developing countries is the relatively low income of the urban populations. Not only are many cities growing at unprecedented rates but the income levels are strikingly low. National GNP per capita figures illustrate that high urban growth is occurring in countries with very low per capita incomes. Moreover, the incidence of urban poverty is high with ranges from 20 to 80 percent of total urban population estimated for Asian countries (See, for example, ADB 1989).

Overall, the soaring rates of population growth and private car ownership pose a real threat to the existing Third World urban system. Despite the much greater volume of private vehicles in developed cities, it is the developing cities that in general suffer most from traffic congestion, road accidents, environmental pollution, overcrowding of public transport and poor conditions for pedestrians and cyclists. On the other hand, developed cities tend to suffer more from parking difficulties and infrequent public transport.

Table 1:

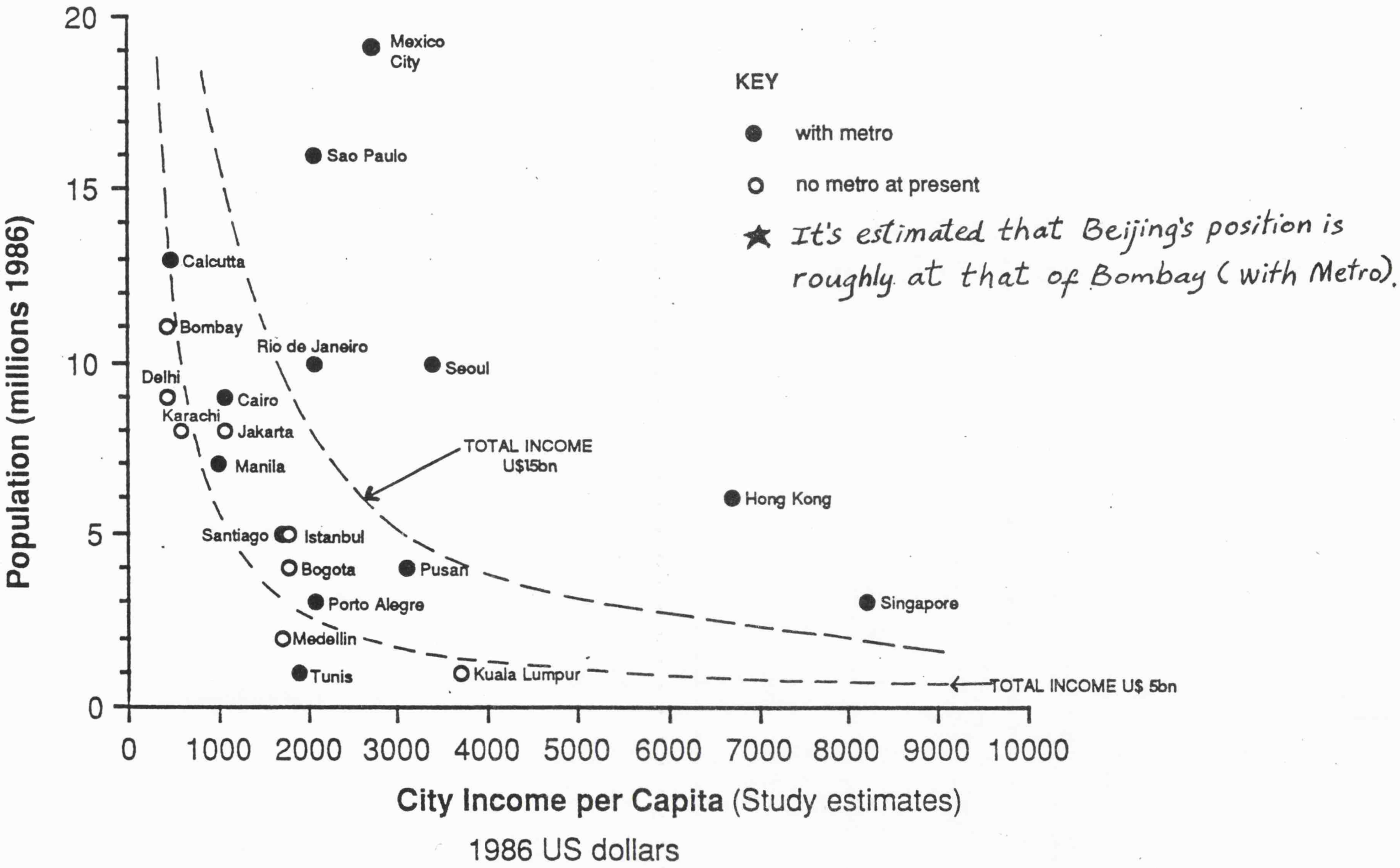
Government-owned Bus Companies in
Selected Southeast Asian Cities

City, country and company	Date founded	Performance
Bangkok, Thailand		
Great City Transport Company	1976	na
Bangkok Mass Transit Authority	1976	loss
Jakarta, Indonesia		
Penang Kutan Penumpang	1979	loss
Kuala Lumpur, Malaysia		
Sri Jaya Denderaan Sdn. Bhd.		loss

Manila, Philippines		
Metro Manila Transit Corporation	1974	loss
Penang, Malaysia		
Lembaga Pengurus Kerajaan Tempatan		loss
Singapore		
Singapore Bus Service Ltd.	1978	profit
Surabaya, Indonesia		
PN Damri	1974	loss

Source: after Rimmer 1986a; Roschlau 1989.

Fig. 1



Source: Allport et al 1990

1.4 Metro: A Distant Dream

During the 1950s and 1960s policy-makers in the Third World were bombarded with advice to concentrate their resources upon large-scale, capital-intensive transport activities such as light railways, metro systems and fleets of large buses. In a way, the governments have been encouraged to assume control of the public transport industry, expanding state ownership and to penetrate local market for transport equipment and consulting services (Roschlau 1989). The question is: Can sophisticated transport systems, such as metros, and direct state control save the Third World city?

In the developed world metros have become the backbone of the transport system in most large cities (outside the USA). They are often recognized as essential to civilized urban life and thus their image shines brightly in developing countries. After the shabby, crammed bus jolting along seething, smelly roads in the sweltering or pelting climate of the tropics, the sleek, clean efficiency of the metro, with its "first world" air of modernity, comes as a prodigious improvement. Thus metros are politically popular -- that "metros gain votes", something which improvements to bus operations cannot achieve. In this context, a metro brings prestige to the city and also to the man who "built" it. It is perhaps not surprising to see that some metro projects have been closely linked with the mayor and have been a major selling point at elections. Several others have been promoted by the personal intervention of the head of the state. The credit that politicians hope to acquire from the opening of a metro is thus an important factor (Allport et al 1990). Indeed, for governments seeking landmarks and monuments in their honour, political prestige, internal control and international status have often clouded the purpose of building a metro (Roschlau 1989).

In respect of mass movement, the motive for constructing metros is a revolution in the quality of public transport, as regards speed and comfort. It is thought that a metro would relieve congestion by reducing the number of passenger vehicles on the road, as well as release the tension of land use on the ground. This prospect particularly appeals to the private motorists, who often have little intention of using the metro themselves.

However, experiences from Cairo, Sao Paulo and many other cities indicate that metros are no cure for traffic problems. First, the capacity of the metro is limited. This is because the typical developing city is rather class conscious in that the citizens are segregated geographically by income level, whilst the metro network is often designed to serve high density corridors which are usually in lower income areas. In the absence of integration with buses, its catchment-area is confined to passengers within walking distance from the station. Second, in contrast to the expectation of relieving congestion, the construction of a metro seems to cause even more disruption. Construction is usually cut-and-cover or elevated along the most important traffic arteries. When building metros through old, heavily built-up areas in developing countries, difficulties and delays are unavoidable. And since construction seldom goes according to plan, implementation tends to be longer than expected. (Typically it would take 5 years for each line). For instance, in Hong Kong the disruption from the first lines, which were cut-and-cover, was so bad that the Island line had to be designed as a tunnel. In Manila the closure of two main roads created such an outcry from the owners of frontage properties, faced with bankruptcy as they became inaccessible to customers, that new construction methods were needed (Allport et al 1990). Overall, metros do not significantly improve traffic conditions. In most cases they carry only a small or modest proportion of all public transport passengers. In Beijing, for example, the metro carries less than 1% of the total public transport passenger volume (BRIUPD 1990).

If constructing a metro has already represented the greatest investment a city will ever make, causing a heavy drain on foreign exchange, then the running of the system could cost even more. Metros are hugely expensive to run and almost certain to lose money. So far, no metro appears likely to be financially viable, only the Hong Kong Mass Railway approaches financial viability. Most metros (two thirds) in fact require an annual operating subsidy (Allport et al 1990).

In terms of social equality, metros bring little benefit to the poorest people who cannot afford to use public transport. The low-income group can use the metro only when it is heavily subsidized. On the whole, metros offer no real solution to the transport problem in developing cities as their proponents often believe. They can best play a partial role in solving the transport problem. For this reason nowadays few international aid agencies would support them. Finance is therefore a crucial problem and consequently, the dream of a metro remains distant for many developing countries wishing to build a metro.

1.5 The "Cradle" of Paratransit

The urban transport problem is fundamentally similar in all large cities. But while the problems are similar, the solutions are not. Rich cities can afford motorways, multistorey carparks, rapid transit and sophisticated control systems and can fund lavish subsidies if they so wish (Thomson 1983); whereas poor countries cannot. Therefore, there is a wide disparity in the supply of public transport between cities.

By international standards, in most Third World cities, public transport supply is characterized by a wide variety of physical and organizational forms; compared with the First world cities, the level of provision of conventional bus services is low. This shortfall is to a large extent made up by the operation of "Paratransit" services (Table 2). In the Far Eastern cities -- the "cradle" of paratransit -- there are not only paratransit services but also what may be called "paratransit cultures".

Before explaining paratransit in detail, it is necessary to introduce briefly the "cradle" in which this form of transport service originated. First of all, the term "Far East" refers to the region of Asia adjoining the Pacific Ocean. Apart from Japan, which itself is a world economic power, most countries there are categorized by the United Nations as developing countries, including the "capitalist" ones such as the Philippines, Malaysia, Indonesia, Thailand and so on and the "socialist" economies such as China and Vietnam. Geographically, these countries are in the western area of Pacific Basin. Taken collectively, with exceptions, the group is unique in the Third World because of its development success. Despite variations in the level of growth, these countries share many common features in economic development as well as in culture and political life (See, for example, Leinbach 1989). (NB: save the political systems in China, Vietnam, Laos and Campuchia)

There are many cities of over one million inhabitants in this region. The most apparent similarities in urban geography are implied in the pattern of land use and traffic flow. For instance, in the classic Western stereotype of the city, with a Central Business District (CBD) surrounded by residential areas, one can often expect to find a heavy tidal flow of passenger movements at the beginning and end to the working day and for this to be concentrated into relatively few corridors in which high-capacity modes, such as rail, might be appropriate; whereas in the Far Eastern countries, most cities show high residential densities even in their geographical centres and their office and commercial functions may be fairly dispersed. This very mixed pattern of land use results in a diverse criss-cross of movements in addition to the "classic" radial flow. Therefore, in respect of urban transport planning, this group of countries is almost an ideal regional laboratory for examining and contrasting the functions of urban transport systems and especially their role in urban development.

Although the urban transport problems are similar among most Far Eastern developing countries, differences exist in the level of motorization and in the distribution of ownership by mode, caused in part by differences in income levels and, more importantly, by differences in urban transport policies. For example, Kuala Lumpur has an automobile ownership rate over seven times that of Seoul, although Malaysia and South Korea have similar per capita incomes. Bangkok has one and a half times as many automobile owners per capita as Manila, although

Thailand's per capita income in 1982 was roughly equal to that of the Philippines (Linn 1987). Whereas in the socialist countries, private car ownership is almost negligible.

In common with most Third World countries, the public transport systems in the Far East developing cities consist of a wide assortment of modes ranging from traditional man-powered rickshaws and horse drawn carts, minibuses to the conventional taxi, bus, tram and rail systems of the industrialized world. These systems are categorized by operational features (either flexible or fixed route) and by the conventionality of the hardware employed (vehicles being either standard or small sized) (See table 3). This latter attribute is arbitrary; it simply reflects whether or not the vehicles fit the "conventional" model of road-based urban public transport as found in the western world, i.e., the standard single-deck, double-deck, and articulated vehicles, operated in large fleets.

The most common physical feature of paratransit is their small capacity, which can vary from only two seats to twenty five seats. Thus the jeepneys, "mosquito", songthau or silor, opelet, kolt, mikrolet, bemo and xich-lo are classified as unconventional. The "professional" minibus can be seen as the latest version of "paratransit family" (See, for example, Spencer 1989; Silcock 1979; Case et al 1981). In the Far East most minibuses are 16-seaters, whilst the 25 - 30-seaters are known as "midibuses". By contrast in Britain and some other developed countries passenger vehicles of up to 35 seats or even over are just referred to as minibuses. On the whole, the catalogue of unconventional transport covers small vehicles of various types and there is no universal definition based on capacity. However, it should be noted that, the conventional taxi is excluded from paratransit for it does not offer collectively-consumed services. It charges one fare per any one charter service rather than one fare per passenger.

The early stage of paratransit development in Southeast Asia did not actually go through any formal pattern, rather, it was a spontaneous process. In the case of Manila, the "Jeepneys" - a sister version of the minibus, actually grew out of army jeeps left by American G.Is after the Second World War. (Now many operators have replaced the jeepneys with formal minibuses - See, for example, JICA). In Hong Kong, the early minibuses were initially vans or van-like vehicles used by factory-owners to carry their employees when the public transport system was paralysed during waves of general strikes in the late 1960s; and after the industrial disputes these vehicles were gradually licensed to provide passenger services for the general public (See, for example, Barden et al 1986). Thus, on the whole, most paratransit systems have developed in an unplanned and informal way, often illegally at first though later incorporated into some sort of regulated pattern. Some services have developed because there is no other form of transport available, others compete directly with conventional rail or bus operations; some are licensed, others may still be illegal. In general, most paratransit services have "just grown", rather than resulting from sophisticated plans. Whilst such evolution does not guarantee desirability in a social context, or ensure "adequate" standards of safety, the systems which have evolved do seem to perform well with respect to local conditions and needs. Above all, it is generally accepted that paratransit is a spontaneous innovation in the Far Eastern cities. The term "paratransit" or "unconventional transport" does not occur in local parlance but is nonetheless a useful generic term to describe these various forms of transport services.

Paratransit vehicles may vary in shape and differ in terms of decor, motive power, capacity, and other features, yet they do share similar features in various aspects, and it is because of these common features that paratransit is also known as "intermediate", "unincorporated", "unregulated", and even "informal" transit to emphasise the "spontaneous", "artisan", and "freebooting" character (Bovy et al 1979). The next section will discuss these common features in detail.

Table 2

Public Passenger Transport Systems
in Selected Far Eastern Cities

City	Population (million)	Metro & light Rail	Conventional bus & Trolleys	Minibus
Bangkok	5.5	59km light rail	5,574 vehic.	7,000 to 15,000
Beijing	8.7	35km full metro	4,007**	1,200**
Hong Kong	5.35	26km full metro	3,494 (exclu. trams)	4,350
Jakarta	7.2	Suburban railways 47km*	2,350	Numerous small vehicles

Kuala Lumpur	1.1	15km light rail*	591	423
Manila	7.5	15km light rail	321 (plus 2,500) Private buses	3,000 minis & 28,000 jitneys

Source: modified from Jane's Transport Systems 1985.

* extracted from Roschlau 1989.

** Beijing: Conventional buses include articulated buses and trolleys. Figures based on data from BRIUPD, 1990. Minibuses include state-owned and collectively-owned.

Table 3:

Conventional and Unconventional Transport Systems
In Far Eastern Cities

Mode	Subtype	Routes	Stops	Fares	Capacity
Conventional					
Rail	Suburban rail	Fixed	Fixed	Fixed	1,000+
	Metro	Fixed	Fixed	Fixed	1,000+
	Light Rail (LRT)	Fixed	Fixed	Fixed	250
Standard bus					
	Double decker	Fixed	Fixed	Fixed	90
	Single decker	Fixed	Fixed	Fixed	50
Taxi		Flexible	Flexible	Meter or negotiated	4
Unconventional					

Man-powered	Flexible	Flexible	negotiated	1-2
(Vietnam)*				
Xich-lo				
(Indonesia, Malaysia)				
Ojek				
Pedal trishaw				
Pecak				
Philippines				
Tricycle				
(Thailand)				
Samlor				
(Beijing)*				
Sanlunche				
Horse-drawn	Flexible	Flexible	negotiated	2-4
(Indonesia)				
Bendi				
(Philippines)				
Calesa, Tartanilla				
Mechanized	Fixed	Flexible	Fixed or negotiated	6-16
(Indonesia)				
Opelet				
Bemo				
(Philippines)				
Jeepney				

(Thailand)				
Songthau				
Silor				
'Professional' Unconventional vehicles (In most cities)				
Midibus	Fixed	Fixed	Fixed	20-35
Minibus	Fixed	Fixed	Fixed	14-20
	Variable	Flexible	Flexible	

Source: after Rimmer 1986a; Spencer 1989. * from the author's own material.

1.6 Informality of Technology, Structure and Service Style

Paratransit, or unconventional transport has commonly been regarded as part of the "informal sector" of the urban economy. The term "informal sector" was introduced by the economist Keith Hart to denote self-employed occupations recruiting labour on a casual rather than a regular basis, and which people resorted to as a means of survival and which they would leave if regular paid employment became available (Hart, 1973). The concept was subsequently adopted by the International Labour Organization (ILO) which attempted to draw up a series of criteria for classifying occupations or enterprises as either "formal" or "informal".

According to criteria (See, for example, Dick et al 1980), the "formal sector" often involves foreign or state ownership and large-scale corporation. The organizational structure is often characterized by high levels of bureaucracy and complexity which tend to increase with firm size. By contrast, the "informal sector" is mainly based on non-corporate structure and traditional working practice, under which the relationships between the employees and the undertaking largely rely on personalized control and kinship ties. Paratransit vehicles lend themselves more directly to small-scale private enterprise, because smaller vehicles are less expensive and easier to build (Ocampo 1982). Consequently, in developing countries, generally paratransit operators embrace a continuum from unincorporated individual and family undertakings ('informal') to registered limited companies owned by a group of investors. In most cases the employees hire a vehicle for a fixed daily rate, pay their own fuel, oil and protection money out of fares collected and take home the surplus revenue. On the other hand, because of the huge amounts of capital required, the more sophisticated conventional systems tend to be confined to government-owned enterprises and foreign-owned firms (See, for example, Dick et al 1980).

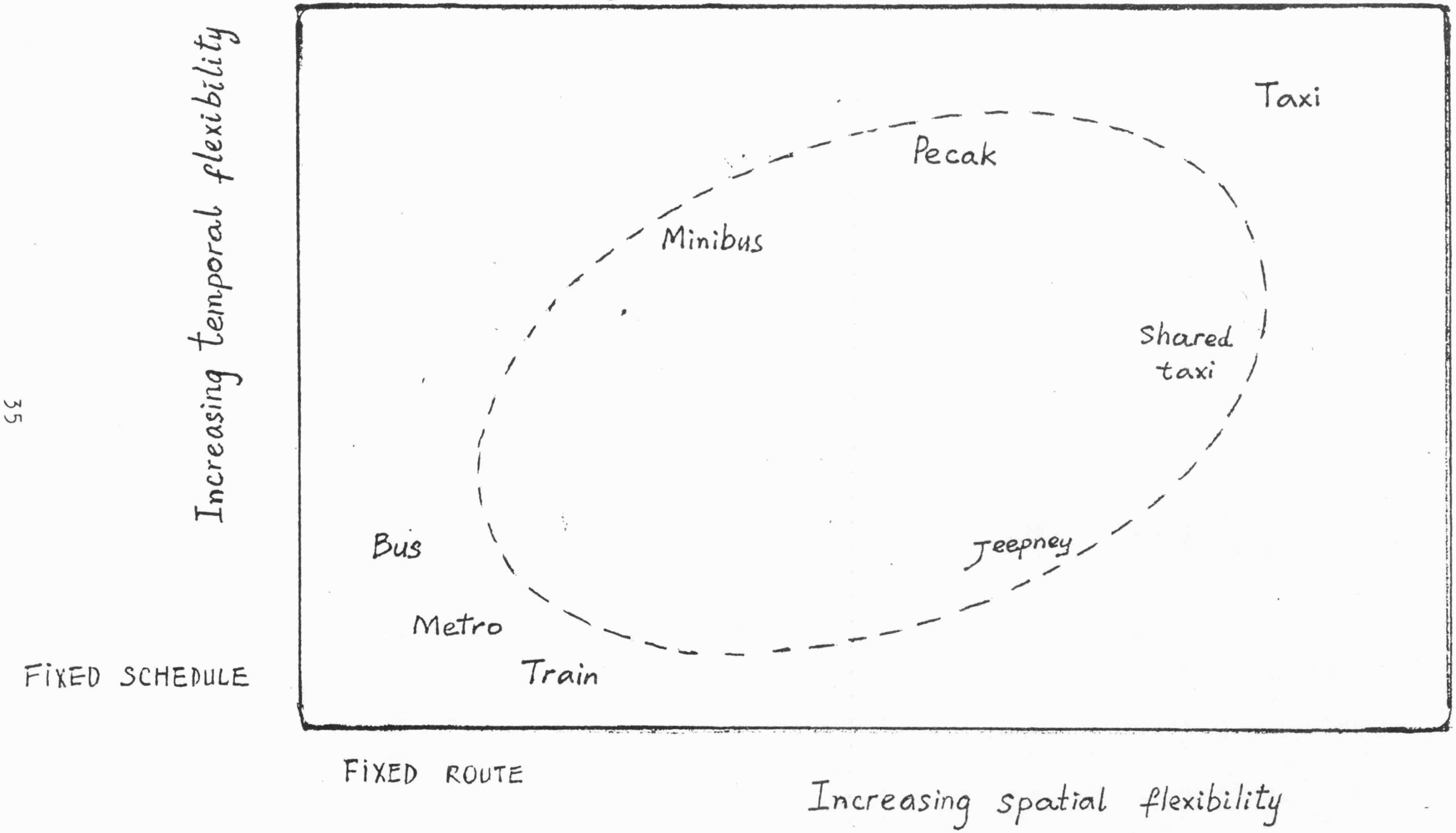
The technology used by the paratransit industry is also "informal" in that it is innovative and largely based on locally obtainable hardware. The "intermediate" category embraces all the modified or converted vehicles that are tailored for local taste. Most of these vehicles or parts are obtainable because they are locally produced at knockdown costs with indigenous technology and materials. They are either converted jeeps or vans, improved cab versions of a motor-cycle or a bicycle or just small buses. The human-powered becak, which appeared on the Indonesian scene shortly before World War II and flourished thereafter, was essentially a pedal-driven tricycle with an open cab that could seat two, or sometimes three, passengers (Pendakur 1984). Although some paratransit vehicles (i.e., the 'professional' minibus) do come from abroad, they too can be repaired and maintained satisfactorily with local technology. Thus, in comparison, whilst unconventional transport is originally a popular innovation, conventional transport equipment, on the other hand, is normally purchased through certain high-cost distribution channels; and in developing countries where motor vehicles are mainly imported through custom offices, it is not uncommon to see that capital costs are an increasing function that gradually rises with the size of vehicle (or the number of seats) (Chujoh 1989).

However, the "informality" of unconventional transport does not merely refer to ownership, organizational pattern and technology; the style of operation is also distinctively informal compared with conventional bus services. Generally, operators are free to choose routes, frequency, and hours of operation. The services they provide do not entirely resemble those of the taxi or the conventional stage-bus, but rather they lie between the two. They can be seen acting as small buses, on fixed routes with fixed fares, as do the jeepneys in Manila. They can be seen with variable routes, variable fare operations (minibuses in Hong Kong), and as variable-route shared taxis (the silor in Chieng Mai); on the whole, fixed stopping points are not usually followed while fares are normally determined by a crudely-enforced consensus among the operators themselves (Spencer 1989; see also Silcock 1981). Overall, the range of spatial and temporal characteristics of paratransit services contrast with the fixed space (the 'route') and fixed time (the 'schedule') attributes of conventional transport (See fig. 2). There is no obvious means of classification or particularly appropriate title which successfully describes the paratransit services in existence.

Above all, the "informality" of paratransit includes ease of entry, reliance upon local rather than foreign capital and resources, small-scale family operation, labour-intensive methods using adapted rather than purpose-built technology, freely competitive rather than regulated markets, flexibility in its times and places of operation, and a tendency of flouting official regulations (Dick et al 1980). Thus, paratransit services, as pointed out by Grava (1978), "... appear to be different, but this is primarily because of variations in hardware -- from bicycle rickshaws to sleek European minibuses. The institutional structure and basic operations are quite similar: private individuals acquire the highest technology vehicle that they can afford, and respond to the mobility demands of their neighbours at a tariff that most of them can pay".

Following the unplanned forms of genesis in the early days, some later paratransit systems have been facilitated in a rather formal fashion. For example, in 1975, an entire system of 400 minibuses was introduced in Kuala Lumpur under the assistance of the World Bank (See, for example, Walters 1979a; 1979b; White 1981a). During the 1980s the use of minibus as an innovative measure for urban passenger service spread out further. Today minibus transport has proliferated in areas

Fig. 2 The domain of Paratransit



Source: after Silcock, 1986

well beyond its cradle (See, for example, Hamer 1983; Murrell et al 1986; Heels 1987a, 1987b; Walmsley 1985).

1.7 The Theoretical Debates

That paratransit has an important role to play for mass movement in cities has been an inclusive argument for more than a decade. On the whole, it has been argued that as a passenger carrier, the paratransit vehicle is effective and efficient, especially in urban areas with mixed land use pattern. Furthermore, most paratransit undertakings are likely to be profitable whereas nationalized giants or publicly-owned huge bus fleets are often loss-making (see, for example, Walters 1979a; 1979b; 1982; Roth 1985; 1987; Rimmer 1986a; Barden et al 1986). Thus public bus companies are in general vulnerable to competition from paratransit undertakings. Manila's bus network for example, has contracted in the face of the jeepneys and would have shrunk even more had the government not ceased to permit jeepney franchises along main bus routes (Dick 1981).

The theoretical debates about paratransit, therefore, surround its three main features: small vehicle size, private ownership and small business scale. Advocates of minibus, for example, argue that small size is an obvious advantage in urban traffic. It is claimed that with a compact body, minibuses are more manoeuvrable than conventional sized buses and can accelerate and decelerate faster. Often, they are the only form of transport able to to penetrate the labyrinth of narrow streets sometimes found in the old quarters of cities (Dick et al 1980; UN 1989; Walters et al 1980; Rimmer 1984; Pendakur 1984; Banister et al 1990). Furthermore, the lower capacity means that, on average, fewer passengers will be carried, so that minibuses make fewer stops to pick up and set down passengers and that total boarding and alighting times at each stop will be lower; therefore they can achieve higher journey speeds than conventional buses do (Ocampo 1982; Banister et al 1990), which in turn improves its output of seat miles and benefits passengers by reducing their time in the vehicle (See, for example, Glaister 1985). Small size is also thought to have implied positive effects on service frequency and convenience. Since more minibuses than conventional buses are required to provide the same passenger carrying capacity, it is therefore argued that minibuses will provide a higher service frequency. A higher frequency service will operate at a lower mean headway, and so offer a shorter average passenger waiting time (see, for example, Oldfield et al 1988).

Obviously, in order to penetrate narrow streets, small size is a necessity. In addition, flexibility of service is also a key determinant. Since minibus services are more closely aligned with taxis than conventional buses, as well as offering flexibility over space, minibuses offer flexibility over time (Jansson 1980). What is more, several small vehicles can serve a wider range of destinations than one large vehicle, and because each carries fewer people it can more easily adopt ad hoc route variations to suit individual passengers. Thus, they are particularly suitable for low levels of off-peak patronage and scattered inhabitants (Glaister 1985, 1986).

Besides the physical factor, private ownership is also essential for high service quality. For instance, paratransit drivers are most familiar with the precise nature of passenger demand and they are able to adjust their service to suit changes very rapidly. Vehicles occasionally deviate from their usual routes to bring passengers closer to their destinations, or can alter the route to allow for shifts in demand patterns. They are thereby also able to circumvent accidents, traffic bottlenecks or other temporary problems (See, for example, Roschlau, 1989).

The reasons for the financial viability of the privately-owned transport firm, be it a taxi driver, or a bus operator, are well known and typical of other types of small business in the service sector. Within the paratransit industry, operators have to assume all costs involved and the net incomes of the employees are usually related to their performance. In Manila, for example, bus crews receive a commission on the basis of fares collected and are in a sense self-employed; Jakarta's private operators hire their buses to the crews, who then retain the fares they collect. Thus, with private ownership, "... the owner is willing to work longer and less regular hours than is a paid bus driver in a large fleet. He will clean his own vehicle (or enlist the help of family members) and is likely to do the routine servicing and maintenance himself. He will not have his own depot but will service his vehicle on the street or at a local garage. His recordkeeping will be minimal; just sufficient to keep the tax inspector at bay. He will make a greater effort than a paid driver to collect fares from passengers and to ensure that the amounts collected do not get lost on the way" (Roth 1985). Since whatever profit that is gained is put into his pocket, he has every incentive to ensure that his operations are efficient and to make quick decisions regarding his service such as modifying fare levels, trying out new areas, opening up new routes, and in general, trying his best to reduce costs and maximize profits (See, for example, HKTD 1988).

Therefore, Dick et al (1980) conclude that the fertility of paratransit is due mainly to private ownership, whereby higher productivity can be gained at lower costs. Within the non-corporate organization, such as a family transport firm, "there is usually a close link between ownership and control and heavy reliance upon personal relationships based upon kinship and common ethnic or geographic origin to ensure loyalty to individuals within the organization rather than to the organization itself". Dick et al (1980) note that, "these personal loyalties are usually reinforced by financial incentives in the form of profit-sharing systems of remuneration. Whereas the corporate form of organization is 'rational bureaucratic' and there is usually a separation of ownership and control: professional managers and their employees are expected to subordinate their own personal goals to those of the impersonal organisation in a mechanized way", whereby employees work for salaries rather than for extra dividends. Apparently, workers' indifferent attitudes within the corporate company are thought to have demoralizing effects on its business vitality. By contrast, higher labour efficiency is the most decisive factor which makes the private firm more energetic.

Besides small vehicle size and private ownership, however, institutional structure is also observed to have contributed to financial viability of the paratransit firm (Walters 1979a; Roth et al 1984; Roth 1985; 1987). Large number of small sized firms means that the concentration of ownership within the industry is low and thus competition is fierce. "Here is evidence that a high level of service over a wide area can be provided by small firms, as long as the organisational structure of the industry is appropriate". "Taxis are a case in point", writes Roth (1985), "while some may be operated as one-person firms, and some in large fleets, there is no need for any formal coordination to achieve an acceptable level of service. Taxis find their way to where the business is most profitable and provide an example of coordination through competition. Obviously, a single operator cannot cover a whole route, but a route can be covered by a large number of individual operators organized, if necessary, as a route association".

Apart from better utilization, flexible routing, lower capital cost, and ease of maintenance, the tendency towards small vehicles stems from a number of other factors, as argued by Armstrong-Wright et al (1987): "Drivers of small buses often have to meet less stringent requirements for driving permits than do drivers of large buses and thus can be paid less; inspection requirements for small buses may also be less costly than for large buses". What is more, "Fares are easier to collect on small buses than on large buses, and the chances of revenue leakage are much reduced". As several operators may be serving a route, they organize despatchers at terminals to ensure that the vehicles leave in an orderly and equitable sequence so that unhealthy competition is avoided. Thus, when comparing the two types of buses, most commentators (See for example, Roth 1985) have come to the conclusion that large buses have higher costs than small ones, even when providing similar services, because "they have less flexibility in making the best use of their resources and because they pay more in total to their (typically larger) workforce".

In conclusion, the dynamics of paratransit has been attributed mainly to four factors which lay the keystone of the theoretical expectations for minibus transport:

a. Small vehicle size,

b. Small scale business,

c. Private ownership, and

d. Effective co-ordination.

1.8 The "Wisdom" Thinking in Urban Transport Planning

While the failure of the metros and rapid light railways casts a shadow over the solution that relies on conventional hardware, paratransit, on the other hand, offers some hope for transport planners in the Third World. As the jeepneys in Manila, the converted vans in Bangkok, and the minibuses in Hong Kong have demonstrated, economies of vehicle size do not appear to exist in urban bus operations; rather, there are diseconomies of size. The case of Kuala Lumpur is particularly instructive.

The contrast in institutional framework between the operators of conventional vehicles and unconventional vehicles is sharpened by the comparative profitability of the two types; privately owned small fleets of unconventional vehicles are profitable whereas conventional buses, usually organized in large fleets and often run by local or central government, are seemingly difficult to maintain as a commercial enterprise. Public urban bus companies in serious difficulties are found in Jakarta, Bangkok, and Manila, just to mention three. They are characterized by poor services and maintenance, a low proportion of buses in service, labour strife, poor management, and serious financial losses. In contrast, Walters (1979a, 1979b) reports that private bus companies have operated very successfully in Chiangmai and Hong Kong. In Seoul, ninety privately operated bus companies provide comprehensive urban services without subsidization. And in Bangkok and Manila successful private bus operators coexist with the troubled public bus companies (Linn 1987).

Inevitably the question is raised as to why loss-making conventional bus services should be maintained and developed when paratransit systems should seem to offer a cheaper alternative. This view recognizes that in an environment isolated from local control and competition, centralized public transport systems increasingly are being challenged as unresponsive, inefficient, and inflexible (Rimmer 1987). A considerable debate has been generated from this simple question of which type of public transport system to encourage (Rimmer 1980). The debate has often been confused because it involves two quite separate issues:

a) Whether the provision of public transport should be left entirely to the government;

b) The technical and economic benefits of different sized buses.

The development of paratransit systems has, therefore, generated controversy over the use of small or large vehicles, the encouragement of small or large enterprises, and whether the public transport sector should be privately-operated or nationalized (See, for example, White 1981b; Rimmer 1987; Walters 1988; Lave 1985). The argument arises as some World Bank economists, notably Roth (1985), have been at the forefront of arguing that minibuses, for example, have functions beyond that of the feeder role for line-haul vehicles mapped out for them by planners. There is no reason why minibuses should not also offer: (1) metropolitan-wide services (for example, jeepneys in Manila); (2) higher quality services (for instance, public light buses in Hong Kong); or (3) specialized line-haul services (for example, supplementary public transport services in Singapore) (Britton, 1980a, 1980b).

Central to this conception of how public transport systems should function are the principles of choice, diversity, and competition. There is a school of thought that challenges the conventional wisdom that large buses in large organizations with subsidies to produce optimum frequencies are the best arrangement for urban road passenger transport . Hence the policies adopted, or proposed, for public transport in developing countries generally have been classified into those which follow the "conventional" and the "unconventional" wisdom (Rimmer et al 1980). This distinction is made on the basis of the types of transport which the planners favour: the "formal" (or corporate) or the "informal" (non-corporate) sector, with the former including the metro, light rail and standard buses, whilst the trishaw, pecak, jeepney and the professional minibus are perceived as the linchpin of unconventional wisdom (Rimmer 1980).

In terms of tactics, the conventional wisdom is meant to stress the problem of congestion and to attribute it to a failure of indigenous technology and the market mechanism. The unconventional wisdom, in contrast, lays more emphasis on the issues of resources and of affordability and blames the transport problem on excessive reliance on capital rather than cheap labour. The dispute over these two "schools of thought" has been going on over the past decades. In this respect, the recent developments of minibus services in the People's Republic of China have provided a platform for looking into this issue from a fresh perspective.

Chapter II

CHINA: A CHANGING CLIMATE AND NEW CHALLENGE

2.1 Introduction

The first three sections of this chapter describe the strategic changes that have occurred in China's development policy since the Communist Party came to power in 1949. There had been some fundamental changes in urban economy prior to the end of the "Cultural Revolution", though marked shift of policy in fact gained momentum in 1978 when the Central Committee of the Communist Party announced the plan to reduce the influence of party politics imposed on industry. Enterprises were given greater power in management and decision-making. Old fashioned business practices were abolished while a market-orientated production policy was gradually established. These changes have had profound impacts on virtually all sectors of the urban economy. At the same time, because of the increasing population within the cities, pressure on the existing public transport systems grew rapidly. The state-dominated transport industry could no longer meet the challenge, the need for change was obvious. Thus, restructuring within the transport sector took place.

The last two sections set the scene for the case study: the hypothesis and research methodology applied.

2.2 The changes of Development Policy and the Economic Reform Since 1978

China - the "Middle Kingdom" - has been the most populous nation on Earth for the last two thousand years, and still is today. Its population has always constituted about one quarter of mankind throughout this period of world history (Schinz 1989). Since the Second World War China's involvement in international affairs increasingly becomes significant. "The success of the Far Eastern Newly Industrializing Countries (NICs) has left in disarray much of the conventional wisdom concerning economic development in poor countries... Japan and the East Asian NICs, however, are not the whole of the region, nor can they entirely monopolize the limelight of economic triumph... economic growth in China since the new reforms began in 1978 has considerably increased in pace, bringing China much closer to the exceptional speed of development of her East Asian capitalist rivals. Thus, the study of East Asia's success must now include China... China's participation in the regional economic miracle suggests that the explanation of that miracle may lie deeper than ideological distinctions" (Gray 1988).

Although being a socialist nation, since the 1980s China has claimed to be distinguished from the rest of the Communist world in that she possesses the so-called "Chinese characteristics". What does this exactly mean is not entirely clear, nonetheless some studies do regard the PRC as belonging to a unique category, being neither entirely "socialist" (that is, similar to Eastern Europe) nor "developing" (Third World), nor "Western". However, in order to understand its process of economic development, it is necessary to look back briefly the country's recent political and economic history.

Since the founding of the People's Republic in 1949 until late 1978, China had been mainly implementing economic strategies based on the Soviet model. Under this autocratic planning system, almost all major economic sectors were nationalized. There was no private ownership for business enterprises. Investments in extended reproduction and other expenses were also centrally controlled and allocated to various localities, enterprises, and institutions through the government ministries by designated items (See, for example, Wang 1982).

During this period, too, the Chinese government emphasized on a full employment policy. For all classes of workers, China implemented a system of lifetime employment that is quite unique: workers were assigned to an enterprise and subsequently the bulk of real income was supplied in kind from the enterprise. Reinforcing this system was that workers typically received their housing, health care, and often even education for their children directly form the enterprise. However, there was little scope for increasing one's real income, save through the important mechanism of obtaining employment for family members. Wage increases were based only on seniority though the distinction between managers and workers was not great. Nonetheless, workers were assured of their "Iron rice bowls" and able to "eat from the same big wok". That is to say, notwithstanding what actual contribution one has made to the enterprise, one would share the same benefits as other workers and could not be quit or be fired. Egalitarianism thus became prevalent and workers had little incentive to work regularly, diligently, or efficiently. Absenteeism, waste of raw materials, low quality of output, and the like were strongly affected by whatever attitudes were pervasive in the general work force (See, for example, Dollar 1990; Thomas 1989; Chen 1989; Granick 1990).

Consequently, the policies implemented in China in this period did not facilitate economic development in a successful manner; rather, they at times led to labour redundancy and made it hard to stimulate productivity. Even with "make-work" employment, china's economy by the late 1970s was not providing jobs for growing numbers of unemployed (as many as 20 million), or ways to improve the living standards of the 200 million Chinese living below China's poverty line (Thomas 1989).

Although, by and large, China's economic policy during this period had pursued the Soviet model, nonetheless, there had also been some "self-reliance" efforts, especially after the country broke up its relationship with the leadership in the Kremlin in the late 1950s. Thus, during the Second Five Year Plan, the Chinese government implemented the so-called "Walking on two legs" policy. The theme of this policy is that economic development should be based on more than just one method or resource, i.e., industry should rely on both indigenous and foreign technology, and on large and small scale businesses. Hence, besides large state-run enterprises, the government encouraged small scale business in the form of collective ownership. As a result of this policy, many backyard workshops were established during the 1950s and early 1960s (See, for example, Xiao 1982). These included craft-making, tailoring, repairing and many other small scale informal industries. They were either set up by residents from adjacent neighbourhoods, in the case of urban areas; or by peasants from the same village, in the case of rural areas. Many of them are still existing and going strong. Today these cooperatives have formed an important sector within China's economic system (See, for example, He et al 1982).

However, under the socialist system, even these collectively-owned small undertakings are not entirely private properties as those conceived in the capitalist economies (See, for example, Xiao 1982). Since, apart from a few exceptions, they were initially supported (in many cases with financial assistance), and licensed by local authorities, such as the commune or the neighbourhood committee, thus they are controlled and in fact owned by the local authorities in question. In a way, it implies another form of (local) government ownership, because members of the cooperative possess no direct financial interests over the existence of the undertaking. The financial relationship between the worker and the organization ends as soon as the worker leaves or retires. The main characteristics of these cooperatives are that they are much more informal in terms of organizational structure and that the workers may share some of the dividends, if any, on top of the basic wages. Whereas on the other hand, there used to be no such rewards for the workers of the nationalized enterprises until the reforms in the 1980s'. This kind of collective ownership is apparently very different from the partnership business prevalent in the capitalist economies.

Beginning in late 1978, the People's Republic of China introduced sweeping reforms into its management of state-owned industry. This reform policy was initiated by the Central Committee of the Chinese Communist Party at its Third Plenum in December that year. Concrete plans for reforms were announced by the state council in mid-1979. The centrepiece of reform has been the devolution of economic control to the enterprise level. Management expertise has taken up a major role in business decision making, replacing the absolute influence of party politics imposed before and during the Cultural Revolution (Dollar 1990). From now on, China has entered an era of what is labelled "Building socialism with Chinese characteristics".

The reforms have provided enterprises with more freedom in hiring or purchasing inputs, including capital, materials, and, to a lesser extent, labour. Enterprises now have limited ability to alter their product line and introduce new products and typically self-market a significant share of their output at prices largely free of government control. Most importantly, enterprises are permitted to retain a share of profits on self-marketed output. (The exact profit retention rate is negotiated between the enterprise and the state). Enterprises typically pay out some of the retained profits as bonuses to workers and managers and invest the balance in new productive activities of the firm. These reforms have clearly created some incentive for enterprises to economize on the use of resources and to produce products (or provide services) for which there is demand from consumers and from other firms (Dollar 1990).

Besides the reforms within major state-run industries, the government has made considerable effort to encourage the participation of the private sector (See, for example, He et al 1982). As a result, the cooperative sector gradually evolves in both the scale of economic activity and structure of ownership. Privately-owned partnerships have been set up allover the country, though they are fundamentally different from the traditional ones in terms of ownership and to a large extent, of management tactics. Furthermore, because of the limitation in raising capital, most of the locally-based cooperatives are relatively small; nonetheless they are a new injection into China's economic entity.

From a broad perspective, the Economic Reform has had tremendous influences to the country's economy. Throughout the 1980s China's economic output has been reported to be growing rapidly. Yet behind these achievements hides another side of the story. The reforms within the economic system have nonetheless brought about new problems to the Chinese society. As well as social and economic changes, there emerges a new horizon of political ideology. After the Tienanmen outcry in the Spring of 1989, the reform programmes in China have somehow bogged down to a low peak. Some commentators argue that this is a time when China is wandering at a cross-roads of ideological thinking and that planners and decision-makers of higher hierarchies within the political machinery are vacillating over how to catch up with the Developed World.

2.3 Urbanization and Insufficient Public Transport

With a total population of over 1000 million, China is one of the many developing countries with a high level of urban inhabitation. It is striking to observe that the number of urban inhabitants per square kilometre of cultivated land is as high in China as in Europe, the most urbanized area on Earth in absolute numbers. It is even more striking that a much higher proportion of the urban population is living in the big cities of China than in those of Europe, although there are fewer such cities in China. This suggests that China is as urbanized as Europe in relation to the unit of inhabitable land (Schinz 1989). No doubt the urban question always appears to be one of most interesting issues in Chinese politics and a research topic for urban geographers and academics alike of both China and the West in attempting to understand the Chinese model of urbanization.

The process of urbanization in the socialist countries has been largely different from those in other countries of the developing world. Under the socialist system, the state plays a decisive role in the process of urbanization through the centralized planning mechanism. Government policies affect the nature, performance and growth of cities, and the rise and fall of the urban population. Therefore the alternating rise and fall of the urbanization process seems to be closely related to organized population movements. Generally, it may be said that urbanization in China during the period 1949 - 1981 was largely manipulated by the government in that the changes occurred in the cities over this period reflect the ideology of the Communist Party. The most obvious change has been the city's function from what is described as "consumptive" to "productive" in urban economy. Hence, the over-emphasis on industrialization, and the unitary system of nationalized industry and property ownership have brought about new spatial patterns: a uniform spread of industries and little segregation of residential sectors. In respect of population control, however, China is said to have made tremendous efforts to restrain the growth in the cities, especially the large ones. Prior to the late 1970s, the Chinese Government had implemented a policy to disperse urban population to the countryside and remote rural areas. As a result, urban population increase during that period had been due mainly to natural increase, and the overall pace of urban population growth had also been relatively slow (See, for example, Sit 1985).

However, since the 1980s, alongside the reform programmes, the Chinese Government has implemented new policies in urban development. These include the designation of "Open Cities" and New Economic Zones (NEZs) along the country's coastline in an effort to boost foreign investment (Fig. 3). Cities thus have been growing rapidly with populations increasing to higher levels and physical size sprawling outwards to surrounding

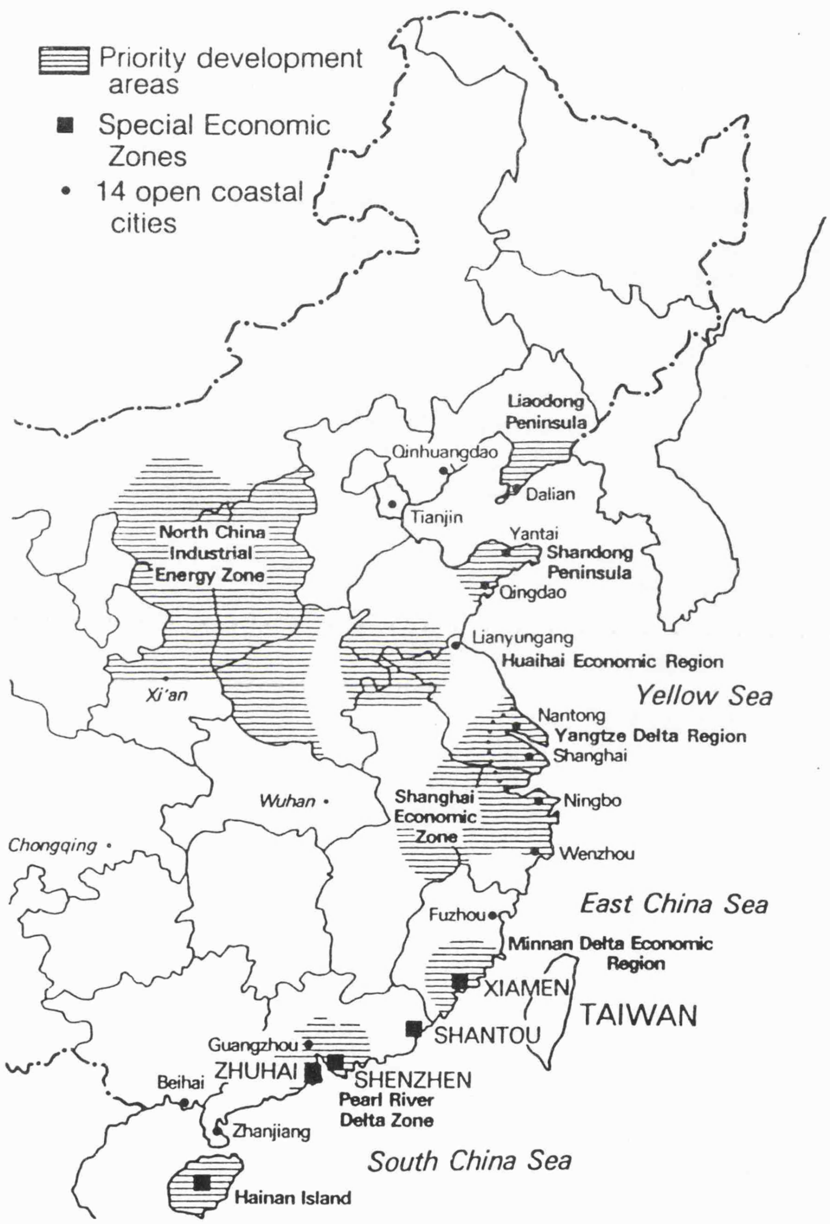


Fig. 3 Special Economic Zones, open cities and priority development areas

Source: Phillips et al 1990

areas. At the same time, the reforms within the industrial sector has brought about changes in the structure of urban economy. Industries in cities have developed in vertical as well as horizontal pattern. Not only does industrial output increase, but the ownership pattern of industries is now also diversified. There are now not only state-owned enterprises and local government-controlled cooperatives as those mentioned above, but also many privately-owned undertakings operating within the economic system. One interesting point is that many of these partnerships proliferate in either urban hinterlands or in the fourteen "Open cities", especially in the latter, where restrictions are more relaxed for private ventures. The main reason for this geographical preference is that many of these cooperatives, in the case of urban hinterlands, have been set up mainly by farmers who were either made redundant as a result of increasing mechanization of farming techniques, or else attracted by the high turnovers of the petty production sector, and who subsequently took up the opportunity to seek their luck in the cities; or in case of the "Open cities", by the more enterprising figures, who have the necessary capital as well as the enterprise spirit to venture on for more business achievements.

The difference in locality between these suburban and coastal cooperatives means that the types of their businesses are somewhat differentiable. For the cooperatives in the coastal cities, the services being offered or the products made tend to be more export-orientated; whereas most of the suburban based cooperatives are engaged in informal urban service provision, such as casual construction contracts, warehousing and distributing of farm produce, local transport services and road repairs and so on. It is important to note that, some of the privately-owned companies in the Open cities are either joint ventures partly financed with foreign capital or else entirely owned by foreign investors. Thus, in some cases their scale of business can be quite large.

The restructuring of urban economy in the past decades in China, however, has not been problem-free. Indeed, many cities are now facing severe problems that had not occurred before, such as shortage in service provision, increasing level of unemployment, overcrowding, housing crisis and so on. Of these problems, the inefficiency of urban transport services is the most critical which implies a direct threat to everyday life in cities. Despite the rapid growth of passenger transport facilities in recent years, the mobility of people in China is still relatively low; it reached 270 pkm per capita in 1982 versus 785 in India, where GNP per capita is lower than in China [pkm = passenger-kilometre]. The low mobility in China most likely results from demand restraint combined with inadequate supply of passenger transport capacity. Demand restraint is partially a consequence of the comparatively low share of GNP going to household consumption, perhaps 50% in China as compared with some 75% in India (World Bank 1985).

Although, in respect of urban public transport provision, there has been considerable development over the past 40 years and passenger transport systems in most Chinese cities have evolved from simple and backward facilities, such as rishaws, to vast systems equipped with considerable technology, e.g., electrified trams, or in the case of Beijing and Tianjin, the metro, nonetheless, the level of overall supply is comparatively low. The number of buses per 10,000 people in the extra-large cities rangers from 2.32 to 6.51, which is a much lower proportion than in the major Asian Pacific Region cities. As privately-owned motor vehicles are almost unknown in China, a large proportion of the public must rely on the bicycle for their spatial movement. Apparently, inadequate public transport services have plagued many Chinese cities (Sit 1985).

In addition to inadequate supply, during the past decades, several conceptual myths derived from the West have been accepted by some radical urban transport planners in developing countries, including China. It has been presumed that transport was part of the welfare function (like education, clean water) and public ownership by itself could provide efficient and economic service. Thus, in China, major planning institutions have been centralized in the hands of a few authoritarian organizations; and under the umbrella of nationalization, the government had long been the sole provider of urban public transport services. Even until today, the role of the private sector in the public transport industry is still insubstantial.

As other sectors of the nationalized industries, the public transport sector has also been characterized by the "eating from the same big wok" syndrome. Until now state-owned public transport companies have been making huge losses while quality of service remains poor. This indeed has been the background for the need to make change. The use of minibuses for passenger movement in large cities in the 1980s, to a large extent, represented such a shift in transport planning. The next section will focus on the Beijing's case in adapting to planning changes.

2.4 The Introduction of "Unconventional Transport"

MAP

Beijing may be described as a "Third World" city equipped with many modern hotels that are almost exclusively for guests from the "First World". In terms of urban structure, generally it has been a planned city since its foundation as a capital about 800 years ago. The development of the city has processed through many dynasties but the most rapid changes occurred in the past 40 years since the founding of the People's Republic, yet the most visible progress in terms of urbanization actually happened in the 1980s, following the implementation of the

Open-door policy and Economic Reform.

These urban changes include economic growth, population increase and physical sprawl. Of course how much has Beijing achieved in terms of economic development is a contentious issue, it is beyond the sphere of this study to discuss the matter in great depth. What is concerned here is primarily the question of public transport planning. In terms of transport facility, the city's public system has developed from man-powered rishaws (See, for example, Strand 1989) to the possession of sophisticated system (i.e., metro). Its path of development has not been a smooth one, though. Like other industrial sectors, the planning of public transport system in Beijing has gone through a period full of ideological disputes, thus in many ways Beijing's transport development can be viewed as a miniature for all large cities in the country.

In respect of passenger movement, although Beijing's problem had long been recognized but it was not until the 1980s that the authorities came to a deeper comprehension of the critical impacts of this long term disease (See, for example, Quan 1990a, 1990b; Ren 1990). Influenced by the myth of "conventional wisdom", the authorities have for decades rested their hope on the hardware -- the power of the more advanced vehicles and equipment. To Chinese planners, the ultimate solution for the transport problem in a metropolis is inevitably the use of conventional technologies. It is partly because of this belief that prior to 1985 the number of articulated buses and trolleys in Beijing continued to grow, whilst at the same time the traditional rishaws were banned from the streets. The pursuit of the conventional approach has been accelerated by the extreme orthodoxy of socialist development philosophy, under which the capital city is taken as a showcase and symbol of the nation's progress and achievement. Throughout the past 40 years, the government has been trying to build a capital city with a "First World" image.

Consequently, urban developments in Beijing have been given high priorities in resource allocation, i.e., in infrastructure provision, road construction, housing development and so on. In the early 1970s the government began to initiate the construction of the first metro line in Beijing. The expansion of the public transport system in the city is indeed unprecedented allover China. Overall, during the past ten years alone, there has been an increase of 92% in total seat capacity in real terms within the conventional modes, including two tube lines (Quan 1990a).

However, despite the increasing amounts of government investments on public infrastructure and of the rolling-stock of conventional vehicles, right until today, many residential areas are still inaccessible to the articulated buses, trolleys and the metro; and both metro and conventional buses have to rely heavily on government subsidies. So far there seems to be little sign of improvements in the conventional bus system in financial as well as operational terms. It was because of these symptoms that transport planners in the city began to realize that the expansion of large buses -- the articulated vehicles -- was somewhat limited in effect and that the metro could offer no ultimate solution to the travel demand of the citizens.

It was at the brink of the dilemma that the thinking of applying the "Paratransit" was imported from abroad. In this context, the use of minibuses for passenger services in Beijing was a very first example of such a "paratransit solution" in a socialist country.

As described earlier, there had already been minibus systems operating in many cities outside China, nonetheless there was no formal transfer of the so-called "minibus wisdom" to the country. Rather, the establishment of minibus transport in cities like Beijing and Shanghai of The People's Republic of China was the result of foreign inspiration in urban transport planning. The channel in which the "wisdom" of minibus transport "travelled" through was the Chinese southern border city of Shenzhen, a designated "Open Economic Zone" where passenger minibuses owned by Hong Kong investors had appeared on the city's streets in the early years of the 1980s. The novelty of the minibuses there enlightened transport authorities of that city and later of Beijing and other Chinese cities who then began to initiate their own minibus plans. At the very early stage, small fleets of minibuses owned by government transport companies were put on service for passenger movements in Shenzhen and the surrounding areas. Before long, Quangzhou, Shanghai and so on, altogether ten big cities, followed suit. Beijing was one of these ten cities. Its minibus system was officially established on April 1st, 1984, when the first passenger minibus run on the streets of the Capital, approximately nine years later than the World Bank's Minibus experiment in Kuala Lumpur, Malaysia.

Similar to the establishment of the system in Kuala Lumpur in 1975, originally the objective of the Beijing minibus service was set to alleviate the problem of passenger movement and to provide travellers with wider modal choices; though over the years, in the wake of fleet expansion and business growth, the role of the system has gradually enhanced. Today, the minibus service has been established firmly within the city's public transport system.

2.5 A Hypothetical Perspective

Although, since the "unofficial birth" of the Hong Kong minibus system in the late 1960s, minibus transport has "officially" existed in the Far East for nearly three decades, today the minibus issue as a transport planning discipline is still a contentious subject amongst transport planners in both developed and developing countries. Following the establishment of minibus fleets in some British cities in the 1980s, this issue has attracted even greater attention. Over the years there have been a series of writings about minibus transport in the United Kingdom (See, for examples, Banister 1990; White et al 1987; Glaister 1985; Turner et al 1990a, 1990b, 1990c; Watts et al 1990). It appears that the original findings about paratransit in the Southeast Asia have provided a theoretical test-stone for minibus transport around the world. Nonetheless, since the world itself is a changing environment and there are always newly emerged issues within the human society, all theoretical postulates must be verifiable against time.

Of all the minibus transport systems in the Far East, those in the Chinese cities are youngest and newest in terms of age and experience respectively. What is more, in terms of public transport facilities, Beijing is comparable to large cities outside China. Its minibuses are operating in a traffic environment similar to those in other cities in the Developing World. Although, it is obvious that "developing countries" are different in experiences and needs, nevertheless they still have many similarities in respect of transport planning (See, for example, Orn 1983). Thus, from just a viewpoint of mass movement, the arrival of the minibus in Beijing has in fact created an opportunity for re-examining the role of paratransit in solving the urban transport problem in the Third World.

More importantly, the performance of the minibus business in Beijing has also opened a niche for further debates over the theoretical aspects of paratransit. In April 1988, just four years after the establishment of the Beijing minibus system, the Minibus Administrative Office (MAO), under the supervision of the Beijing General Public Passenger Transport Corporation (BGPPTC), carried out a major survey aiming to observe the overall performance the system. The survey has produced some very interesting figures about the financial viability of the minibus undertakings (Figures shown in section 4.6). It appears that the original findings need further attention. For this reason researching into Beijing's minibus transport is a particularly challenging but also rewarding task.

Since the urban transport problem is in its nature an epitome of social and economic issues, one cannot look at it as an isolated phenomenon; and since China's socialist economic system is different from its capitalist counterpart, how does paratransit work in a socialist system is thus an interesting issue. The search for the fundamental factors which contribute to the success of Beijing's minibus business is thus the main objective of this study; on this basis, the hypothesis lays emphasis upon the **essence of the entrepreneurial spirit of the paratransit industry in capitalist cities, which can also be made to work in socialist economies, provided appropriate policies are implemented.**

2.6 Research Methodology and the Course of Study

The way that researches on social sciences are exercised in some Communist countries is somehow different from that in the Western societies. In China, before the Reform, there had not been much academic research on urban transport planning. If any, most were concerned with physical planning rather than social and economic planning. Although since the early 1980s there are increasing concerns on this topic, and voices have been raised for a much more liberal and comprehensive planning perspective, the overall literature on this subject is still, on the whole, relatively limited, if not entirely scarce. Thus any attempt to carry out a study on urban transport planning in China, has to rely heavily on on-the-spot observation rather than on existing literature and information stored in libraries. Access to data is never easy, though. One of the obstacles in getting access to information and data is that, in China, statistics concerning major transport facilities are normally regarded as secret, for reasons that are often described as of public security (i.e. transport facilities are strategically sensitive).

As far as this project is concerned, the research methodology involves two major phases, observation and analysis; though there have been different steps during the course of study. The very first step was an extensive literature review on transport planning in Third World cities, concentrating particularly on unconventional transport. After almost a year-long literature review and on-going preparation, the area which the research intended to deal with was eventually identified. Minibus transport in Beijing was chosen as the subject for investigation.

The second step concentrated on intensive work on the case study, during that time a number of tasks were exercised. One of the tasks was that the present author spent a month-long period of fieldwork in Beijing. The main objective of the field-trip was to carry out on-the-spot investigations on the city's minibus service. On the basis of the information collected, a data base was gradually built up and subsequently, a rough yet distinct picture of the current minibus service in the city was constructed.

During the field-trip, information and data were collected from both primary and secondary sources, though a substantial proportion has actually come from the former. In order to enrich personal knowledge over the existing situation, the author travelled extensively on the public systems (trolley, metro and minibus) and visited major transport facilities such as bus termini, parking bays as well as bus-stops to observe the differences between various service characteristics. In doing so the author has experienced directly the service style, reliability, comfort and general quality of the services provided by different passenger transport modes in the city.

Thus, the primary information is mainly based on interviews with local residents and visitors, users and non-users of the public transport service. Two questionnaires (in Chinese) were used: One for passengers, and the other for drivers. The former emphasized on variables such as service quality, convenience and travel costs; whilst the latter on operation time, service style, revenue and so forth.

Most interviews taken randomly at bus-stops and coach stations were conducted in a rather "informal" way (e.g. without looking at the questionnaire!). "Informal" also because there was no pre-set sample size. Instead the author tried to talk to as many people as possible. Most interviews took between 5 and 20 minutes (depending on factors such as whether the respondent had used the minibus before or detailed comments were made). In the first few days only about 8 to 9 people were interviewed per day; later up to 20 each day. Altogether some 350 people (plus 20 crew members) were interviewed during the whole period.

Besides, there were also some formal interviews with those working "in the field": Managers of the Minibus Administration Office, senior engineers of the Beijing Research Institute of Public Transportation (BRIPT), and academics from both Peking and Northern Jiaotong Universities. Through these personal contacts the author was given access to some official documents regarding both financial and structural aspects of the state-owned minibus fleets and the future prospect of minibus transport in the city. Opinions, comments and in many cases, complaints from transport planning experts, academics as well as from ordinary people were recorded. These notes have later become important inputs to the data base; for they reflect a high degree of originality on the quality of the public transport services which the respondents themselves use and hence perceive. On the whole, in respect of data collection, the field-trip was unexpectedly fruitful.

For secondary sources, a series of periodicals, magazines and research papers have been consulted all the way through as basic information for the study. The majority of these have been serials published by the West, though there were also some Chinese periodicals and newspapers which occasionally contain some interesting information about public transport in Beijing and other Chinese cities. In addition to academic serials, official publications by various research institutions and governments agencies, especially reports by the World Bank and by the Transport and Road Research Laboratory on urban transport in Third World cities have also been very useful for comparative studies.

After the initial work for the information required, the next step was to examine the data collected and to find out the relationships between different factors. Efforts were made to dissect different components of the minibus system. Unique characteristics and current limitations were then identified. Further work was then concentrated on analysis and comparative studies. The discussion was narrowed down to the generalization of findings. The initial writing was attempted at this stage, even though there had been much rough draft-work earlier. The work on writing up has taken much of the effort and time. Up-to-date information continued to be monitored and injected into the project. This was to ensure, whenever possible, that recent changes have been covered.

It may be necessary to repeat that, up to now, there have been almost no independent academic studies about China's minibus transport. Although some Chinese periodicals do occasionally contain articles about urban transport planning, most of these seem to concentrate on examining conventional transport and on the planning of infrastructural facilities. Studies on unconventional systems on the whole, and on minibus transport in particular are therefore rare. Until 1990 when the field-trip took place, the only official survey on the minibus system in Beijing was the one mentioned earlier, carried out jointly by M A O and BGPPTC in 1988, which mainly aimed to observe the physical operation of the state-owned minibuses; there was no attempt to tackle other issues, and the subsequent documents produced contain solely raw material about the fleets owned by the state companies other than the independent undertakings. Therefore, the survey was far from being a analytical study aiming to solving the problems concerned. Nevertheless, it should be made clear that, by Chinese standard and according to the Chinese custom of academic documents, the data recorded in the reports and that provided by officials, can all be regarded as of a high degree of reliability and accuracy. Indeed, it is this faithfulness which, explicitly, provides the fundamentals for this particular research project to be carried out.

Chapter III

BEIJING: GEOGRAPHY AND THE ROOTS OF THE TRANSPORT PROBLEM

3.1 Introduction

This chapter continues to focus on the case study.

There are two main parts to this chapter. The first part briefly describes the city's physical location and the public administration system, the patterns of population distribution and land use, followed by a description of the current public passenger transport system. The second part deals with the problems of passenger movements in Beijing and the likely causes of these problems in an historical perspective.

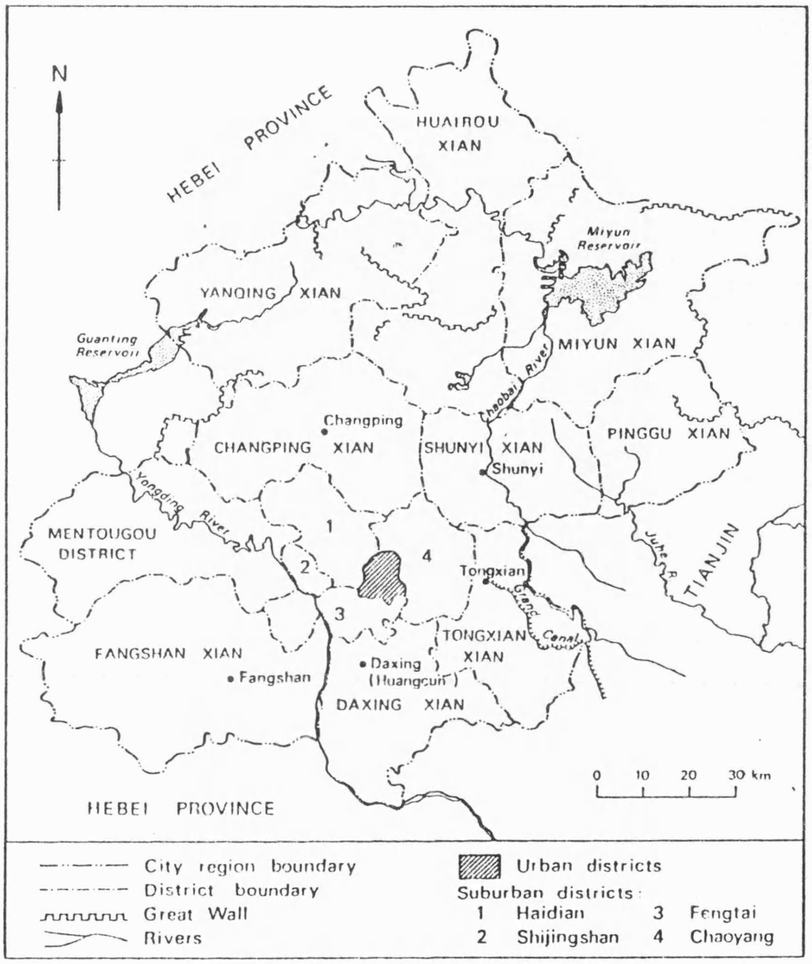
Let us first look at the city structure.

3.2 Location, Administration and Infrastructure

Beijing, the capital of the People's Republic of China, is located on the alluvial fan of the Yongding and Chaobai Rivers at the north-western edge of the North China Plain. The city occupies a strategic position in relation to the Mongolian Plain, the North-east China Plain and the Lowlands of the Huang He (Yellow River) and the Huai River. Beijing Shi, or Metropolitan Beijing, is one of the three municipalities directly under the Central Government (the other two are Shanghai and Tianjin). Beijing comprises 19 districts and xian (counties), covering a total area of 16,800 sq.km.. It is about three times the area of Shanghai, making it the largest municipality in China in terms of administrative territory (Dong 1985). (See fig. 4).

Under the Communist Government, the city is divided into three major zones according to the level of built-up infrastructure: the inner city zone, the suburban zone and the outskirt zone. Each zone has several administrative districts: (a) four City Districts (the inner city zone): East City District, West City District, Xuanwu District and Chongwen District; (b) four Suburban Districts (the Suburban zone): Haidian, Fengtai and Shijingshan; and (c) ten outskirt Xian (counties) (the outskirt zone): Tongxian, Changping, Shunyi, Miyun, Yanqing, Pinggu, Daxing, Fangshan, Mentougou and Huairou

Fig. 4 Location of Beijing City Region



Source: Modified from *Transport Map of Beijing*, 4th edition (Beijing, Xinhua Bookstore) (in Chinese).

(Dong 1985). The four City Districts are where the old city was while the present built-up area includes the old city and the four Suburban Districts (i.e., City and Suburban Districts) (Fig. 5). It might be of interest to note that the built-up area of Beijing with its 300 Square Kilometres in 1978 was by far the largest of all cities in China, i.e., twice the size of the two next largest cities, Tianjin and and Shanghai with their 150 sq.km of built-up area in 1979 respectively (Schinz 1989).

The structure of urban administration in Socialist China is more or less similar to that of the former Eastern Bloc. In Beijing, apart from the urban districts, the rural xians are rather independent and self-administered in a number of aspects, such as the provision of local public amenities. Each xian is governed by a County Council. Together with the built-up area these counties are under the overall administration of the Beijing Municipal Committee, which is the highest administrative authority for the entire metropolis. The idea to designate rural counties around urban centres is rather common in the socialist countries; Vietnam, for example, is also a country whose major urban centres are "guarded" by a vast area of agricultural activities. It is a way of socialist public administration supposed to secure the supply of necessary farm produce, such as vegetables and fruit, for citizens living in the entire catchment area. In the past two decades or so, most large cities in China actually had their

Four City Districts of Beijing

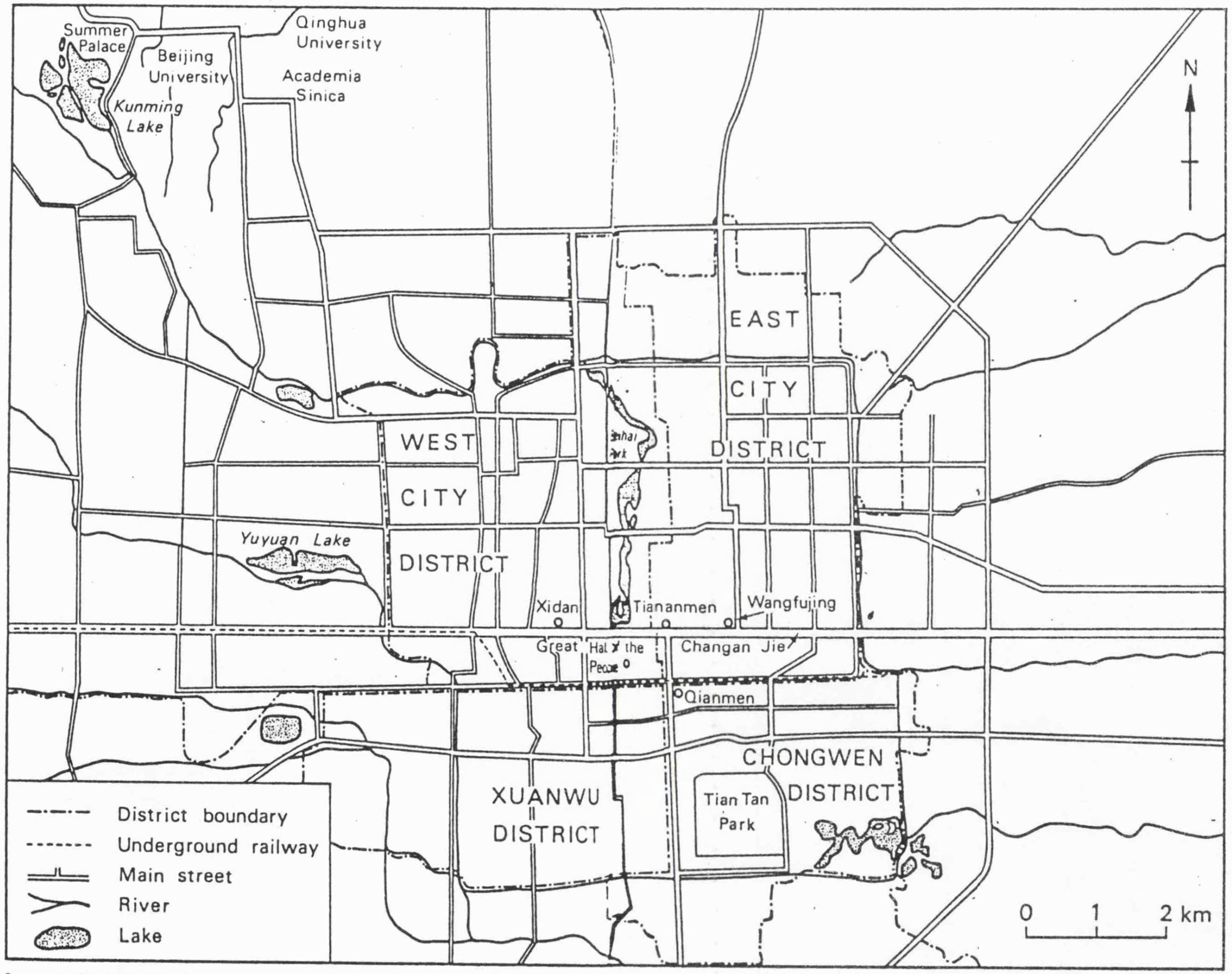
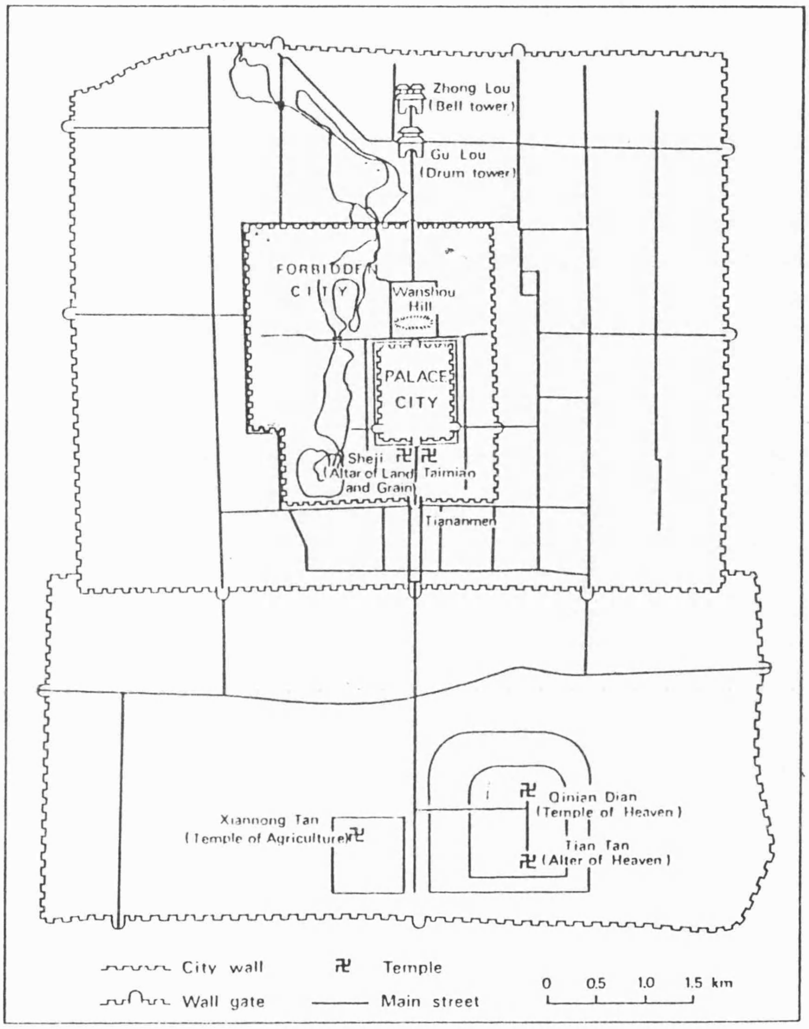


Fig. 5

Source: Modified from *Transport Map of Beijing*, 4th edition (Beijing, Xinhua Bookstore) outskirt areas expanded. To avoid technical confusion, therefore, it should be stressed that the "built-up area" in this study is referred to the four City Districts plus the four Suburban districts. Altogether they make up what is known as Beijing city (or urban Beijing). Those satellite towns at the xians are excluded from this definition. And the whole area which includes urban Beijing and the xians is on the other hand known as Metropolitan Beijing or Beijing Municipality.

For over 3,000 years Beijing has been an important centre of transport and communications in northern China and, since its establishment in 1153 as the capital of the Jin Dynasty, Beijing has become a national capital of successive kingdoms. Being an historical administrative centre for over centuries, the city is predominantly rich in cultural treasures and ancient architecture. The building structure of the old city is embodied by the presence of both the big and the small, the high and the low, reflecting the typical features of a feudal capital. This can be seen by looking at the overall arrangement of the street layout: On the one hand, residential quarters are characterized by a uniform pattern of traditional Northern Chinese bungalows -- small quadrangular compounds situated one after another along narrow alleyways; and on the other hand, the "Forbidden City" complex, a magnificent royal palace for generations of monarchies, dominates the skyline of the historical city at the very heart of the built-up area (Fig. 6).

Fig. 6 Beijing during the Ming and Qing Dynasties



Source: Modified from A.F. Wright, 'The Cosmology of the Chinese City' in G.W. Skinner (ed.), *The City in Late Imperial China* (Stanford University Press, 1977), p. 68.

Generally speaking, the land use pattern in the old city area of Beijing is similar to that of cities in the developing world, e.g., Karachi, Hanoi, Cairo and so forth, where the city centre is often the workshop of factories of various kinds and warehouses of different sizes, as well as the home for most government offices and political institutions. In a word, industry, commerce and residence are inter-mixed. For example, in Bangkok, the old city centre shows a diverse land use pattern. It contains the city hall, museums, government ministries and the Grand Palace. In addition there are various shop-house and commercial activities including tailoring, basket sales, metal fabrication, silver crafting automotive repairs, warehousing, furniture manufacturing, soft drink bottling and many other industries (See, for example, Jones et al 1982). In Saigon, too, there is no distinct separation between commercial and residential zones within the city. On the whole, cities in the Third World share many common features in terms of urban functions and land use. (In the next section this will be mentioned further).

However, the current urban development strategy in Beijing focuses on physical expansion. Major development projects are concentrated on the extended built-up areas, with special attention on constructing public infrastructure to meet long term demands (See, for example, Zhu 1986). Today, in terms of urban topography, the check street pattern in the old city is somehow inherited in the suburban areas. Besides the traditional narrow streets, there are many newly built broad avenues interlocking one another, lying on a fairly flat landscape right across the city. As well as trunk roads, there are now three major ring roads circling in and around the built-up area, each acts as a major artery of the traffic network. Commuting traffic forms the most important part of urban passenger flow in Beijing but, unlike Western cities, in Beijing as well as in other Chinese conurbations, the overall commuting pattern is less focussed. Although there are railways, as Howard (1990) points out, rail networks are not designed to carry short-distance passenger into the city centre; they are mainly for long-haul inter-city movements.

Over the past 40 years, the built-up area of Beijing has expanded rapidly and continues to spread out. Today's Beijing has grown several times bigger than it had been decades ago, from 109 sq.km in 1949 to 340 sq.km in 1979 (Dong 1985); and the present proposal is to expand it to 440 sq.km by the year 2000 (Schinz 1989). Undoubtedly, with the current speed of urban development, Beijing will become one of the world's major metropolises in the Twenty First Century.

3.3 Population Distribution and Land Use

Beijing has the second largest urban population in china after Shanghai; it is also one of the most populated cities in the world. The current population in metropolitan Beijing is about 11 million, of which 6.5 million or so live in the built-up area (Urban Beijing), including roughly one million short-term residents counted up with successive waves of visitors from other provinces. These short-term dwellers are constantly staying in various places such as hostels, residential halls and lodging facilities or in some cases, just outside railway stations. Some of them are sightseers, whose tenancy could be as brief as one or two days, others may be on various kinds of temporary employment in the Capital, some of which could last as long as a couple of years. On the whole, because of the temporary nature and the "footloose" style of their residence, they are thus classified locally as "Floating population".

The population in metropolitan Beijing is unevenly distributed at an average density of 518 persons per sq.km (Li 1990). And although it has been acknowledged that, over the past 40 years since the Communist government came to power, efforts have been made to decentralize both the population and some public amenities from the city core to suburban areas, yet so far the effects of decentralization have not been satisfactory; hitherto, the majority of the population still live in the heart of the city and the overall pattern of land use has hardly changed. The concentration of population in the city centre reflects the traditional pattern of residential distribution in an Eastern city. Overall, it can be described as an hierarchical distribution pattern whereby the core of the city is highly populated with a gradual decline of density towards the suburbs and outskirts. In the built-up area, the average population density is 13,000 persons/sq.km. (Schinz 1989). Major concentrations are found within the 87 sq.km. of the historical City Districts in which the density is many times higher than the average figure: at a level of 27,000 persons/sq.km. (Li 1990), with the highest density recorded in the busy commercial areas of Qianmen (the Front Gate) and Dashanlan (the Great Railings) where the average figure reaches the level of over 50,000 persons/sq.km.. Thus it is not surprising that the four City Districts alone have accommodated 26.3% of the Metropolis' total population (Dong 1985). If only these four City Districts are considered, then the population density of Beijing far exceeds that of London, Tokyo or Paris. (See Table 4 next page & fig. 7).

Population Density of Selected Capital Cities

(1979)

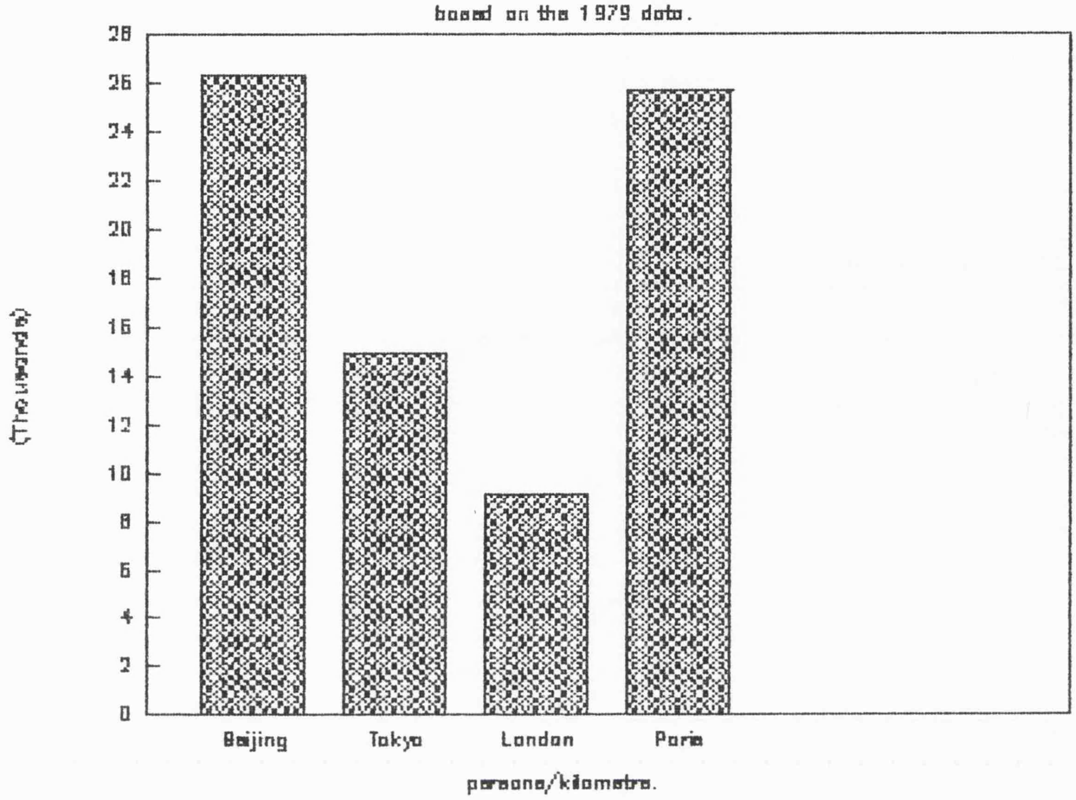
	Beijing	Tokyo	London	Paris
Central city area (sq.km.)	87	578	300	105
Population (million)	2.29	8.64	2.75	2.7
Density (persons per sq.km)	26,300	14,948	9,166	25,714

Source: After Dong Liming 1985 In Sit V. ed. "Chinese Cities" Oxford University Press.

This residential distribution pattern indicates that, despite the Government's effort to decentralize the population from the old city, the City Districts remain to be the main residential zone as well as the core for commercial and trade

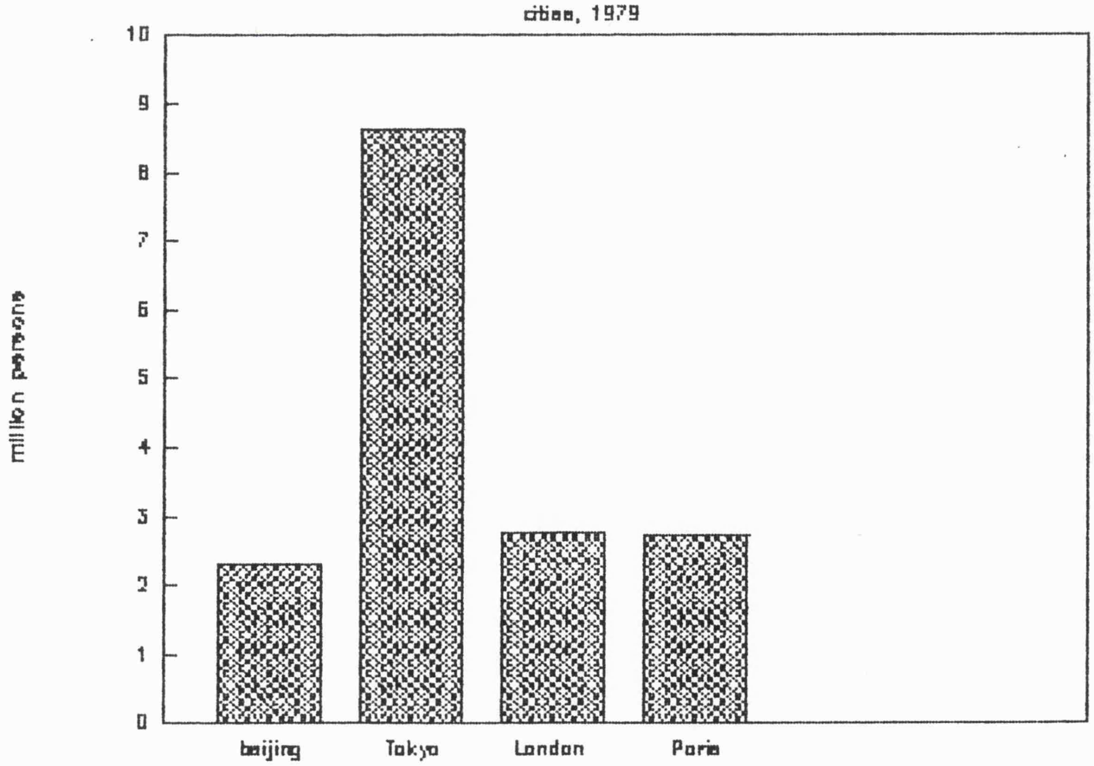
Fig. 7 Population density of selected cities

based on the 1979 data.



Population in central area of selected

cities, 1979



activities. In 1980, factory sites occupied 6.6 sq.km., or 11% of the inner city area (Dong 1985); until today, there are still 4.27 million square meters of land for industrial and warehouse purposes (Quan 1990a). Obviously, with a variety of opportunities, the old city zone acts as a magnet where many travellers are drawn from all directions of the environs.

Moving outwards to the four Suburban Districts, the average figure of population density here begins to decline, at a level of 1,800 persons/sq.km.. This is because their overall size of 1,283 sq.km. is comparatively spacious, much larger than the City Districts (Dong 1985). The most visible forms of land use in the suburban zone are sites for workers' residential estates, for higher educational institutions and recreation, for warehouses of food and agricultural produce, and for as much as about 60% of Beijing's industrial complexes. Put in another way, the Suburban District are the most "productive" area of the city.

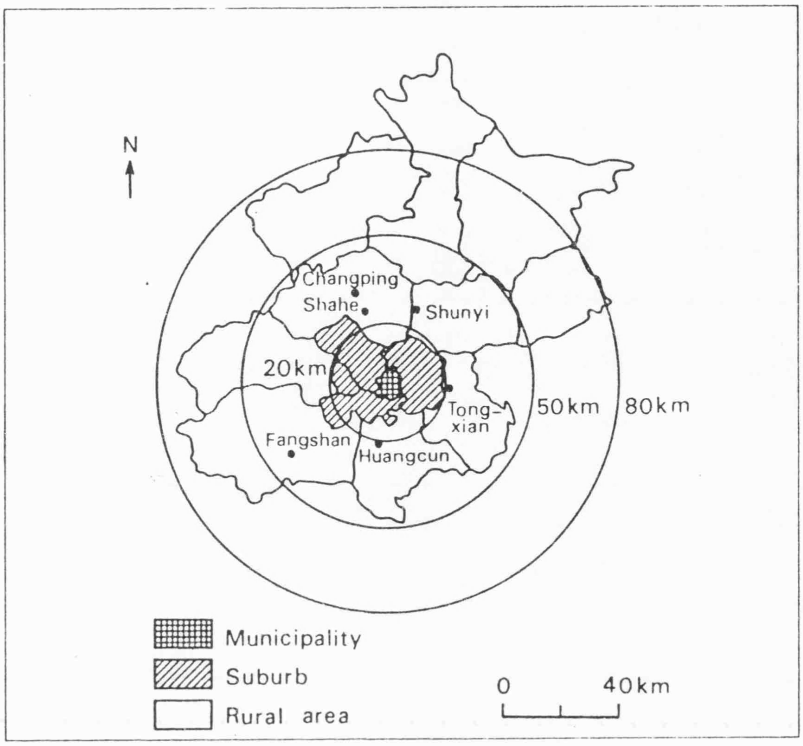
Further outwards are the Xian (counties) lying on the outskirts, where the population density is even lower. Mainly rural in character, these xians altogether cover a vast area of 15,437 sq.km. and contain 80% of the rural population of the metropolis (Dong 1985), even though each of which does have a county town plus some other built-up areas here and there. Since the primary economic activity in these xians is farming, the labour force is thus mainly locally-based in terms of employment. There are few instances whereby people have to commute into central Beijing for work. In fact, long distance commuting has not yet become common in Beijing, nor in any other city in China.

The geography of Metropolitan Beijing indicates that its urban context is rather unique compared with the West in that it consists of rural as well as urban components. (fig. 8). Nevertheless, in terms of land use and population distribution, there are many similarities between Beijing and other Far Eastern metropolises, especially the mixed pattern of land use and high concentration of population within the historical quarter of the city. It is these similarities that provide for this study a basic frame-work for grouping the Far Eastern cities in a category whereby the performance of the transport systems may be compared meaningfully.

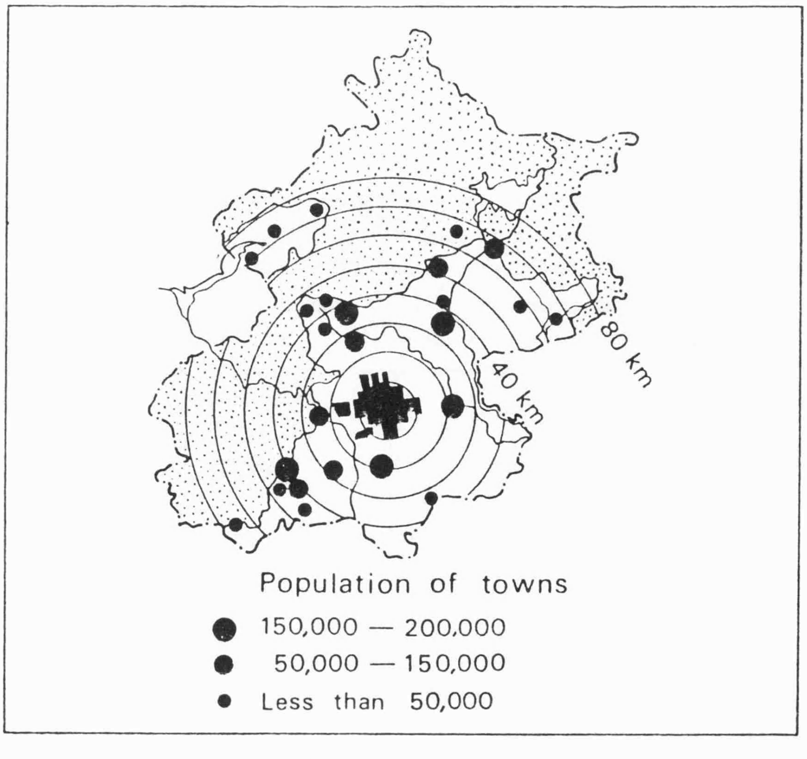
Because of the vast rural areas within the municipality, when considering the urban transport system in Beijing, one should bear in mind the distinction between the sub-systems in the rural areas and that in urban Beijing. For the sake of a comparable perspective, it may be important to note that, the system which operates in the built-up area is the subject matter to be focussed here; whereas those in the outskirt xians should be viewed in a different context and excluded from the urban transport system in question, as far as this study is concerned.

Fig. 8

Latest Major Development Schemes within Beijing City Region, and Satellite Towns



Major Satellite Towns within Beijing City Region



Source: Dong 1985

3.4 The Public Transport System

As the nation's capital city, Beijing is served by the best public passenger transport facilities of the entire country. First, Beijing has the most spectacular urban infrastructure amongst all cities in China. Second, the public transport services are more sophisticated in terms of hardware and modal variety. Up to now Beijing is one of the only two cities in China which have a metro system (The other is Tianjin, China's third largest city, with a 5km metro line). Being an important industrial base as well as a political centre, Beijing is well linked with other provinces through a long-distance national railway network. The Beijing Railway Station, with some 150,000 passengers on more than 170 trains depart and arrive every day, is the largest railway terminal in China. Located at the heart of the city, the Station is not only the nerve centre of the country's railway network but also a key position of the capital's urban passenger transport system upon which most city centre-bound bus routes converge.

Beijing's intra-urban passenger transport network is made up of different modes, both underground and ground-based, conventional and unconventional. Except for a small proportion of unconventional vehicles, the majority of the city's public transport vehicles are owned by the state, and all under the umbrella of the Beijing General Public Passenger Transport

Corporation. The ground-based system is served largely by conventional vehicles, namely the large buses and trolley-buses. In Beijing both large buses and trolley-buses are the same size and are articulated vehicles. The trolleys are not running on a track. Thus apart from the fact that they are electrified rather than diesel-driven, there is no other physical difference between the big buses and the trolleys. (fig. 9). Since the trolleys require above-ground electric-cable facilities, most suburban routes are thus served by diesel-driven articulated buses rather than trolleys. Nonetheless because of their identical appearance and service characteristics, they are both regarded as belonging to the same category of conventional transport system. According to BRIUPD (1990), currently there are more than 4,000 of these conventional buses running on over 180 routes across the city.

The other conventional mode is the metro system, which began its operation in the late 1970s and presently has two lines, totalling only 35 km in length. It is served by a rolling stock of 790 underground trains, though plans are being considered to extend the network. Table 5 shows a breakdown of the capacities of different modes, including private transport; and table 6 shows the volumes of passengers carried by these modes (both 1988 figures). These figures indicate that on the public transport side, the conventional modes, namely the articulated buses, trolleys and metro are the backbone for passenger movement. Altogether they carry nearly 10 million

Fig. 9. A trolley bus in Beijing (the "conventional" bus
-- diesel -operated, running without a track). The
electricity -operated buses are also of the same size and shape.

Photo H Lam

passengers everyday (BRIUPD 1990). By contrast, the contribution of other public modes is still insignificant.

Table 5:

The Capacity of Different Transport Modes in Beijing (1988)

Mode		Seat/Vehicle	Fleet size	Total capacity	%	Group %
Conventional Buses		137	4007	548995	9.3	
Minibus		15	398	5970	0.1	10.2
Metro		180	252	45360	0.8	
Rental Vehicles	taxi	4	9349	37396		
	van	20	1304	26080	1.9	1.9
	coach	40	1227	49080		

Company &	big	40	10874	434,960	10.3	
private	small	4	44729	178,916		11.4
vehicles						
Motorbike		1.91	36015	68,788	1.1	
Bicycle		1	4,540,000	4,540,000	76.5	76.5
Total				5,935,509	100	100

Source: after "The Comprehensive Report" BRIUPD. July, 1990.

NB. a) The term "company" in here refers to factories, production units, government institutions, and all sorts of organizations generally.

b) This table is based on the information gathered in 1988, it should be noted that since then the numbers of bicycles and minibuses have risen to higher levels.

c) The minibuses here are referred to those owned by the state; independent minibuses are excluded.

Table 6:

The Volumes of Passengers Carried by Different Modes in Beijing (1988)

Mode	Volume of passengers (million persons)
Public transport:	
Conventional bus and trolley bus	3,003
Minibus (state-owned fleet)	24
Taxi and other rental vehicles	59
Metro	307
Private transport:	
Social vehicles & private motorized vehicles	247
Bicycle & other personal vehicles	2,949
Total	6,589

Source: after the "Comprehensive Report" BRIUPD. July, 1990.

NB. a) The data are concerned with the built-up area only.

b) Independent minibuses are excluded.

Table 6 also shows that in 1988, roughly a half of person/trips is made by private modes - mainly the bicycle. On the other hand, the ownership of motorized vehicles in Beijing is low, at a persons/vehicle ratio of 115:1 only; and most of the privately-owned motorized vehicles are motorbikes rather than cars (Ren 1989). Private car ownership is almost non-existent in Beijing, or indeed in most other places in China, except some very special cases, especially perhaps the city of Shenzhen where the richest fraction of the country's population reside.

On the unconventional side of public transport service, there used to be (man-pulled) rickshaws in Beijing decades ago, now there are virtually no such vehicles for passenger transport in the city (See, for example, Strand 1989). The new unconventional modes are mainly the tricycle (fig. 10) and the minibus. The former is a pedal-powered three-wheeler and mainly for carrying tourists for short journeys; and the the latter is a relatively new mode in Beijing and the subject matter of this particular study.

Besides, there are a large number of taxis serving in Beijing, mostly for foreign visitors. Local residents seldom travel by taxi because the costs are extremely high for the majority of the wage earners. As a result of their "export-orientated" style of services, the taxis tend to wait outside large international hotels rather than cruising around the streets for customers. This is also a common feature of taxi

Fig. 10 Beijing's Tricycles. Nowadays they are mainly for sightseers on short journeys.

Photo H Lam

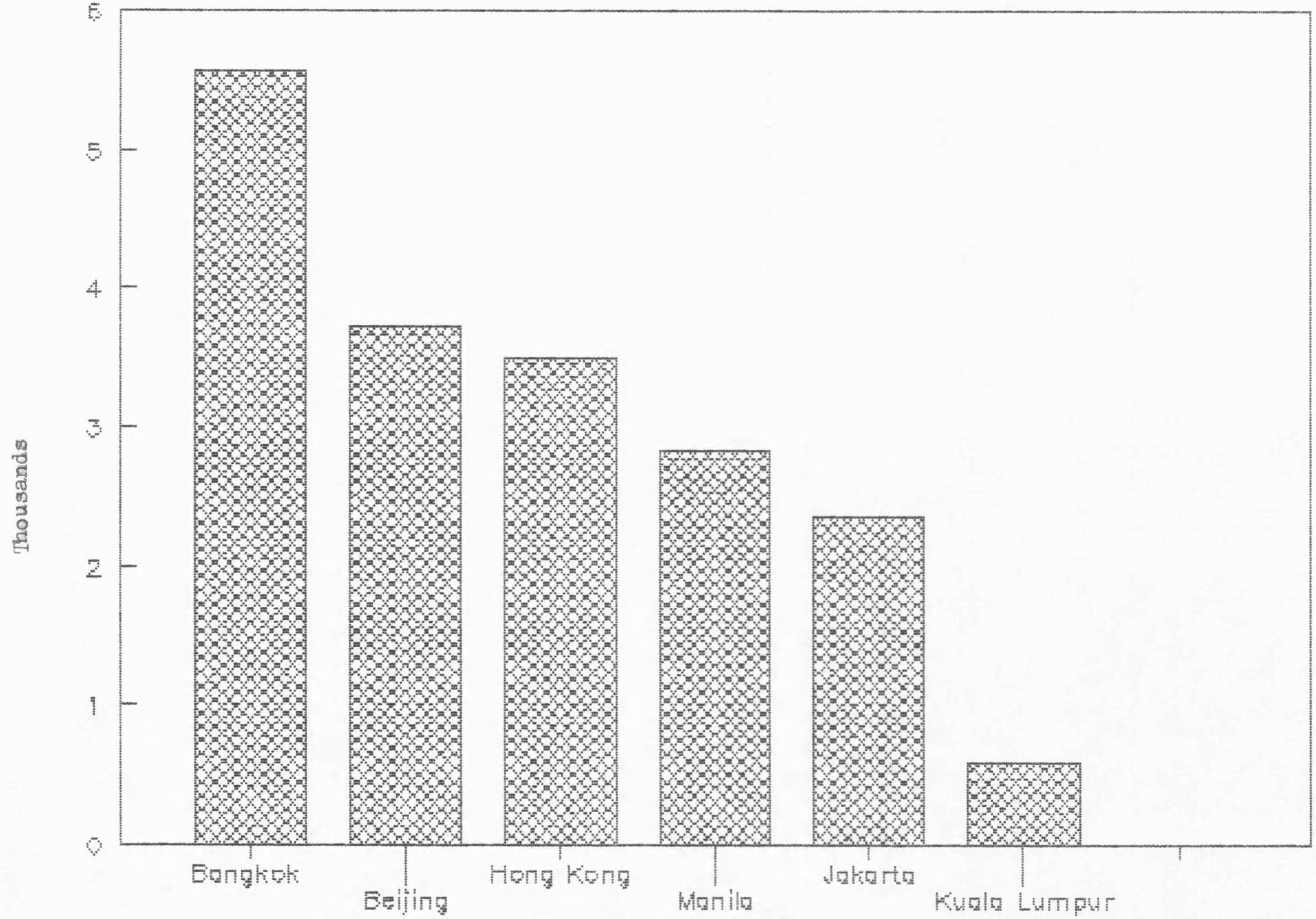
services in many other Third World cities.

On the whole, in terms of infrastructural facility and public transport provision, today's Beijing is perhaps what provincial cities may long for for tomorrow. Nonetheless, even with these facilities, Beijing is by no means problem-free. Although it has been enjoying so much privilege in receiving government's financial assistance that is so greatly envied by other cities, the Capital's passenger transport problem has not yet gone away. Much to the contrary, it is even getting worse. According to official figures, for the articulated bus and trolley system, there was a 2.7% decrease of vehicle utility rate during the ten year period between 1978 and 1988, in which the average daily distance per vehicle dropped from 173km in 1978 to 157km in 1988 (BRIUPD 1990). Above all, the areas that currently being served by the entire public transport network (including conventional buses, trolleys, minibus and metro) remain sparse and yet rather imbalanced; the overall geographical coverage of these modes is limited (See fig. 11 & fig. 12). It has been observed that areas where some form of the public transport service is available within 500 metres of distance occupy only 17% of the whole built up area and that they can cover only 52% of the total urban residents; what is more, of those who are covered in these areas, 74% of them either cannot or do not want to use public transport modes for one reason or another (Quan 1990a).

Furthermore, since 1986 patronage on the conventional bus

Total Numbers of Standard Buses

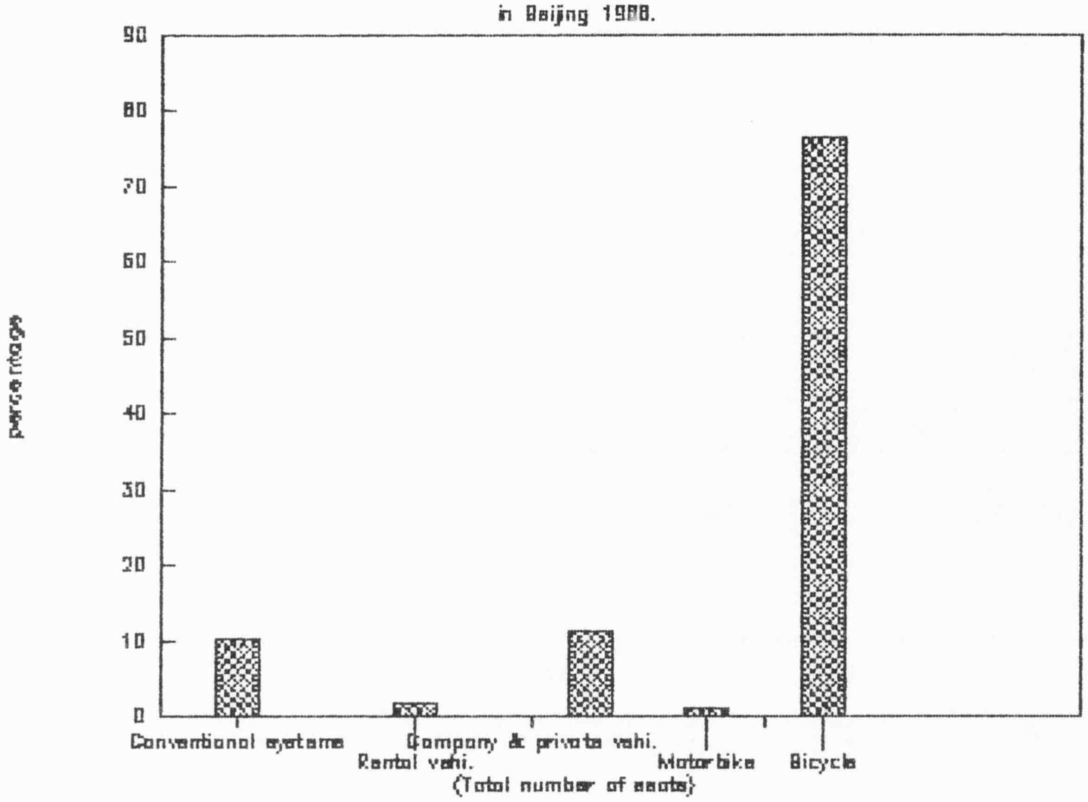
(excluding metro & minibuses)



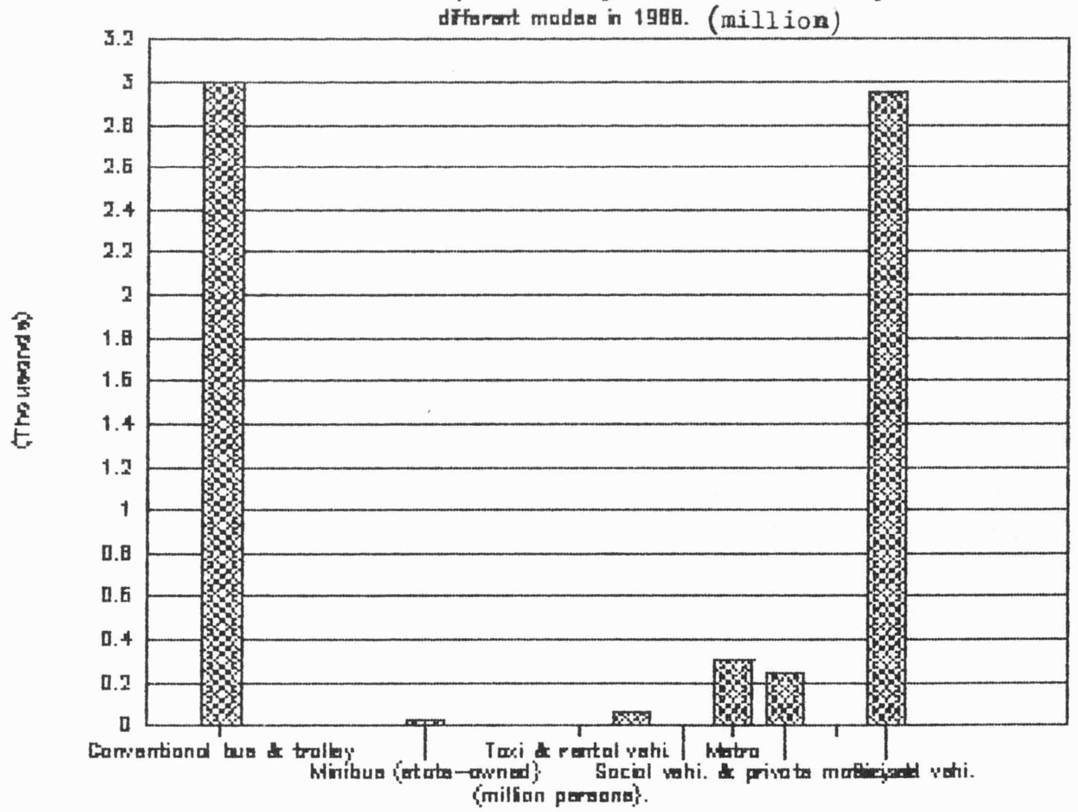
Source: Jane's 1985

Fig. 11

Fig. 12 The capacity of different modes



Volumes of passengers carried by



and trolley system has stagnated and then declined slightly (See table 7 & fig. 13); whilst on the other hand, demands for travel in the city continue to increase. What then, is the cause of this dilemma? Let us now examine the roots of the problem in the following sessions.

Table 7:

Fleet size and passenger volume of conventional bus & trolley systems in Beijing (1978 - 1988).

Year	Fleet size	Total passengers carried (000)	passengers carried per vehicle (000)
1978	2,627	1,694,650	645.1
1979	2,889	2,009,180	695.5
1980	3,001	2,314,770	771.0
1981	3,259	2,574,780	790.1
1982	3,459	2,767,020	**800.0**
1983	3,711	2,919,770	786.8
1984	3,932	3,108,000	790.6
1985	**4,033**	**3,175,630**	787.4
1986	3,905	3,080,670	788.1
1987	3,994	3,060,360	766.2
1988	4,007	3,003,730	749.6

Source: after the "Comprehensive Report of BRIUPD", July, 1990.

N.B. The above table also shows that, in 1982, passenger utility rate per vehicle reached the highest level. This rate fluctuated and declined slowly ever since.

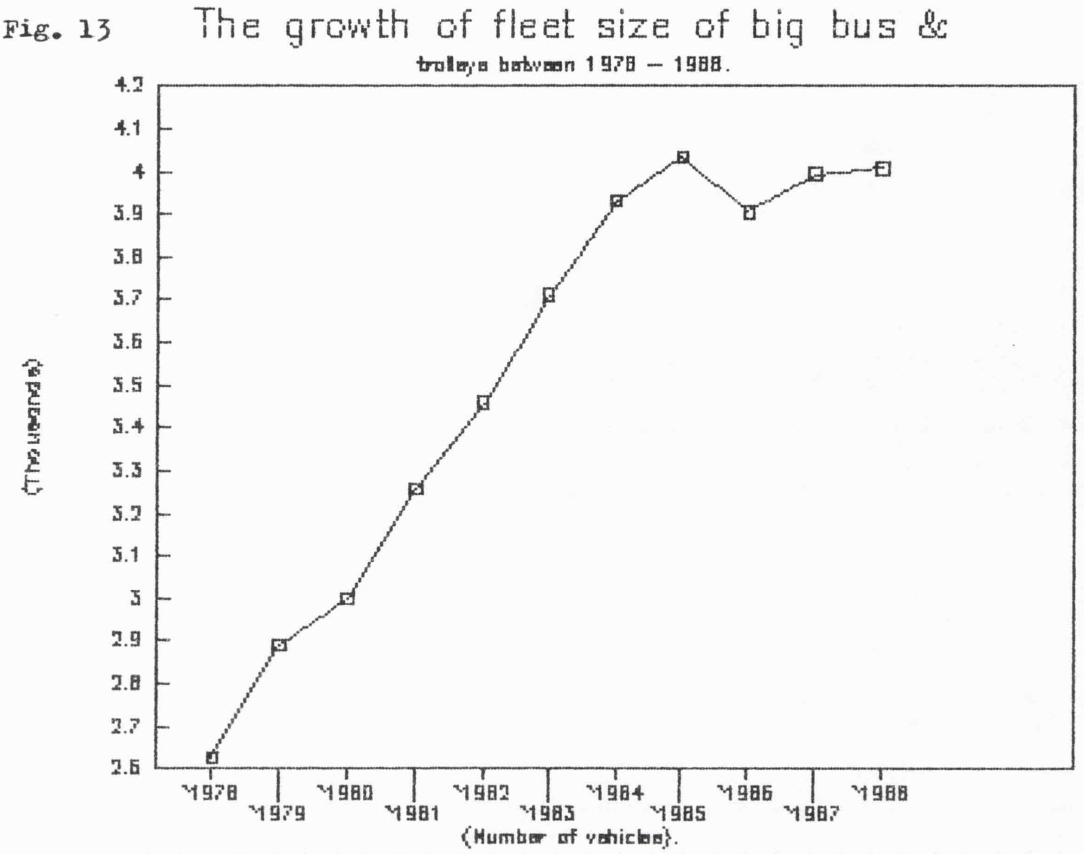
3.5 Urban changes and Pressures on Traffic

The process of rapid urbanization in Beijing over the past decades has largely contributed to the transport problem. The following sub-sections describe the causes of the problem in an historical perspective.

3.5.1 The Population Increase:

As what has been happening in other large developing cities, the rapid increase of population is a major cause for Beijing's passenger transport problem; this includes both the increase of permanent population and floating population (Not to mention that in comparison Beijing has fewer vehicles - see

Fig. 13


The growth of fleet size of big bus &
trolleys between 1978 – 1988.
(Thousands)
(Number of vehicles).

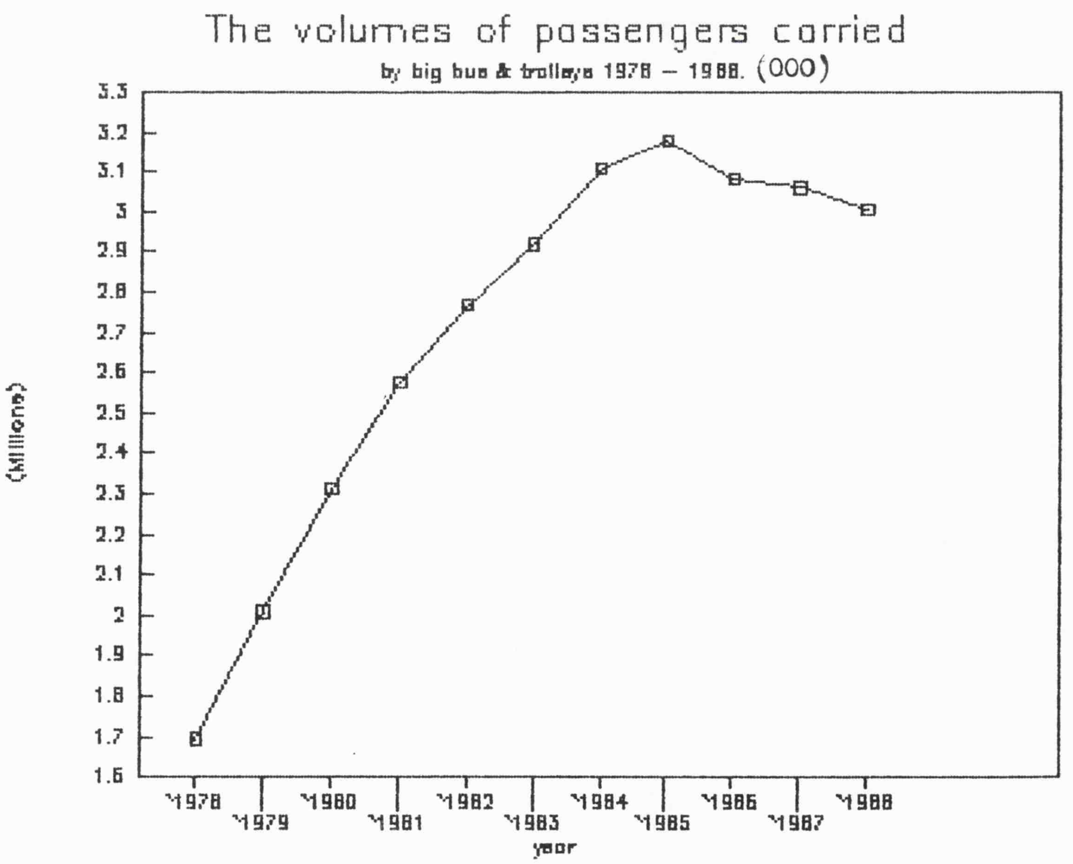

The volumes of passengers carried
by big bus & trolleys 1978 – 1988. (000)
(Millions)
year

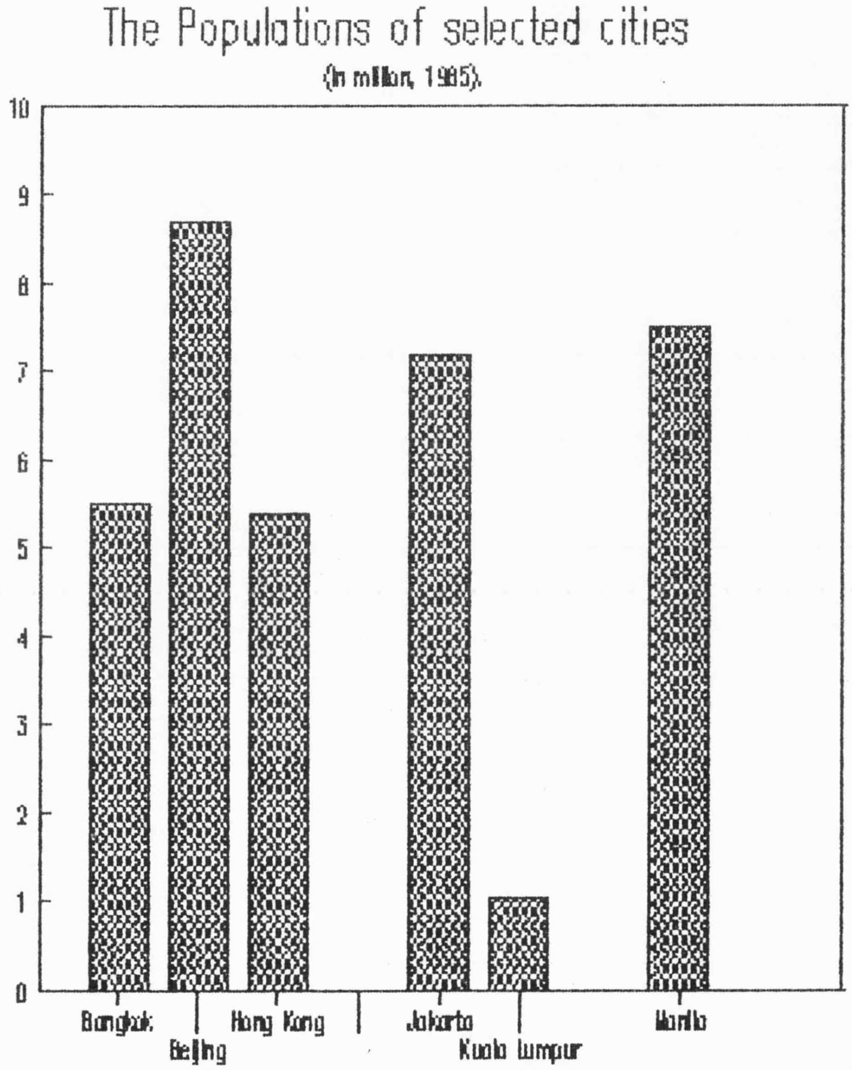
table 8).

Although the government had previously planned to control the increase of the city's population to under 10 million by the year 2000, it is estimated that by 1988 the figure already reached that limit (Quan 1990b) (fig. 14). In fact, Beijing's population in 1949 within the present administrative boundaries is estimated to have been about 4.14 million only, of which 1.76 million might be considered as urban. Since 1949, though, the growth of industry and other social and economic activities has caused a rapid increase in the city's overall population. By 1979 the city had a population of 8.71 million, of which about 5 million were urban residents. The average annual net growth between 1949 and 1979 was 110,000 persons. This annual increase of 3.64% was higher than that of other major cities such as shanghai, Tianjin and Guangzhou. And of the total net growth, the actual figure through natural growth was 3.37 million and that through in-migration 1.2 million (Dong 1985).

What is more, Beijing's population continued to grow throughout the 1980s. Between 1978 and 1988, the total increase during this ten year period was 17.6%, or roughly by 140,000 persons per year. In the meantime, the proportion of floating population over the city's total has also increased from 6% to 18% (Quan 1990b). At the end of 1988, the total floating population in Beijing was recorded to have reached 1.31 million (Quan 1990a).

Together with the increase of permanent population, this

Fig. 14


The Populations of selected cities
(In million, 1985).
10
9
8
7
6
5
4
3
2
1
0
Bangkok
Beijing
Hong Kong
Jakarta
Kuala Lumpur
Manila

huge number of visitors has increased the burden on the city's public transport system. It has been observed that visitors are more likely to travel and use the public transport facilities than local residents. At the individual level, the average number of trips per day made by a visitor is 1.4 times of that by a local resident (Quan 1990b). Thus, although Beijing's floating population accounts only about 16% of the population within the built-up area, the total number of trips made by these people as a whole is much higher than this percentage. For example, statistical figures show that, of all the person/trips by public transport in 1986, 35.5% were made by floating population (Quan 1990a). This percentage may have become even higher in the 1990s as the number of visitors has since then increased further.

Clearly, as a consequence of rapid population increase, the volumes of spatial movements in terms of person/trips have increased rapidly. As early as in 1980, the daily average number of passengers carried by all means of public transport already reached 7 million. Peak periods' carriages were particularly heavy. The hourly volume carried during peak hours amounted to 930,000 persons; 600,000 of whom were commuting between the Suburban and the City Districts (that is to say, within urban Beijing) (Dong 1985).

In addition to the growing volumes of passengers carried by the public system, the increase in overall trips made private transport facilities has also been remarkably high.

Thus the total increase of trip volumes during the past decade has been very huge. For example, in 1986 alone, the daily number of trips made within the built-up area totalled 11.23 million; those made by local residents 9.26 million, and by floating population 1.97 million (Quan 1990b). All told, during the ten year period between 1978 and 1988, the overall increase of trips made by both public and private transport modes in urban Beijing was 80%; if interpreted in actual terms then the net increase amounted to 230 million person/trips (excluding walking trips). It should be noted that, however, 58% of these were made by either bicycle or the so-called "social vehicles" belonging to the organizations where the travellers worked (Quan 1990b). Again, in 1986 only, of all the person/trips made in that year, only 24% were made by public transport, while 54% by bicycle. Comparatively, the increase of patronage on the public transport system has been low. Nevertheless, if the past 40 year period is considered as a whole, then the absolute number of passengers using the public transport service has actually increased by 108 times (Ren 1990). As one can see, although not all the modes have shared the same percentage of growth, the rapid increase of population in Beijing has indeed exerted tremendous pressure on the urban passenger transport system.

Table 8: Bus and Metro Systems in Selected Far Eastern Cities

City	Population (million)	Standard Bus		Metro & Light Rail (Km)
		Bus	Trolley	
Bangkok	5.5	5,574		59.0 RL
Beijing	8.7	3,183	528	35.0 MT
Hong Kong	5.4	3,494	163 (tramcar)	26.1 MT Light Rail ~~(planned)~~
Jakarta	7.2	2,350		Suburban rail
Kuala Lumpur	1.03	647	549 (tramcar)	Light Rail (planned)
Manila	7.5	2,821(Private & state-owned)		15 LR

Source: Modified from "Jane's Transport Systems" 1985.

NB. Paratransit vehicles are excluded.

3.5.2 The Physical Sprawl:

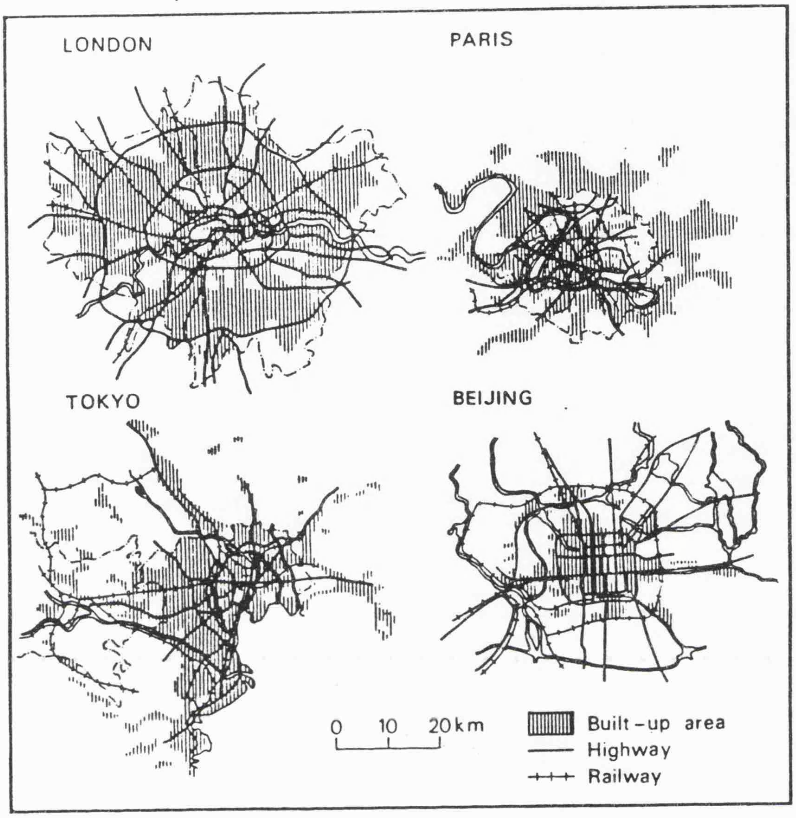
After a long period of implementing the policy of urban depopulation and controlling urban growth in the 1950s, 1960s and early 70s, the Chinese Government was still unable to modernise the economic activities in the countryside successfully. In the 1980s the authorities changed their strategies on economic development and adopted new policies to develop major urban centres in an attempt to boost urban economy and raise living standards of the citizens.

In Beijing, throughout the last decade, there has been a large scale construction programme to upgrade the image of the city. Apart from luxurious hotels in the central area, the suburbs sprawled out rapidly to the outskirts with new residential estates built on the urban fringes. Tens of hundreds of flats and tower blocks were constructed on what previously had been the farming land for greenstuff. Several satellite settlements were also designated and built in and around the Suburban Districts. The idea to expand the city was supposed to decentralize and disperse commercial and cultural activities from the historical city centre, and to ease the overcrowding situation in the whole urban area.

In terms of transport infrastructure, emphasis has been focussed on building trunk roads and ring roads. Over 6 million square metres of roads have been constructed during the period between 1978 and 1988 (Quan 1990a); many are spectacular six-lane avenues connecting sub-centres lying in the Suburban Districts. Some of the major streets in the old city have also been widened by cutting off corners and contracting pavement.

Overall, Beijing is growing fast. Altogether the built-up area has grown by 2.4 times over the past 40 years since 1949 (Li 1990). In planning a national capital symbolic of socialist achievements, the Chinese authorities have deliberately compared Beijing's urban development with major First World cities. Taking London, Tokyo, Paris and New York as examples, Chinese planners are convinced that the problem of congestion in Beijing is not because the city is too large, as they themselves used to think, but, on the contrary, too small and concentrated (fig. 15). For example, Dong (1985) argues that the road system in Beijing forms only 6.9% of the total built-up area, whereas comparable figures for most cities in the West are in the regions of 20 to 40 per cent. It is therefore believed that the corresponding percentage in Beijing must be raised gradually to between 20 and 30 per cent to keep pace with the rapid increase of motor vehicles and that in order to tackle congestion, further urban expansion is necessary.

Fig. 15 Comparison of Built-Up Areas of Beijing, London, Paris and Tokyo, 1979



Source: Zhao (1982).

Currently, the authorities plan to increase public open space to an average of 10 sq.m/person. To achieve these targets, it is argued, that the city must be expanded further by 40 to 50 sq.km. in size. And according to the Chinese planners, if urban Beijing is supposed to accommodate some 6.5 million residents by 2000, then the built-up area will need to double (Dong 1985).

Whether the outward sprawl of residential estates on the urban fringes has helped to alleviate congestion and overcrowding in the urban core or not is not clearly visible, since there is very little quantitative evidence available to indicate any such change. Nonetheless it is generally accepted that the larger the city size the greater the need for motorized travel and the longer the average travel distance. Until now, despite all the efforts to decentralize the population, the highest population density figure still remains in the four City Districts; in fact, over the past 40 years, this figure actually increased by 20% (Quan 1990a).

According to the present author's informal interviews with some local residents, many of those newly built flats adjacent to the urban fringes mainly accommodate the peasants, who used to live in the villages that had existed there, rather than citizens relocated from the city centre; and above all, people living in the City Districts are generally reluctant to move to the urban fringes where public services are seen as inadequate. If this is the case, then the decentralization policy which mainly relies on urban physical sprawl may indeed have been futile. Obviously, by implementing this kind of rehousing policy, the authorities have actually absorbed more rural residents into the expanded built-up area, rather than dispersing the population from the overcrowded city centre and, because of the increased number of urban residents, consequently, it creates greater inadequacy of public amenities, including transport services, not to mention that the acquisition of arable land from the farming communities around the urban area could, in effect, destabilize the supply of seasonal vegetables for the whole city.

Another impact resulting from rapid urban expansion is the increase of average travel distance. In this respect the increase has been considerably significant. For instance, during the three year period between 1983 and 1986 alone, the average travel distance for each public transport user in Beijing increased by 4.3% per trip. As the built-up area continues to spread out, this percentage is likely to keep increasing. It is estimated that by 2000, the increase in average trip distance per person would reach one kilometre in actual length and that the frequency of trips per day per person would also increase from 2.22 in 1990 to 3.0 by then (Quan 1990b).

Again, in short, it is quite clear that the increasing expansion of the built-up area has, to a large degree, contributed to the existing urban problems, notably to the problem of mass movement. The strategy of deconcentration of urban land use has not been particularly effective in controlling the increase of population nor in taming the traffic in the built-up area, even though the expansion of the city can be regarded to have been carefully planned by the authorities.

3.5.3 The Increase in Vehicle Volumes:

Besides rapid physical expansion and population growth, Beijing faces another even greater problem in planning and managing urban transportation. This is the dramatic increase of vehicles of various types and different sizes. Although there is often the image that more vehicles could mean greater mobility for the citizens, the sheer number of growth that without effective control has on the other hand created many problems in intra-urban traffic owing to severe congestion, not to mention other related problems such as environmental damage, noise, accidents and so forth.

Indeed, since 1949, the total number of vehicles registered in Metropolitan Beijing has increased fast, though the most dramatic increase actually occurred between 1978 and 1988, when motorized passenger vehicles increased from 81,300 to 312,100, or by 2.83 times during that ten year period; it was at a rapid upward trend of 10,000, 25,000, 33,000 and 56,000... in the successive years throughout the second half of the 1980s (Quan 1990b). Again, considering the 1980s alone, in actual terms, the number of motorized vehicles increased by 300,000; non-motorized vehicles by nearly 5 million. There are now about 400,000 motorized vehicles in the Chinese Capital (including both commercial and passenger vehicles) (Ren 1990).

One of the "Special characteristics" in China is perhaps the use of the so-called "Social vehicles", whose total number increased so rapidly during the past decade across the country. The aggregate term "social vehicles" is a Chinese-style jargon used to describe motorized vehicles belonging to public organizations, such as production units, factories, farms, state-owned shops, hospitals, educational institutions, research establishments and so on. To a large degree a social vehicle is the Chinese version of what is known as a "company vehicle" in the U.K.. The main difference is that most "social vehicles" in China are either coaches or vans equipped with seats rather than cars. They are used for carrying the company's employees when required, and mostly on business trips or for official duties. As a consequence, they are only used occasionally and thus have lower utility rates and often low load factors than a "full-time" passenger bus. According to official figures, on average, only about 63% of all social vehicles in Beijing are in constant use. If considered from a perspective of utility against time, then, again, on average, only 18% of each hour is used; that is to say, during most time of the day, the vehicles are parked idle (BRIUPD 1990). Indeed, it is estimated that, on average, about 58.2% of all the trips made by social vehicles are run with empty seats (Quan 1990a).

Compared with the growth rates of the social vehicles, the increase of big buses and trolleys has been slower. These conventional buses indeed had their "golden years" in the mid 1980s (i.e., 1985) when both fleet size and passenger volume reached a peak. Since 1986 their growth rates have approached to zero (Ren 1989). In 1988, even though the fleet size went up again close to the level of 1985, the number of passengers carried however, fell to a level lower than that of 1984. This declining trend, to some extent, suggests that the performance of the conventional bus and trolley systems has actually deteriorated and that the acquisition of further vehicles will not on its own bring passengers back onto their seats.

The rapid increase of motorized vehicles is not the end of the story, though. If non-motorized vehicles are also counted, then the overall growth rates recorded are even higher and the total number of (motorized and non-motorized) vehicles registered in Beijing is remarkably high; for in addition to all kinds of motorized vehicles, there are now 7.87 million bicycles in metropolitan Beijing (Ren 1990).

The growth of bicycles actually built up its momentum in the late 1970s following the reforms and relaxation of the commodity market, since when the growth of bicycles in Beijing has grown at an annual rate of 555,000 vehicles. Between 1980 and 1988 the total number of net growth was 4.44 million. It was estimated that in 1978, the ratio of persons per bicycle in Beijing was only 2.93; until 1988 this figure has grown up to 1.4; that is to say, there were 2 bicycles between 3 persons (Ren 1989). And then in 1990, the average ratio of persons per bicycle eventually reached 1.3 (Ren 1990), making it roughly 8 bicycles per every 10 citizens in the city. (See table 9 & fig. 16). One of the reasons for the bicycle boom was due to the inefficiency of the conventional modes, whose overall accessibility is limited in a diversified urban traffic environment; whilst in comparison the bicycle is much more suitable for traffic within residential neighbourhoods. Therefore it is not surprising to see that the corresponding ratio between public transport users and bicycle riders has dropped from the previous 50:50 to 36:64 over the last decade (Ren 1989).

Fig. 16 A "bicycle-park" at Qianmen (the Great Front Gate - near Tiananmen Square), where population density in Beijing is at its highest.

Photo H Lam

Table 9: The Growth of Bicycle Volumes (1949 - 1988)

Year	Interval (year)	Total volume (000)	Accumulated growth (000)	Annual growth (000)
1949		140		
1967	18	1,140	1,000	55.6
1975	8	2,230	2,090	136.6
1981	6	3,210	3,070	163.6
1983	2	4,290	4,150	450.8
1985	2	5,510	5,370	607.8
1987	2	6,710	6,570	598.9
1988	1	7,320	7,180	614.8

Source: Ren Baoxing "Comments on the Issue of Bicycle Expansion in Beijing", in Beijing City Planning & Construction Review. 1989, PP30.

Overall, over the past 40 years, in Beijing, motorized vehicles have increased by 158 times and bicycles by 55 times in volume respectively, yet the mileage of roads has only increased by 20 times (Ren 1990). There is obviously an imbalance between the growing volumes of vehicles and the space that needed to accommodate them. Considering the rather undisciplined traffic behaviour of the bicycle riders and the low load factors of the social vehicles, it is not difficult to imagine that the massive volumes of these vehicles on the roads are one of the main factors responsible for serious congestion in the city. What is more, huge volumes of moving bicycles are also a common cause of road accidents. In Beijing, between 1980 and 1990 there had been 23,693 road accidents involving bicycles, of which 22,105 persons were injured and 1,644 dead; the numbers of the injured and deaths accounted for 40% and 32% of the city's total (road accidents) corresponding figures recorded over that period, respectively (Ren 1989). (See fig. 17).

Indeed, the problem of traffic congestion and mass movement in Beijing is critical. It has been observed that of the 128 major road junctions within the City Districts, 34 frequently experience heavy congestion, and on average, normal traffic flow can be maintained at about one-quarter of these

Fig. 17 A bicycle dump near the People's Square, in central Shanghai. This is a vivid example of environmental pollution and illegal occupation of road space in urban centres.

Photo H Lam

junctions only (Dong 1985). However, whilst congestion is typical in Chinese cities, it is rather different from those in the First World and the Middle-income countries. This is because congestion in Beijing and other Chinese cities is chiefly caused by non-motorized vehicles and pedestrians, rather than by cars. Nonetheless, the impacts of congestion are obvious. The average speed of motorized vehicles in Beijing is low even though the city is almost "private-car free" by any standard (Unconfirmed sources estimate that there are about 600 privately-owned cars in Beijing). Currently, the average speed for motorized vehicles on main corridors is only 15.8km/hour, which indicates a decrease of 40% compared with what had been ten years before. As a result of decreased average speed, longer travel time is now needed for most journeys. Indeed, during the past decade, there has been a 10.3% increase of average travel time per each vehicular trip made in the city (Quan 1990a).

For public passenger services, bus speeds have also been affected. The conventional buses become more crowded and less punctual than ever. In 1983, for example, average travel-to-work times for the City Districts and Suburban Districts of Beijing were 44 minutes and 66 minutes; by 1986 these had increased to 60 and 90 minutes respectively (Smith 1991). In many cases, travellers would find it faster to ride the bicycle than travel by big bus or trolley, especially for short journeys or where the bicycle can take a short cut. It has now been observed that, ironically, about 64% of bus travellers have to spend 87% longer in terms of average time per trip compared with riding a bicycle; that is to say, on average, more than a half of the bus-users would find it much quicker to travel by bicycle than otherwise by conventional bus or trolley (Quan 1990a). Above all, apart from showing the effects of congestion, these figures have indicated that in Beijing, the average journey distance is relatively short, and thus big buses are generally unsuitable for most local residents.

3.6 Summary

Beijing's passenger transport problem is common in large cities in China, yet its causes are also of a typical nature. Overall, there are three main causative factors:

a) Population growth,

b) Physical sprawl, and

c) Increase of vehicle volumes.

Of these three the growth of population in absolute terms is perhaps the most important factor that exerts heavy pressures on demand for travel. Adding to the problem is the physical sprawl of the city which causes greater needs for motorized trips and longer journeys to be made. In respect of traffic congestion the problem is partly a consequence of the speedy increase of vehicles without effective control and management. Thus, technically speaking, there is a mismatch between demand and supply in terms of type of vehicles and style of service; and in this way, the public transport service has failed to meet the requirements of the citizens. Above all, the transport problem in Beijing is rather typical in Third World cities, thought the level of problem each city faces may differ.

Bearing in mind the persistent domination of conventional buses and trolleys on the streets previously, the arrival of the minibus in Beijing was indeed an injection of new blood into the city's public transport system. The next chapter will look at the development, structure and characteristics of the minibus transport in Beijing in detail.

Chapter IV

BEIJING'S "UNCONVENTIONAL TRANSPORT": THE MINIBUSES

4.1 Introduction

As introduced earlier in chapter I, in many Far Eastern cities, apart from conventional buses, small passenger vehicles are a major component of urban transport system; most all of these "paratransit" vehicles are owned by the private sector: some belong to small groups of investors; others are owned by families or individuals. Therefore it is not unusual to see that the driver himself/herself is the owner of the vehicle and that the whole "unconventional" system in a city is made up of many small fleets.

Here in Beijing the picture is quite different. The most visible differences are ownership pattern and institutional structure of the minibuses. This chapter aims to bring the argument onto the table by introducing the special features of Beijing's minibus service; these include routeing, service style and fare structure.

4.2 Fleet Structure and Ownership Pattern

Beijing's minibus transport service was established in the climate of the Chinese Economic Reform during the 1980s. Under the assistance of the Municipal Government, several state-owned bus companies began their minibus business one after another. The Rental Company was the first to launch the minibus operation in Beijing, followed by four more companies later, making it five major minibus providers altogether (Interview notes 1990). Along with these companies there are now many small undertakings too; though, because of the "informality" and the restrictions imposed upon their operation, they are often excluded from official statistics. Further details about these small fleets will be discussed later.

Of the five major transport companies in the city, four provide intra-urban minibus services, whilst one mainly operates inter-city services, i.e. between urban Beijing and the satellite towns located in the outlying counties. There are differences in terms of fleet size between the four companies which provide intra-urban minibus services. Until 1990, the First Automobile Company had 174 vehicles; the Second Automobile Company 169; the Trolley-bus Company 165 and the Rental Company 60. All told, the number of registered vehicles that belong to the four major intra-urban service providers was 568 in 1990 (Manuscript data provided by M.A.O officials,

1990. The total number excludes the fleet of the Long-distance Coach Company). However, it should be noted that, the new figure in 1992 may have already passed the 600 mark.

Generally speaking, the minibus fleets of these companies are, with perhaps exceptional cases, larger than those owned by individual undertakings in other Far Eastern cities. For instance, in Hong Kong, in the early 1970s, 96% of minibus owners owned only one or two vehicles (HKPWD 1973). What is more interesting is that, although the minibus fleets in Beijing are not particularly huge, the companies themselves are actually quite large, because they also run conventional bus and trolley-bus business and in fact, the minibus operation is just a small proportion of their concerns.

In practice, each of these companies is responsible for everyday operations of its own minibus teams. That is to say, much of the operational activity is managed by the executives of the companies in question, such as actual routing, dispatching vehicles, frequency control, allocating vehicles for hire, arranging extra schedules, personnel matters and so on. On the other hand, in terms of overall business management, they are all under the control of the Minibus Administrative Office, which itself is an internal department of the Beijing General Public Passenger Transport Corporation. The Minibus Administrative Office makes decisions over the overall planning and development of the minibus business, looking after financial gains and losses. Thus, although the minibuses are separated in different companies, they are all under the umbrella of a state-owned organization (See fig. 18). Their business licences are controlled by the municipality's public security and transport authorities and fare charges are regulated by the Pricing Department. It is entirely up to the government's approval to invest or hold up in their business. In contrast, the managers of the companies act as agents operating within the framework of a nationalized enterprise.

However, as mentioned above, there are actually more minibuses running on Beijing's streets than just those owned by the major transport companies. According to the present author's interviews with some experts in the field, altogether the small undertakings possess even more minibuses than the state-owned fleets. Unfortunately, there is no official information on how many of these minibuses are constantly operational. Conservative estimates put their total rolling stock (in 1990) at around 600 vehicles or even more.

Hence, the overall picture of minibus transport system in Beijing is a large fleet surrounded by small fleets, and under two major forms of ownership. What is the ownership structure of these small undertakings? Let us move on to explore this in greater detail.

In comparison with state-owned fleets, the ownership structure of the independent minibuses is somehow distinctive. The term "informality" of the independent minibuses actually refers to their ownership as well as organizational structure:

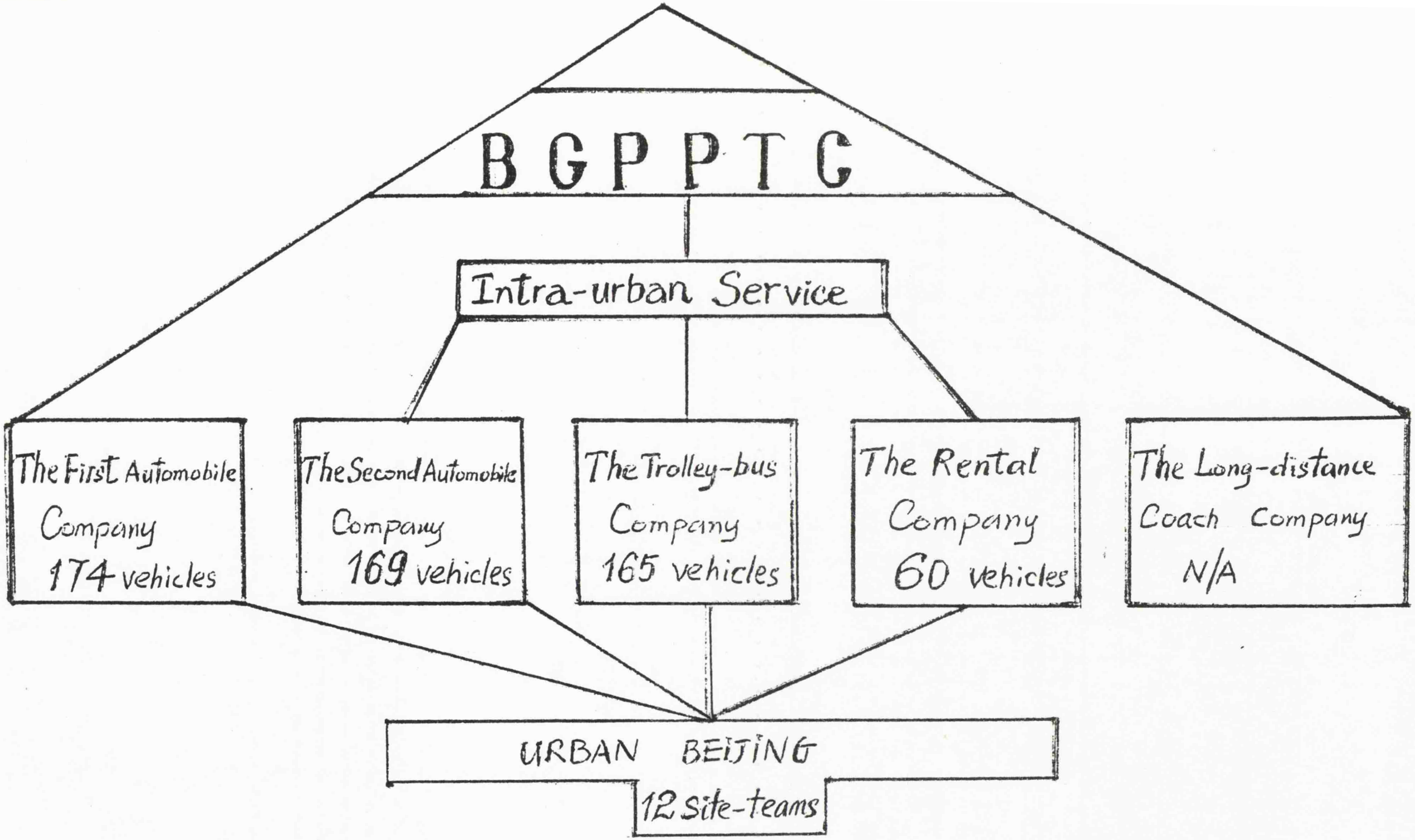


Fig. 18 The "umbrella": the nationalized minibus Service.

Unlike those directly owned by the state companies, these minibuses belong to various cooperatives (Most of which are those mentioned in section 2.2). From the original business of various kinds of petty commodity production the earlier cooperatives seized the opportunities of the 1980s' Reform to expand their production line and start the minibus operation. Thus, in some cases, the vehicles are owned by a production unit, or a backyard factory; in other cases, by a neighbourhood workshop or a group of relations or friends, though the latter case of family business is by no means common. Technically speaking, their ownership is more close to "public" than "private" because the vehicles are collectively owned by the "people", rather than by any individual. In a sense, it is another form of state-ownership.

Since the cooperatives are small scale undertakings, their minibus fleets are also small; some are as small as having only a few vehicles. As a result, their overall institutional structure is likely to be simple, normally without obvious managerial hierarchies. The staff are more or less in equal terms in that they are supposed to carry the same burden over the business performance of the undertaking. In this context, the staff are self-employed rather than being hired by someone else; this is a unique element which does not exist in a "state-owned" institution. Nevertheless, on the whole, it has been a tradition in socialist China to categorize all collectively-owned business concerns, and hence these minibus cooperatives, as "individually-owned", or "independent" enterprises, as in contrast to companies directly owned by the state. (More about the impacts of their ownership and structure will be analysed in section 5.5 of the next chapter).

It is perhaps useful to note that, unlike the state-owned transport companies, the majority of these independent minibus undertakings are based at the satellite towns and areas close to the urban boundaries, rather than within the built-up area. The reason that few of them are based in the urban zone is because for decades, passenger services in the urban area have been monopolized and dominated by the state-owned conventional bus fleets, small scale enterprises in the urban area thus find it too risky to enter the business and face the challenge from a heavily subsidized entity. Whilst in some small urban settlements adjacent to the city, there were some routes here and there that had not been covered by the conventional bus network; this created opportunities for the petty commodity workshops already existing there to set up passenger services to fill the vacuum. As a consequence, many of these small independent minibus fleets are registered locally in the counties and supposed to operate in the immediate catchment areas.

Hence, strictly speaking, there are no privately-owned minibuses or owner-drivers in Beijing as those in the Southeast Asian "capitalist" economies, i.e., Malaysia, the Philippines, Hong Kong and so forth. One of the main reasons is that unlike their overseas counterparts, people in Beijing (indeed, in China as a whole) have little money saved in the past for them to acquire the means of production -- the vehicle, which is far beyond the purchasing power of any individual wage earner. Imagine a worker can earn a monthly wage of Y250 (probably a typical amount for a driver). For a mere Y50,000 (the price of a Chinese-made minibus in 1990), it would take the individual more than 15 years to save, not to mention that if he/she could save any substantial amount at all after expenditure on other basic items for living, since saving is very much dependent on the size of the family that one has to support.

Another reason concerns the barriers to entry existing in the transport sector. These refer to the problems one has to face when trying to enter the transport business, such as obtaining a driving licence and getting the business registered, which in China have never been easy under the bureaucratical system. Furthermore, fuel is almost entirely controlled by the state, who does not supply petrol to private vehicles on a sufficient basis. All these, together with the state monopoly mentioned above, have created invisible obstruction within the passenger transport industry. This is why so far there has been little involvement of private capital in the provision of passenger transport services, except perhaps for the man-powered rishaws.

On the whole, in broad terms, Beijing's minibus system can be considered to have consisted of two major sectors, one owned by the state and the other by cooperatives. There is no private ownership as is commonly known in capitalist economies. In terms of fleet size, one may easily see the similarities between the cooperatives in Beijing and the family- or individually-owned concerns in other Far Eastern cities. On the other hand, as an independent business unit, the state-owned fleet in Beijing as a whole is remarkably large, probably larger than any fleet owned by any single privately-owned minibus undertaking found in the whole region. Nonetheless, as will be discussed further later on, there are zonal restrictions between these two sectors in respect of operation.

4.3 Routeing and the Boundary Restriction

The physical size of the minibuses in Beijing is a feature that should be given special attention. Unlike the 25 - 30-seaters seen in the U.K and some other Western cities, the vehicles employed by the operators in Beijing are smaller, similar to those in Hong Kong. The average seat capacity is within the range between 14 and 16 passengers according to different models, though the Rental Company does have some 22-seaters. (fig. 19). There is no obvious difference in external decoration between the minibuses. According to officials of the Minibus Administrative Office, for the state-owned fleets, 97% of the vehicles are Chinese-made, with many actually built by the city's own automobile factories. The imported vehicles are mostly from Japan and more expensive than locally-built ones.

Since there are differences in terms of locality between the state-owned and the independent fleets, the routes they run are also geographically differentiable. Let us first consider the state-owned vehicles. The whole fleet under the management of the Minibus Administrative Office is divided into 12 site-teams, each of them is based at a nodal location of the city's main traffic. Altogether they form a thinly distributed network of routes across the built-up area, covering mainly trunk roads and busy streets. (See table 10). At each site there is usually a parking bay. Performing as a small terminus the bay provides facilities such as sign-posts and spaces for the minibuses to line up and wait for their turns to pick up passengers. Some of the minibus termini are adjacent to underground stations, others are close to a similar bay provided for the conventional buses and trolleys. Nonetheless, for various reasons, such as the big differences in fare charges, nodal integration between the minibus and the conventional buses remains poor.

Fig. 19 Beijing's minibuses collecting passengers at the North gate of the Forbidden City. The words on the sides of the vehicles read: "Hail and ride. Get off wherever convenient".

Photo H Lam

Table 10:

Number of Routes, Average Route Length & Average Distance Travelled per Vehicle in Urban and Suburbs (State-owned Minibuses) (16 April 1988)

Check

Route	No. of routes	Length of routes (km)	Average distance per vehicle (km)
Urban	21	174.42	5.73
Suburban	18	393.22	19.44
Total in built up area	39	567.64	12.16

Source: Modified from "The Collection of Major Data on the Survey about Passengers". December 1988b, BGPPTC & MAO.

NB: a) Data based on a one day survey.

b) Information on Independent minibuses is not available.

Compared with those operating in other Far Eastern cities, the minibuses in Beijing are rather unsettled in terms of regular routeing and service intervals. According to official document (BGPPTC 1988a), altogether there are five different forms of services (Table 11 & fig. 20); though, on the whole they can be classified into two main categories: **routed** and **non-routed services.**

i. The first category is the **routed** services. These are provided by the state-owned operators. There are (in 1990) 39 routes, totalling 567.64 km in length. This category can be divided into three forms:

a. Eleven fixed routes: Like the conventional buses, they are fixed in business hours, and supposedly with fixed frequency and bus-stops along the route. Each minibus displays a route-plate on the windscreen to show the destination of the route.

b. Twenty six non-fixed routes: The main difference between the a fixed route and a non-fixed route is that the latter is more variable. That is to say, though the minibuses normally begin their journeys from a bay, the crew may divert the route when necessary. There are no fixed business hours nor fixed bus-stops. Route diversions often fluctuate with changes of traffic pattern, for example, in the morning the minibuses tend to ply between rail and coach stations and recreational sites, and in the afternoon between recreational sites and hotels or entertainment facilities.

c. Two special routes for tourists: They mainly link major sight-seeing areas and the city centre. One of which is the route from the former royal park of Summer Palace in the west end of the city, via Beijing Zoo to the world famous Tiananmen Square. On these tourist-routes the minibuses operate in the form that more or less resembles long distance coach services in that they start from the origin and terminate at the destination without making fixed stops en route unless demanded.

ii. The second category is the **non-routed** services. There are two kinds of non-routed services.

a. Collective rental services: Passengers are collected at normally a beauty spot or a transport terminus, who all want to travel to the same destination and thus share the costs amongst themselves. There is no schedule or fixed route but it is rather like a taxi service.

b. Contracting out services: Charter-service where both the driver and the vehicle are hired out. Prearrangements are usually made so that specific requirements on timing, duration or distance can be negotiated before hand.

It is interesting to note that, whilst only a small proportion of state-owned minibuses provide rental and contracted out services, in their operations within the built-up area, the majority of independent minibuses are engaged in these forms of services. The reason that most independent minibuses do not have fixed routes in the built-up area but rely mainly on non-routed operations is because the authorities have imposed zonal restrictions to prevent them from operating there where routes are properly identified and designated for the state-owned minibuses. Under these restrictions, independent minibuses based at the satellite towns or areas adjacent to the urban boundary are only allowed to provide services locally in the county areas where they are registered. On the contrary, those based at the urban area (mainly state-owned ones) may not cross their urban limit to travel to the county territories. For those who break this rule and operate beyond the permitted boundaries, an instant fine will be imposed on the spot if seized.

Nonetheless, these zonal restrictions cannot entirely deter those county-based operators who are determined to strive for higher earnings. It has been observed that, in practice, many of the minibuses from the Xian counties and areas close to urban boundaries prefer to face the risk of possible penalties to operate in the urban zone, where more and probably "richer" customers are easier to be found.

The independent minibuses from the counties and border areas normally travel into the urban zone in a "demand-pull" fashion; that is to say, they start to go into the city area by carrying in a load of urban-bound passengers; thereafter, they may stay there and continue to provide intra-urban services, or else return to the counties with another load of outward-bound passengers, provided they can fill up the vehicle. Clearly, because of the nature of non-routed services whereby destinations are highly variable, it is not always easy to enforce the boundary restrictions throughout and, since the routes of these minibuses are so unpredictable that they travel into the urban area without any regular basis, no official record on the total volume of their urban business is, and perhaps never will be, kept.

Nevertheless, the volumes of passengers carried by these county-based minibuses are really remarkable. Though partially restricted, they are in fact part of an entire minibus network; and together with other modes, they make up Beijing's passenger transport system.

Table 11: The Five Different Forms of Services (State-owned fleets)

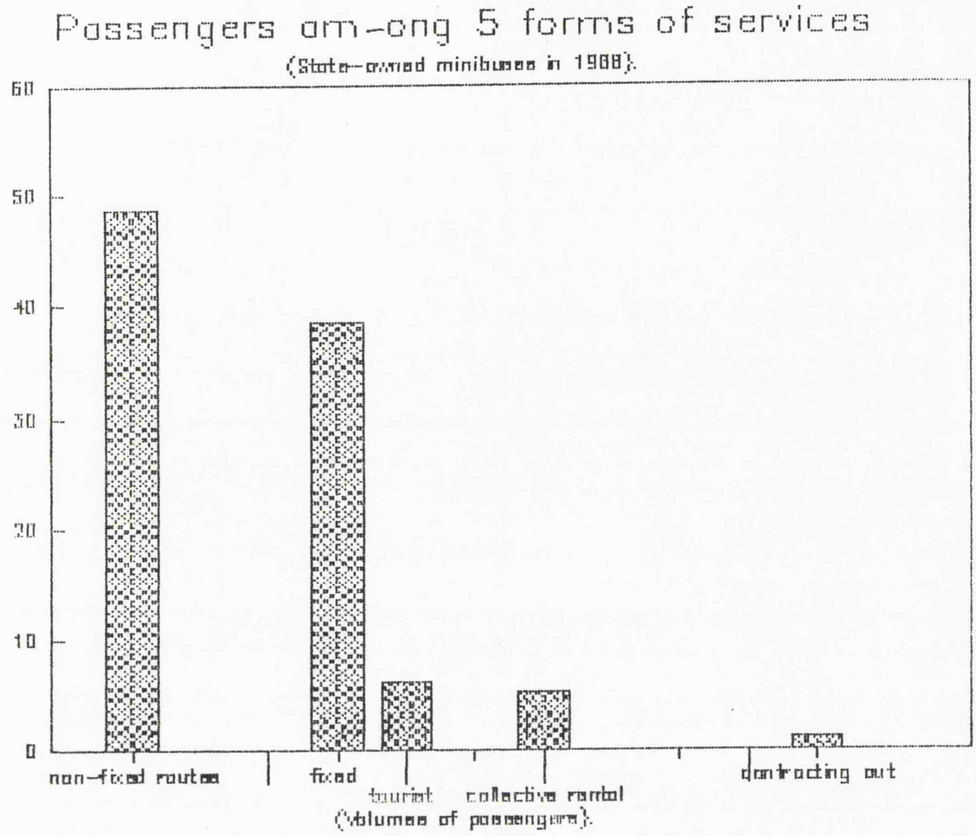
Service	No. of routes	Length of routes (km)	Average distance per vehicle (km)
Fixed routes	11	128.55	8.77
Non-fixed routes	26	329.59	10.27
Tourist routes	2	109.50	48.09
Collected rental		517.96	7.87
Contracted out			18.16
Total	39		12.01

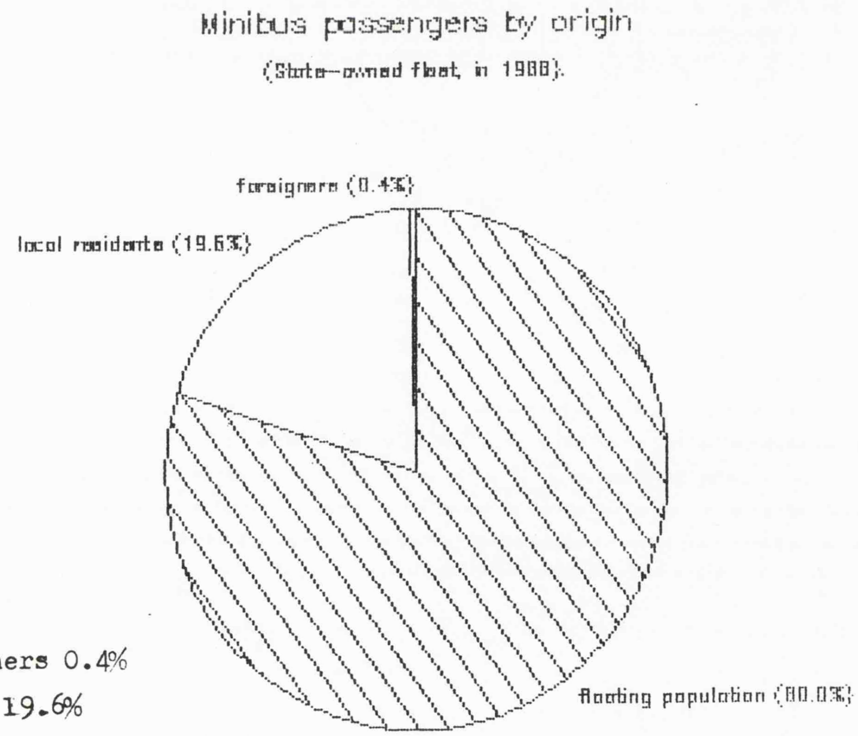
Source: Modified from report by BGPPTC & MAO, December 1988b.

NB: a) Data based on a one day survey.

b) Information on Independent minibuses not available.

Fig. 20





Foreigners 0.4%

Locals 19.6%

Floating population 80%

4.4 Service Characteristics

Although there are supposed to be routed and non-routed styles of services as described above, in practice, the crews are rather independent over their routeing as well as schedule; as a result most services provided are relatively flexible in accordance with actual needs. Overall, compared with those in other Far Eastern cities, the operational characteristics of Beijing's minibuses are different in a number of ways, which require some detailed description.

First of all, most minibuses in other Far Eastern cities are one man operated. Each vehicle is driven by a driver who also acts as a conductor. Here in Beijing each minibus is manned by a crew of two people, a driver and a fare collector. Interestingly in most cases the driver is male and the fare collector female but they are not necessarily relations as those of family business found in Manila or Jakarta; in fact there are not many cases where the crew members are relations, especially within the state-owned fleets. The conductress is seated by the door to collect fares and operate the door for passengers alighting and boarding the vehicle.

Except for contracted out services whereby fares are paid according to prearrangement, in all other forms of services, fares are collected on board the vehicle. There is no monthly or weekly ticket available for using the minibus system in

Beijing, regardless of the ownership of the fleet.

Unlike minibus services elsewhere where no ticket is given to the passenger, here in Beijing each passenger will normally receive a ticket for the fare paid, the reason is that in China, especially for office workers or professionals, the money spent on business-trips are normally returnable by the organization where the passenger works, tickets are thus retained as proof for claiming travel expenses.

Another unique feature of the Beijing minibuses is that each minibus is equipped with a loudspeaker. This is for the conductress to make announcements when collecting passengers at the starting point or the stops along the route. Sometimes the driver joins in to solicit passengers too. With a route-plate displayed on the windscreen, the minibus crews compete with each other by shouting out like stall traders to the waiting crowd. The conductress gives information about the destination and fares charged, so that potential passengers may "shop around" and decide what particular service they need and which minibus they want to board. If a passenger wants to alight at a stop, the conductress is often to be informed the intended destination when the vehicle is about to approach it. The message is then passed to the driver who will make the stop accordingly.

For the 11 fixed routes operated by state-owned minibuses, the services are supposed to be scheduled with a fixed frequency. According to information available at some parking bays, the designed service frequency is at an interval of ten minutes, giving a mid-headway of five minutes. However, in practice, neither schedule nor frequency is properly followed. When starting a trip from a parking bay, the crew would always try to collect as many passengers as the seating capacity can hold rather than running to a schedule without having a considerable number of passengers on board. In fact, in most cases, they would wait and depart only when most of the seats are occupied.

In Beijing, perhaps as in other cities in China, bus routes tend to be designated on major corridors.(fig. 21). Probably it is because most Chinese citizens travel by bicycle for short journeys, thus bus routes are supposed to serve longer trips. Another feature is that the average distance between bus-stops is quite long, much longer than that seen in London. But the main point here is that, it is not just conventional buses that ply along major arteries, the fixed minibus routes are also concentrated on trunk roads. Hence in many cases, minibuses share the same routes with the conventional buses and trolley-buses; and in many locations, minibuses not only duplicate the routes of the conventional buses but also call at the same bus-stops. Nevertheless, minibuses are more flexible in that they would stop for passengers to get on or get off wherever required along the route, similar to the "hail and ride" style; whilst the conventional buses would only call at designated bus-stops.

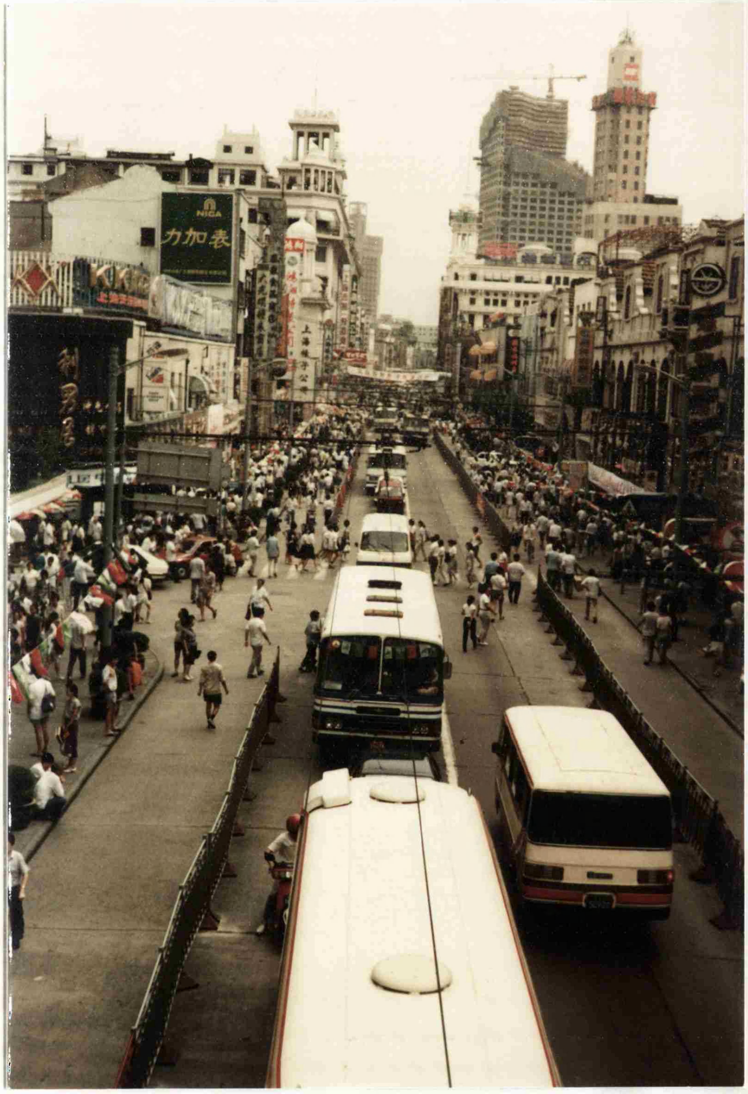


Fig. 21 Nanjing Road -- the main commercial street in Shanghai. Both trolley-buses and minibuses share the same route.

Photo H Lam

Although minibuses do offer "hail and ride" services to travellers at any point along the route they run, it is quite common for passengers to wait for a bus at a bus-stop rather than at a random location. The reason is that in most cases, both conventional buses and minibuses call at the same stops of the route, therefore waiting at a bus-stop could increase the probability of getting on whatever bus that arrives. As a consequence of this "on-the-spot" waiting, it is not unusual to see a fixed-routed minibus to have stopped at designated stops only along the route it runs.

However, there is some difference in stopping time amongst the minibuses themselves, as well as between the minibus and the conventional bus. For the minibus, the stopping time varies at different bus-stops. This is because occasionally fare negotiations may take place, thus the length of stopping depends on how long the fare haggling lasts. When a negotiation is locked in a stalemate, the stopping could last as long as up to several minutes. On the other hand, if the minibus is approaching a bus-stop at which the driver reckons that the chance of collecting potential passengers is slim, then he tends not to make a complete stop but may only slow down the vehicle to make a few announcements in an effort to attract those who otherwise might have been thinking of waiting for a conventional bus. In that case, the stopping time may actually be reduced to minimum or equal to zero. By contrast, there are no fare negotiations for using the conventional bus.

No doubt, difference in stopping does contribute to difference in journey time.

In summarizing the actual service characteristics of Beijing's minibuses, there are two major points on routeing and flexibility. First, most routed minibuses ply on major trunk roads, duplicating the routes of the conventional buses (The impacts of trunk road concentration will be discussed further in section 6.2). Second, the non-routed ones are generally at large to run where and when they feel more suitable to do so. For them, schedules are mainly dependent on "load factor" rather than time.

Table 12 on the next page gathers all the information about the state-owned fleets (Performance based on a one day survey). It indicates that the majority (76%) of the minibuses are engaged in non-routed services.

Table 12:

Structure, Capacity and Performance of Minibuses Owned by BGPPTC (1988)

Fleet size		510 vehicles
Vehicle capacity		15 seats
Number of routes		39 routes
Total route length		567.64 km
Non-routed operation		387 vehicles (76% of total fleet)
Total passengers carried		24,500,000 person/trips
Actual vehicles operational		339 (66.47%)
Distance travelled per vehicle		115.3 km
Passengers carried per vehicle per day		119 person/trips
Average load factor per day		81.77%.
Average trip length:		12.01 km
	* built up areas	5.71 km
	* outskirts	19.44 km
Average journey speed:		23.53 km
	* built up areas	16.74 km
	* outskirts	29.79 km

Source: Modified from Comprehensive Report BRIUPD 1990.

NB. a) data were based on a one day survey; since the actual number of vehicles operational might differ each day, the daily performance could vary. b) The survey was carried in 1988, the fleet has increased ever since, so has the corresponding data.

4.5 Fare Structure and Travel Costs

It has been argued that small vehicles tend to incur higher operation costs per seat than larger ones (See, for example, Bly et at 1986); thus in order to cover costs involved minibuses often have to charge higher fares than conventional buses do. In Beijing, although the rates of fare charges are subject to restrictions set up by the city's Pricing Department, in practice, for various reasons they are higher than the proposed rates and are very costly. First let us look briefly at the fare structure of minibus service.

Similar to the big buses and trolleys, the minibuses are supposed to operate at a graduated fare rate whereby fares are charged according to the actual distance travelled. At present the minibus fare rate is Y0.15/person/km and the basic fare is set on a 5km journey; any further distance travelled beyond this basic journey would be charged under what is known as the "Two out three in" principle for each additional 5km (Interview notes, 1990). The general idea of this principle may be interpreted as a method of rounding off between the figures 2 and 3 in a sum of 5. What this actually means is that, once a passenger boards a minibus, his or her basic fare is Y0.75 for any distance within the first 5 kilometres (at the rate of Y0.15/person/km). Now after the first 5 kilometres, if a further journey travelled is within 2.5km (considered to be 2), then it would be dropped and this additional journey is gratis, the passenger only has to pay the basic fare. On the contrary, if a further journey is between 2.5Km and 5Km (considered to be 3), then an additional fare is chargeable at the rate of Y0.15 per kilometre calculated under this principle. Put in another way, if a passenger altogether has travelled 8km, then the amount that he/she has to pay is the sum of two basic fares, which is Y1.50.

Of course, because of the diversity of travel distances, in reality it is impossible to measure the exact distance travelled by each passenger and hence charge the fare at the prescriptive rate. Operators have thus adapted a more practical method in charging fares. This working fare rate is interpreted into the form of total bus-stops travelled and displayed at parking bays and on the vehicles:

Three stops: Y0.50.

Six stops: Y1.00.

Over six stops: Y1.50.

However, even fare charges are based on the number of bus-stops travelled, it is not always possible to follow the rate strictly. In practice, instead of a graduated rate, each route charges a flat fare in accordance with the length of the route. Although most collectively-owned minibuses do not run on a fixed route, in most cases, they do adapt a flat fare for each trip they run. There are exceptions, though. For example, if the trip is too long, then the cost for a mid-way journey may be reduced (normally to two-thirds of the whole fare).

Currently, the typical flat fares are Y1.0, Y1.5, Y2.0, Y3.0, Y4.0 and Y5.0, and depending on the time of the day as well as the length of the route. In other words, the fares are not fixed at any time; the crew would increase the normal fare whenever they see the chance that is suitable for them to do so. As a result, peak-time fares are often doubled. Overall, whether during peak-times or off peak-times, minibus fares are generally very expensive compared with the fares charged by the subsidized conventional bus and trolley services. For instance, the average fare for a ride on the big bus or the trolley costs just Y0.30, with the lowest extreme at Y0.05 and the highest at about Y0.50 respectively. Thus, the flat fares charged by the minibuses and the graduated fares charged by the conventional buses differ remarkably. (The cause of high travel costs will be analysed in section 6.3).

Another feature is that, unlike minibuses in other Far Eastern cities where peak fare charges often occur in the early part of morning and late afternoon when commuters are on the move, in Beijing, peak fare charges tend to occur from late morning to mid-afternoon, roughly between 10.00 hours and 15.30 hours during the day. Put in another way, the demand curve for minibus travel reaches a peak in the mid-day period, rather than in two separate periods in the morning and afternoon respectively. This is obviously a reflection of the demands by tourists, in that the mid-day period is normally the busiest time for sightseeing activities. (See table 13 & fig. 22). Furthermore, since tourists are busier on public holidays, there are fare fluctuations throughout the working week as well as the working day; peak fare charges are likely to occur at weekends and on public holidays.

On the other hand, there seems to be little difference in terms of fare charges among the minibuses. The crews, though may belong to different companies, tend to adhere to the usual rates. In other words, they are somehow "self-regulated" and supposed to stick to the same flat fare. In fact, they seldom compete with each other for passengers by offering cheaper fares. The most obvious form of competition is their industry and hardworking spirit, e.g., their patience and friendliness towards the potential passengers. Therefore, when deciding to board a minibus from a terminus, a passenger would often choose the one that will depart first, rather than any vehicle that may charge a lower fare, since in most cases, a lower offer at the beginning of a journey would hardly happen.

Although, in general, a flat fare is charged for each route or each journey, negotiations for fare reductions do occur occasionally, especially with passengers who join the vehicle in the mid-way of the route. Fares are normally adjusted according to the crew's judgements over whether there would be any more potential full-fare passengers waiting at the forthcoming stops. Since the nearer to the end of the route, the fewer the passengers would board the vehicle who would pay the full fare; the crew thus make the reductions so as to maximize marginal revenue. Understandably, fare reductions tend to take place when the minibus is approaching to the second half of the route, where the possibility of picking up full fare payers is rapidly diminishing.

Perhaps it should be mentioned that, although there is little direct competition between routed services, from time to time a competitive atmosphere does exist within the non-routed services. This is because contracted out and rental services are often various in space and irregular in time, it is therefore practically impossible to compare the costs for each and every trip and thus charge different services at identical rates; such incommensurability consequently creates a situation whereby some crews may charge less than others. Nevertheless, due to the differences in service requirements, the competition between non-routed services is unlikely to influence the fares charged by routed services.

Table 13:

Classification of Travel Purposes

(1988)

Purpose of Travel	%
Tourism	40.01
Work	25.37
Shopping	14.36
Visiting friends & relatives	7.77
Commercial activities	5.35
School	3.81
Medical engagement	1.98
Cultural activities	1.06
Meeting and conference	0.11
Other	0.18
Total	100.00

Source: Official data, BGPPTC December 1988b.

N.B. information on independent minibuses is not available.

Classification of travel purposes

of state-owned minibuses (1988)

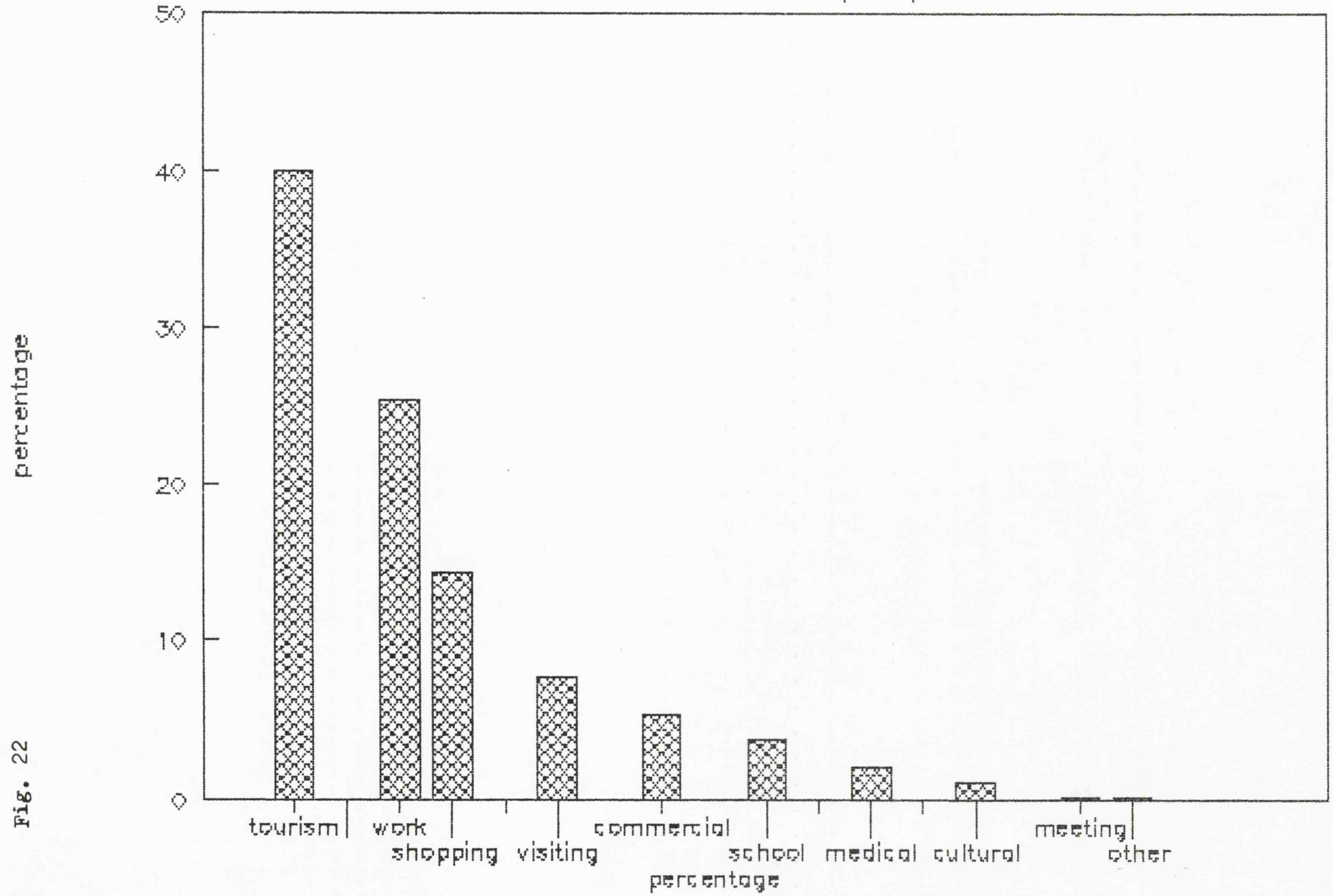


Fig. 22

4.6 Patronage Growth and Financial Achievements

Although, in comparison, the establishment of Beijing's minibus service was later than those in other Far Eastern cities, the Government authorities and the operators have been very anxious in trying to explore the problems as well as potential of the system. The survey carried out between the 19th of March and 16th of April 1988, was an ardent attempt to identify the current issues. A total of 88,900 persons, some on board the minibus, some at bus-stops, were interviewed during the survey over various aspects of the service.

Of the 12,000 regular public transport users interviewed at bus-stops, 56.87% of those from the local residents said they had travelled by minibus before; the figure for those from the floating population was 69.96%. And of the 37,000 minibus passengers interviewed on board the vehicles, 60% said that they had travelled by minibus regularly, 40% just travelled the minibus for the very first time (BGPPTC 1988a).

In respect of patronage, until December 1988, just four years after the initial operation, the total number of passengers using the state-owned minibuses had increased by 14 times in volume, from just over 1.5 million person/trips in 1984 to 24.5 million (See table 14 & fig. 23). At the same time, the collective sector has also proliferated, even though they have been officially barred from operating within the urban zone.

Table 14:

Annual Passenger Volumes of State-Owned Minibuses (1984 - 1988)

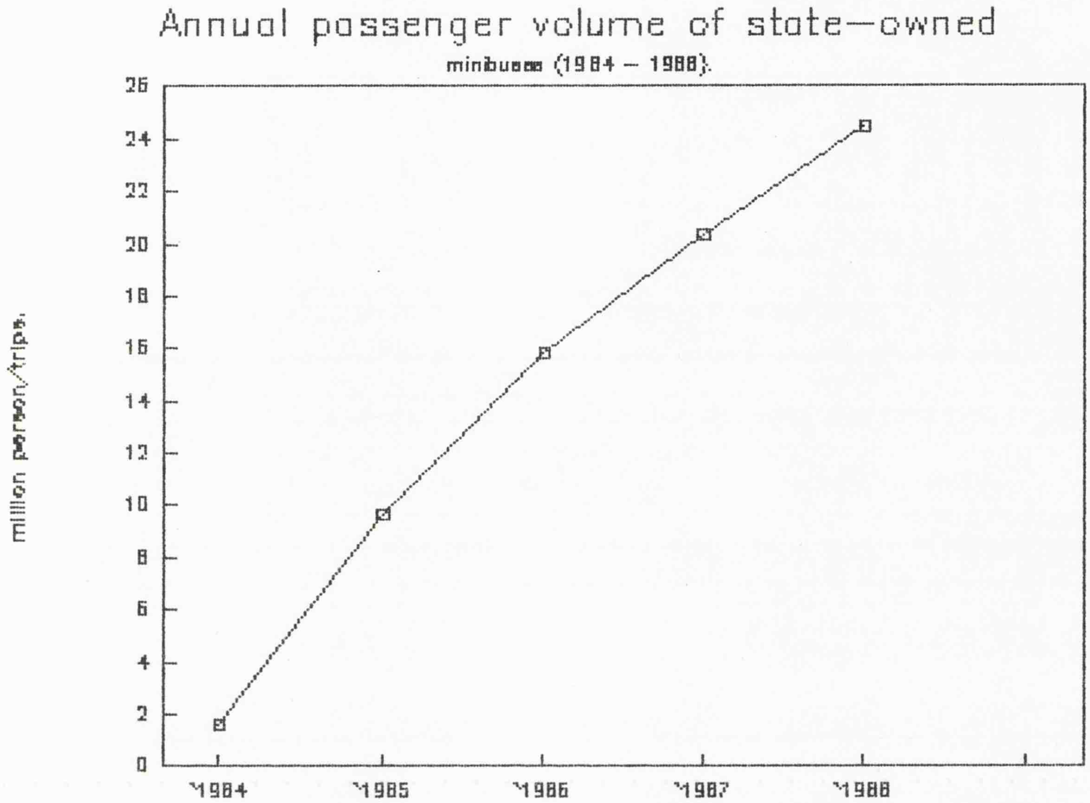
Year	Passenger volume (million person/trips)
1984	1.633
1985	9.630
1986	15.830
1987	20.360
1988	24.500

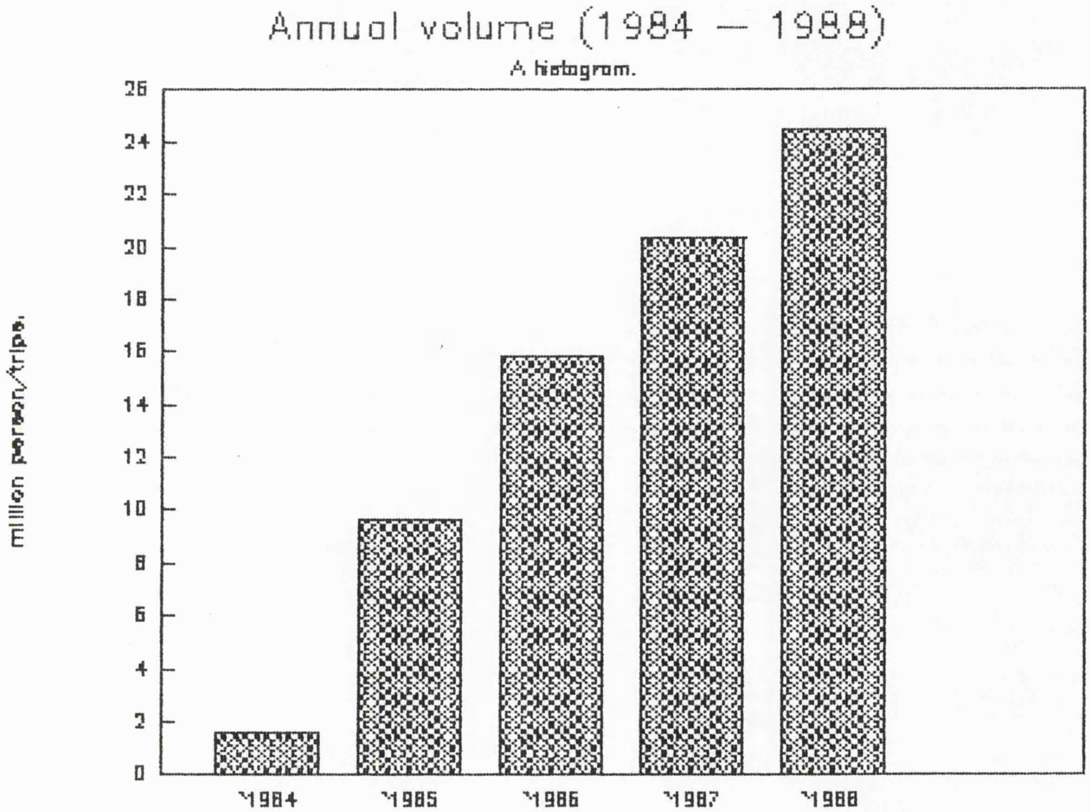
Source: BGPPTC December 1988a; 1988b.

N.B. information on Independent minibuses is not available.

The figures shown above suggest that the increase of minibus patronage in Beijing is highly significant and its rate of increase is the fastest compared with that of any other system. The most remarkable increases have been in the first two years when the yearly increase amounted to 8 million in 1985 and 6 million in 1986 respectively. These annual increase rates each on its own approximately equals the entire population of Greater London. In this sense it is not too

Fig. 23


Annual passenger volume of state-owned
minibuses (1984 – 1988).
million person/trips.
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1984
1985
1986
1987
1988


Annual volume (1984 – 1988)
A histogram.
million person/trips.
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1984
1985
1986
1987
1988

difficult to imagine how huge the increases have been. More interestingly, it has also been observed that the proportion of local residents using the minibuses is gradually increasing. After all, a sizable market for minibus service is now firmly formed and the demand is set to grow.

However, the achievements are not only reflected in fleet expansion and patronage increase, but more importantly, the industry has flourished without financial subsidies from the Government. In a way, the minibus industry is seen as the "flagship" implying the success of China's Economic Reform. With such a rapid speed of increase in patronage one could expect turnovers to be impressive. Indeed, until now, of the major public passenger modes owned by the state in Beijing, only the minibuses are profitable. Revenues earned by both state-owned as well as independent undertakings are high, making them among the most successful enterprises in the city (See table 15 & 16). For example, between 1985 and 1988, altogether three state-owned companies, namely the First Automobile Company, the Second Automobile Company and the Trolley Company received a combined gross revenue of Y53.03 million from their minibus operations and paid Y5.52 million of income tax to the government. The total net profits during that three-year period amounted to Y19.27 million (Interview notes 1990). In 1987, revenue gained from minibus operations alone of these three companies amounted to 11% of their total revenue that year, even though their minibus fleets were much smaller than their conventional bus fleets (BGPPTC 1988a). And in 1988 the four state-owned minibus companies as a whole earned Y8 million (Interview notes 1990).

Meanwhile, although there are no official data showing the turnovers gained by the small independent undertakings, it is still possible to assess their profitability by drawing inference on the basis of findings elsewhere. This will be discussed further in chapter V, section 5.6.

On the whole, the minibus transport system in Beijing has strengthened greatly since its maiden operations. There are now increasing sights of public approval to expand the service (See table 17). Survey shows altogether the respondents want a total of 61 new routes to be designated. If the plan for these new routes is to be materialized, then the total length of minibus routes in Beijing will increase to 1,501 kilometres, which is two and a half times of the current length. Along with the demand for new routes, the respondents want further improvements to be made in the quality of service on 20 existing routes. The survey also indicates that most travellers request that the current minibus service hours to be lengthened, from early morning well into the night time period (BGPPTC 1988a). For these and other reasons the authorities have now begun to realize the importance of the minibus and the increasing need of a more flexible approach in urban transport planning.

Table 15:

Total Trips Made, Passenger Volumes & Earnings

(State-owned Minibuses; on 16 April 1988)

Company	Total No. of trips made	No. of passengers	Earnings (Yuan)
First Co.	888	15,306	21,100
Second Co.	958	14,037	25,297
Trolley Co.	496	8,284	15,575
Rental Co.	92	1,660	3,753
BGPPTC (total)	2,434	39,287	65,726

Source: Modified from BGPPTC & MAO report December 1988b.

NB: a) Data based on a one day survey.

b) Information on Independent minibuses not available.

Table 16:

Earnings, Average fare/Trip & Load Factors
of Urban and Suburban Routes
(Beijing's State-owned Minibuses)
(16 April 1988)

Zone	Earnings (Yuan)	Fare/trip (Yuan)	Load Factors %
Urban	22,691.50	1.16	80.12
Suburban	38,235.00	2.22	84.35
Total	60,926.50	1.66	83.40

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.

NB: a) Data collected on one day basis.

b) Information on Independent minibuses not available.

Table 17:

Passenger Opinions on the Importance of the Minibus Service (in 1988)

Grade	%
Very Important	53.8
Important	46.0
Not important	0.20
Total	100.00

Source: "The Compilation of Major Passenger Survey" by MAO & BGPPTC, 1988b.

4.7 The Ultimate Question

Operating in a business environment in which rival conventional modes charge as low as close to a "free-commodity" level, yet the minibus undertakings in Beijing are not merely sustainable and hold their own financially, but lucrative and thriving; their turnover figures are indeed stimulating. It is undeniably of great relief for the fiscal department of the municipality, for during the recent few years alone, subsidies given to the conventional transport systems in Beijing have exceeded Y200 million per annum (Quan 1990a), eating up huge amounts of government's budgets.

What is even more interesting is that, unlike its counterparts in the South East Asian cities, the **Beijing system can be profitable under public ownership** and in a **large business scale.** These discoveries are somehow novel compared with previous findings whereby minibus systems were largely believed to be financially viable only under private ownership and in small scale business. Thus the most crucial question is: What makes these large, and state-owned, minibus undertakings financially viable? The following chapter will be attempting to explore the dynamics of the minibus transport in Beijing.

Chapter V

THE DYNAMICS OF THE MINIBUS SERVICE

5.1 Introduction

Earlier in section 1.6 it was discussed that there were four major factors which contributed to the success of paratransit. Since the economic system in China is different from those where these factors were found to be important, there emerges a question: to what extent can they influence the performance of Beijing's minibus service? Thus this chapter mainly looks at the dynamics of minibus transport in a socialist urban environment.

The chapter is divided into two parts. The first part deals with the operational advantages of the minibuses: the service quality derived as a consequence of small physical size. The second part tries to analyse the possible effects of ownership and organizational structure in relation to profitability. In other words, the discussion will be surrounding on trying to examine the hypothesis. First of all, let us start by looking at how fast the minibus can travel on Beijing's streets.

5.2 Journey Speed

The average travel speed of a motorized vehicle in an urban environment is very much subject to the condition of the road surface and congestion rather than its engine capacity. As mentioned earlier, empirical studies in other Far Eastern cities have indicated that small vehicles can travel faster than big conventional buses in cities with narrow streets (See, for example, Walters 1979b; Pendakur 1984; Rimmer 1986a). In the case of Beijing, the average travel speed of the minibus is observed to be faster than that of the conventional bus and trolley bus, at 16.74 km/h for the minibus and 14km/h for the conventional buses respectively (BRIUPD 1990). Based on findings elsewhere, it may be assumed that the faster travel speed is mainly due to the fact that the small minibus is more capable of travelling amongst a large number of bicycles as well as being more penetrable to narrow streets, rather than to anything related to the engine power, although how it can achieve this is a question of how well it can cope with the congested traffic.

Assuming the congestion effect is minimum, faster vehicle travel speed may result in less in-vehicle time needed for the passenger. However, in reality, it is impossible to travel in a large city without encountering some kind of congestion. Clearly, urban passenger movements depend upon many other factors than the motive force of each vehicle. These are sometimes known as "non-mechanical" factors and exist in various forms, e.g., they include route design, service frequency, stopping time, end-to-end service, modal integration and so forth. What makes minibus service more significant is its journey speed, which is influenced by a combination of these elements. Interestingly, some of these elements, such as stopping time and end-to-end service, are in turn determined by the size of the vehicle and its manoeuvrability on the one hand, and its route adaptability and penetrability on the other. In other words, the minibus service's flexibility over time and space is a primary feature in achieving higher average journey speed.

With flexible schedules the minibus is quick in responding to travel demand. For the non-routed minibuses, by offering a "hail and ride" style of service the minibus is able to reduce the passenger's waiting time to a minimum. In terms of time saving, when a minibus is hired for chartered service, theoretically speaking waiting time can be reduced to as little as zero. In Beijing, examples of time saving due to non-scheduled operations can be found in many places, such as major modal connecting points, i.e. at coach depots and railway stations, where modal changes normally take place. For instance, at the South Beijing Railway Station, known as the Southern Gate of the Capital, both conventional buses and minibuses meet in front of the Station to pick up passengers.

When a train arrives at the railway station, there are normally a large number of people wanting to continue their journeys to other places across the city. This sudden influx of people often creates a peak demand for intra-urban travel. Here passengers will not only find the conventional buses overcrowded but what is even worse is that their fixed schedules often cause long delays. For those who have not been able to board the first wave of conventional buses, waiting for the second wave of buses could mean further delay and additional uncertainty. Many travellers at this stage choose to board the minibus. The minibus is more responsive since it has no fixed service schedule and would depart as soon as most seats are occupied. And it is often easy to fill up a minibus under these circumstances.

The non-routed services are adaptable in terms of areas covered as well as in routes; when offering rental services, they are practically responsive to destinations required by the passengers. With responsive service style and flexible routing, the minibus not only reduces passengers' waiting time, but can also increase journey speed greatly by reaching close to passengers' alighting point, without further modal changes or unwanted walking which may possibly be needed if otherwise travel by conventional bus or trolley. On the whole, minibus services in Beijing are attractive to users who value time higher than travel costs. It is therefore not difficult to understand why roughly two thirds of the state-owned minibuses choose to run on non-fixed routes.

Of course, in any city, travel costs are also an important factor influencing the demand for passenger transport services. Yet interestingly, in Beijing, besides affecting demand for travel, high travel costs cause another problem on the journey speed of the minibus service. This works through a chain of interactions between costs and journey length and is explained as follows. First of all, as mentioned in section 4.5, because the minibuses charge a flat fare on a route basis regardless of the distance travelled, for a passenger who travels only some section of a route, the ride is obviously too expensive. Therefore it becomes more cost-effective to use the minibus on long trips rather than on short ones; in a way, the average travel distance by minibus is thus indirectly prolonged by its high travel costs and method of charge. Consequently, in reality, most minibus passengers are long-journey travellers on the route they are travelling (i.e. they are likely to travel from the beginning to the end of the route) (This coincides with experiences elsewhere, e.g., Kuala Lumpur). This therefore reduces the chances of unloading passengers en route (See, for example, JMP 1981). Furthermore, because the minibus carries fewer people than the conventional bus, it would normally stop less frequently than the conventional bus does. Since the minibus makes fewer stops, it can maintain a steady speed and thus can shorten the time needed for the journey. Hence, assuming other factors being equal, compared with the conventional bus which calls at all stops, the overall journey speed works in favour of the minibus; that is to say, the passenger's "in-vehicle journey time" by the minibus for the same distance would be shorter. This is one of the reasons which explain why, in Beijing, the minibus's journey speed is generally higher than that of the conventional bus and trolley.

Clearly, with small body the minibus is easy to manoeuvre, load and unload, quick to turn and can penetrate in small lanes. By contrast, due to its big and long body the conventional bus is difficult to move about, and even more difficult to overtake other vehicles. This is particularly true when travelling amongst huge armies of manpowered vehicles of various types, such as bicycles, rishaws, not to mention pedestrians. The slow movements or stationary presence of these small vehicles, in particular their rather undisciplined traffic behaviour, are often the main cause of traffic jams, which make the conventional bus become even more difficult to manoeuvre, noticeably during peak hours. In fact, it has been observed that, in general, travel by minibus can save up to one third of the time needed by the conventional bus for the same distance (Interview notes, 1990).

Perhaps it is important to note that, in low income developing countries, the perception of time saving on passenger transport services is somewhat different from that of developed countries. This is quite true in the case of Beijing in that there is an implicit distinction between what may be described as the passenger's "in-vehicle time" and "in-vehicle moving time", meaning when the passengers are sitting on a vehicle in motion. Here, people tend to value the "in-vehicle moving time" rather than just "in-vehicle time" more important than the actual journey time needed from origin to destination. This can be illustrated by the example when passengers waiting inside a stationary vehicle. As mentioned earlier, often, when a minibus begins its journey from a terminus, the crew tend not to depart until most seats are occupied, some early-arrived passengers thus have to wait inside the vehicle, until the number of passengers big enough to make sense for the crew to start the journey. In the early morning hours when most tourists have not yet begun their sightseeing activities, this kind of "in-vehicle waiting" could last for over thirty minutes in some cases. Obviously, for those who have been waiting inside the vehicle, the time spent for waiting seems less important but the value of "in-vehicle moving time" is what matters most. The fact that most minibus travellers in Beijing are not the Western style "Nine to Five" commuters explains why the "in-vehicle waiting time" is somehow tolerable. In any case, this has confirmed the point made by some writers that the value of time in Third World cities is unlikely to be high for the majority of passengers (See, for example, Fouracre et al 1979).

On the whole, small size is an obvious advantage for the minibus to achieve high travel speed in Beijing's urban traffic. Furthermore, because the minibus carries fewer passengers while most of whom are long-trip makers, it makes fewer stops en route than does the conventional bus, as a result, it can increase passengers' journey speed. For the non-routed minibus, their adaptiveness in terms of space and time can reduce travellers' waiting time to a minimum.

5.3 Accessibility and Convenience

In any city, the physical structure and topography of land use are crucial factors which influence the demand for transport services as well as the pattern of traffic flow. Thus, the design of bus route network is important in providing accessible services, this is particularly true in developing countries where the buses are normally the only public system available. For minibuses, the greater choice of routes provided by them, especially their potential for penetrating residential areas along roads unsuited for large buses, may reduce average access time and provide convenient services (See, for example, Bly et al, 1985).

It has been mentioned in chapter II, that like most Chinese cities, the pattern of urban land use in Beijing is paradoxical to those of Western cities, e.g., London or Paris, whose centres are mainly a heartland for political, financial and cultural activities. Here in Beijing, the city centre is an area of mixed land-use and different activities, including residence. As a consequence of high residential concentration in the central zone, demand for passenger transport services there is potentially high. The high level of travel demand in the historical urban centre is reflected by the sheer volume of traffic it bears. For instance, the four City Districts occupy only 8.2% of total built up area, but they bear 28.7% of the city's traffic (excluding the Xians') (Quan 1990b). It is also striking to note that, within these City Districts, the three large commercial centres of Wangfujing, Xidan and Qianmen alone attract a daily passenger flow of about 600,000 person/trips (Dong 1985). Again, as one can see, traffic levels within the central area are particularly high.

In addition to the high level of demand for travel, the high density of inhabitants also creates special needs in passenger services. According to a survey, in urban Beijing as a whole, the average vehicular journey distance by local residents does not exceed 6km (Quan 1990a). This suggests that the need for short journey transport services is particularly apparent. In order to meet the demand pattern, the average distance between bus-stops needs to be short and frequent stops may have to be made. Nonetheless, the conventional buses and trolleys in Beijing mainly ply, and in fact can only ply, along broad avenues of the city. They are particularly cumbersome to accelerate and decelerate, frequent stoppings would decrease travel speed. And since Beijing's trolley-buses require overhead-cable wiring, thus, technically speaking, it is not always possible to install them in the cramped residential quarters. Clearly, the disability of conventional buses for penetrating narrow street is due both to their poor routing, namely over-concentration on trunk roads, as well as to their bulky and unwieldy size. To borrow a technical jargon, both their "software" and "hardware" are incompetent in meeting the requirements of the real world. This kind of unsuitability is particularly obvious in the old city area, where the old streets are simply too narrow for any conventional buses.

By contrast, the small minibus is more penetrable to the streets and suitable for the travel pattern and, above all, superior in terms of access to trip destinations. Indeed, amongst various kinds of motorized vehicles except the taxi, the minibus is the only public passenger mode that can travel in the alleyways and be able to accelerate and decelerate comparatively easily. The fact that most local residents prefer to travel by minibus when carrying heavy luggage (Interview note 1990) does indicate that with the minibus the passenger can minimize the walking distance required.

Urban travel often requires changes to be made on the journey between origin and destination, sometimes from vehicle to vehicle, sometimes from one mode to another. When changes are needed, delay is almost unavoidable. In Beijing, as in any other city, because of the uncertainty of the traffic conditions, it is not always easy for the buses to follow their schedules on time; as a result, services become dislocated, and passengers often have to wait at changing points. Each change does not only increases the time needed, but also adds a negative value of uncertainty to the trip. Owing to the long average interval between bus-stops and the poorly-linked transport facilities, modal changes in Beijing are particularly time-consuming.

In contrast to the need of making changes, the ability of being able to offer end-to-end services can boost the degree of convenience as well as of reliability of a system. Because of the comparatively penetrative route network and flexible style of service, most passengers need not make changes when using the minibus service. According to data recorded during a survey over changes made on the state-owned fleets, in 1988, of the 70,000 or so daily minibus passengers (including those using the routed and the non-routed services), 51,000 of them claim that they are able to reach their destinations on just one ride. Put in another way, about 72.47% of person/trips on the minibus system do not need to make any change in reaching their destinations (Table 18). It is estimated that this high level of non-changing services on the minibus system alone can altogether reduce a daily total of 84,000 person/trips caused by changes otherwise would have been made on other modes of the city's public transport system (BGPPTC 1988a). Above all, for a total of just 600 or so minibuses, yet they manage to avoid so many unwanted changes, the achievement is undoubtedly very significant. On the other hand, for the independent minibuses, due to the fact that most of them are offering charter services, one would have little doubt that their passengers even have to make fewer changes.

In general, the accessibility and convenience of Beijing's minibus services have been highly appreciated by those who use them. This is reflected in the comprehensive survey carried out in 1988 which took interviews on board the state-owned minibuses. A total of 37 thousand passengers were asked to rank the level of convenience in three categories. The results indicate that 49.22% feel the minibuses are very convenient; 50.33% say they are convenient; only very few people do not think that they are convenient (table 19). Above all, 99.8% of the respondents say that the city should expand the minibus transport services further (BGPPTC 1988a).

Table 18:

Changes Made When Travel By Minibus
To Reach trip destination.
(on 16 April 1988)

Company	(Need to change) (%)	(No need to change) (%)	
First Company	21.17	78.83	100
Second Company	36.61	63.39	100
Trolley Company	24.13	75.87	100
Rental Company	26.62	73.38	100
Total (BGPPTC)	27.53	72.47	100

Source: MAO & BGPPTC, 1988b.

N.B. a) data based on a one-day survey on the state-owned vehicles.

b) Information on Independent minibuses is not available.

Table 19:

Passengers' Opinions on the Level of Convenience
By Minibus (1988)

Grade	%
Very convenient	49.22
Convenient	50.33
Not convenient	0.45
Total	100.00

Source: Office of Minibus Administration. 1988b.

N.B. a) data based on a one day survey.

b) information on Independent Minibuses is not available.

5.4 Comfort of the Minibus Services

Analysis of modal choice shows that choice between two modes of transport is not determined solely by differences in travel time and cost. When time and cost are equal, passengers tend to show a preference for one mode or the other; they do not divide equally between the two. The bias is attributed to general "comfort and convenience" (Allport et al 1990). The last section has shown that the minibus service is convenient for all users in general, however, for sightseers, comfort is even a more important factor in determining the quality of transport service.

What is the most important indicator of comfort offered by a passenger service? One of the elements of comfort is the state of being free from containment, and thus the opposite is physical uneasiness. In Beijing, many of the travellers who choose to use other modes other than the conventional buses often appear to have been put off by their discomfort rather than slower speeds. When a passenger waits for a bus at a bus-stop served by both conventional buses and minibuses, he or she would normally make the modal choice by making a trade-off between comfort and costs of the two different modes. If the passenger is led to believe that the forthcoming conventional bus will be too overcrowded, then he/she may choose to pay a higher fare for the more comfortable and faster minibus when it arrives. On the contrary, if he/she reckons the conventional bus might still be roomy, then he/she would stick to waiting for this slower but cheaper service. Clearly, for them, the value of time is less important than the value for money, and more importantly, comfort, but not speed, is often the major factor that can weigh against travel costs.

Overloading is the main reason causing uneasiness on board a passenger vehicle. In low income developing countries, often there is little practical enforcement to limit the number of passengers boarding an urban bus. As Allport et al (1990) put it, when the vehicle becomes "full" the limit is set by people's unwillingness or physical inability to force their way in (or to cling to the outside as in some cities). When conditions reach this point, the demand for the service is restrained by sheer discomfort. Thus, the first to avoid using public transport, when it is like this, are presumably the old, the weak, women and children.

What displeases the passengers in using the conventional bus systems most in Beijing is that the buses are often too overcrowded. Like the situation in Bangkok and many other Far Eastern cities, there is little distinction between peak- and off-peak times in Beijing. Bus-stops seem to be crowded constantly with long queues of travellers whilst the buses are unable to carry them with desirable efficiency. The internal design of an articulated bus or trolley bus in Beijing is rather like that of a train compartment of the London underground system, though the Beijing bus has even fewer seats. These few seats are located on the sides of the cabin and parallel to the driver's seat; while the middle space in between is supposed to hold most of the passengers as well as being the gangway. The entire design is for standing rather than sitting passengers. Apparently, the idea is to maximise the passenger capacity.

Although the supposed maximum capacity set is 137 passengers, in practice, there is no such upper limit. Hence, when a bus arrives at the bus stop, the queue waiting there would normally break up, and the passengers then rush to the doors and force their way in. Consequently, it causes a sudden wave of heavy pushes and squeezes amongst the crowd. The bus, on the other hand, would normally take in as many people as it possibly can, until no more person can force him or herself in inside the vehicle. Hence, it may be imagined that, in many cases, in order to get on the bus, passengers need physical ability rather than self-discipline. Although at some busy terminuses, several "order-keepers" are installed on the spot to maintain people in queue, in practice, this kind of order-keeping is unlikely to be effective. (See fig. 24).

If getting onto the vehicle is already an undesirable experience, being on board it is no better in any way. In most cases, passengers are squeezed shoulder by shoulder inside the vehicle and unable to move about. Indeed, overcrowding on the conventional transport systems has almost become a norm.

Fig. 24 A queue waiting for bus in central Beijing. When a bus arrives people would rush onto it and the queue would normally break up.

Photo H Lam

What is more, the intervals between bus arrivals are highly uneven and unpredictable. It is not unusual to see more than one bus arriving at the same time, or to have to wait for more than 30 minutes for a bus to arrive. All these problems existing in the conventional bus system have added to the sheer discomfort constantly experienced by their users.

In addition, the unrestricted intake of passengers on the conventional buses causes yet another problem. Because bus frequencies are so unreliable and passengers tend to vie for the first arriving bus, thus sometimes it creates an alternating crowding and underloading cycle between buses. For example, at a bus-stop, whilst the first arrived bus had swallowed up the majority of the waiting crowd, the next one which arrives a little while later after the first one has just gone may be left with few waiting passengers to pick up and hence under-loaded. The situation could go on like a successive cyclic movement since, after a group of passengers is gone, the bus stop will then be filled up with another group of potential passengers in a short period of time, forming another wave of pushes and squeezes when another bus arrives, while subsequently leaving the next one under-loaded. This kind of uneven distribution of passengers between service intervals often occurs in the less busy period of the day, when, in some cases, an articulated bus or trolley may be only half-loaded. Thus, by analogy one may infer that the average load factors of the conventional buses would not be too high, yet the overall quality of service in terms of comfort is far from being desirable.

By contrast, the services provided by the minibuses are more comfortable in a number of ways. Let us briefly look at the issue in a wider context. First, in developed countries, such as Britain, travel by minibus does not guarantee any greater comfort than by conventional bus, rather, because of the relatively low load factors, seats are normally available on the conventional bus, thus the probability for a passenger to have to stand on board the bus is low, especially during off peak-periods. It is also argued that, with two large doors, passengers would find it easier to get on or off and thus more comfortable with the conventional bus than the minibus. On the other hand, as some writers claim, because of its small body, the minibus is rather cramped. Thus, while highly rated on factors such as frequency, accessibility and friendliness, minibuses are perceived less favourably in respect of pushchair/luggage space, ease of boarding (especially among the more elderly users) and overcrowding. Furthermore, with minibuses, a higher proportion of passengers have to stand on board, and greater probability of passengers being left behind at stops (due to full load), than for bigger buses (White et al 1987).

However, this is certainly not the case in many developing countries, where the majority of conventional bus travellers are standees, whereas in most cases a seat is guaranteed for any passenger on the minibus (Rimmer 1986a; Pendakur 1984). In Beijing, there are almost no standees on the minibuses. Everyone is seated. Occasionally when all the seats are taken up, the conductress would vacate her own seat for an extra passenger and then she herself would stand up instead. In this respect Beijing is different from Kuala Lumpur, whose minibuses are officially restricted to 16 seated passengers only but in practice carry up to about 10 standees (See, for example, White 1980b).

With a seat on the minibus, the passenger is having more room to stretch him or herself out. This is particularly important for visitors who are unfamiliar with the city's geography, since most sightseeing passengers want to be seated with a proper view, and occasionally doing some map reading. In this way Beijing's minibuses can provide for the passengers something that the conventional buses and trolleys cannot cater for. Travel by minibus is apparently more comfortable than by conventional buses (See table 19). Furthermore, unlike Britain, where minibuses have often been seen as rather cramped for space, here in Beijing they are generally found to be more favourable for passengers with some luggage. This of course is not because Beijing's minibus is larger (in fact it is smaller than those 20+ seat models in Britain or Kuala Lumpur), but it is just because when compared with a much squeezed footing on board the conventional bus, a minibus seat is, in any case, undeniably ampler and more comfortable.

In summing up, the minibus services in Beijing are particularly attractive to sightseers and occasional users, whose travel times are more random and destinations more scattered. However, they are less popular with the commuters, whose journey ends are usually more concentrated, for which larger passenger carriers are more suitable.

Unfortunately, the argument does not stop here. There are other elements which are more important than just comfort and convenience. In low-income countries, discomfort in using urban public transport services is almost way of daily life. Many urban dwellers have already become used to and able to bear this kind of experience. Quite understandably, for the majority of Beijing commuters, the most decisive factor for modal choice is the travel expenses involved, rather than comfort. The high travel costs are one of the main barriers preventing the commuters from using the minibuses. In chapter VI there will be a further discussion about the effects of travel costs.

Table 20:

Passengers' Opinions on Service Quality
(1988)

Grade	%
Very good	37.64
Good	40.08
Reasonable	21.80
Bad	0.41
Very bad	0.07
Total	100.00

Source: Office of Minibus Administration, 1988b.

5.5 The Effects of Ownership and Scale of Business

The last few sections have analysed the forces which make the minibus service superior to that provided by the conventional buses. The next two sections will concentrate on the financial viability of the transport business in Beijing. To begin with, let us recall the distinction between the minibus system in Beijing and those in other Far Eastern cities.

First, scale of business. In Beijing, apart from the independent fleets, the entire fleet owned by the Minibus Administrative Office is considerably large. This state-owned fleet alone is even larger than the entire system operating in Kuala Lumpur, which consists of many small privately-owned fleets. Second, ownership of business. As mentioned, although it may seem that there are two major forms of minibus ownership in Beijing, from a perspective of capital investment, there is little difference between state-owned and collectively-owned minibuses. For instance, no single individual is entirely liable for their financial performance and there is no way that a worker can "withdraw" his "shares" from the undertaking as he may wish to. As far as business premises and vehicles are concerned, they remain as "people's assets" or "public properties" as long as they exist. In this context, both types of organization are under state control in one form or another.

Hence, each minibus may be considered as a single production unit in which the vehicle is the tool of production, the crew provide labour in return for wages from the state undertaking which owns the capital of production. (NB: The private partnerships which developed during the 1980s are excluded from this category, though in the public transport sector, they are actually rather rare in Beijing).

Under both forms of organizational structure, everyone is an employee rather than an owner or a partner of the undertaking. In other words, whether the vehicle belongs to the Minibus Administrative Office, or to a cooperative, basically, the relationships between the crew and the vehicle do not differ. As far as the employees are concerned, there is no obvious differentiation in terms of working spirit between the two "different" forms of ownership. That is to say, there is no such thing that an employee of an independent minibus is much more loyal than his counterpart working for a state-owned company and thus he is more conscientious, as what has been widely acknowledged to have existed within the private transport sector in other Far Eastern cities (See, for example, Fouracre et al 1977, 1978, 1979; Rimmer et al 1980; Rimmer 1986a; Walters et al 1980; Weicher 1988).

Obviously, the analysis in production relationship has demonstrated the similarities between these two forms of ownership. Since the labour costs as well as mechanical performance for all minibuses are about the same, the operation costs for each vehicle would not differ too much; logically, it may be inferred that, there is little difference in overall costs between state-owned and collectively-owned undertakings at the micro production unit level (In this case, at the level of each vehicle). Nonetheless, since the state-owned fleets are large and collectively-owned fleets are small, what may have made operation costs different between them may only be found at the institutional level, that is when the whole undertaking is considered as a single production unit.

In order to find out the differences, it is necessary to look at the overall production costs involved for the undertaking as a whole. Unfortunately, under the Chinese business structure, acute information on production costs is hard to obtain for two reasons. First, as mentioned earlier, most of the minibus fleets are part of a larger business establishment, in which all business branches share the same overhead costs and maintenance facilities, often there is no obvious record to determine the costs incurred by each branch separately for using these services. Second, the statistics recorded on maintenance work may not reflect the actual market value of the labour costs involved anyway, since the mechanics are paid on a fixed monthly wage rather than paid by the job. As a result, it is difficult to assess the exact costs incurred and hence calculate acutely the profitability of each branch within the whole enterprise.

Furthermore, the state-owned fleets are not operating under a real market mechanism, for there are zonal restrictions to protect and guarantee their interests, preventing possible competition from the county-based small undertakings. Taking all these into account, one may realize that, even though both large and small fleets are generally found to be earning high revenues, it is still not statistically possible to determine and compare the superiority, if any at all, that may have been derived from the scale of business at the institutional level.

Nonetheless, as widely claimed (see, for example, Walters 1979a; Roth et al 1982, Rimmer 1986c; Roschlau 1989), there are no economies of scale in transport business; a large structure may not help to save production costs or increase production efficiency. In fact, as a common feature existing in most business enterprises in the socialist world, big organizations in China tend to employ large number of personnel based on complex structure and, in most cases, use more advanced equipment, hence they are more likely to incur heavy production costs. By contrast, small economic units mainly relying upon intermediate technology and simple business premises, may be able to keep capital costs low to a minimum. Indeed, in Beijing, most independent minibuses do not need a garage or a terminus compound; no investment is required for modern office equipment such as computers and so on. What is more, small undertakings employ fewer clerical personnel and thus incur less labour costs and departmental expenses. Logically, therefore, a small fleet without too much bureaucracy may, in general, be more generative in business operations.

In fact, the overall growth pattern of minibus business in the entire city may be used as guidance to distinguish the difference in vitality between large and small fleets. During the past few years, despite the zonal restrictions, county-based small fleets grew even faster than the state-owned large ones. The proliferation of these small fleets, to a certain extent, has helped to verify the authenticity of the "small is beautiful" argument which has been debated for so long and amongst so many dissenters.

The question now turns to a deeper level: If neither ownership nor scale of organization can directly facilitate the financial achievement of minibus business, what then, if at all, has had considerable influence upon its performance?

5.6 Enterprise spirit

As discussed above, the smallness of vehicle and of company size is a positive factor for attracting patronage and for saving costs respectively. However, the amount of costs that can be saved as a result of smaller structure is somehow limited. Above all, patronage and cost saving alone cannot always explain the profitability of a transport system, just as the case of Beijing's conventional buses, which are so overcrowded yet still losing money. Indeed, what is more important for a business to be lucrative rests upon its ability to obtain optimum profit-margin. For minibus transport, smallness is only a feature of the mode of production, what benefit can be derived from applying this mode is altogether another issue. In other words, productivity is what makes matter different.

What is the driving force behind the high productivity of transport business? Experiences in Southeast Asian cities have indicated that the entrepreneurial spirit of operators, especially of the drivers themselves have a decisive role to play in stimulating higher revenues (See, for example, Roth 1988; Fouracre 1977; Dick 1978, 1981; Pendakur 1984; Roth et al 1984; Walters 1979b, Walters et al 1980; Rimmer 1980, 1986a; Lee 1989). Indeed, in Beijing's case, the hard working spirit of the employees has been a crucial factor for high productivity, and subsequently high profitability. In order to illustrate this point, let us look at the working practices implemented by the minibus undertakings.

For the state-owned fleets, unlike the metro and the conventional bus systems, which exist as a welfare service, the entire service is run similar to a privatized business. Although the vehicles and premises are state-owned assets, the management and staff are operating under a principle of self-sufficiency. For the crews, instead of relying on a fixed monthly wage regardless of how they perform, each minibus is now given a quota on a daily basis. The current quota per vehicle per day is Y150 on average, though there are variations in accordance with differences in route allocated and duration of shift. In the light of this practice, if the quota is surpassed then the crew will be paid a bonus above the basic wage. If otherwise the ticket earnings are below the quota, then the bonus may be deducted or taken out, though the basic wage is somehow guaranteed. As one can see, compared with the previous "Iron bowl" policy, this practice is a small but, from a socialist perspective, considerable step towards further economic reforms.

The flexible style of minibus services is also an important factor for higher revenues. In order to pick up more passengers and earn more money, the crews would decide the routes for themselves. For the non-routed services, the minibuses simply respond to instant demand. For those on non-fixed routes (but with a 'home parking bay'), when necessary the crews would change their usual routes in accordance with fluctuations of travel demand during the day. Sometimes route diversions occur even with fixed-routed minibuses, often depending on the crews' judgments over potential passengers they may collect on the new route. By adjusting routes sensibly the crews can actually increase the possibility of picking up more passengers.

With this pragmatical route adaptability the crews can also save time and operation costs. Since the minibus services normally originate from either a railway station, a busy market, or a sightseeing spot where potential travellers are plentiful, it is therefore quite easy to fill up the vehicle with all the passengers wanting to go to a same destination, e.g. another beauty spot or transport terminus. When this happens, the crew would normally divert the route for the shortest distance instead of plying along the usual route, because there would be no need to collect more passengers en route. In that case, fuel consumption as well as journey time may be minimized. Of course, owing to this kind of diversions, there would be fewer minibuses running on the usual route, consequently the frequency there is reduced and services become unreliable, and thus average waiting time for those along the usual route is bound to increase.

By nature the collectively-owned undertakings are even more active in adapting the rewards system. Like their state-owned counterparts, the crews are also given a target to beat so that their industrious spirit can be stimulated. The only distinction is that each cooperative sets the quotas for its own crews, thus the levels among them may be different from one another. Nonetheless, the principle is the same; the crews are also expected to work for a bonus payment after the set quota is surpassed. It is argued that since they are supposed to be entirely self-sustainable (without a guaranteed basic wage), they are thus more likely to achieve higher labour efficiency, and consequently higher revenue per vehicle (Interview notes 1990).

Clearly, on the basis of the self-supporting principle, the crews have become more conscientious and responsible. They would make every effort to increase work efficiency and productivity by maximizing vehicle utility whenever possible. For instance the crews often choose not to waste time on a formal mid-day break, rather, they tend to have their lunch at the terminus when waiting for their turn to pick up passengers. In contrast, the crews of the conventional buses work against a fixed daily shift, during which there is a formal break when some would go home for meal and then turn back for the second half of the shift. Owing to these formal working practices, time is often being lost when changing shifts or making preparations. Thus in comparison, both vehicle utility and labour efficiency tend to be lower. Furthermore, unlike the minibuses, there is no real target for the crews to beat in financial terms. What may earn them a premium is normally dependent on whether they can show commitment to their job, such as their helpfulness and friendliness towards passengers, rather than how much they can collect from the ticket earnings, since the fares are so low that the business is losing money anyway.

However, it must be noted that, when considering labour efficiency in terms of number of crew members employed for each vehicle, then the conventional bus tends to be more favourable than the minibus. In theory, assuming a conventional bus can reach its full capacity of 137 passengers, with a three-man crew it has a passengers/crew member ratio of over 45/1. By contrast, with a two men crew the corresponding ratio for the minibus is only 8/1 when it is full. Now, as mentioned earlier, in practice, there is no upper limit for the conventional bus and whenever possible it would carry many more passengers than the supposed capacity; and since, compared with developed countries, the average load factors of the conventional bus and trolley can maintain considerably high due to the inadequacy of public transport facilities against the population in absolute terms, hence, even the minibus can reach full capacity in most of the time and thus has high load factors (Table 21), its ratio of passengers/crew member is, on average, still somehow lower than that of the conventional bus. Thus, with greater passenger capacity, it seems to have implied that on average the conventional buses and the trolleys are much more manpower-efficient in relation to passengers carried.

Nevertheless one must remember that, since the minibus can travel faster, the time needed for a turn-round journey would be shorter than that for the conventional bus; thus with higher frequencies the minibus may also be able to maximise its crew's labour efficiency as well as vehicle utility. Indeed, on a seat basis, the utility of the minibus is only marginally lower than that of the conventional buses. For instance, in 1988, each seat of the conventional bus system in Beijing carried 5,454 persons and of the minibus 4,020 respectively, indicating a close ratio of about 15:12 (see table 22). Apparently, the seat utility rate of the minibuses is really impressive. Furthermore, since the conventional bus system is loss-making, whereby wages of the crew are dependent mainly on government subsidies anyway, its lower man-power requirements (passengers carried per crew member) would make no practical sense against a profit-making rival -- the minibus system. Above all, taking all sides of the argument into consideration, it is obvious that, for the minibus, the enterprising spirit of the staff is undeniably a more decisive factor for higher revenues.

Besides the crews' individual effort, the operators have also adopted Western management skills and innovative tactics in running the business. They are keen and quick in responding to new demand and market changes. One vivid example has been the launch of temporary services for an international sports event. In August 1990, about one month before the opening of the Eleventh Asian Games, the operators seized the opportunity to set up new routes to provide services between the city centre and the newly completed athletic village. With a return fare of Y7.0, it was both beneficial to the operators themselves as well as convenient for visitors who were eager to see the giant sports complex.

Another example is the tactic of advertising to boost the services provided. Since, in China, as in many other Third World countries, the image of imported technology tends to be more appealing to consumers than its native counterpart's, thus foreign made vehicles are especially put on for contracted out services to attract potential users, for whom smarter models often mean something unique for their special occasions or purposes. Although these two examples may look commonplace in the West, in a socialist system like that in China, they would not have happened anyway before the Economic Reform; and more or less they have contributed to the booming of the minibus business there.

On the whole, effective management and the rewards system implemented by the minibus operators are a boost to the efforts of the employees. So far, owing to the enterprising spirit of the crews, coupled with practical adaptability in the style of services, in most cases, the quotas are well achievable and the earnings remain steadily high. However, there are also other reasons, besides these, which contribute to the financial viability of the minibus business in Beijing. They will be discussed further in chapter VI.

Table 21:

Load factors and utility rate over distance travelled
(State-owned minibuses, 1988)

Company	Loaded mileage/total distance travelled (%)	Daily load factors (%)
First Company	87.47	81.51
Second Company	94.44	81.78
Trolley Company	86.19	82.50
Rental Company	98.94	83.18
Total (BGPPTC)	90.33	81.77

Source: Office of Minibus Administration & BGPPTC, 1988b.
N.B. Information on independent undertakings is not available.

The table above indicates that over 90% of distance travelled is loaded with passengers. The average load factor of the fleet as a whole is as high as 81.77%. Overall the utility rates are high.

Table 22:

Ratio of seat capacity of different modes
(in 1988)

Mode	Persons carried/seat	Load factor/seat
Metro	6,759	18.52
Minibus	4,020	11.14
Big bus & Trolley	5,454	14.94
Bicycle	649	1.80
Taxi	524	1.45
Social vehicle (including private motorbike)	361	1.00

Source: after the "Comprehensive Report" of the BRIUPD 1990.
N.B. The index value of social vehicles and private motorbikes is set at 1, comparisons are made on this basis.

The above table indicates that in 1988, on a seat basis, where each seat on the social vehicle could carry one person, each seat on a conventional bus carried about 15 persons and each minibus seat about 12 persons. The utility rate of social vehicles is therefore very low.

5.7 Summary: the Important Elements

In summarizing the chapter, there are several important points discovered in Beijing's minibus service as below. First, on operation and structure:

(a) With small body and hence greater manoeuvrability, the minibuses can achieve higher average journey speed. And by applying adaptable routing and flexible schedules they can derive higher accessibility, in some cases, to narrow streets where their conventional counterparts cannot enter.

(b) At the individual vehicle level, all minibuses are equal in respect of operation costs and labour costs, regardless of ownership and scale of business.

(c) At the institutional level, small undertakings mainly using informal facilities may be able to save more overheads and clerical costs and be more efficient in business even under biassed zonal restrictions.

Second, on the factors which contribute to financial viability:

(a) The rewards practice generates entrepreneurial spirit of the staff and thus stimulates labour efficiency, allowing the maximum utility of vehicles.

(b) The minibus service is demand responsive (mainly to non-commuting users). With comparative superiority it is able to meet the requirements of their users (tourists) who are willing to pay higher for more comfort, in an environment where there are no alternatives of similar quality (e.g., the private car, affordable taxi services).

In short, the Beijing Phenomenon indicates that when financial responsibilities are held at the vehicle level, ownership plays no decisive role in profitability, and that there is no determinative correlation between scale of organization and business success. The dynamics behind financial achievement rests upon the generation of rational entrepreneurship and the implementation of effective management tactics. In this context, the enterprise reforms have, to some extent, improved the prospects of investment in industry in general; and the minibus sector is one of the public services which begin to move slowly from subsidy-dependence to self-reliance. Thus, while many commentators have argued that the profitability of paratransit is due both to ownership as well as small vehicle size, here in Beijing, the self-reliance principle is the cornerstone of business success. Under the rewards working system, the operators have actually generated a competitive environment for the employees to remain royal to, and ambitious with, an organization which they do not own.

However, it should be made clear that bureaucracy and overstaffing are often a by-product of state-owned enterprises in socialist countries but not necessarily of large institutions. In any case, the Beijing experience does not necessarily suggest that large scale undertakings are bound to be disadvantageous. The core issue lies in rational structure and effective management rather than scale. Nonetheless, in a competitive market, the optimal size of a transport undertaking may be set at the point where the highest utility rates of all the vehicles are realized with marginal profits.

Besides the factors mentioned above, the limited total seat capacity serving a rapidly increasing (permanent and floating) population which digests any public facility that is on offer also helps to explain the high patronage and consequently high turnovers. This is indeed a shadow of what had happened in Kuala Lumpur, where, according to Roth et al (1984), one of the consequences of the scarcity of whose minibuses was their windfall profitability.

The point about limited total supply needs further attention. How large should the total capacity be? This question concerns the negative side of paratransit. The next chapter will be trying to identify the constraints of Beijing's minibus system.

Chapter VI

THE CONSTRAINTS OF BEIJING'S MINIBUS SERVICE

6.1 Introduction

In the last chapter it was argued that the financial gains of minibus transport in Beijing were due to a combination of different factors, including relatively higher service quality offered to passengers and the management tactics implemented. At the same time it was also suggested that owing to limited availability, users had to pay more for the service they consumed. There seems to be some unanswered questions which require further consideration.

Generally speaking, there are two basic elements for measuring the desirability of a transport service in an urban area (excluding other effects such as its contributions to social and economic developments): First, how well the system serves the commuters (i.e. accessibility); and second, whether it serves them at the lowest possible costs (i.e. financial efficiency). The fact that in Beijing most minibus passengers are not commuters suggests that there are drawbacks with the system as a whole. These problems are particular obvious when compared with the sophisticated systems in other Far Eastern cities. First let us look at the imbalance between demand and supply.

6.2 Dissonance between demand and supply

One important element for a passenger transport system to attract patronage is its overall accessibility to the catchment area it serves. Cities are different from one another in physical structure and land use: their streets are diversified in width as well as in quality; their patterns of residential distribution are varied in location and density. It is because of these disparities that the levels of travel demand between different streets as well as between different cities are varied. Hence, in order to meet different types of travel requirements, vehicles of varied shapes and capacities, and of different fleet sizes should be employed.

The design of a passenger network with appropriate types of vehicles is therefore very important. Bus-routes should be designated to different vehicle sizes according to capacity and demand. As suggested by the World Bank (World Bank 1986), large buses tend to be more suitable for routes where demand is high enough to sustain frequent service and where the entire benefit of their more economic use of road space and energy per passenger can be realized, whereas small buses are more adaptable to narrow streets or in areas where demand is low.

In the last chapter, it was argued that in Beijing the minibus is more suitable for the residential areas of the city than the conventional bus, this is because the former can travel along narrow streets while the latter cannot and thus services provided by the former, in general, are comparatively more accessible to travel destinations. However, when considering the accessibility of a transport service, it is important to distinguish what a vehicle can perform and what level of service the entire rolling stock can provide.

In Beijing, one of the problems with the minibus system is its routeing. Although the small size is a visible advantage along narrow streets and more manoeuvrable amongst busy traffic, perhaps it is partly because both the urban minibuses and the conventional buses are owned and controlled by the same corporation, there is no rational control over which routes they may choose to run on; thus most minibuses have chosen to ply along the broad thoroughfares. As mentioned, in most cases they simply imitate the routes of the conventional buses, primarily linking busy business districts, rather than penetrating into residential quarters. The design of routes therefore has, to a large degree, limited the expectations of the system. Table 23 below shows the proportions of passengers carried by different forms of services.

Table 23:

Percentage of Passengers Among the Five Forms of Operation (state-owned minibuses 1988)

Form of service	%
Non-fixed routes	48.66
Fixed routes	38.59
Tourist routes	6.21
Collective rental	5.29
Contracting out	1.25
Total	100.00

Source: Modified from MAO & BGPPTC December (1988a, 1988b).

N.B. information of Independent minibuses is not available.

The figures indicate that currently the non-fixed routes carry the largest volume of passengers, followed by the fixed routes in the second place. It should be noted that, the number of fixed-route vehicles makes up only 24% of the total fleet, yet they can carry as much as 38.59% of the total passenger volume (BGPPTC 1988a); this perhaps demonstrates that most of the fixed routes are on trunk roads, where there are more potential public transport users. Clearly, trunk road duplication may benefit long distance travellers, but not the local residents whose journeys are normally short and somehow diversified in aggregate terms. By repeating the routes run by the conventional buses, the minibuses may have helped to ease overcrowding on the conventional buses, but has not actually filled the vacuum of unserved streets left out by the conventional bus network. Thus, the small vehicle which is more suitable for narrow streets is now being used for broad avenues, where demand for travel is much heavier. In this context, it is the wrong type of vehicle that has been allocated to serve the wrong place and thus, achieves little. Above all, it is the routeing but not the vehicle that is to blame.

What is more, as mentioned, the inadequate supply of vehicles against such a huge metropolis which they serve is another major problem of Beijing's minibus service. At the time of writing the total number of minibuses is still under 1,300 (including the county-based vehicles) and there are only 132 designated bus-stops in the entire built-up area for the state-owned minibus fleets (BGPPTC 1988a). With these limited facilities many residential streets are still uncovered by the network. Obviously, besides forcing up fares, limited total seat capacity has yet another negative factor affecting average frequency and reliability.

In general, from the user's convenience point of view, there is a major difference between an infrequent service, where the user needs to know the timetable, and where that timetable may be changed from time to time, and a frequent service where the user can just go to the route at any time, without having to worry about timetables at all, in the knowledge that a bus will be along within a few minutes. Where headways are large, say every 20 minutes or more, it is usually assumed that passengers aim to catch particular departures. Reliability is then often measured in terms of missing buses and adherence to schedule (it's distribution and the mean lateness). For close headways it is usually assumed that passengers arrive at stops at random, and reliability is measured in terms of waiting times. With perfect reliability and no full buses the theoretical average waiting time is half the headway. In practice, the average is increased by missing buses and perturbation to the service (Watts 1990). Thus, without steady and desirable headways, a transport system cannot be said to be efficient. In order to provide convenient services, bus intervals should be kept at a mid-headway short enough to minimize travellers' waiting time.

In Beijing, because of the small rolling stock, the minibuses cannot provide a service frequency high enough to outstrip their conventional rivals. Although, for some fixed routes, the interval between services is supposed to be 10 minutes, in practice, due to their "full-and-go" service style, the actual interval times vary greatly. Sometimes there are several vehicles leaving the bay at the same time; while other times the frequencies are lower than expected. As a result, the headways are unpredictable, and the overall reliability of minibus service is relatively poor. In reality, the average frequency of minibus service on some less busy routes is even much lower than that of the conventional buses and trolleys.

When compared with other systems, the problem of low frequency in Beijing is particularly obvious. For example, in a study earlier, it was found that in Kuala Lumpur, the hourly minibus frequency by route varied from 1.5 to 20, but along the major corridors where many routes combine, frequency was as high as 80 to 90 minibuses per hour, carrying up to 1900 passengers. The frequency of service varied only slightly over the 16 hour service period (06.00 - 22.00 hrs) (JMP 1981). As one can see, although there are slightly fewer minibuses in Kuala Lumpur (about 500 minibuses - JPCL 1985), the city and its population (roughly 1 million people) are much smaller than the corresponding figures in Beijing, therefore its minibus system can provide much more frequent services than that of Beijing. Another example is in Cebu, the second largest city in the Philippines, where the service frequency of the jeepneys is very high. On some routes, vehicle flows exceed 200 per hour, which translates to an average frequency of less than 20 seconds (See, for example, Roschlau, 1989). It should be mentioned that, although the system in Kuala Lumpur can provide reasonable frequent services to the users, as a result of the freeze on numbers, the minibus service, which was conceived as an all-seated service for long-distance commuters, has now become degraded by overcrowding and standing passengers (Roth et al 1984).

Clearly, in order to serve the population within a certain catchment area effectively, there must be an adequate number of vehicles. For example, in Manila, where there are thousands of jeepneys and minibuses serving a population of 4 million inhabitants, most people are within 250 metres of public transport routes and enjoy frequencies of less than one minute. Users are offered a good level of service in terms of spatial coverage, frequency, reliability, speed, and cost. Even in less dense areas, motorized tricycles offer virtually door-to-door feeder service, connecting bus and jeepney routes (Roschlau 1989). By contrast, the total number of passengers carried by Beijing's state-owned minibuses in 1988 was only about 1% of the total passengers carried by the city's entire public transport system (BRIUPD 1990). Supposing the independent minibuses carried another 1%, then the total volume of minibus passengers would have been something just over 2% of all public transport users. Compared with other sophisticated systems in the Far East, e.g., the Hong Kong system, which had more than 4,000 vehicles and carried a total of 103.9 million passengers in 1983 (JPCL 1985), the system in Beijing is poor.

In summing up, because of inadequate total seat supply, Beijing's minibus system has two limitations: One, it is unable to cover the catchment area effectively to provide end-to-end services. Two, the system possesses no advantage in terms of frequency as those found in other Far Eastern cities. Overall, the problem may be attributable to ineffective planning between (minibus) transport and land use (population density and distribution).

Hence, although in the last chapter it has been claimed that those who were interviewed in the 1988 survey admired highly the convenience and accessibility of the minibuses, nonetheless, it should be pointed out that since the survey was carried out on board the vehicles, one may expect that most of the respondents were visitors rather than local commuters. In this way the results do not necessarily reflect the views of the local commuters. It therefore cannot be claimed that local residents would have felt the same. In fact the low level of patronage by local residents might perhaps suggest that the system as a whole is still relatively inaccessible, especially to the old city's neighbourhoods where local people reside (See table 24 next page).

Table 24:

Composition of Passengers by Origin

(State-owned minibuses 1988)

Passenger origin	%
Floating population	79.99
Local Permanent residents	19.6
Foreigners	0.41
Total	100.00

Source: after MAO & BGPPTC December (1988a; 1988b).

N.B. data of the independent minibuses are not available.

6.3 Limitations in Service style, Customer Orientation and Operational Hours

In the last section, it was noted that if the minibuses were supposed to serve the local residents, the priority of route design should have been given not on the outlying trunk roads but, on the streets cutting through the residential neighbourhoods. However, the fact that the minibus operators chose to concentrate on trunk roads is perhaps because, in any case, they would never be able to cover every corner of the city with such a small rolling stock. Anyway, with heavy travel demand by the visitors on the major trunk roads, one would have every reason to doubt that the crews would bother to force their way into the labyrinth of small alleyways to collect the locals, who are often perceived as being less generous than the tourists when it comes to travel spending.

Another set of reasons which restrain the functioning of Beijing's minibus system concern the characteristics of operation, hours of business and customer orientation. First, in respect of schedule flexibility, compared with some systems in other Far Eastern cities, the minibuses in Beijing still cannot be considered as being highly adaptable to actual travel requirements. Although most do not run to fixed schedules, the service style of many is more closely aligned with conventional buses than taxis. Instead of running constantly at a somewhat loose frequency and picking up passengers en route, they still follow a rather old-fashioned style, operating like a coach service starting from a specific terminus where they can queue up at the bay to collect passengers and depart until most seats are occupied. This practice wastes time and causes long delay for travellers, since as a minibus waits for its turn to pick up passengers, it is actually lying idle without any profitable engagement, yet at the same time, there may be potential passengers awaiting at bus-stops along the streets. Clearly, the potential ability of the small vehicle as a flexible passenger carrier has not been given full play, even though in general they are relatively more responsive in places where demand is high enough to fill up the seats quickly.

Besides, most minibuses in Beijing, especially the state-owned fleets, operate mainly on a one shift basis. For the fixed-routes, the minibuses normally run from early morning to about 18.00 hrs, while the non-fixed routed ones run a relatively longer period, extending to about 20.00 hrs in the evening. For the tourist services, the minibuses are almost exclusively responding to the demands of the sightseers, which means that, some only run a few hours during the busiest time of the day, between 9.0 hrs to 17.00 hrs, when most tourists are on the move. Overall, their daily business time is short.

If short business hours have already caused low vehicle utility, then the low rate of operationally available vehicles makes the problem worse. For instance, during a one day survey in March, 1988, only 339 out of 510 vehicles owned by the MAO were put on service, a disappointingly low proportion of just 66.47% of the whole fleet, roughly one third of the rolling stock was not operational (See, BRIUPD 1990). As a result of this short-hour service and limited operation, neither labour nor system can be utilized to its full capacity. This situation is particularly obvious when compared with other systems whereby the vehicles run long hours daily. For example, in Kuala Lumpur, the minibuses adopt a shift-working practice, in which the crew works one shift while the vehicle runs two, making a total of 16 hours daily. Another example is in Cebu, where most jeepneys operate 18 hours per day, from six in the morning until midnight, and few operate less than once per minute (See, for example, Roschlau, 1989). No doubt in these cases, the operators are able to maximize vehicle utility and hence marginal revenues.

Another dimension is customer orientation. It is generally accepted that travel purposes and hence the aggregate travel demand pattern in an urban environment would shift in accordance with the change of sunlight and that most night-time trips are primarily home-social activity based. If this is really the case, then it would be very likely that any tourist-orientated transport system would find its demand decreases after sunset, since most sightseeing activities are concentrated during the day time rather than in the evening or at night. Hence, it is not surprising to see that, in Beijing, the demand for minibus travel gradually falls as the streets begin to light up. Based on this inference, it may be confirmed that, the one shift working practice and "day-light" concentration of minibus service in Beijing are actually a result of over-emphasis on tourism.

Clearly, the one-shift only operation can merely serve a limited market consisting of mainly the tourists. In fact, the over-emphasis on corridor roads is a result of excessive tourist-orientation. This is obviously a drawback in both vehicle and labour utility, which critically limits the possibility of maximizing revenues. Nonetheless, if the assumption of "evening shift" of aggregate travel purposes is true, one may presume that, in Beijing, unlike the day-time period, a considerable proportion of night-time minibus travellers are local residents, who otherwise would have ridden the bicycle for their evening outings. In this context, the role of the minibuses does change in accordance with sunlight, improving considerably in respect of serving more local residents, even though it is still not for commuting.

While the majority of minibuses operate only a short period daily, on a few busy corridors the services do continue after dark. Many of these "evening services" are in fact run by the independent minibuses. This is because they are mainly engaged in non-routed and non-scheduled services without time control anyway, they tend to be more adaptable to changes of demand. Therefore, in comparison, their daily working hours are normally varied and on average, may well be longer than that of the state-owned fleets. Some crews may choose to run till the later hours in the evening as long as demand for minibus services remains, especially to serve people engaged in social and cultural activities, i.e., at cinemas, theatres, stadiums and so on. Thus, because of their higher rates of vehicle and labour utilities, it is not surprising to see that they are often more successful in financial terms.

In summary, due to its narrow objective and limited adaptability, the minibus system in Beijing is still under-used, even though there are fewer vehicles while travel demand is heavy. On the whole, they can only provide a skeleton service to mainly tourists, and local residents on specific-purposed trips, with the choice of some higher qualities. (Note: table 25 and figure 25 illustrate the 'occupations' of the passengers, not their 'commuting purposes').

Table 25:

Passengers Classified by Occupation

(State-owned minibuses 1988)

Occupation	%
Factory workers	37.82
Office clerks	30.60
Peasants	12.70
Commercial & Retailing personnel	6.26
Students	4.39
Military personnel	3.58
Retired people	2.21
Other	2.44
Total	100.00

Source: MAO & BGPPTC December (1988b).

N.B. data of the independent minibuses are not available.

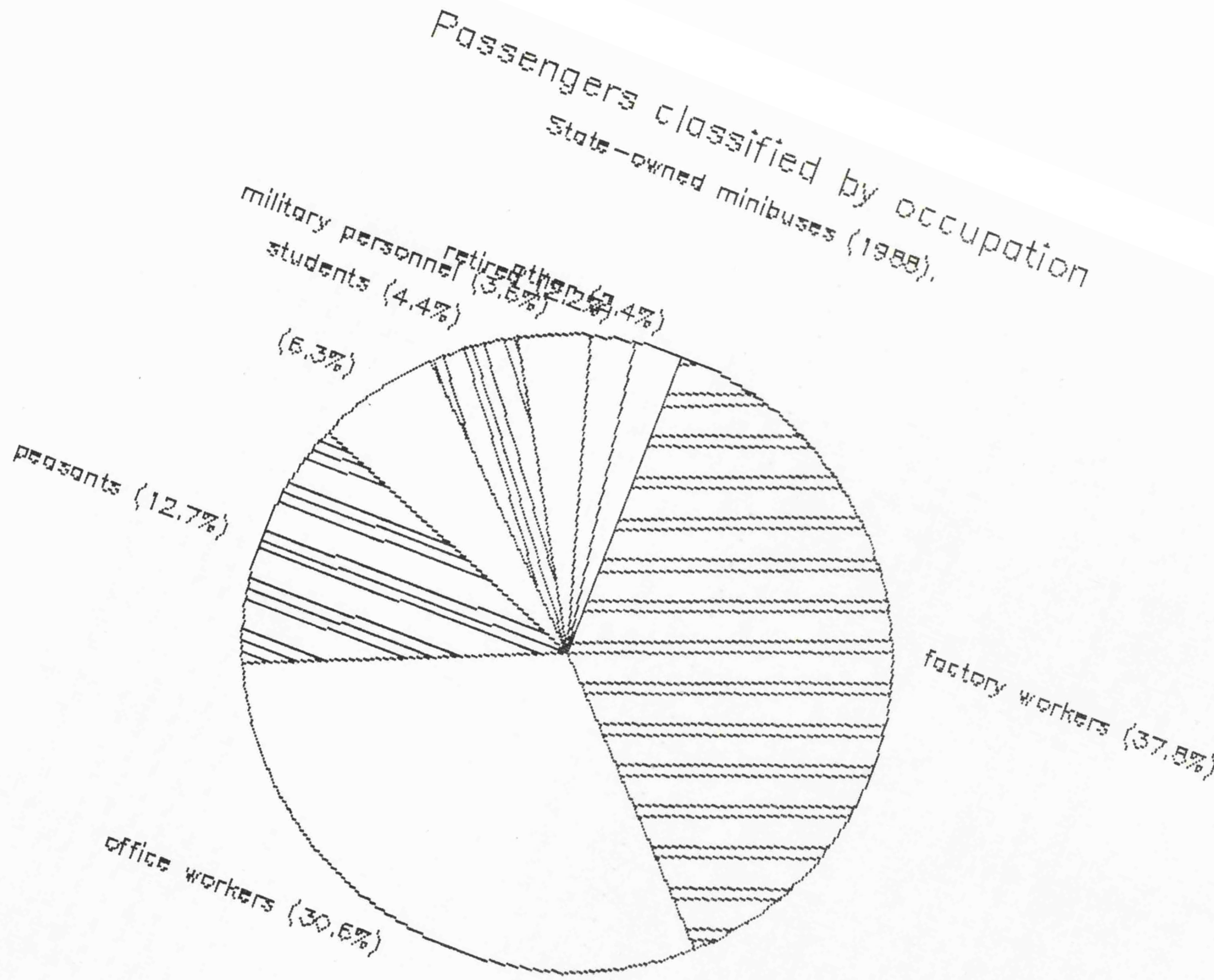

Passengers classified by occupation
State-owned minibuses (1988).
military personnel (3.6%)
students (4.4%)
retired
others (2.4%)
(6.3%)
peasants (12.7%)
factory workers (37.8%)
office workers (30.6%)

Fig. 25

6.4 High Travel Costs: Subsidies to Conventional Modes and Monopolization

Apart from inaccessibility due to limited total seat capacity and unsuitable routeing, the problem of high travel costs is an even more crucial barrier which prevents local people from boarding the minibus. As mentioned earlier, minibus travel costs in Beijing are very expensive compared with the conventional bus services. The differences in terms of fare charges between the two modes are so great that minibus travel has almost become a luxury for the ordinary Beijinger. Compared with what is charged in other minibus systems, the differences within Beijing's public transport services are particularly obvious.

One of the primary reasons for low fares for conventional bus services in Beijing is due to the government's policy of subsidizing the conventional transport services. In contrast, the minibuses are meant to be self-sufficient, which suggests that high fares are the only way to keep them going. An immediate and direct effect of this subsidization policy is the creation of a big gap in travel costs between conventional bus and minibus services. This differentiation becomes even more significant if a combined monthly ticket is purchased for the conventional buses. Currently a monthly ticket for the entire conventional bus (including trolley) services in Beijing costs

Y5.0 only; if the metro is to be included, then it costs just Y10.0. In addition to cheap rates, there are various concessions for students and some other sections of the community, who pay even less than the standard rates. Normally, for each single journey, a minibus fare could be about 10 times that charged by the conventional buses for the same distance. However, since it is a flat fare anyway, a passenger who travels only some section but not the whole route may find it even more expensive. In other words, if only the length of the distance actually travelled is considered, then in some cases, the minibuses could charge as many as 15 to 20 times more expensive than that charged by the conventional buses.

In order to illustrate this point further, let us look into the structure of travel expenditure in proportion to personal income, based on an hypothetical analogy. First, at present, the typical fare for a single journey on a conventional bus on any route in Beijing is Y0.3, while a ride on the minibus on the same route would cost as much as Y2.0. Now assuming the monthly wage of a school teacher is Y150 (which is the average amount for most teachers in China), on average, about Y5.0 per day, then a single journey ride on the conventional bus would cost about 6% of his/her daily income, whilst in contrast, a minibus fare would take as much as 40% of his/her daily wage. This level of travel expenses could mean much less expenditure on other goods and services if a minibus is used on a daily basis. Clearly, with a relatively low income per capita in contemporary China, a ten-time gap between the two different bus services undoubtedly means a great deal to the average wage-earner, who in any case would choose the cheaper one rather than the much more expensive alternative for regular use.

What is more, it is worth mentioning that, although the subsidized conventional buses cost less to use, they are not necessarily cheap for the wage earner; because the low average travel expenditure may merely be a reflection of shorter average commuting distance in China; it should not be blindly interpreted as being lower than those found in the developed world where average commuting journey is much longer.

Because of the big gap, in effect, the conventional modes and the minibus system are barred from direct competition. For instance, owing to the differences in fares, even where both conventional buses and minibuses running on the same route and call at the same bus-stops, they are not really competing for the same passengers. Local residents and students, who are normally monthly ticket holders, tend to board the conventional buses only. While the visitors are more prepared to board the minibus. As a result of this separation, the targets for customers between these two systems are rather different. Since their customer-orientation differs from one another, neither mode can utilize seat capacity effectively in accordance with actual travel needs. And since each system operates within a protected market, they would find it rather safe to demand high fares without serious challenge.

Another cause for high travel costs in Beijing's minibus service is the monopolistic ownership of the minibus business. Although in Beijing it may seem that there are two major forms of minibus ownership and that those collectively-owned do belong to rather different cooperatives, in fact, as explained, all minibuses are "public properties" in one form or another. In effect, therefore, there is little vital competition amongst state-owned companies. In addition, the boundary restrictions have created further obstacles in the transport business in that an irregular proportion of the service provided by the county-based fleets is confined within their own territories. Thus the minibuses themselves hardly compete with one another directly in an open market. In theory, therefore, the state-owned minibus fleets in urban Beijing are to some extent close to a monopolistic system, under which the operators are able to charge fares as high as the passengers can bear and stick to a flat rate rather than charging according to different travel requirements.

Examples of such inelastic fare charges can be found, either with state-owned or collectively-owned vehicles. On the route from Yi-he-yuan (Summer Palace) to Beijing Railway Station, the effects of these restrictions are particularly obvious. Yi-he-yuan is one of Beijing's most famous scenic spots, located in the northeast sector of the city, just outside the built-up area; it is roughly 20km away from the city centre. Its bus terminus is often busy and crowded with passenger vehicles of various kinds. The main passenger flow from here is between the terminus and the Beijing Railway Station in the city centre. Beijing Zoo, another major tourist attraction, is midway between these two ends. Two minibus routes from Yi-he-yuan share the first section to Beijing Zoo; one of which then terminates at the Zoo, the other travels further on to the Railway Station. During peak times the fare for the Zoo is normally Y2.0 and the Railway Station Y3.5. The problem is that minibuses travelling directly to the Railway Station tend to stick to the fare of Y3.5 and aim at full-fare passengers rather than offering a lower fare for anyone who may wish to travel a shorter distance. Thus, passengers who want to travel to a destination within the first section up to the Zoo would tend to board only the minibuses which end their journey there, rather than those running further to the Railway Station, because otherwise the non-reducible fare rate would make the ride too expensive against the journey they intend to travel. It is for this reason that sometimes minibuses travelling to the Railway Station have to start without full capacity, with the hope of collecting full fare passengers at the next one or two bus-stops, while there are still passengers left behind, waiting for minibuses to the Zoo. What is more, since the possibility of picking up full fare passengers along the route is so unpredictable, it is not unusual for a minibus failing to fill up its vacant seats after leaving the terminus. As one can see, such inflexible fare charges could affect the load factors, subsequently the fares remain high for those on board the minibus yet at the same time, causing inconvenience for those passengers left behind.

Clearly, without complete and effective competition, it is difficult to expect fares to go down. This is different from other countries where minibuses belong to various owners, fares must be kept at a competitive level, for the drivers often have to negotiate with their potential passengers. In this context, state monopoly and market protectionism are the main obstacles for an enterprising transport industry. Coupled with this state monopoly is the shortage of total seat capacity against a huge market in absolute terms, as mentioned earlier, whereby the supply can hardly meet the demand for travel, and thus there is little need for the minibuses to compete with one another for passengers. Apparently, inadequate supply not only causes infrequency and inaccessibility, but also causes high fares.

Apart from monopoly and the inertia of the market, there are other factors causing high travel costs, some of them are mainly concerned with mechanical performance of the vehicles. As pointed out by Bly et al (1986), it has been widely accepted that the costs of bus operation are different with respect to bus size. Other things being equal, reducing the size of a bus reduces its operating cost much less sharply than the number of its seats. Thus, the cost per seat-km operated increases as the size is reduced. In the case of Beijing, in addition to low capacity, each minibus is manned by two people rather than one as in many of those in other Far Eastern cities; consequently, it is not difficult to see why minibuses incur higher unit costs, and hence greater operating costs than the conventional buses do.

Even though the fares are high, the majority of the respondents in the 1988 survey did not think so. Nearly two thirds of them say that the fares are reasonable (Table 26 & fig. 26a). The reason for this confusing result is because a large proportion of minibus travellers in fact have their fares paid for them by their own organizations. For instance, during that one day when the survey was carried out, only 55.76% of minibus travellers paid the fares for themselves, while 44.24% had their fares paid for them by the organizations which they work for (BGPPTC 1988a). (See table 27 & fig. 26b). This is because in China, it is common for companies to pay their staff travel expenses for performing the so-called 'work duties', such as meeting business contacts and attending conferences. And for this reason, when an employee expects to have travel expenses paid by his or her organization, he/she would always choose the more comfortable means to travel, except the taxi, which is too luxurious and normally used by foreigners rather than by local people.

Table 26:

Passenger Opinions on Travel Costs

(1988)

Grade	%
Reasonable	63.27
Expensive	35.56
Very expensive	1.17
Total	100.00

Source: Modified from BGPPTC & MAO, 1988b.

Table 27:

Percentage of Travel Expenses Paid By Companies
(16 April 1988)

Company	At own expense (%)	Paid by company (%)	(%)
First Company	51.67	48.33	100
Second Company	61.04	38.96	100
Trolley Company	53.28	46.72	100
Rental Company	63.65	36.35	100
Total (BGPPTC)	55.76	44.24	100

Source: BGPPTC & MAO, 1988b.

N.B. Information of the independent undertakings is not available.

Fig. 26a Passenges` opinions on fare charges

Beijing. 1988

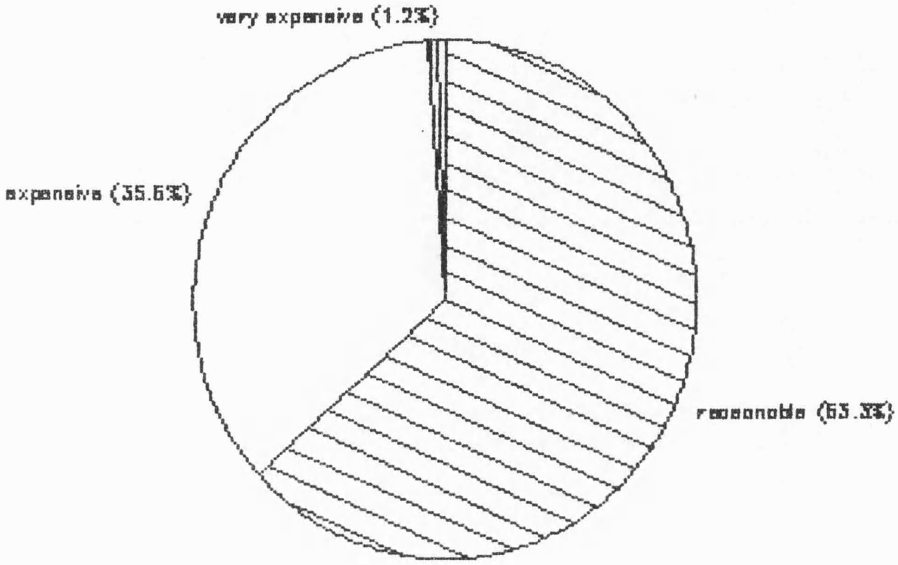
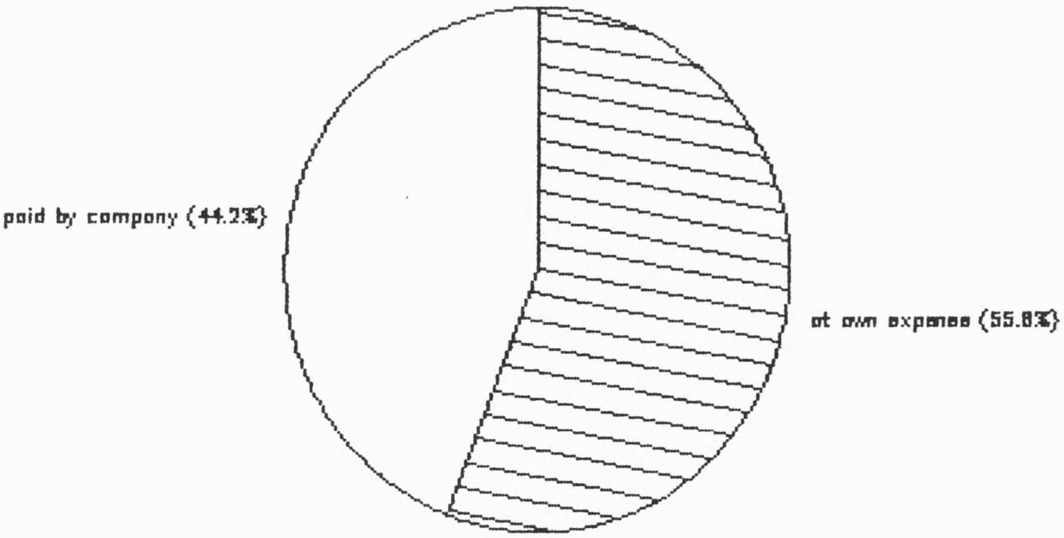


Fig. 26b Percentage of fares paid by company.

State-owned minibus 1988.



6.5 Summary: A Problem of Planning

Overall, in assessing the status quo of Beijing's minibus transport from a broader perspective, several important points can be drawn:

(a) The total seat capacity is too small against the size of the catchment area it serves and thus the overall accessibility is limited. Insufficient rolling stock also means that the system cannot sustain high frequencies on the routes where passengers' average waiting time may be reduced to minimum.

(b) As a passenger carrier the minibus is less efficient for trunk road mass movement (in terms of operation cost and energy consumed per passenger/km). Over-emphasis on corridor traffic thus restrains the superiority of the minibus in serving particular urban structure (narrow streets). It also creates unhealthy and unnecessary competition between different modes, while leaving out unserved vacuums on other routes.

(c) The "Leave when full" style of services lengthens passengers' waiting time and thus decreases journey speed. On the other hand, the inflexible fare charges prevent passengers from using the minibus for short journeys.

(d) The short business hours and narrow customer orientation restrain not only vehicle utility but also the operational capacity of the entire rolling stock.

(f) Monopolization and market protectionism cause disincentives in the transport sector. Because of the absence of competition, operators are able to charge high fares beyond what most commuters can afford.

These are the main reasons why the system has failed to become a major commuter carrier as in other Far Eastern cities. While the tourists have to suffer exorbitant costs for the service, local citizens who seldom use them only receive little benefits. Thus, although Beijing's minibus service has grown fast but its path is somehow "distorted" in relation to expectations. This is by no means to conclude that the growth is altogether unhealthy, but it merely refers to the limited contribution of the system in carrying urban commuters and the real beneficiaries of the service.

The next chapter will therefore attempt to discuss possible tactics to improve the capability and business efficiency of the minibus service in Beijing.

Chapter VII

IMPROVING THE MINIBUS SYSTEM

7.1 Introduction

The last chapter has expounded the constraints of Beijing's minibus system. As indicated, the main obstacles are related to planning policies. It appears that inadequate supply is a major cause of low frequency, unreliability and limited accesibility. Thus, how to resolve these problems rests, partly, upon sufficient supply. On the other hand, high travel costs are also a barrier preventing commuters from using the service. This chapter discusses the possible steps for upgrading the capability of the system for commuter use. These include expanding total supply, re-arranging operation tactics and restructuring fare rates. There is also a review on the effects of subsidizing public transport services.

Subsequently the chapter will round up the major points of the case study and comment on outcome of the hypothesis test. It will end with a brief summary on the objectives achieved, setting the scene for an overall generalization on paratransit in the final chapter.

7.2 Balancing the Supply of Total Seat Capacity

As indicated earlier, the problem of Beijing's minibus system is two-fold: limited accessibility and high travel costs; both of these are partly caused by inadequate total seat capacity. The question is whether these problems could be solved if there were more minibuses on the road. First let us examine the effects of fleet expansion on travel costs.

In some cities in Britain, e.g., Leicester, minibus conversions have shown that a frequent, convenient, and user-friendly bus service can attract people voluntarily back to public transport (Watts et al 1986, 1990). This, to some extent, implies that if the minibus fleet within an urban environment is adequate and efficient, then the system could play a major role in moving commuters. What are the development prospects of the minibus transport in Beijing?

Presently Beijing's minibus service is inadequate, though it looks set to grow. For the BGPPTC, plans have actually been made to increase the total number of vehicles throughout the 1990s. According to official information provided by the Minibus Administration Office, it is estimated that by 1995 the state-owned companies will have 1,000 minibuses, compared with the present number of 600; a big step forward in fleet expansion. And after that, with a steady increase of more than 100 new vehicles every year, the corporation expects to double its entire fleet, bringing the total to between 2,000 and 2,500 vehicles by the year 2000 (BGPPTC 1988a).

Alongside fleet expansion undertaken by the state-owned companies, the collectively-owned operators will also try to increase their share in the market. However, owing to the limited availability of financial resources, their expansion may be more difficult to achieve. Above all, in socialist economies, only the state is able to raise the money and launch a large scale business in a relatively short period.

Nevertheless, the BGPPTC's plans for minibus transport development in Beijing look ambitious and concrete enough in attempting to tackle the current situation of minibus shortage in the city. The question is what will happen if there are more minibuses in service and will local residents use them? In order to find out these, it is necessary to examine what may happen to travel costs and to what extent accessibility can be improved if the total number of minibuses increases. First, let us look at any possible changes in travel costs.

Assuming other things stay the same, an increase of vehicle supply increases the total availability of seats. Provided the increase is really large enough to absorb most potential passengers who prefer the minibus to conventional bus, then one may expect that, at the point where supply exceeds demand, fare charges will reach a highest level, because demand is now saturated; further supply may only share the existing market and thus fares will begin to fall as the fleet keeps on expanding. In the case of Beijing, whilst most visitors use the minibus anyway, a decrease in minibus travel costs would probably attract some users from the local population, especially those who earn more. However, because of the higher operation and labour costs per seat, minibus fares would remain higher than that of conventional buses, possibly still too high for commuting purposes. Thus most commuters would stick to the bicycle, since they need to pay almost no extra costs for bicycle travel beyond the initial costs of purchasing the vehicle.

In that case, it may be inferred that, increased minibus rolling-stock without necessary improvements may not deliver benefits to the citizens as a whole. On the other hand, for the state-owned minibus service providers, as long as they can charge high fares due to the absence of competition, fleet expansion could still mean guaranteed turnovers for them and consequently for the parent company, namely the BGPPTC. For the independent operators, the more state-owned minibuses on the urban roads, the harder the battle they may have to face, unless there are revolutionary policies to legalize their operations in the urban zone.

Nevertheless, fleet expansion under effective management and pricing tactics may improve the efficiency of the system. Presumably there is an optimal level of supply at which the congestion effect is minimum, pricing regulations may thus be imposed so that fares are kept at a competitive level compared with those charged by conventional modes. Since most tourists tend to travel during the period between 10.00 hrs and 16.00 hrs whilst commuters mainly travel in the morning and the afternoon periods, a two-level fare structure may be applied for the day time period. This is to separate the fare charges into two "time zones", namely "commuter rates" and "tourist rates"; whilst the former are to be kept at a level attractive to commuters, the latter may be left to a free market "self-regulated" by the tourists' demand for travel. In other words, during the morning and afternoon "commuter rates" periods minibus fares are set at levels close to conventional bus fares so that commuters may trade off between a cheaper conventional bus service and a relatively more expensive minibus service; and in order to avoid tourists pouring into these periods, services should be provided for commuting ticket holders only. Besides the day time rates (including both the commuting and the tourist rates), an even cheaper "evening rate" may be adopted for leisure activities so that, on the whole, both local residents and visitors can benefit from the expanded minibus service in accordance with their needs and their ability to pay (see fig. 27).

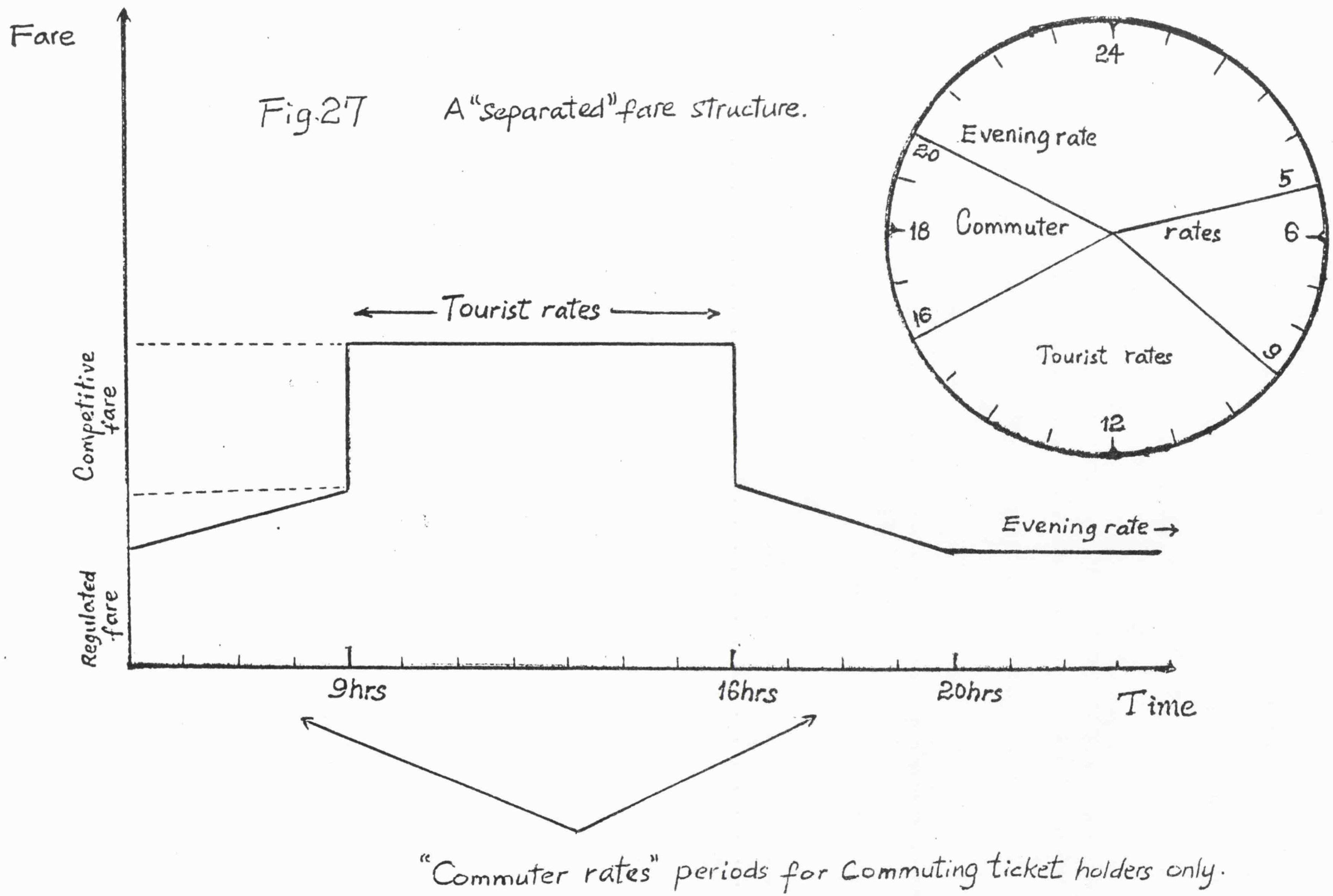


Fig.27 A "separated" fare structure.

7.3 Towards An Optimum Rolling Stock

Another issue is how will accessibility be improved after fleet expansion. Since it is argued that the total minibus rolling stock is too small to be able to provide high frequency and sufficient services, what is the optimum size of the total fleet in the city likely to be? To answer this question, it is necessary to look at the negative as well as the positive effects brought about by large volumes of small vehicles in an urban area.

First of all, it is quite obvious that several small vehicles can reach different points at the same time whilst a big vehicle with the same capacity can only travel to one destination; thus a large fleet of small vehicles can cover a wider geographical area than a small fleet of only a few big vehicles. For example, in Manila and Jakarta, with thousands of small vehicles of various kinds, most areas are accessible. Nonetheless, at the same time, they also cause concern in several ways. Therefore there is a negative dimension for using small vehicles in urban passenger movement.

The congestion caused by small vehicles during peak times is often blamed for unsafe service and poor accessibility. In Kuala Lumpur, for instance, the minibus operators have been subject to severe criticism from several quarters. They have been criticised by the government for not operating as franchised, by car users for reckless driving, by passengers, who were packed in unsafe and overcrowded vehicles and by stage bus companies for unfair practices and competition (see, for example, Silcock 1985; White 1980a; Mogridge 1983). Although, in comparison, the present minibus fleet in Beijing is rather small, experiences from cities abroad do cause deep concern among the transport planners. In fact, over the past few years, the minibuses have been blamed for causing congestion in busy locations, such as markets and road junctions. It has long been pointed out that when platoons of minibuses queue at major junctions, greater manoeuvrability is of little advantage, thus giving little frequency advantage to travellers. Complaints have also been made over the rather undisciplined traffic behaviour of some minibus drivers whose illegal stopping and parking practices are often held as being responsible for traffic delays (BGPPTC 1988a; Interview notes 1990).

It is because of these criticisms, the development of the minibus system in the Chinese Capital is somewhat restrained. What is significant is that it nonetheless indicates a degree of dissatisfaction and discontent over the unrestricted increase of small vehicles in an urban environment. For the bicycle commuters who seldom use any form of public transport services, the more motorized vehicles on the roads, the greater danger they may face and the less the benefits they would obtain. Clearly, something must be done to reduce these problems.

In theory, in respect of mass movement, the optimum rolling stock of a minibus system is proportionate to the optimum average frequency that the system can offer and disproportionate to the congestion it causes. In order to materialize the advantage of having higher average journey speed in a large urban area, it is necessary to achieve a balance between optimum frequency and minimum congestion, which requires a sufficient supply of vehicles with optimum utility rates. In the case of Beijing, a possible tactic is to encourage a free market mechanism for minibus undertakings to develop their own fleet on the basis of the government's fare regulation; that is to say, providers are allowed to increase their own rolling stock with fare charges subject to the "time-zone rates" mentioned earlier. Under such a free market minibuses continue to compete with other modes by trying to offer higher quality of service. Thus, as long as the average journey speed of the minibus remains higher than other means, and as long as the fares are still attractive for commuters to travel, there may still be room for more minibuses to enter the market. The market is said to be saturated at a point when service quality begins to fall, especially when average journey speed of all traffic decreases as a direct consequence of congestion caused by the increasing volume of minibuses; at which time further expansion would merely cause negative effects. Thus the optimum rolling stock of a minibus system may be illustrated by a simple equation as below:

$$R_o = f(S_{ma}) + f(C_{mi}) + f(F_c)$$

where R_o = optimum rolling stock of minibuses,

$f(S_{ma})$ = function of maximum average speed of traffic,

$f(C_{mi})$ = function of minimum congestion effects,

$f(F_c)$ = function of competitive fare charges.

(N.B. $f(S_{ma}) \neq f(C_{mi})$ because congestion here refers to that caused by minibuses only).

If this analysis is correct, then one may see that at least until the "time-zone" fare rates are set, it is difficult to predict how large the rolling stock of minibuses should be in Beijing, since presently no one knows how attractive are the separated "commuter" and "tourist" services going to be. Clearly, in this context, practical management is decisive. However, because of the scale of the problem and other related dimensions, there is a need to tackle the planning issue from a wider perspective. The following section will be looking at the question of financial subsidies to public transport services in Beijing.

7.4 Reviewing the Subsidization Policy

Ever since the start of the economic reform in the late 1970s and the early 1980s, business enterprises in the People's Republic of China have been encouraged to take measures to operate in a competitive environment and slowly shift to a market-orientated system. Managers and workers are held to be more responsible for their performances. Following the reforms, there have been considerable improvements within the public transport industry. Nonetheless, as mentioned, of the three major public transport systems in Beijing (metro, conventional buses and minibus), only the minibus undertakings are profitable, the other two are loss-making and still have to be subsidized heavily by the Government.

The problem with the conventional transport modes is that they are operated as a welfare service. In socialist countries, public transport is seen as a basic necessity and not a commodity and should thus be provided by the government at all costs. Subsidies are mainly provided via taxes and justified to be beneficial to the general public at large. Since it is held that there is no distinctive "higher-income class" in a socialist country and up to now no significant level of private car ownership in the city, every citizen could be a public transport user and consequently a potential beneficiary. What is more, it is also argued that, in reality, the conventional modes are the only facility that most of the ordinary Chinese, particularly those from other parts of the country, can afford to travel on in the capital. And since, unlike the local resident, the visitor cannot bring with him or her a bicycle into the city every time they come to the capital, cheap public transport services are thus believed to be the only alternative.

Hitherto, the fare charges of the conventional buses and trolleys have been frozen at the levels of the 1950s. The fares for the metro are kept even lower, at a flat rate of Y0.30 per trip, regardless of journey distance. On the whole, the fare rates of these "mass-transit" modes do not reflect the actual market value for the costs involved; they are almost a symbolic payment. This partly contributes to the failure of their business.

From an equality point of view, universal subsidization raises the issue of where the benefits actually go. At times it seems that the welfare service policy would benefit every citizen on equal terms, unfortunately when it comes to public transport services, it is not so. Instead of "something for everyone", the policy has actually made inequality more apparent. Whilst financial subsidies are supposed to be shared equally amongst all public transport users, it is obvious that the need for travel varies from person to person. Within the urban community for whom the transport services are subsidized, some people may have to travel every day, others may not need to use the public transport service at all. And since, in Beijing, indeed, in most Chinese cities, people live reasonably near to their work places and thus travel relatively shorter commuting distances, the bicycle is still the most convenient and economical mode for the local residents. Therefore subsidies may not reach the bicycle riders on equal terms, even though many of them live on the lowest level of wages. Apparently, universal subsidization to public transport service has not delivered equal benefits to every citizen. Non-users, and consumers of unsubsidized services are the losers who either receive no real benefits or else have to suffer from high travel costs for using the services they need.

Furthermore, under the universal subsidization policy, transport undertakings become almost totally dependent upon official resources and often structured under a complicated framework, characterized by superfluous personnel and bureaucratic trammels. Since jobs are guaranteed and wages fixed anyway, the staff work as a "timed-machine" with no entrepreneurial initiative; consequently, the quality of service cannot be improved.

As one can see, in Beijing, despite a series of attempts to improve the performance of the transport facilities, there have been no substantial strategies to restructure the market; so far the participation of the private sector in the public transport industry is trivial. Hence, the municipal authorities still have to pick up the largest part of the bill for their citizens' transport consumption. Along with increasing deficiency in service operation, the conventional modes continue to lose money. According to Quan (1990a), over the past few years the amount of subsidies given to (conventional) public transport in Beijing in order to keep it running exceeded Y200 million per annum; if the money for development projects are included, then the sum has reached a figure in the range between Y400 and Y500 million annually. Clearly, the public transport industry is one typical example of the "eating from the same big wok" syndrome. In this sense, one may reason that, the idea of subsidizing a potentially self-sustainable industry is no different to killing off the goose that lays the golden eggs.

Overall, it may be argued that the inertia of the public transport industry in Beijing is an outcome of the socialist planning philosophy. The main obstacles are as below:

(a) The pursuit of socialism in public service provision. This leads to the persistent channelling of financial resource to state-owned transport undertakings without ensuring substantial improvements on service quality and reaching the targeted users of the services offered; and

(b) The legacy of egalitarianism in economic activities. The enterprise reforms within the transport sector remain incomplete and thus unable to change the potential vitality of the industry.

It must be said that, however, not all subsidies are necessarily a bad thing. For instance, cross subsidization may be justifiable and sometimes even helpful. In Beijing's minibus service, if a two-level fare structure is implemented, profits gained from tourist operations may be cross-subsidized to the commuter service, in case the latter is loss-making. This will keep the system working reasonably justified amongst all parties involved. In fact, subsidies are often found necessary in the urban public transport industry, especially in cities of developing countries where the majority of the poor cannot afford to use the public transport service. This will be touched again in the end of the chapter.

7.5 Implications and Significance of the Findings

As Jacobs et al (1986) have pointed out, different cities have approached the problem of providing for transport demand in different ways. There is evidence of a broad correlation between certain characteristics of the city and its transport and also between the demand for public transport and the level of supply.

It is observed that "paratransit" places much more reliance upon the market to help match supply to demand than does the conventional approach. Where operators are free to enter the business and to choose the vehicles, they will be able to respond more closely to the preferences of passengers, therefore it is not uncommon to find a variety of paratransit vehicles, which are likely to range from vehicles offering basic conditions at low fares to more comfortable vehicles at higher fares, providing different forms of services and competing fiercely with the conventional bus (Armstrong-Wright et al 1987), even though small vehicles are more likely to incur higher operating costs. Freedom of vehicle choice is thus an important factor in meeting with travel demands. Because of the operator's intimate knowledge of road conditions, levels of demand, and operating costs, buses freely chosen by operators are far more likely to be cost effective and appropriate than vehicles specified by inflexible government regulation.

In this context, the study of Beijing's minibus service has provided fresh grounds for paratransit in urban transportation. To summarize the implications derived from the "Beijing Phenomenon", there are a range of issues to be taken into account in "paratransit" planning:

First, the optimum vehicle size should be made on the basis of several criteria, such as the traffic volumes to be carried, the capacity of the city's transport infrastructure, the vehicle's load capacity and its ability to penetrate in accordance with the demand for travel and topography. In populated metropolises where travel demand is high, larger sized minibuses (midi-bus) may be more suitable provided the roads are accessible. (Thus, in Beijing, larger vehicles, say, 25 - 30-seaters may be more suitable).

Second, fares must be kept at a competitive level so that they are attractive and affordable for the majority of the citizens and to challenge the use of conventional modes and man-powered vehicles. Furthermore, since paratransit patronage is not only influenced by the price of the fare (cost for travel) but also the way fares are charged, attention should be paid to the fare structure: when a flat fare is applied, it would become more cost-effective for the passenger to use the service for long journeys, whereas it may be uneconomical for short distance travel; short journey travellers (i.e. scattered residents) would choose other modes if available (in the case of Beijing, the bicycle). In large cities of the developing world where travel demands are varied and trip patterns diversified, a graduated fare rate should be adopted in accordance with the variability of travel requirements. A flat fare rate may only be introduced on short routes and when it is still attractive compared with that charged by alternative public modes. In practice, therefore, a "pay what you ride" fare structure, whereby fares are charged according to distance travelled, is much more favourable than a "pay whatever you ride" structure in which a flat fare is demanded regardless of the distance. Meanwhile, services must be demand responsive in accordance with temporal and spatial changes.

Third, in urban areas where public transport services are provided by several operators (or by a large number of small scale operators, such as in the Southeast Asian cities), co-ordinations amongst drivers and operators can help to improve service efficiency and reliability. With stable frequencies, optimum headways on the routes may be maintained so that mean waiting time is reduced to a minimum, at the same time unhealthy competition can be avoided.

Fourth, in order to maximize the capability of paratransit in passenger movements, a market-signalled mechanism should be adopted. This may be achieved by relaxing entry control and encouraging the participation of different sectors to form a competitive business environment so that fares may be forced down to a level which reflects a state of balance between demand and supply and the affordability of the users.

Fifth, when transport organizations are privatized or expected to be self-supporting, in areas where residents are sparse or activities not attractive to travellers, demand for public transport may either be unstable or too low to be able to maintain economic services, refusals to service could occur; Subsidies may be required to maintain a basic service using probably smaller vehicles. Universal subsidies which are meant to support all citizens but often unable to reach them on equal terms, however, should be best avoided. Rather, money should be given to support the less accessible areas of the city and to the provider(s) on a basis of competitive tender; that is to say, subsidies are considered in accordance with particular geographical (spatial) rather than social (welfare) needs (i.e., low fares for all). Above all, some form of help is necessary in especially cities of developing countries, where most deprived areas are normally resided by the low-income group. Above all, rational subsidization would produce positive results provided the methods applied are appropriate.

Overall, the "Beijing Phenomenon" has implied that the minibus is potentially a dynamic mode for moving commuters in urban areas, provided appropriate planning tactics are implemented. More importantly, it has demonstrated that paratransit undertakings can be made to be self-sufficient in socialist as well as capitalist countries, though not necessarily under private ownership and in a small scale. Hence, the main factors which contribute to the success of paratransit may be re-written as below:

(a) small vehicles,

(b) entrepreneurial spirit,

(c) effective management tactics.

Although in Beijing's case there are also other minor factors contributing to the financial viability of the minibuses, the fundamental elements are nonetheless these three listed above. In this respect, the findings have indeed proved the hypothesis, and the objectives of the study are well achieved. The next chapter will build on the findings to reaffirm the overall role of paratransit in cities of the developing world.

Chapter VIII

A MODEL OF URBAN TRANSPORT PLANNING FOR DEVELOPING COUNTRIES

8.1 Introduction

Urban transport is essentially the spatial representation of dynamics in cities. There are at the same time a multi-dimensional projection of various underlying forces, such as economic objectives, safety considerations, environmental standards, energy use, land-use compatibility and maintenance of community lifestyle (Nijkamp et al 1987). The main goal of urban transport planning must therefore take all aspects of the urban society into consideration. In developing countries the need for a long term perspective is particularly fundamental.

The overall significance of the "Unconventional transport" lies in its emphasis on contributing to social and economic development. The aim of this final chapter is thus to sum up the role of paratransit in the developing world; and on this basis it will attempt to construct a model reflecting this special feature of the "Unconventional wisdom".

8.2 As A Major Passenger Carrier

The ultimate objective of an urban passenger service is to offer the population transport services at a reasonable fare, good area coverage, regular and appropriate schedules, reliability, comfort, safety, energy efficiency, and to impose minimum hazards to the environment. Therefore, the choice of a solution to transport problems of many cities should be based on the particular characteristics of the city, such as its structure, its functions, its population size and so forth (UN 1989). Venice, for example, may be better served by motorboats and gondolas. Whereas Los Angeles is argued to be unsuitable for light trains (See, for example, Richmond 1991). Thus city form is likely to influence the type of public transport that may be employed.

It is now clear that, in Beijing, conventional buses tend to be confined within broad avenues, whereas minibuses are more suitable for narrow streets. This situation is similar to that of many other Third World cities, where trips tend to be short in distance, diversified in time and scattered in orientation. Therefore, although big buses may be more cost-effective to run, they are physically inaccessible to trip ends; on the other hand, individually mobile modes (motorbike/bicycle) are more accessible to travel destinations but rather congestive due to their inefficient use of road space. In comparison, a paratransit vehicle can be seen as a reduced version of the big bus or an enlarged version of the motorbike, though what it can achieve may become impossible for either of these. This explains why paratransit accounts for as much as 60 - 70 percent of public transport output in some cities (See, for example, Jacobs et al 1987).

The role of paratransit systems is demonstrated best by their performances in Southeast Asian cities. In Jakarta, public transport is provided by 2,000 public owned and 500 privately owned large buses with a capacity of 80 - 120 passengers each, some 3,350 privately owned 20-seater minibuses and 2,000 private 10-seater microbuses. These buses carry 3.3 million passengers daily -- 1.8 million in large buses, 1.3 million in minibuses, and 0.2 million in microbuses (Armstrong-Wright et al 1987). Overall, in Jakarta, nearly 50 percent of all public transport trips are by unconventional transport vehicles (Pendakur 1984). In Bangkok, in addition to big buses, there are an estimated 4,500 to 10,000 minibuses running on the streets (UN 1989).

On the other hand, in Manila, previous studies show that when all the work and school trips are considered (including walking), 8% walk, 10% go by car, 17% by bus, 60% by jeepney, and 6% by other means (motor-cycle, taxi, bicycle). When only the trips by vehicles are taken into account (that is, excluding walking), 25% go by private vehicles (cars and motor-cycles), 50% by jeepney, 15% by bus, 9% by tricycle and just 1% by taxi (Dent 1981). Earlier as the Metro Manila Transit Corporation failed to reach the stated objectives during its first full years of operation and incurred huge deficits, the paratransit industry grew rapidly. At the time, a total of 4,800 jeepneys with a seating capacity for over 75,000 passengers -- nearly double the number of seats provided by the Corporations's fleet of 700 buses, has served the population effectively. In direct contrast to the intent of government policy and regulation, the number of buses in service in Metro Manila dropped between 1976 and 1980, while the number of jeepneys more than doubled. Concurrently, the volume of bus passengers declined by over 40 per cent while that of jeepney passengers steadily increased, until in 1980 about 85% of public transport passengers in Metro Manila used jeepneys (See, for example, Roschlau 1989). In Britain, too, one of the developed countries where the use of minibus transport is a relatively new phenomenon, the scale of operation to date has indicated that the minibus is far more than a feeder or a specialist service vehicle (Turner et al 1987).

Clearly, as suggested by the UN (1989), small sized buses are more accessible to neighbourhoods and thus can provide convenient services to the communities. Nevertheless, for the over-populated megalopoles such as Cairo, Calcutta, Bangkok, Seoul, Jakarta, Shanghai, Beuenos Aires, Sao Paulo and Mexico City, a subway or surface rail system that suits very well to high density corridors might be the best solution for providing fast transport and eliminating traffic congestion in central areas; as it probably has done in Hong Kong. However, it should be stressed that, conventional transit and paratransit are not necessarily antagonistic; in fact, they can well be designed to collaborate with each other to form an integrated urban passenger transport system, in accordance with their own ability and suitability.

In conclusion, paratransit is indeed a major passenger carrier and thus a viable solution to many cities' transport problems.

8.3 Low Labour Costs and Employability

Leaving aside physical accessibility, another important feature of paratransit is its contribution to urban economy. As argued by Linn (1979, 1983), paratransit is not only a major passenger system in carrying people and improving the efficiency of urban public transport services but also promises to promote energy conservation, foreign exchange saving, public resource saving, employment generation, regional balance, and equity.

A previous examination of the structure of operating costs in cities in developed and developing countries has revealed some interesting differences: In the UK the major cost component, about two-thirds the total, is that of staff, with maintenance and spares making up most of the remainder. Operating costs in the Third World cities are markedly different, with staff costs being about one-third the total, but with fuel and depreciation/interest costs being much greater than in the UK (Jacobs et al 1987). On the whole, from an international perspective, the ratio of manpower cost to the total cost is positively correlated with per capita national income, being about 70% - 80% of total cost in the advanced countries, 50% in Newly Industrializing Countries like Singapore, and in the range of 20% - 30% in Thailand, and the Philippines (Chujoh 1989).

In cities of the developing world, the transport sector normally absorbs a substantial proportion of the labour force, providing, in most cases, profitable jobs to the urban dwellers, especially to the poor (See, for example, Dick 1981a). Compared with expensive conventional technology, paratransit is much more labour intensive. Small vehicles can provide more jobs than large ones at the same amount of capital invested. For instance, Dick (1981b) points out earlier that the capital cost of eight 11 passenger bemo would be about the same as for one 90 passenger bus but, employment per vehicle being the same, direct employment would be eight times greater. Thus, in cities where manpower is cheap and plentiful, the ?

ability of absorbing labour for the alternative of expensive high technology and capital, is not merely a matter of job creation, but also an achievement in respect of cost saving.

The paratransit industry is particularly labour-intensive is because of its multiplier effects in the urban economy. As Roschlau (1989) finds out, in the Philippines, paratransit undertakings directly employ a large number of staff, including drivers, conductors, luggage boys, dispatchers, mechanics, wash boys, and drivers' companions. Each tricycle, pedicab, tartanilla and urban jeepney normally has one full-time or two part-time drivers. Small buses and provincial jeepneys require a driver and a conductor, with large buses often employing a driver, conductor and luggage boy. Aside from this there is a large contingent of young boys who wash the units, and companions who act as de facto conductors by assisting the drivers, who in turn pay for their food while together. While this is in part the symptom of a more fundamental problem of underemployment, it also underlines the public transport industry's ability to absorb surplus labour in a useful and productive way. Furthermore, financing companies, motor vehicle dealerships, oil companies, parts suppliers, wholesalers and retailers, manufacturers, insurance agents and the government collect monetary benefits. Thus, while income distribution within the industry is far from optimally equitable, it reaches a substantial cross-section of the population.

In extreme cases, for example Manila, the 30,000 or more

Jeepneys are a major source of employment. In 1975, about 7 percent of the city's population was dependent upon the Jeepney industry for their livelihood (Silcock 1986). In Hong Kong, there are roughly 5,000 minibuses with more than 10,000 drivers (JPCL 1985). And in Surabaya, the number of people directly employed (either full or part-time) in the transport sector is of the order of 78,000 which represents about 9% of the potential economically active population (Fouracre et al 1978).

In the case of Beijing, since the BGPPTC itself is a multiple production organization, besides providing passenger services, it also produces vehicles and transport equipments and therefore employs a considerable number of employees; though, with about 600 vehicles, the total number of staff employed by the BGPPTC for the minibuses is just over 1,500 (BGPPTC 1988a). On the other hand, there is no good information available showing the total number of people employed by the independent minibus undertakings. However, since many of them run on shifts, one may assume that each vehicle may therefore employ three to four persons on average. Again, with a total of about 600 vehicles, altogether there should be about 2,000 employees. In sum, the total labour force engaged in Beijing's minibus industry is roughly 3,500 people.

Although, at an employees/vehicle ratio of about 3/1 for the entire fleet and with a two-man crew per vehicle, the minibuses in Beijing seem to be overstaffed and have lower manpower efficiency than one-man operation, and consequently causing higher travel costs for users, nonetheless, with a two-man crew instead of one, the number of jobs can be doubled. Of course, in a built-up area of more than six million people (excluding population in the Xians) the employability of the minibuses in Beijing certainly makes no significant sense. Nonetheless, in a country where employment is already a problem, an industry which can support the livelihood of so many people is perhaps something rather encouraging. Thus, the strength of argument manpower efficiency is really dependent upon the values perceived. To the Western operator, it would be important to reduce manpower requirements to a minimum. But if transport is to be seen as a potential provider of employment and as a seed-bed for small businesses, the case of the two-man operation is strengthened.

Therefore, in developing countries, overstaffing should not be considered merely a question of man-power deficiency, but also an issue of wealth distribution between employees and the users of transport services within the community. Above all, as some writers (See, for example, Silcock 1986) have suggested, few would seriously challenge the view that transport policy and investment should seek to maximize net economic benefits, though, how the costs and benefits are calculated, and what is an equitable distribution of them, are more contentious issues.

Clearly, pursuing the more modern equipment at the expense of paratransit is having the side effect of a substantial loss of employment opportunities, as well as the diversion of capital from potentially more productive fields. Therefore, in response to the widespread poverty in the third world, a number of international development agencies have declared their intention to assist the poor to become more productive. The World Bank for example, has stated that development efforts should especially try and provide better access for the less privileged to essential public services. Unfortunately, the intentions have not been matched by sufficient action in the field. Most transport plans and projects concentrate upon making the mobile more mobile and in so doing, scarce resources are allocated to the "needs" of the more privileged and already mobile sections of the community, thus enhancing their situation. Whilst the urban poor suffer the opportunity cost of such action by being continually deprived of sufficient resources to tackle their movement problems (Dimitriou 1982).

Apparently, this is an important point concerning the issue of equal opportunities in urban development. The next section will move on to discuss the social and economic perspective of transport planning policies.

8.4 Transport Policy and the Urban Poor

The basic needs approach focuses upon critical human needs in terms of: health, food, education, water, shelter, transport, simple household goods, as well as non-material needs including: participation, cultural identity and sense of purpose in life (Linn 1983). In developing countries, the urban transport problem relates closely to the everyday life of their citizens. For the low-income group, the role of movement, as a means of furnishing access to other basic needs is obviously critical. Transport however, is not merely important to the urban poor as a means of facilitating movement. Most important of all, urban transport policy can specifically contribute to alleviating poverty. Access to employment, health and schooling facilities for example, not only raises the quality of life to those previously deprived of access to such facilities, but indeed increases their very opportunities of future survival (Dimitriou 1990).

In developing countries, typically for those who can afford public transport -- and perhaps a quarter of households are below this threshold -- 10 to 15 percent of household income is spent on transport, and sometimes up to 30 percent or more. Generally these low-income families spend proportionately more on public transport than others, while making fewer trips (almost entirely of an 'essential' nature) and usually on a poorer quality service (ADB 1989). They are thus at the margin subsistence which as Linn (1983) points out, makes them very sensitive to disruptions in their earnings brought about by inadequate transport policies.

Transport related problems among urban low income groups are exacerbated by rising transport costs and their need to travel long distances in search of employment. Given the rapid growth of cities, and the frequent location of low-income areas on the fringes of such settlements, low-income trip makers may have to travel much greater distances than they would wish. Such circumstances hamper their opportunities to engage in and contribute to economic activities of the city (Dimitriou 1990; White 1990). Not surprisingly, it is common for large fare increases to provoke civil unrest in low-income communities. Hence, for the urban poor, reductions in public transport costs open the prospect of gaining access to income-generating activities which represent their sole hope of economic advancement; and the efficiency of public transport reflected in the fare is thus seen to be of critical importance to them.

Furthermore, in many developing countries, rates of labour force growth are rising even in cases where fertility rates have begun to fall. The scope for increasing labour absorption in agriculture is often limited and, although there is substantial evidence of the growth of off-farm employment in rural areas (so that nonfarm jobs may account for between one-quarter and one-third of rural employment), job opportunities in rural areas cannot be expected to keep pace with potential rural labour force growth. Accordingly, much of the burden of labour absorption will fall on urban areas. In view of the probability that 62 percent of aggregate population growth between 1980 and the year 2000 will occur in urban areas, the estimate that about 16 million people have entered the labour force in the 1980s compared with 10 million in the 1970s, and the negligible agricultural employment growth of 0.27 percent per annum in the 1970s, what happens in the urban areas will determine the degree of success in meeting employment creation goals (Richardson 1987). The goal of employment creation is therefore a truly national goal.

The urban transport sector also consumes large amounts of public resources which have a high opportunity cost. After labour, fuel and materials constitute a major cost, especially where they are imported. Road transport in urban conditions typically consumes 30 - 40 percent of total road transport fuel, a proportion which will increase as urbanization takes place (ADB 1989). On the whole, fuel ranges from about 15 percent to 20 percent or more of total costs in Third World operations, compared with about 6 percent in Britain (White 1990). Continuity of supply is thus critical in countries where foreign exchange reserves are limited. Hence, one of the main causes for concern about the strategy of conventionalism in transport planning is its disregard of the social opportunity costs of labour and capital. Clearly, urban transport directly influences both city efficiency, and thereby the national economy, and the welfare of city dwellers.

Therefore, besides policies on population control, the degree to which urban areas in the poorest countries can satisfactorily meet even the most basic needs of their inhabitants is closely based upon the development of a more efficient and effective transport system. Effective improvements, in turn, require a close understanding of the dynamic and complex characteristics of such urban areas with their associated transport needs. A realistic but comprehensive transport planning approach is needed, one which is rooted in an understanding of the local context, offering a replicable method for identifying affordable and effective improvements and which holds the promises of increasing economic efficiency and, in particular, helping to meet the travel needs of the urban poor (Lockwood 1982).

8.5 The Need for a Strategic Perspective

The transport problem is therefore dominated by the poverty of the majority and the gross insufficiency of resources with which to tackle the problem. However, as Rimmer et al (1986) point out, while poverty may be the reality, modernity must be the image. Despite the scarcity of resources, governments in many developing countries have continued to bestow upon their capitals the visible paraphernalia of a modern city. Nonetheless, experiences in the First World countries have indicated that the engineering-based approach for transport problems offers little success for the urban transport problem. Whilst the Third World cities have very limited resources their problems are as severe as that of the First World (Bly 1987). Whether modern equipment constitutes real solutions is another question, but it is irrelevant to developing countries since they cannot afford them anyway (Thomson 1983).

Therefore, it is quite apparent that solutions from developed countries are often transplanted to developing countries with little adoption or consideration for the differences in needs, values, resource availability, climate and so on. Such transplants typically use imported technology based on the capital/labour mix optimal in developed countries, require skills, foreign exchange, or other resources that are in short supply, and fail to take advantage of resources that are really plentiful (Carter et al 1984). What is more, the new high-capacity modes often reduce accessibility for the poor for they cannot easily penetrate the narrow lanes of low-income residential areas. The conventional wisdom also discriminates against the small entrepreneur and reduces the changes of individual prosperity of the citizens. It is also inequitable in that expensive transport systems tend to benefit the better-off urban residents, who use them most.

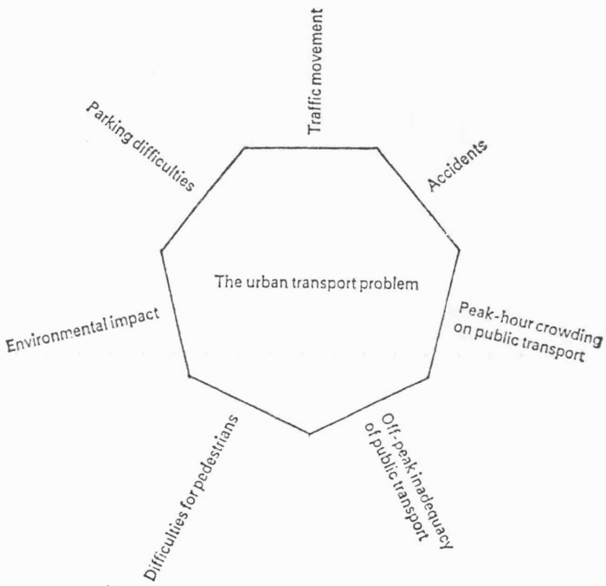
What is more, in respect of economic development, capital-intensive industries tend to be less creative in employment, except where jobs are generated as a consequence of multiplier effects of the investment. The problem is that they are often artificially stimulated at the expense of other industries. Clearly, the only possible solution for the transport problem in Third World cities -- apart from cities in a few oil-rich countries and the Newly Industrializing Countries (NICs) -- is a low-cost solution, which in practice means extensive bus priorities, traffic management and traffic restraint, together with selective road improvements. Thus, the transfer of planning technology to the developing world must be accompanied by a drastic change of values; and the task of transport planning in developing countries must place stricter emphasis on cost-effectiveness (Thomson 1983).

Apparently, due to the limitation in resources supply and the need for social and economic development, transport planning has become an ever challenging issue in developing countries. The search for a philosophical model capable of helping to balance the two sides has thus become an urgent task amongst those working in the forefront of the planning discipline. The essence of transport models is to capture some important characteristics of the real world in a way that permits easy comprehension and manipulation to aid decision. It is based on this principle that the next section attempts to construct such a model.

8.6 A Model of Resources Emphasis in Transport Planning

According to Thomson (1977), there are 7 dimensions within the urban transport problem, shown as figure 28 below:

The Condition of Transport in Cities



The urban transport problem.

(After Thomson 1977).

Thus, where **P** = urban transport problem

$$P = \mathbf{t} + \mathbf{a} + \mathbf{p} + \mathbf{o} + \mathbf{d} + \mathbf{e} + \mathbf{pk}$$

(**t** = traffic movement; **a** = accidents; **p** = peak hour crowding on public transport; **o** = off peak inadequacy of public transport; **d** = difficulties for pedestrians; **e** = environmental impact; **pk** = parking difficulties).

Leaving aside the relatively less important resources, there are five major elements to be considered in transport planning: Capital, technology, labour, time and management. The first three are functional elements measured in terms of economic availability; they vary greatly in accordance with the economic background of the city in question. The relationship between the three functional elements is that, within a given urban environment, the greater the availability of capital, the more modern the transport facilities may be acquired, and subsequently the less the manpower is needed to operate the public transport services (See fig. 29a).

On the other hand, being a useful resource, time is distributed equally across the land; it is a "neutral" property irrespective of geographical difference. Assuming the problem is manageable with the given amounts of functional resources, then time is certainly needed for the implementation of the plan; thus under this situation time always carries a positive value. And, similar to value of time, the impacts of management policies which refer to tactics such as business regulations, enterprise incentives, subsidization and so forth do not vary as far as volume is concerned; management thus carries a constant value over time rather than a functional one, for itself alone cannot solve the problem but may help to solve it. However, within any business, management is a must, be it good or bad; thus its value may either be positive or negative, but can never be equal to zero. Under these premises, the major elements in urban transport planning can be written as below:

(1) $$f(L^2 + T^2 + C^2) + tm$$

either $L^2 > (T^2 + C^2)$

or $L^2 < (T^2 + C^2)$

or $L^2 = (T^2 + C^2)$

Where

f = the functional value of (the element, depending on the volume of the element in question; where $f > 0$)

L = Labour (measured in terms of economic availability e.g., low unit cost of labour, but not on quantity of manpower; where $L > 0$)

T = Technology (vehicles, equipment, infrastructure; measured chiefly in terms of their modernness; where $T > 0$ meaning there is no negative T value)

C = Capital (money for investment, for foreign exchange; especially for infrastructural provision; where $C > 0$ meaning there is no negative C value)

t = time (time span needed for the implementation of plans, where $t > 0$)

m = management (regulations, incentives, concessions and so on; measured in terms of effectiveness; where $m \neq 0$)

(N.B. the inputs are emphasized on resources rather than costs;

thus external costs such as pollution, congestion, and travel time and operating costs are excluded).

Although cities are different in various aspects so that the requirements for each of these elements may differ, nonetheless all cities have to rely on them in dealing with their transport problems. Obviously the functional elements are basic necessities; the square values of these elements confirm their fundamental importance. Put in another way, without the square, the algebra T with the condition $T > 0$ only emphasizes the number of vehicles; it could lead to the assumption that there is at least one vehicle (or some equipment) available; whereas using the square value is to symbolize the significance of quality as well as the quantity of the element, i.e., they are not simply vehicles, but vehicles of a certain quality.

It is recognized that transport problems (defined as above) in developing cities are more serious than those found in the developed world, yet generally the former have a much thinner financial base for vast investments. Developed cities tend to have more money and more advanced technology, whereas their labour force is an expensive, even though not necessarily scarce, resource. On the one hand, in the developing city, manpower is abundant, (often) ununionized and inexpensive, whereas capital is scarce and technology often has to be imported at considerable costs. Hence, comparing the two "worlds", the differences are obvious. Overall, the relationship between the transport problems of the developing city and the developed city can be illustrated as below:

(2) $P_{dp} > P_{dd}$ (on the criteria of the 7 dimensions mentioned above)

Where

P_{dp} = the transport problem in the developing city

P_{dd} = the transport problem in the developed city

Since cities differ in urban form and the pattern of land use, the transport problem of a city is also affected by its physical structure; that is to say, the urban topography, road condition, street pattern and so on may contribute to the ease, or the degree of difficulty of the traffic, thus the value of P, which consists of the seven elements listed above, in fact also implies the impacts of the city's physical structure in urban movements.

The bigger the transport problem a city has, the more difficult it is for a solution to be found, hence, from the perspective of problem solving, there is a converse relationship between a solution and the problem. (It does not mean, however, that if there is a big solution, then there must be a small transport problem in the city). Now, assuming the elements shown (1) above may, to a highest possible degree, constitute the factors for solving the urban transport problem, then

$$(3) \qquad S \geqslant \frac{f(L^2 + T^2 + C_2) + tm}{P}$$

Where

S = solution for the problem

$f > 0 \qquad t > 0$

$m = \text{constant} \neq 0$

According to this model, due to the differences in respect of resource availability, planning strategies employed by the First World and the Third World cities differ in the emphasis of resource allocation. In the developing city where wages are low, the opportunity cost of labour is substantially lower than that of technology. Thus, cheap labour is the best alternative for expensive technology, on the other hand the technology employed should be based mainly on innovative and indigenous grounds, so that the use of capital can be kept at a level affordable for the city in question. The substitution of cheap labour for expensive technology can thus help to release capital for investment in other sectors of the economy, which may also be of fundamental importance for the urban population.

Apparently, in developing countries, heavier reliance on human energy capitalizes on a resource which is locally abundant and "recyclable"; though, the emphasis on the labour component is by no means static; it will shift in time. As the city gradually develops, particularly in terms of economic advancement, the costs of labour will nonetheless increase as a result of higher wages; at the same time the financial capability of the city is strengthened. The city will now be rich enough to acquire more advanced technology and equip new facilities. In some cases the city itself may be able to produce some needed technology locally. At this point the traffic is improved and the problem is temporarily stabilised. Because of the improved transport network the city grows further in other productive sectors, e.g., industry, commercial, tourism and so on, it may become even wealthier so that its financial base is further strengthened. Put in another way, the urban economy is now reaching a higher stage.

Following a period of stability, owing to changes occurring in the urban arena, e.g., changes in population, landuse, economic activities and so on, new transport problems emerge; the current solutions are no longer able to cope with the new challenges. A shift of paradigm in the philosophy of transport planning is required. High wages mean that labour may no longer be considered as a cheap alternative so that more attention is paid to technology. Since the city is richer than before, it may be able to acquire perhaps the more up-to-date facilities. Now equipped with modern technology less labour is required for the transport systems in service; in some cases existing workers may even be laid off. Thus, the importance of each functional element shifts gradually with the economic advancement of the city. The richer the city becomes, the greater the emphasis may be placed on technology and capital, and the lower the manpower required.

Therefore, as indicated in figure 29b, the development of urban transport systems is indeed a continuing process in a spiral shape as time rolls on: transport systems progress from low-technology at the bottom to sophisticated systems at higher positions of the "transition cone"; each city is at a certain ellipse of the continuum. Whilst most developed cities have climbed up to high levels with smaller ellipses, indicating a smaller transport problem (as compared to that seen in the developing world), the majority of developing cities are still wondering around at lower levels with large ellipses symbolizing big problems. At each ellipse previous problems are solved, whilst new problems emerge in new forms; thus there is no ultimate end for the urban transport problem; rather the development of urban transport appears in a form of retrogressive-progressive waves. In another word, there may never be a tip at the top of the cone. On the other hand, the emphasis on the functional elements shifts with the size of the ellipse; the smaller the ellipse, the greater the emphasis on

Fig. 29a

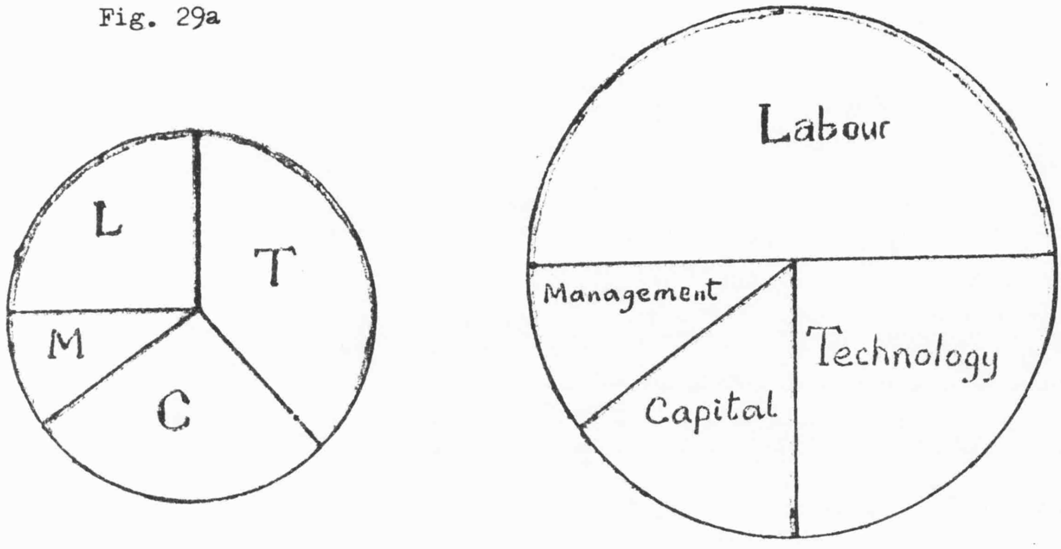


Fig. 29b

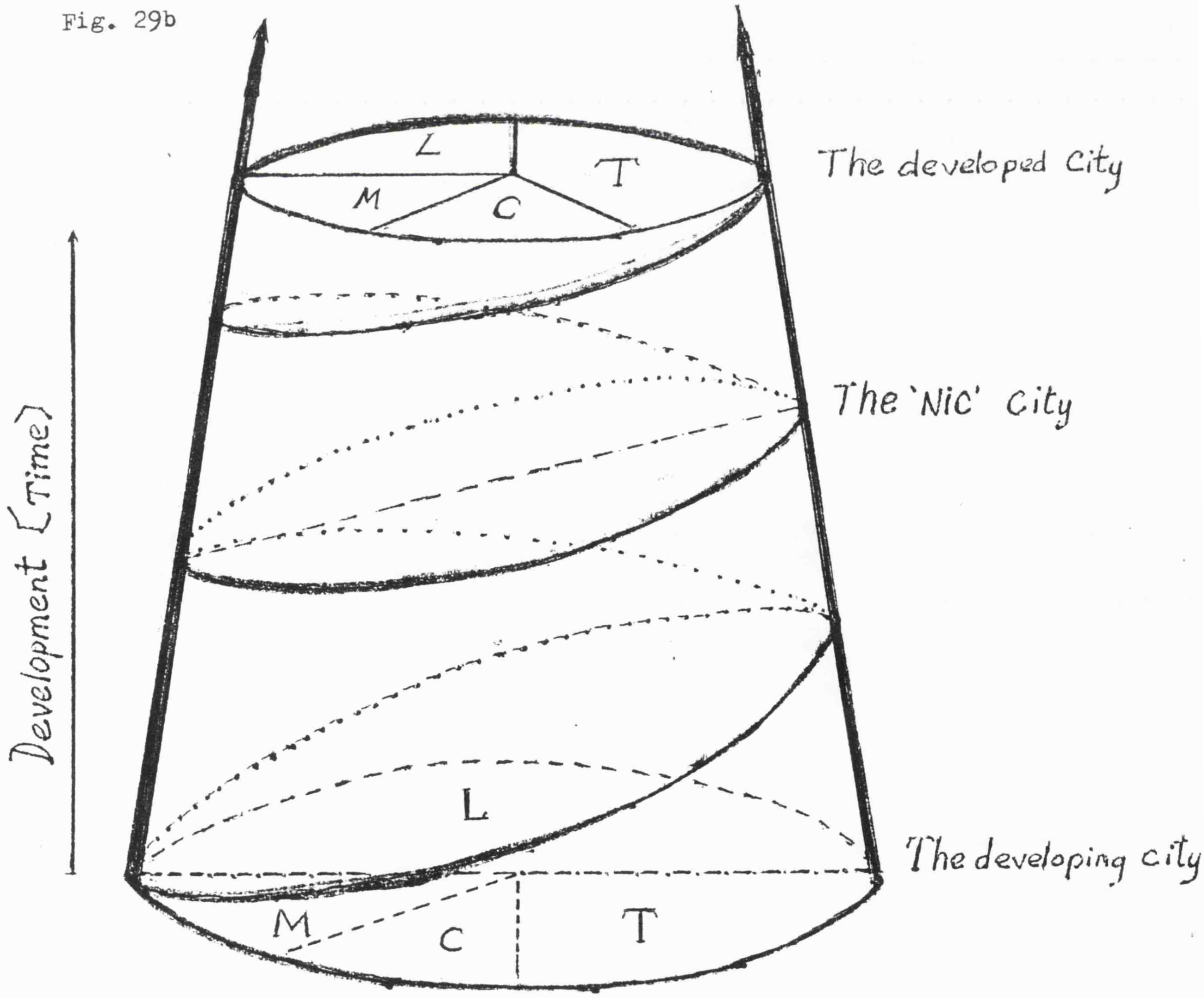


Fig.29b The Spiral pattern of Resource Reliance in Transport Planning.

technology and capital. Although this transition process may be slow and the speeds of change may differ greatly between cities, the general pattern is nonetheless so modelled.

8.7 Paratransit: A Model in the Real World

Under the model described above, the developing city starts off to solve the transport problem with heavier reliance on labour, less on finance and technology, thus,

$$(4) \qquad S_{dp} \geqslant \frac{f(L^2 + T^2 + C^2) + tm}{P_{dp}}$$

Where

S_{dp} = solution for transport problem in the developing city

P_{dp} = transport problem in the developing city

$(L^2) > (T^2 + C^2) \quad f > 0 \quad t > 0 \quad m = \text{constant} \neq 0$

In this context, the paratransit is indeed a practical version of this model. (In China the capital cost of a minibus is much cheaper than that of a conventional bus). In terms of the three functional elements and management tactics, paratransit matches the requirements shown in the equation:

(5) $$\text{paratransit} = (L^2 + T^2 + C^2)$$

where L = informal labour, based mainly on neighbourhood or kinship manpower sources, e.g., relatives and friends,

T = indigenous hardware, e.g. pecak, jeepney, samlor, minibus and other forms of small vehicles,

C = individual (family) or partnership business, small scale investment, and $f(L^2) > f(T^2 + C^2)$,

symbolizing the emphasis on cheap labour. Thus, the criteria for determining "paratransit" in this equation base mainly on the kind of vehicles used, the organizational structure of the industry, and on the emphasis placed upon each element. Take Manila's jeepney service as an example: most vehicles are manufactured or refitted with imported parts locally; and in most cases the size of the establishment is small whilst the employability of the industry as a whole is remarkably high. In this context, Beijing's minibus service also approaches the problem with similar tactics; even the state-owned fleets possess these features besides pursuing an informal working practice that normally seen only in the private sector.

Thus, when applying paratransit to the model, the solution for the developing city will be:

$$(6) \qquad S_{dp} \geqslant \frac{\text{function of paratransit} + tm}{P_{dp}}$$

where $t > 0$ $\quad m = \text{constant} \neq 0$

m = relaxed control, competitive market mechanism, enterprise spirit, route association and so on.

As a method of tackling the transport problem in the Third World city where the issue of poverty alleviation is a major concern, the "paratransit solution" (S_{pa}) approaches the problem by aiming at both economic and movement objectives. On the other hand, in respect of public transport, the developing city is characterized by three major limitations: the problem of passenger movement; the lack of finance for investment; and the high level of unemployment (or low average income for the population). Put in another way, the tactical function of "paratransit solution" is to increase employment and improve mass movement, under the restraints of limited capital and high unemployment (plus the problem of movement). This function may be written in a mathematical form as below:

$$(7) \qquad S_{pa} = \frac{J_c + M_p}{P_m + F_s + U}$$

where S_{pa} = the 'paratransit solution'

J_c = job creation, M_p = moving passengers;

P_m = problem of movement,

F_s = financial scarcity,

U = unemployment.

Once the commuters become rich enough to afford higher fares, more advanced facilities may be required. Indeed, in respect of mass movement, as the city spreads further, there is also an obvious need for acquiring modern transport means to accommodate the increasing travel demand.

Indeed, the process of shifting emphasis on resource reliance in transport planning has happened in many countries. Hong Kong and Singapore are two of the best examples whose public transport systems have more or less evolved in this way. Although nowadays paratransit still constitutes a major component within the transport systems of these cities, there are now also metros, light railways and sophisticated equipment; whilst at the same time, the labour costs are gradually catching up with those of the West. By contrast, in the Less Developed Countries such as Vietnam, the use of paratransit vehicles is still predominant, reflecting the abundance of cheap labour being utilized in substitution for expensive means.

Above all, this model does not suggest that paratransit will lose its weight in the developed city, what it implies is that transport policies must follow the needs of the changing environment on the basis of the resources available. The essence of the argument is that in low-income countries, labour is a favourable asset that should be exploited appropriately. In this context, the model in fact hints that the unconventional wisdom which emphasizes on innovative and indigenous knowhow should be encouraged and prioritized in transport planning in Third World cities.

EPILOGUE

Which Wisdom?

Although urban transport problems in developing countries may be perceived in a variety of ways, depending upon the location, wealth and motorization levels of the city concerned; transport policies obviously have to be planned in the light of urban development objectives, operating circumstances and resources available. Clearly, the argument over conventional and unconventional wisdom involves the following issues: the availability of technology in terms of costs; cross-subsidization to public transport; and employment creation for urban economic development.

The transport/development relationship is essentially a two-way interaction and the results of the interaction depend on the type of economy involved and on the level of development at which transport improvements are introduced. Development needs parallel attention to other sectors of the economy, such as mineral products, fuel, power production and agriculture and manufacturing industry. At a given stage of economic development, a certain optimum capacity level of transport facilities is required to enable the potential of the area to be developed. Insufficient transport may have serious adverse effects on the economy, while over-investment in transport can lead to waste and to the opportunity cost of not investing in other sectors (Cole 1987).

It is hardly surprising that foreign consultants tend to reject the unfamiliar pedicabs and jeepneys. As Rimmer et al (1986) suggest, foreign consultants and overseas-trained local planners with traffic engineering backgrounds instinctively look upon these simple vehicles as hindrances to smooth traffic flow and took little account of their very real, but less visible, advantages. This jaundiced view often reflates the thinly disguised role of foreign consultants as "trojan horse" to facilitate aid programmes for developing large-scale and capital-intensive public transport. The result is increasing dependence upon foreign technology, foreign capital and foreign skills -- the "Imperialism of urban public transport". Clearly, emphasizing on the conventional wisdom would further widen the gap between the wealthy and the poor; such a policy thus benefits little the majority of the population.

Transport policy in developing countries must therefore be directly and consciously linked to economic policy. The flow of technology and organizational forms from the international metropolis to the Third World town and village must take the local context into consideration. "There is a need for a prospective and longer term planning of urban development based on new concepts that will anticipate and integrate requirements for social and economic services" (UN 1989). Policies should be directed towards the introduction of intermediate technologies better suited for local communities, promoting greater efficiency in resource allocation by drawing upon entrepreneurial spirit and self-reliance.

In the past decades, the strength of the unconventional wisdom has captured the imagination and, more importantly, the financial support of many local, national, and international organizations (See, for example, Rimmer 1980). Buoyed by the steep increases in the costs of energy and operation, the World Bank insists that future lending for transport projects will be directed to low cost systems that will be flexible enough to cope with population increase and cost-effective in that an inefficient use of resources is not borne by those least able to afford them (Armstrong-Wright 1986). Overall, in conclusion, one may argue that for developing countries, the "unconventional wisdom" does offer a feasible solution to their transport problems.

APPENDIX 1:

Performance of Asian Economies 1965 - 1985

Country	1985 per capital (GNP)* US$	1985 per capital (GNP)* Relative to Philippines	Increase in per capita GNP 1965 - 1985 % per annum
Singapore	7,420	12.8	8
Hong Kong	6,230	10.7	6
Korea, Rep.	2,150	3.7	7
Malaysia	2,000	3.4	4
Thailand	800	1.4	4
Papua New Guinea	680	1.2	0
Philippines	**580**	**1.0**	**2**
Indonesia	530	0.9	5
Sri Lanka	380	0.7	3
Pakistan	380	0.7	3
China	**310**	**0.5**	**5**
India	270	0.4	2
Burma	190	0.3	2
Nepal	160	0.3	0
Bangladesh	150	0.3	0

Source: 1987 World Development Report, the World Bank
* In developing countries the cities invariably have larger recorded incomes per capita than the rural areas. Some countries have much lower urban/rural ratios than others and therefore have GNPs which substantially understate the wealth of their cities (Allport & et al TRRL CR188).

APPENDIX 2

Comparison of Conventional and Unconventional Systems

Aspect of System	Conventional	Unconventional
Business Structure		
No. of Providers	Few (can be monopolistic)	Many
Market Entry	Usually difficult	Easy (but may be regulated or subject to corruption)
Ownership	Large organization (often state-owned)	Often small enterprises
Labour	Often unionized	Non-union, sometimes family business
Costs		
Capital	High (often involving huge amounts of foreign currency	Usually low (may or may not need foreign currency

(Appendix 2 continued from the preceding page)

Labour	Variable, depending on staff to vehicle ratios	Low to moderate
Supply features		
Technology	More sophisticated (often imported)	Mainly inter-mediate
Vehicle size	Long, big and some-times articulated	Small and compact
Route/frequency	Fixed in space and time	Tends to be demand responsive
Fares	Fixed; often below required to cover costs	Tend to be flexible accordingly
Regulation and control	Often easy	Difficult

Source: Modified from Silcock D. 1986, 'Bus or paratransit?: the issues involved'. Transportation Planning and Technology vol. 10 pp.305-322.

APPENDIX 3

Capital Cost of Urban Buses
(1986)

Type of bus	Capacity Seated	Total	Purchase Price Excluding tax (US$)	
Minibus	12	20	25,000	)Usually)production
Small bus	20	30	40,000	)line)vehicles
Standard bus	40	80	50,000	
Large single-deck bus	50	100	80,000	
Large double-deck bus	80	120	100.000	
Super-large double-decker	80	170	120,000	
Articulated bus	55	120	130,000	
Super-articulated bus	55	190	150,000	

(Wider variations in price can be expected, particularly where buses are locally assembled or locally manufactured).

Source: World Bank Study (see, Armstrong-Wright & Thiriez 1987).

APPENDIX 4

Distance Travelled, Passengers & Load Factor per Vehicle
(Beijing's State-owned Minibuses)
(16 April 1988)

Company	length travelled per vehicle (km)	passengers per vehicle	load factor (%)
First Co.	8.5	13.4	81.51
Second Co.	12.0	13.3	81.78
Trolley Co.	15.1	13.2	82.50
Rental Co.	28.5	18.3	83.18
BGPPTC (Total)	12.0	13.6	81.77

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.

NB: a) Data collected on one day basis.
b) Information on Independent minibuses not available.

APPENDIX 5

Kilometres, Passengers & Earnings per Vehicle/Day
(Beijing's State-owned Minibuses)
(16 April 1988)

Company	kilometres	passengers	earnings (Yuan)
First Co.	96.74	133	183.48
Second Co.	124.11	130	234.23
Trolley Co.	131.24	98	185.40
Rental Co.	108.95	69	156.40
BGPPTC (Total)	115.31	119	188.57

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.

NB: a) Data collected on one day basis.
b) Information on Independent minibuses not available.

APPENDIX 6

Passengers & Earnings per Hundred Kilometres Travelled
&
Earning/passenger per Hundred kilometre
(Beijing's State-owned Minibuses)
(16 April 1988)

Company	No. of passengers	earnings (Yuan)	earning/passenger (Yuan)
First Co.	138	189.66	1.38
Second Co.	105	188.73	1.80
Trolley Co.	75	141.27	1.87
Rental Co.	63	143.56	2.27
BGPPTC (Total)	103	172.20	1.68

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.

NB: a) Data collected on one day basis.
b) Information on Independent minibuses not available.

APPENDIX 7

Earnings, Average Fare/Trip & Load Factors
of Different Services
(Beijing's State-owned Minibuses)
(16 April 1988)

Service	No. journeys made	Earnings (Yuan)	Fare/trip (Yuan)	Load factors %
Fixed routes	891	19,789	1.31	86.51
Non-fixed routes	1,127	30,926	1.62	79.58
Tourist routes	106	10,208.50	4.19	90.98
Collected rental	133	2,826.50	1.36	64.80
Contracted out	77	1,973	4.01	49.56
Total	2,434	65,726	1.68	81.77

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.
NB: a) Data collected on one day basis.
b) Information on Independent minibuses not available.

APPENDIX 8

Passengers' Opinions on Convenience
(Beijing's State-owned Minibuses)
(16 April 1988)

Company	No. of interviewees	Very convenient %	Convenient %	Not convenient %
First Co.	15,037	45.43	54.23	0.34
Second Co.	13,506	52.92	46.67	0.41
Rental Co.	1,172	51.45	47.44	1.11
Trolley Co.	7,597	49.80	49.56	0.65
Total	37,348	49.22	50.33	0.45

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.
NB: a) Data collected on one day basis.
b) Information on Independent minibuses not available.

APPENDIX 9

Passengers' Opinions on Service Quality
(Beijing's State-owned Minibuses)
(16 April 1988)

Company	Very good %	Good %	Average %	Not good %	Bad %
First Co.	36.75	41.36	21.69	0.20	0.01
Second Co.	36.95	37.91	24.43	0.53	0.18
Rental Co.	34.47	43.17	21.76	0.60	0.00
Trolley Co.	41.10	40.91	17.38	0.62	0.00
Total	37.64	40.08	21.80	0.41	0.07

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.

NB: a) Data collected on one day basis.
b) Information on Independent minibuses not available.

APPENDIX 10

Passengers' Opinions on Travel Costs
(Beijing's State-owned Minibuses)
(16 April 1988)

Company	No. of interviewees	Reasonable %	Expensive %	Very expensive %
First Co.	15,037	63.42	36.05	0.52
Second Co.	13,506	64.01	34.32	1.67
Rental Co.	1,172	63.65	35.92	0.43
Trolley Co.	7,597	61.58	36.70	1.73
Total	37,348	63.27	35.56	1.17

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.

NB: a) Data collected on one day basis.

b) Information on Independent minibuses not available.

APPENDIX 11

Making Change(s) in Reaching Travel Destination
(Beijing's State-owned Minibuses)
(16 April 1988)

Company	Total of interviewees	Need to Change %	No need to change %
First Co.	10,573	21.71	78.83
Second Co.	13,506	36.61	63.39
Trolley Co.	7,597	24.13	75.87
Rental Co.	1,172	26.62	73.38
BGPPTC (total)	37,348	27.53	72.47

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.

NB: a) Data collected on one day basis.
b) Information on Independent minibuses not available.

APPENDIX 12

Fares paid by Passengers' Organizations
(Beijing's State-owned Minibuses)
(16 April 1988)

Company	Total of interviews	At own expenses %	Fare paid by passengers' Organization %
First Co.	10,573	51.67	48.33
Second Co.	13,506	61.04	38.96
Trolley Co.	7,597	53.28	46.72
Rental Co.	1,172	63.65	36.35
BGPPTC (total)	37,348	55.76	44.24

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.

NB: a) Data collected on one day basis.
b) Information on Independent minibuses not available.

APPENDIX 13

Passengers' Opinions on Further Development of Beijing's Minibus Service (16 April 1988)

Company	No. of interviewees	Very important %	Important %	Not important %
First Co.	15,037	51.61	48.29	0.11
Second Co.	13,506	55.29	44.41	0.30
Rental Co.	1,172	51.20	48.12	0.68
Trolley Co.	7,597	55.87	43.98	0.16
Total	37,348	53.80	46.00	0.20

Source: Modified from 'The Collection of Major Data on the Survey about Passengers'. December 1988b, BGPPTC & MAO.

NB: a) Data collected on one day basis.

b) Information on Independent minibuses not available.

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