GREY, A., 1975, *Fares Policy* (Saxon House).

The book presents a critique of conventional transport planning models and outlines an approach to urban fares policy which includes consideration of managerial and social implications and of the legal organizational framework within which decisions are made. The aims and objectives for fares policy are set out under the general headings of social, environmental, financial and economic, and operational, and three categories of fares policy option are defined. The impact on demand and receipts of general changes in fare level arising from fares policies is discussed, and current practice in fares policy in other (mainly Western European) countries is reviewed. The book also includes an examination of the likely effects of fares changes on income redistribution and on improving travel opportunties for specific social groups.

(Author)

HUGHES, P., 1980, *Fares elasticity of suburban rail travel*. Transport and Road Research Laboratory, SR 614.

This report describes the progress made so far in an attempt to determine elasticities of demand for suburban rail travel using British Rail's NPAAS (National Passenger Accounting and Analysis System) data—a four-weekly time series started in 1971 and giving passenger flows by ticket type. It describes the method of analysis, used to determine the elasticity of rail travel demand with respect to the main types of fare used. The model used has been applied to a sample of 62 flows with origins outside Greater London and with destinations at one of the main London terminals. The analysis has covered the period from the setting up of NPAAS to the middle of 1977. Elasticities of about −0·1 for reduced-fare tickets, −0·7 for full-fare tickets and between −0·2 and −0·4 for season tickets have been obtained. A similar model applied to a small sample of flows where there have been appreciable service changes showed no plausible frequency or journey time elasticities significantly different from zero.

(Author)

PARODY, T. E., and BRAND, D., 1979, Forecasting demand and revenue for transit prepaid pass and fare alternatives, *Transportation Research Record*, 719, pp. 35–41.

This paper presents a relatively low-cost, easily implemented method for forecasting the demand and revenue impacts of alternative transit-fare prepayment (TFP) instruments and transit fares. In addition, alternative TFP strategies and their price implications are derived in some detail from basic TFP objectives. The forecasting technique focuses on computing price elasticities by individual market segments by using data from previous fare and service changes and then applying these results to forecast changes in the present transit system. The market segments are chosen to correspond with the issues being analyzed, thereby increasing the usefulness and accuracy of the procedure. To illustrate how the technique can be used to forecast the impacts of different monthly transit pass programmes along with increases in transit fares, a case-study approach that uses local data from the Jacksonville, Florida, transit system was chosen. The data required in the analyses are typically available from most transit properties; therefore, the method is readily transferable to other areas.

(D. J. B.)

TRANSPORT REVIEWS, 1981, VOL. 1, NO. 2, 151–168

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# Urban paratransit in the Developing World

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ABSTRACT

In recent years, transport planners in western cities have shown increasing interest in the testing and application of 'unconventional' public transport, to explore means of providing public transport services in those situations where it is not considered to be practicable or economic to operate conventional rail or stage carriage bus services. Various experimental services have been introduced in both urban and rural areas, the U.K. perhaps emphasizing the latter, as exemplified by the RUTEX programme of unconventional, experimental services, introduced with Government support. Ridership on such systems is, however, very small, often measured only in hundreds per day in urban areas and in tens per day in rural areas.

Many western transport planners seem not to be aware, or choose to ignore, the fact that most developing countries have a variety of public transport systems, some carrying passengers numbered in millions per day. Generally these systems have 'just grown', rather than resulting from sophisticated transport plans. Whilst such evolution does not guarantee desirability in a social context, or ensure 'adequate' standards of safety, the transport systems which have evolved do seem to perform well with respect to local conditions and needs: it may well be that useful conclusions which will have implications for public transport in western cities can be drawn from examining the 'unconventional' operations of the Developing World. Many are privately owned and operated and almost all are commercially successful for their owners; the 'Jeepney' in the Philippines and the 'Public Light Bus' (PLB) in Hong Kong are well-known examples. This paper discusses such systems, attempts to identify their characteristics and compares these with more 'conventional' passenger transport modes.

## §1. INTRODUCTION

### 1.1. *Background*

The fundamental importance of transport in the functioning of cities is widely accepted although the traditional view of transport as an urban service is changing with the recognition that a transport system is also an integral part of the urban fabric. As Thomson (1977) points out in his intriguing review of transport issues in 30 major cities around the world, cities are made up essentially of buildings *and* transport. Indeed in the modern cities of North America transport facilities can occupy up to 40% of the land surface in the city centre.

Whereas the proportion of a city which is its transport system may well be less in the Developing World transport is recognized as a prerequisite of urban development. The World Bank, in its sector papers on urbanization (1972) and urban transport (1975), states this very clearly. The need for an efficient transport system, to meet the present demands of the city and to provide a basis for its growth, is not disputed. What is disputed, and often hotly, is an appropriate definition of 'efficient'

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in this context. Even in circumstances where political ideology and absence of corruption admit some technical debate, transport investment decisions depend largely upon the prevailing economic philosophy and the relative strengths of the pressure groups involved, rather than upon reasoned argument and the evidence available from the world at large.

There are many aspects of transport where such disputes take place. The area to which this paper is a contribution is the 'big or small' debate in urban public transport. In particular 'paratransit' in the cities of the Developing World. The objectives of the paper are modest. It attempts to review the characteristics of such systems, to discuss various attempts which have been made to classify them and to compare paratransit operations with more conventional passenger transport modes. From this certain conclusions can be drawn which may be of value elsewhere. It must be remembered, however, that generalizations in the urban transport field may dangerously mask the complexity of the issues. To assume a universal 'best' policy is unwise.

### 1.2. *Definition of paratransit*

The term, like many of the systems to which it is ascribed, is a mix of the old world and the new, the Greek prefix 'para' (in the sense of beside, or irregular) attached to the American term 'transit' (public transport, usually buses). Broadly interpreted the word can be, and often is, applied to any form of public transport which lies in the spectrum between conventional bus services and taxis.

In North America and Europe it is more commonly applied to 'car-pool' and 'dial-a-ride' types of system; in the Developing World it is more usually attached to shared taxi services and on occasion to such man-powered modes as cycle-rickshaws.

The term will be used here to describe motorized public transport modes which have some flexibility in at least one of the characteristics of route, frequency, or fare, in contrast to bus or rail services which are assumed to be constrained in all three. This definition thus includes shared taxi types of operation, but excludes conventional taxis serving only single passengers or affinity groups. In practice almost all non-motorized modes function as taxis, their size and practicable journey-length prohibiting use by more than one person or small affinity group.

## §2. Urban transport in the developing world

### 2.1. *Urbanization and car-ownership*

The extent of world urbanization is increasing rapidly. Between 1920 and 1970 the proportion of the world's population living in towns and cities increased from 19 to 37% and by 2000 over half the world's population is likely to be living in urban areas (World Bank 1979). Table 1 illustrates this and shows an average current growth rate of urban population in the Developing World of 4% per annum.

Such averages, of course, mask a wide range. Annex 1 of the *Urbanization Sector Working Paper* (World Bank 1972) lists several countries with urban population growth rates in excess of 9% p.a. and many greater than 7% p.a.†. This phenomenal growth is exemplified by looking at the largest cities. In 1950 only one Developing World city had a population over 5 million (Greater Buenos Aires). By the year 2000 there will be 40 of this, or greater, size (World Bank 1979).

† At 7% p.a. growth, a city's population will double in a little over a decade.



Table 1. World urbanization rates and urban population growth, 1950–2000.

| | Urban population as a percentage of total population | | | Average annual percentage growth of urban population | | |
|---|---|---|---|---|---|---|
| | 1950 | 1975 | 2000 | 1950–60 | 1970–80 | 1990–2000 |
| Developing countries | 20·6 | 31·1 | 45·8 | 4·0 | 4·0 | 3·5 |
| Industrialised countries | 62·4 | 74·4 | 83·6 | 2·0 | 1·2 | 0·8 |
| Capital surplus oil exporters | 16·9 | 55·5 | 77·9 | 7·9 | 7·1 | 3·1 |
| Centrally Planned Economies | 20·7 | 34·4 | 49·2 | 5·2 | 2·7 | 2·4 |
| World | 29·0 | 39·3 | 51·5 | 3·5 | 2·8 | 2·6 |

Source: World Bank (1979), Table 31.

Population growth on this scale brings many problems, not least for transport. The rapid rate of change, whereby populations and the urban area may double in a decade or less, is perhaps the predominant characteristic of Developing World cities that sets them apart from those in industrialized countries. It is certainly a crucial difference when examining transport systems.

There are, of course, a great number of other determining factors, two of which stand out as of particular importance for urban transport. Both are manifestations of economic circumstances: the dearth of infrastructure; and wide disparities of personal income and wealth, with large numbers of poor people.

The dearth of infrastructure can be seen in a number of ways: a poor road system whose streets often also fulfil the roles of market place and monsoon drainage channels; dilapidated—and to western eyes, unsafe—vehicles; and perhaps most evident of all the overloading of public transport vehicles and the masses of would-be passengers waiting by the roadside. In more quantitative terms table 2 shows buses per 10 000 population for a number of cities. The numbers presented must be treated

Table 2. Buses per capita in a number of cities.

| City | | Year | Population (thousands) | Buses | Buses per 10000 population |
|---|---|---|---|---|---|
| Addis Ababa | (1) | — | 500 | 135 | 2·7 |
| Bombay | (2) | 1979 | 7000 | 1832 | 2·6 |
| Calcutta | (3) | 1977 | 4800 | 2400 | 0·5 |
| Istanbul | (1) | — | 2000 | 498 | 2·5 |
| Kuala Lumpur | (4) | 1977/8 | — | — | 5·0 |
| Pune (India) | (4) | 1977/8 | — | — | 3·0 |
| London | (1) | — | 10236 | 7917 | 7·7 |
| Milan | (1) | — | 1721 | 1241 | 7·2 |
| Tel Aviv | (1) | — | 750 | 775 | 10·3 |
| Washington | (1) | — | 1500 | 1192 | 7·9 |

Sources: (1) Zahavi (1976) (dates to which data pertains is uncertain); (2) Buchanan (1980); (3) Thomas and Sengupta (1977); (4) White (1980).

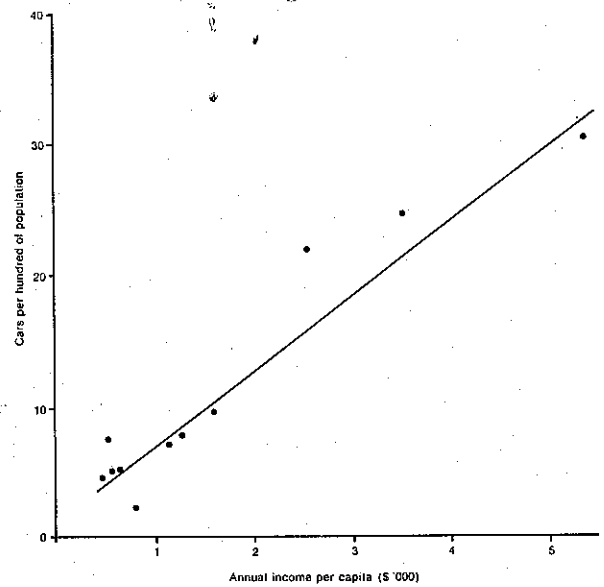
Note in all cases there is debate about what constitutes the urban area and what bus fleet serves, as opposed to is registered in, that area. Consistency of definitions is not claimed.

with great caution as definitions of both urban area and populations within or serving them are debatable. Nevertheless there is a suggestion that cities in the better-off countries have more buses per head than do those with lower GNP per capita. This contrast becomes starker when the very much higher levels of car-ownership in the former group are taken into account.

The relationship between car-ownership and per capita incomes is shown in fig. 1. This illustrates the commonly observed increase in car-ownership with wealth. In continental terms Zahavi (1976) cites a 1972 world car population of 219,253 million. Of this figure some 85% were in North and Central America, Europe and the USSR; Asia had $7\frac{1}{2}$% and Africa only $1\frac{1}{2}$%. Looked at in terms of cars per 100 persons the 1972 world average was 8·0: North and Central America had 32·1 whilst Asia, Africa and South America combined mustered only 1·3.

Despite their relatively low national car-ownership levels the larger cities of the Developing World are renowned for their chronic congestion; Lagos, Tehran, Bangkok ... the list of contenders for the 'worst' traffic conditions is a common topic of debate amongst the cognoscenti. The traffic problems of the largest (usually capital) cities stems in no small part from the concentration in them of national wealth and power. Jacobs and Fouracre (1974) have illustrated the very high proportions of total national car population in some cities which stems, no doubt, from the concentration of political power and personal wealth in the capitals. This is rarely matched, however, with the public wealth or political will to provide for, or control, the motor car. Such circumstances, combined with poor traffic management, lead to inefficient and probably inequitable use of the infrastructure which exists. Congestion for both car and public transport user is the result.

Fig. 1.




Car-ownership versus income in various cities in 1970.
Source: Zahavi (1976) Table 1.6.



### 2.2. *Modal split*

The term modal split conventionally applies to the percentages of motorized travel made by private and public modes; private being car and sometimes taxi; public being bus, rail, etc.... In Developing World cities there are two major problems with this simple binary division: firstly walking may well be a significant mode; and secondly the 'etc....' may include a number of modes with a significant percentage of the total.

The extent of available data on walking as a mode of transport is limited. Nevertheless, in the poorer cities, it is undoubtedly very important as many cannot afford even the cheapest public transport. The degree to which paratransit can offer an alternative to walking is therefore dependent upon its price.

Table 3 presents estimates of the proportions of daily motorized travel by various modes in various cities. The category 'other' is predominantly paratransit and it can be seen that in certain cities paratransit modes cater for a significant part of the overall motorized travel pattern. Where the total of daily journeys is in the millions the patronage of the paratransit systems is thus seen to be substantial. For example Seneviratne (1979) estimated that the 4300 PLBs registered in Hong Kong in 1978 carried 1·5 million passengers per day.

Table 3. Modal split in various cities.

| City | | | Proportion (%) of motorized travel by | | |
|---|---|---|---|---|---|
| | | | Car | Bus | Other |
| Bangkok | (1970) | (1) | 29 | 59 | 12 |
| Hong Kong | (1977) | (2) | 30 | 39 | 31 |
| Jakarta | (1972) | (1) | 29 | 49 | 22 |
| Karachi | (1971) | (1) | 16 | 63 | 21 |
| Kingston | (1978) | (3) | 36 | 49 | 15 |
| Manila | (1974) | (4) | 29 | 22 | 49 |

Sources: (1) World Bank (1975); (2) Wilbur Smith and Associates (1976); (3) Heraty (1979); (4) Freeman Fox and Associates (1977).

## §3. Characteristics of paratransit systems

Section 1.2 contains the broad definition of the term paratransit used here. Useful summary descriptions of a number of operations are given by Grava (1978) and Runnacles (1976). They encompass a very wide range of characteristics and in seeking generalizations it is difficult to decide where to begin. Four main headings are used here to describe their characteristics: vehicle type; operations; price; and ownership and employment.

### 3.1. *Vehicle type*

There are examples of water and rail based paratransit systems to be found, such as the 'long-tail boats' plying the river and khlongs in Bangkok and the rail carts (illegally) making use of the seasonally-used narrow gauge sugar refinery railways in the Philippines. In the great majority of cases, however, paratransit is road-based and competing with a more or less conventional bus system.

The vehicles usually are smaller than buses and often are locally made or modified versions of vehicles initially intended for uses other than public transport. Arguably the most picturesque version is the Filipino jeepney which has its origins in the surplus of US army jeeps immediately after World War II. These jeeps filled what was thought to be the temporary vacuum in the public transport system caused by war damage. In fact they have become the mainstay of public transport, both in Manila and elsewhere in the Philippines, and their manufacture, maintenance and operation is now a thriving industry. The locally assembled vehicles resemble jeeps only in concept; most accommodate 14 seated passengers in a flamboyantly hand-painted body with elaborate chrome-work, streamers, lights and quadriphonic sound! The total effect is a magnificent machine which is recognized as a folk art as well as a public transport vehicle.

Many other examples can be quoted where local ingenuity and financial constraints have resulted in modified vehicles performing, in the local context, as very satisfactory public transport vehicles. Examples of new, imported vehicles being used are much fewer; they are usually 'minibus' versions of light vans such as the 14-seat Nissan Echos which are the predominant type of Public Light Bus in operation in Hong Kong.

The main controlling factor on vehicle type is undoubtedly cost; primarily initial cost but also the running costs of spares for maintenance, fuel and suchlike. This is particularly so in countries without any local vehicle manufacturing capability where financial issues strongly influence the size and type of vehicle. Whether these are secondary to any government controls on vehicle type is difficult to establish. It is probable, however, that where they exist, removing such controls would lead to some larger paratransit vehicles and a broader mix of vehicles sizes coming into use.

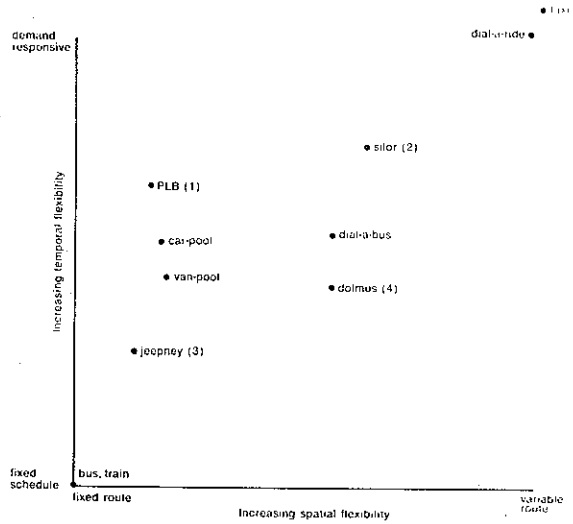
### 3.2. *Operations*

The flexibility of operation is one of the main aspects of paratransit cited by transport planners. Flexibility, that is, in terms of route and frequency, which generally lead to claims that the systems are demand-responsive. Public transport systems can be described with reference to a diagram such as fig. 2 where the axes represent spatial and temporal flexibility. Thus a railway system which is constrained to its tracks and timetable, or a bus operating to a fixed route and schedule, appear in the bottom left hand corner of the plane. A taxi, which goes where and when its passenger require it, appears at the top right hand corner. The space between is the domain of paratransit and systems can be compared in terms of their relative operational flexibility by examining their position on the plane.

When considering the demand-responsive nature of the systems it is the rate at which change can occur which is important. Bus routes can and do change as demand changes, but it is a lengthy process. The term, demand-responsive, implies an almost immediate change or response as circumstances alter. This may be a change in frequency to cater for fluctuation in demand by hour of day, changes in routes served to cater for spatial shifts in demand, or, in the case of the dial-a-ride concept, responding on a passenger by passenger basis to travel requirements. It is also important to recognize the need for a rapid evolution of the transport system as the city expands. The rates of urbanization quoted in table 1 are wellnigh impossible for any planning or administrative system to deal with. Capital resources are not available, qualified staff are in too short supply and bureaucracy and a degree of



Fig. 2.




Domain of spatial and temporal flexibility for public transport. (1) Public Light Bus: a minibus service in Hong Kong; (2) a shared taxi type of operation in Thailand; (3) a fixed route minibus type of service in the Philippines; (4) a shared taxi in Turkey.

corruption constrain change. It is generally only the paratransit system which can match the rate of expansion of the city.

The typical paratransit driver exercises his own judgement on when and where to seek passengers, subject to any overall constraints on routeing or despatching which will apply equally to his colleagues/competitors. Constraints on where he goes are more common than those on when he goes; most paratransit systems have a considerable degree of temporal flexibility. They are unconstrained by timetables and each individual driver usually is free to time his journeys as he feels. This results in high peak period frequencies when demand often exceeds supply, but often leads to lower off-peak frequencies as a consequence of drivers waiting for a full-load at their terminal points before setting off on a journey. The service level for those wishing to board between terminal points is thus relatively poor, vehicles are infrequent and may be full when they do arrive.

Spatial flexibility is more common on the jitney (shared taxi) type systems where the driver develops his route on the basis of where his passengers want to go. (Usually the first one or two passengers to board determine the route; others are only picked up if they want to travel to somewhere close to that destination point, or elsewhere *en route*.) Other systems operate to a predefined route basis which may be determined on a very short timescale and be displayed by the driver on a journey to journey basis, or be a condition of vehicle licensing on an annual, or even lifetime, basis.

The ability of the system as a whole to be demand-responsive depends critically upon the extent of such constraints. In their absence drivers seem able rapidly to respond to changing travel patterns and new services appear where demand

manifests itself. It must be remembered, however, that commercial viability is fundamental to these systems and maximizing revenue is the driver's paramount concern.

### 3.3. *Price*

It is common for farescales to be defined and levels fixed by government or trade associations. It is by no means uncommon to find such regulations abused, either overtly by direct overpricing, or in more devious ways such as turning journeys short (that is not completing the advertised route, but ejecting the last few passengers before the end in order to turn and commence the return journey, where more passengers may be available). Some operators claim that fares are fixed at levels higher than they wish, but cases of deliberate under-pricing are rare.

The mechanism of charging usually is a flat fare paid to the driver and, even where regulation does not require it, convention is that the great majority of drivers follow common practice.

One of the few examples of an openly market-oriented system is the PLB in Hong Kong, where no government fare controls exist. In normal circumstances all drivers plying a route will charge the same fare, agreed in advance by a trade association (alleged to be under the control of organized crime). During peak periods this fare will be increased, often to twice the normal amount, and in exceptional circumstances—such as extremely adverse weather or periods of very high demand like a major sporting event—fares can increase fivefold.

The fare being charged for a journey must be displayed, so passengers have the option of not boarding the vehicle if they regard the journey as overpriced at that time. This allows first-hand observation of the laws of supply and demand. This author has watched would-be passengers clustered in a doorway on a rainy evening, mostly refusing to board a single waiting PLB asking about US$1·0 for a journey. The arrival of a second or third vehicle soon brings the price down to 60 or even 40 cents and the passengers go on their way—a little later and wetter, but having exercised their powers as consumers! Such direct examples of the market at work are, however, rare in the urban public transport field. Seneviratne (1979) has estimated that 7 to 12% of PLB passengers in Hong Kong pay higher than 'normal' fares.

Looking at the general level of fares charged by paratransit with respect to more conventional bus systems in the same locations leads one to conclude that the systems generally aim at the upper end of the market. Case (1980) has examined public transport systems in a number of cities in Southeast Asia and found that what he terms Personalised Public Transport generally is more expensive to users than other public transport modes. Given that any form of public transport is beyond the means of a significant proportion of the population of many Developing World cities then it may be argued that paratransit is not particularly suited for a developmental role in the Third World.

In Kingston, Jamaica, for example, Heraty (1980) found that the lowest income households spent over 30% of their income on travel and about three-quarters of households with incomes under U.S.$100 per week (the level above which car-ownership begins to influence travel expenditure) spent at least 16%. In Kingston the minibus fares were just above the level of bus fares, no public transport being particularly cheap. It can be seen, therefore, that transport costs are a major factor in the cost of urban living for the lower income categories.

However, there are other aspects to development in addition to catering for the needs of the very poor, desirable though this clearly is. Certainly the profitability of



paratransit offers an avenue for entrepreneurial activity that may not be available elsewhere in the economy. It must also be remembered that most publicly-owned bus operators lose money, although most would accept that economic rather than financial, viability should form the basis for evaluation.

### 3.4. *Ownership and employment*

Paratransit ownership is overwhelmingly private and the owner/operator is commonplace. There are examples of cooperatives where the operator members collectively own their vehicles and utilize common resources for maintenance and the like, but it is probably true that the most common circumstance is the owner of a single or few vehicles who rents them out to regular drivers. A few owners may possess large fleets, but this is rare. In Hong Kong, for example, in 1978 74% of vehicles were owned by the registered owner of just one vehicle; only 3% of registered owners had more than 10 vehicles. (Seneviratne 1979).

The jeepneys in Manila represent a common rental structure. The renting driver(s) pay a daily 'boundary fee' to the owner which depends upon the size of the vehicle, the hours used, the age and state of repair of the vehicle including accessories (e.g. radio, tape systems), and the route profitability as perceived by the owner. The driver then pays for his fuel, any minor running repairs, small charges to a despatcher and for vehicle washing, and 'tong' (bribes) out of the fares collected. The excess of fares over all of these costs represents the driver's net income. It is interesting to note that, for one particular route in Manila, Pendakur and Riguera (1976) have estimated that drivers' net income would increase by up to 29% were tong not to be paid.

It is claimed that owning a jeepney is very profitable, but firm evidence is not avilable. However, in Hong Kong, there are strong indications that PLB ownership is very profitable indeed. Present government policy restricts the number of licenses to 4300 and when licenses change hands the reported price is as high as HK$250 000 (say US$50 000). Conversely, Heraty (1980) suggests that minibus operation in Kingston only appears to be profitable if depreciation is excluded: returns do not provide sufficient income to meet the costs of vehicle replacement.

By their nature paratransit systems must be financially viable; the extent to which this translates into a large profit or scratching about 'to make ends meet' seems to vary widely. Detailed comparative analysis is not possible due to paucity of financial data; however, the extent of legal controls on entry to the business, operation and fares seems to be important. The more controls, the less the profit. Hong Kong has few controls and large profits, although government restraints on fleet size clearly influence fares. Manila has route licensing and fares controls but licenses can be 'bought' and overcharging can, and sometimes does, occur. The consequence is a profitable operation but not to the same extent as Hong Kong. In Kingston most operators contravene the licensing laws, fares are controlled and the profitability of the minibus operations is doubtful. To a large extent, therefore, paratransit profitability is a function of imposed constraints.

It can be argued that the most pressing problem associated with rapid urbanization is that of employment. If people can be provided with jobs then they can avoid much of the indignity and suffering prevalent in the cities of the Developing World. In this context a labour-intensive transport industry is held to be attractive, not only because of the direct employment opportunities but also looking to the complementary employment opportunities in vehicle manufacture and

maintenance. Paratransit systems often utilize locally made, or modified, vehicles. They do not require import of specialized equipment which pre-empts limited hard-currency expenditure elsewhere. Also, they are simple and do not require highly skilled labour or special equipment for maintenance.

Pendakur and Riguera (1976) have estimated that the 15 000 jeepneys in Manila in 1975 supported some 300 000 Manileños, about 7% of the then metropolitan population. A substantial contribution to the economy of the city is thus made by the jeepney system. It should be noted however that many Developing World publicly owned bus systems employ very high numbers of staff and it cannot always be claimed that a paratransit alternative would be more labour intensive. Whether the public bus companies *should* employ so many people is, of course, a different question.

## §4. Classification of paratransit systems

### 4.1. *Different approaches*

A number of writers have attempted to categorize paratransit systems in a variety of ways. Fouracre and Maunder (1979) divide them into 'bus-like' and 'taxi-like'; Rimmer (1976) considers a 'corporate' and an 'unincorporated' transport sector; Ecoplan International (1977) group modes by ownership and operation; and Case (1980) emphasises flexibility in a 'personalised public transport' when compared with conventional public transport. All these have their strengths and weaknesses but the great variety in the nature of paratransit systems means that there is no obvious title which comprehensively describes the range of services in existence. They can be seen acting as small buses on fixed routes with zonal fares, as do the Carros por Puesto in Caracas. They can be seen with variable route, variable fare operations (the PLB in Hong Kong), as fixed route shared taxis (the dolmus in Ankara) and as variable-route shared taxis (the silor in Chieng Mai). Vehicles vary from purpose-built minibuses meeting Government safety standards (the PLB in Hong Kong) to old trucks (Mammy wagons in Africa). 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 are illegal; few are cheaper than conventional buses most are popular amongst users. The list of possible comparatives is a long one and the only truly common factor seems to be that all are (allegedly) subject to extortion and protection rackets, often by the local police! Despite this, in seeking general lessons from the diversity, it is helpful to attempt some broad classification.

### 4.2. *The user's viewpoint*

First, consider the viewpoint of the user and two important aspects of the system: the level of service; and the price. Figure 2 portrays various public transport systems in terms of their spatial and temporal flexibility. As has already been pointed out, the paratransit modes have varying degrees of flexibility in these respects, but generally more than conventional bus or rail systems. The user may see this in two ways: the ability to react to changes in the pattern of demand over the day or in response to urban expansion may well be seen as beneficial; conversely, the uncertainty which is a corollary of flexibility may introduce an element of mistrust. In practice, it should be said, such uncertainty is often small in all but outlying areas in off-peak times. The density of service is usually such that there is a high probability of a vehicle going



where you want at most times of day. Indeed the higher frequency service offered by the smaller vehicle is undoubtedly a point in paratransit's favour in most users' eyes.

Other aspects of service must also be considered. The greater personal contact with the driver/conductor, particularly in those situations where a close link is forged with a particular community or affinity group, is welcomed in many societies. The smaller vehicles used may provide seated travel for all passengers and in tropical climates give better ventilation. In some cases the 'benefits' provided by radios or tape cassettes are much appreciated by passengers in the long crawl through congested urban traffic.

The price to be paid for this 'better' service is a higher fare, although the extent to which the operating costs of paratransit truly do exceed the cost of bus operation is difficult to establish. Walters (1979) argues that 'small is cheap', citing the minibus operations in Kuala Lumpur in comparison to the conventional bus services as one example amongst many. Walters's argument, more strictly, is publicly owned big-bus versus privately owned small-bus, and size of vehicle is probably less important than the institutional factors. The price of paratransit operation may reflect market conditions rather more than do bus fares in some cities; it must be noted however that often fares are controlled so that bus and paratransit fares are similar or identical.

Case (1980), in a review of public transport in cities of South-East Asia, demonstrates that there is some relationship between route flexibility and fare. Those systems operating to fixed routes, often as small buses, were similarly priced to the bus systems in their cities. The more flexible paratransit systems usually were more expensive. Whether this reflects greater operating costs or more freedom in setting their price is not clear; what is clear, however, is that there is a substantial proportion of those in the travel market who are willing to pay a higher price for a service they perceive as better, even in relatively poor cities in the Developing World.

### 4.3. *The operator's viewpoint*

A consideration of the operator's viewpoint must first define what is meant by operator. To the professional transport manager in a large western bus operation most paratransit systems appear to be chaotic and unmanaged—which, in his terms, they are. To the entrepreneur, without an interest in transport as such, the paratransit system may offer an opportunity to enter the business world on a small scale where 'management' is not a relevant concept.

The attractiveness of paratransit operation as an activity will depend upon the potential return and the ease of entry to the business. In the currently foreseeable situation in Third World cities, with rapidly expanding travel demands, neither presents much cause for concern. Capital requirements are limited, labour is abundant and the skills required are not great. The opportunities offered to those in support are similarly attractive, particularly in the construction and maintenance of vehicles.

### 4.4. *The Government's viewpoint*

Most governments are ambivalent in their views about paratransit. Their own planners and bus operators (of the often state-owned system) tell them that 'rationalization', 'integration', or 'coordination' are necessary, that competition is unfair and that such systems exploit the population. Official police policy is almost always against them (but the contribution of bribes to some policemen's incomes

may suggest an alternative view). Conversely, governments recognize the contribution to employment which the systems offer, are aware of the (probably insurmountable) problems of replacing them with anything else and, in some cases, the owners themselves form a powerful pressure group.

Planners' arguments often stem from a traffic engineering viewpoint, which states that one 60-seat bus is clearly a more 'efficient' user of roadspace than four 15-seat minibuses, thus having a lower 'congestion cost'. Whilst this may be so in terms of occupancy of carriageway for a line-haul type of operation along a densely trafficked corridor, it is far more debatable when diffuse travel patterns prevail and there is no obvious line-haul.

Traffic safety is another topic which arouses heated debate. Whilst few would argue that many paratransit drivers have good traffic manners, and often a paratransit vehicle is inolved in more accidents in its lifetime than other vehicles, the picture may well be very different when expressed in terms of accident rates, that is accidents per vehicle-kilometre or per passenger-kilometre. Unfortunately statistics of this kind are hard to come by.

## §5. Comparison with 'conventional' systems

The main characteristics of Third World paratransit systems emerge most clearly when comparisons are made with conventional bus systems. The terms "corporate" and "unincorporated", used to describe transport modes by Rimmer (1976), have been developed for such comparisons by the present author (Silcock 1979). Table 4 follows this approach and summarizes the major differences under four headings: business structure; supply conditions; demand conditions; and external effects.

The essential differences in business structure lie in the size of the operating companies. Paratransit systems are aggregations of many small businesses, often fiercely competitive. The western bus systems are large, often monopolistic, and bureaucratic in their management, particularly when publicly owned.

Supply conditions relate mainly to the user's viewpoint of the service, as has been discussed earlier. The corporate industry is fully controlled and the passenger knows (subject to some qualification depending upon the availability and comprehension of information) what to expect. Flexibility is the keynote of paratransit, which brings with it a degree of uncertainty. The uncertainty may be high in those parts of the system which are felt to be unprofitable, while in the busier parts of the system service level is probably higher than that provided by the corporate operator.

The main feature of the demand conditions are the contrasting rates of change. There are few cities in the non-communist Western world where demand for public transport is increasing; there can be few cities in the Developing World where it is not, often at a spectacularly high rate as a consequence of burgeoning population growth. Alternative means of transport may also be difficult to find in these circumstances which tends to produce a lower price elasticity of demand than prevails in the cities of the West.

External effects is a rather loose term intended to cover the broader comparisons between the two types of transport system. The more important ones identified in Table 4 are the employment aspects, the comparison between deficit operation and the profitable avenue for the entrepreneur, and social aspects in so far as the systems may impinge upon social mores.



Table 4. Comparison of Developing World paratransit and Western 'corporate' passenger transport.

| Aspect of system | Western 'corporate' passenger transport industries | Developing World paratransit |
|---|---|---|
| Business structure | | |
| Number of sellers | Few (often monopolistic) | Many (often competitive) |
| Market entry | Very difficult | Generally easy (but can be expensive) |
| Source of labour | Union controlled, often short supply | Abundant |
| Ownership | Usually single ownership, often Government | Diffuse, often family ownership |
| Accounting methods | Audit, often publicly accountable, detailed budget-control | No audit, little accountability, no budget control |
| Government controls | Strong, easy to implement | Weak, difficult to enforce |
| Cost structure | High fixed costs | Low fixed costs |
| Supply conditions | | |
| Service type | Scheduled | Demand-responsive |
| Price | Controlled | Market-responsive, although nominally controlled |
| Equipment | Expensive, limited sources of supply | Often cheap/local improvisations |
| Demand conditions | | |
| Method of purchase | Fixed price | Often negotiable (generally with respect to accepted base) |
| Travel demand | Slow rate of decline | Rapid rate of increase |
| Price elasticity | Moderate (say −0·5) | Low |
| External effects | | |
| Employment opportunities | Moderate; institutionalized and skills required | Many; open market, limited skills |
| Economic impact | Deficit operations but seen as 'essential' | Profitable business; avenue for entrepreneurs |
| Social aspects | Anonymous big business, prone to bureaucratic inefficiency | Prone to corruption |

In looking towards the reasons for success of paratransit in Third World cities several of these comparisons stand out. The expansion of the market, the lack of governmental controls, the structure of ownership and the flexibility of labour would be at, or near, the top of most lists of reasons for their success. Perhaps the first pointer towards conclusions is that the contrast between the western corporate and Developing World paratransit industries is very stark in these aspects.

## §6. Conclusions

Arguably, it is easy to sell a product or service in an expanding market; the product need not be so good nor the seller as efficient when compared to the difficulties of a declining market. If so, it may be claimed that almost any transport

system will succeed if demand is rising rapidly and most will meet problems as demand falls.

The situation in Western cities of a decline in public transport patronage as car-ownership has increased is well-documented. The expansion of urban transport demand in the Developing World has been outlined earlier in this paper. This difference between the two contexts is perhaps the most important point to bear in mind when seeking conclusions about the two types of transport system. Nevertheless the flexibility which the paratransit systems offer in meeting rapidly-changing demand is very different from the inflexibility of the Western transport operation faced with a slower rate of change, albeit fast expansion compared with slow decline. The reaction of most Western operations has been slowly to reduce services, progressively to seek subsidies to offset increasing operating costs, ultimately becoming locked into maintaining an uneconomically high level of conventional scheduled services. This lack of flexibility is not all attributable to the bus operator. He is fenced in by legislation, local government policies and restrictive practices as well as by the inherent conservatism of the industry. It seems clear, however, that changing transport markets are dealt with much more readily by systems with limited regulation and more, rather than fewer, suppliers of the service.

The extent to which regulation is deemed necessary depends upon the prevailing economic doctrine. In most Western mixed economies a wide range of levels of regulation can, in practice, conform with the politics of the moment. Those controls which are most generally applied stem from arguments of public safety and financial accountability. These types of control need not be inconsistent with a paratransit operation; basic vehicle construction and use regulations can be met, driving regulations enforced and a small transport business is no different, in general terms, from any other small retail organization.

The types of control forming the main constraints on paratransit application relate to service provision. It is usually argued that granting a monopolistic franchise or licence can be justified if the operator in return guarantees a level of service, the required level of service being specified by the licensing authority. The contrast emerges between 'market demand' being the determinant of service provision for the paratransit services and 'government planners' determining franchised services. The extent to which urban bus systems respond to travel-demand, or condition it, is debatable. In this author's opinion there is considerable scope for criticism of the current situation and for examination of flexible services more oriented towards community travel requirements.

The 1980 Transport Act in the U.K. may allow some of these avenues to be explored, particularly in the context of the small operator.

The price to be paid for this may be seen in more expensive travel or less public transport services in the marginal areas such as outlying rural districts. Ultimately society must determine the extent of subsidisation which it is willing to offer and how it is to be provided in these conditions. In an urban context, with a more substantial level of travel demand forming the market to which services can be sold, there appears to be scope for broadening the choice of transport modes available. The current basic choice of bus or private car does not adequately reflect the range of service levels offered by different types of transport systems, paratransit in particular. This does not imply paratransit *instead* of buses, but *as well as* buses. It is probable that paratransit would 'cream-off' some peak demand from stage carriage buses, possibly leaving them a more uniform, and more profitable, operation. Not



the same number of buses would be required, almost certainly some bus passengers would be attracted to paratransit, but, by providing the opportunity for different modes to operate, it is this author's view that some new services would prosper, some old bus services could be cut and costs saved without much hardship and with an enhancement of the transport system as a whole. The lessons are there to be learned in a number of cities around the world.

## Foreign summaries

Au cours de ces dernières années, les planificateurs de transport dans les villes occidentales ont manifesté un intérêt croissant pour l'expérimentation et l'application des transports publics 'non-conventionnels': il s'agit de tentatives en vue d'offrir un service public de transport dans les situations où il n'est guère envisageable, pour des raisons pratiques ou économiques de faire fonctionner des transports classiques, sur rail ou par bus. On a ainsi vu apparaître divers services expérimentaux tant en zones urbaines que rurales; au Royaume Uni, on a mis l'accent surtout sur les expériences rurales, dont le programme expérimental RUTEX, soutenu par le gouvernement, constitue un bon exemple. L'utilisation de ces services est toutefois très réduite et s'exprime souvent en centaines d'unités par jour en zone urbaine et en dizaines en zones rurales.

Il semble que de nombreux planificateurs occidentaux n'ont pas conscience, ou refusent de voir que dans la plupart des pays en voie de développement on trouve une grande variété de transports publics de ce genre, dont certains transportent des millions de voyageurs par jour. Souvent ils sont apparus et se sont développés tout seuls, sans aucune planification élaborée préalable. Ce type de développés tout seuls, sans aucune planification élaborée préalable. Ce type de développement ne garantit pas la désirabilité sociale de système; il n'assure pas nécessairement le respect de normes de sécurité appropriées; mais cela fonctionne bien par rapport aux conditions et besoins locaux. Et il n'est pas exclu que l'examen de ces systèmes 'non conventionnels' ne puisse amener à des conclusions utilisables, après transposition, dans les conditions des villes occidentales. Très souvent, ils sont possédés et organisés par des particuliers et ils fonctionnent dans des conditions commercialement satisfaisantes pour leurs propriétaires: c'est le cas des 'Jeepneys' dans les Philippines et des 'bus publics légers' de Hong-Kong, pour ne citer que des exemples bien connus. L'article analyse ces systèmes de transport, essaye d'identifier leurs principales caractéristiques et les compare aux modes de transport de voyageurs plus classiques.

In den vergangenen Jahren haben Verkehrsplaner in Großstädten der westlichen Welt mit zunehmendem Interesse neue, unkonventionelle öffentliche Verkehrsmittel getestet und eingesetzt, um Möglichkeiten zu erforschen, öffentliche Verkehrsmittel auch in solchen Situationen anzubieten, die gemeinhin als unwirtschaftlich oder wenig zweckmäßig für Schienen- oder Busverkehr galten. Verschiedene Systeme sind im Großversuch sowohl in Städten wie in ländlichen Gebieten eingesetzt worden. In Großbritannien hat man das Schwergewicht auf ländliche Gebiete gelegt; ein Beispiel hierfür ist das Rutex-Programm konventioneller ÖV-Andienung, das mit Unterstützung der Regierung eingeführt wurde. Die Annahme solcher Systeme ist allerdings sehr gering. Die Beförderungsfälle werden nur in Hundertern pro Tag in städtischen Gebieten, in Zehnerdimensionen pro Tag in ländlichen Gebieten gezählt.

Viele Verkehrsplaner in westlichen Industriestaaten scheinen nicht zu wissen oder ziehen es vor, darüber hinwegzusehen, daß die meisten Entwicklungsländer eine Vielzahl öffentlicher Verkehrssysteme mit zum Teil in die Millionen gehenden Beförderungsfällen pro Tag haben. In der Regel sind diese Systeme nur gewachsen und nicht so sehr das Ergebnis detaillierter und begründeter Verkehrsplanung. Obwohl eine solche Entwicklung nicht immer im Hinblick auf den sozialen Kontext die Erfüllung bestimmter Zielvorstellungen garantiert oder annehmbare Sicherheitsstandards erschwerte, scheinen doch die so entstandenen öffentlichen Transportsysteme im Hinblick auf die örtlichen Bedingungen und Notwendigkeiten gut zu funktionieren. Es kann sehr gut sein, daß nützliche Ergebnisse für den öffentlichen Verkehr in den Städten der westlichen Welt aus Untersuchungen über die unkonventionellen Betriebsmethoden in den Entwicklungsländern gewonnen werden

HERAMB, C., SEN, A., and SOOT, S., 1979, Jitney paratransit services: an appraisal of present and future operations. *Transportation Research Record*, 724, pp. 1–8.

Jitney, one of the oldest paratransit modes and one of the few that are privately owned, is examined to ascertain its present and future viability. Land use, population, travel patterns, and transportation system characteristics are drawn from field observations and census sources for jitney corridors in Atlantic City, Chicago, and San Francisco. These corridors are prototypes of two different types of jitney operations: (*a*) taxicabs operating as jitneys and (*b*) specially licensed jitney vans. Jitney and bus operations are compared to differentiate the relative start up and operating cost advantages of each mode. An advantage of the jitney is its low start-up cost. Corridors appraised to be suitable for jitneys are those that have a mix of intense land uses that generates a consistent demand for intracorridor travel, low rates of automobile ownership, and travel demand that is evenly dispersed spatially and temporally to reduce dead-heading. However, the future viability of jitney could be endangered if fare increases instituted to provide adequate wages for drivers threaten jitney's competitiveness with publicly-subsidized transit services.

(Author)

JACOBS, G. D., and FOURACRE, P. R., 1976, Intermediate forms of urban public transport in developing countries. *Traffic Engineering and Control*, **17** (3), pp. 98–100.

This paper describes intermediate forms of public transport devised in developing countries to meet demands of rapidly-growing urban populations. Such systems are frequently composed of individually-controlled vehicles carrying more people than a taxi but less than a bus, thus achieving flexibility in routeing and scheduling without sacrificing entirely the efficiencies of large-scale operation. Examples given include the jeepneys of Manila, converted vans and trucks in Africa and Asia, and shared taxis of various kinds, including the dolmus of Istanbul and Ankara, the jeepneys of Manila, and the cycle rickshaws of the Far East, the betjak of Indonesia.

(Authors)

Paratransit: 1979. Proceedings of a Workshop, *Transportation Research Board*, SR 186, p. 89

The proceedings are presented of a Conference that synthesized and evaluated the significant paratransit services across the U.S. and Canada, and assessed their relevance for other communities, The Conference was organized to provide results that would help the Urban Mass Transportation Administration (UMTA) to understand the problems and potentials of paratransit. Comprehensive resource papers were presented on six major issues: labour protections and labour standards; appropriate institutional framework for paratransit development; evaluation and measurement of service effectiveness; competitive opportunities in paratransit; co-ordination of social-service agency transportation; and technology requirements. Workshop reports and plenary session transcripts on these major issues are also presented. Introductory articles briefly discuss current conditions, briefly review the resource papers, and present some considerations on the changing environment of paratransit.

(HRIS Abstracts)

TRANSPORT REVIEWS, 1981, VOL. 1, NO. 2, 169–188

# Urban transport policy and policy analysis methods

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ABSTRACT

The change in emphasis of urban transport policy during the past 25 years is described. The concentration on identifying opportunities for investments in new transport capacity has given way to policies which emphasize the better management of existing facilities and the more equitable provision of transport services. The evolution of transport systems analysis tools is also briefly reviewed and the capabilities of these techniques as policy analysis aids are discussed. Four groups of techniques are discussed: land use-activity allocation models, multi-stage aggregate demand models, disaggregate demand models, and household-based activity models. It is concluded that while available analysis techniques can assist in evaluating a limited range of policy options their relevance is decreasing as the urban transport environment changes rapidly.

## §1. URBAN TRANSPORT POLICY 1960–1980

The change in emphasis in urban transport policy during the past 30 years in the economically developed parts of the world has been noted by many observers. During the 1950s and 1960s the main focus of transport policy was on the identification of medium to long-run capital investment opportunities in new transport capacity. Sustained urban growth and steady increases in automobile ownership stimulated this policy emphasis. Martin (1970) in commenting on the first London transport study observed:

> "In the 1950s the problem was defined in the rather restricted terms of congestion on city streets. How can this congestion be removed and provision be made for future growth of traffic? This was certainly a major consideration in defining the objectives of the London studies in 1960. Car ownership was expected to increase rapidly, but there was no basis to estimate how large the increase in road traffic would be and how the nature and pattern of travel would be influenced."

Martin's observations apply to most of the metropolitan-scale transport planning studies conducted throughout the world during the 1960s. The automobile, one of the principal stimuli to the expansion of the manufacturing sector and of urbanization, a cheap and convenient supply of energy and increasing incomes created an explosion in automobile ownership and use. Transport policy formulation and execution were relatively straightforward in this type of environment. 'Reduce traffic congestion', 'high-speed travel between different parts of a metropolitan area' and so on were the 'positive' transport policies that found fertile political ground and could be implemented incrementally as resources become available.

Large increases in the arterial and freeway capacities in many cities tended to exacerbate the problems of traffic congestion and environmental degradation. In the developed world the increased mobility of car owners stimulated the development of

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