



**Planning for public transport in the future:
challenges of a changing metropolitan Melbourne**

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Abstract

Present day transport infrastructure has been largely inherited from earlier industrialised regimes. Yet, significant changes have occurred in metropolitan Melbourne's economy, particularly in response to globalisation since the 1990s. Such changes can be characterised by, amongst others, casualisation of the workforce, growth of the service sector (including portfolio careers), and fragmented patterns of work in many of the service industries themselves. The demand for increased mobility to cater for these emerging changes in the workforce is further reinforced by increases in disposable income (associated with rising vehicle ownership), continuing urban sprawl in metropolitan Melbourne and changes in life-style aspirations (e.g. increasing expenditure on recreational activities). At the same time, Melbourne's socio-demographics have been changing. As in other Australian cities, significant trends include the ageing of the population, increased participation of women in the workplace, dwindling average household size and a significant increase in the proportion of single-person households, a trend towards delaying child bearing, and so on. Changes like these have important implications for infrastructure planning, including the provision of transport.

This paper describes changes in transport mode usage and out-of-home activities occurring within the metropolitan area since the mid 1990s, as well as underlying changes in socio-demographics and other factors. The study is largely based on analyses of data from the Victorian Activity and Travel Survey (VATS), compiled by the Transport Research Centre at RMIT, for the period 1994 to 1999. The paper identifies emerging trends of relevance to public transport planning over the next couple of decades. Of particular importance is whether broader societal trends are likely to work for or against an expanded role for public transport. This is highly pertinent in view of the State Government's stated target of increasing public transport's share of motorised travel to 20 per cent by 2020.

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Introduction

Significant changes have occurred in metropolitan Melbourne's economy since the 1990s, particularly in response to globalisation. Such changes can be characterised by, amongst others, increases in service-related industries, casualisation of the workforce, growth in portfolio careers and fragmented patterns of work in many of the service industries themselves. The *demand for increased mobility* to accommodate these emerging changes in the workforce is further reinforced by increases in disposable income (associated with rising vehicle ownership), continuing urban sprawl in metropolitan Melbourne and changes in life-style. Yet, present-day transport infrastructure has been largely inherited from earlier industrialised regimes.

Melbourne's socio-demographic characteristics have also been changing. Like other Australian cities, significant trends include the ageing of the population, increased participation of women in the workplace, dwindling average household size and a significant increase in the proportion of single-person households, a trend towards delayed child bearing, and so on. Changes like these have important implications for infrastructure planning, including the provision of transport. These changes are of particular importance, given that the State Government in Victoria is about to release a Metropolitan Strategy document intended to guide the city's development for the next 30 years. As part of this process the Government has identified modal shift as a clear policy objective. A specific target is to lift public transport's share of motorised travel to 20% by 2020. The future outlook for public transport is thus of interest for more than academic reasons. It is important to establish whether the State Government's stated target is a realistic goal, and what barriers may need to be overcome in moving towards this goal.

There are a number of key socio-demographic, economic and physical changes that are likely to occur over the next 20 years in Melbourne that will have a significant impact on transport planning – and more particularly on the outlook for public transport. This paper briefly describes aggregate travel patterns in present-day metropolitan Melbourne before turning to examine the key factors affecting travel demand, with emphasis on how these may be changing. Of particular interest is where the opportunities may or may not lie to modify current trends. The concluding section of the paper looks at the most likely implications of these changes from the point of view of achieving modal shift. The task of identifying the travel outcomes of these changes is a difficult one; and hence some consideration is given at the outset to some methodological issues.

Methodology

The estimates of travel presented in this report are mostly based on information collected by the Victorian Activity and Travel Survey (or VATS). VATS is a continuous household travel and activity survey that has been conducted in Melbourne since 1994 by the Transport Research Centre at RMIT University,

yielding detailed information on the travel habits of Melburnians. Based on a postal survey of about 5000 responding households per annum, the information is then expanded (or weighted) to produce estimates of travel undertaken by the population as a whole. The combined VATS databases released to date span the years 1994 and 1999. The next data to become available will be VATS 2000, which is due to be released shortly; however, this was not available in a suitable form to include in the analysis undertaken for this report.

The combined VATS database is nonetheless one of the most comprehensive contemporary datasets that have been produced anywhere in the world. The survey seeks to obtain information on all travel by all modes undertaken by each member of the selected households for their given survey day. By conducting the survey over the 365 days of the year, the survey thus provides a continuous picture of the travel and out of home activities undertaken by Melburnians. The survey is based on a random sample of residential households in the Melbourne Statistical Division stratified according to the 31 municipalities, thus also providing a spatial representation of travel and activity occurring across the city. Full documentation of the survey can be found in a report produced by the Transport Research Centre (1999), which is also posted on the Centre's website (www.trc.rmit.edu.au).

Before looking in detail at current travel patterns in Melbourne, it is necessary to explain some basic terminology. The travel that is undertaken by households over a given day can be examined in a number of different ways. Each of these involves dissecting daily travel into smaller segments. The individual travel segments may be "stops", "trips", "journeys" or "trip chains". "Stops" are the most basic units of observation used in VATS, and these represent all individual travel movements that are made outside the home involving participation in an activity of some kind. Such activities include shopping, going to work, performing business in the course of work, engaging in recreational pursuits, changing to a different mode of travel, and even taking the dog for a walk. For the most part "trips" are defined in the same way as "stops", except that stops made for the purpose of changing to another mode of travel are "absorbed" or "linked" with the next "stop" or primary activity to form a trip. For example, Melbourne residents make around 13 million *stops* (or individual travel segments) on an average day. This translates to some 12 million personal *trips*, after absorbing (or combining with the next activity) those stops where the purpose is simply to change to another mode of travel (Transport Research Centre, 2001). In this report the analysis is based on trips (but these may be further combined to produce "journeys" or "trip chains"). It should be pointed out that the choice of the appropriate unit of analysis is far from trivial, and can have an important bearing upon the results that are obtained.

Issues of this nature also indicate the arbitrariness of defining modal shift on the basis of the percentage of tips made by a given mode. Certainly, different conclusions can be drawn about the relative contribution made by public transport if other metrics are used (eg. per cent of stops or trip stages, or of distance or time spent travelling). Defining what exactly is meant by a particular policy objective is not a trivial issue, and one that needs to be addressed in a

considered way. For present purposes, however, trips will form the basis of the analysis.

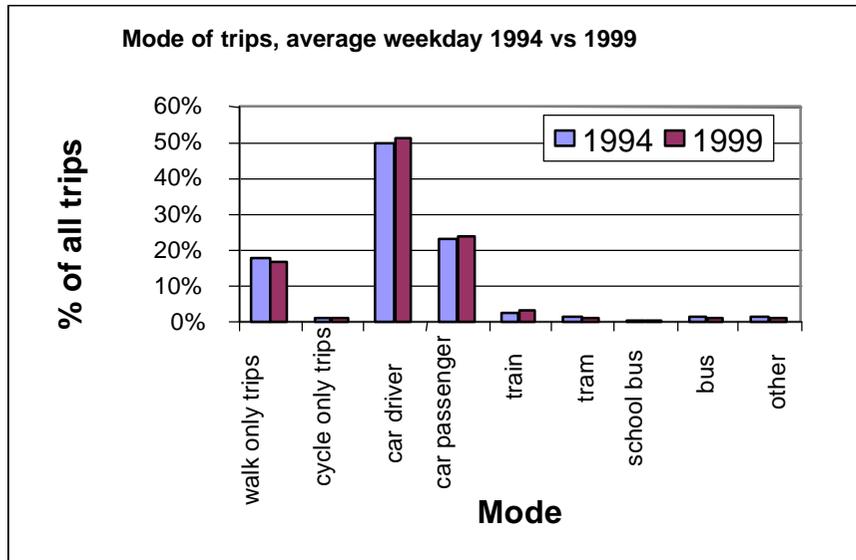
It is also important to note that a hierarchy is employed to define the 'mode used' in the case of multi-modal trips and this has the effect of down playing the role of trams and buses, where these are used in conjunction with trains (and/or trams, in the case of buses). The priority order is train, tram, other bus, school bus, taxi, car driver, truck, car passenger, bicycle, walk, and other. Hence, by this very definition, the support role performed by trams and buses in providing a connecting service with other modes is not apparent in the analysis presented in this paper. The role played by the lower order modes in providing access to the higher order modes may nonetheless be identified. This would be possible by analysing the information on a different basis (ie. stops). But as already noted, analysis based on trips is considered to be the most useful when considering issues relating to modal shift (from car to public transport as a whole).

Present-day travel patterns in Melbourne

The sheer size of the daily metropolitan transport task is considerable – for example, on an average day Melbourne residents make around 12 million personal *trips* (Transport Research Centre, 2002). This figure represents the amount of travel generated by *residents* in a city with a present-day population of more than 3.5 million people and some 1.1 million households. Overall, the level of metropolitan trip making is, of course, much higher, after allowing for travel by visitors to the city (including both non-residents and tourists) and travel undertaken by the freight and commercial sectors.

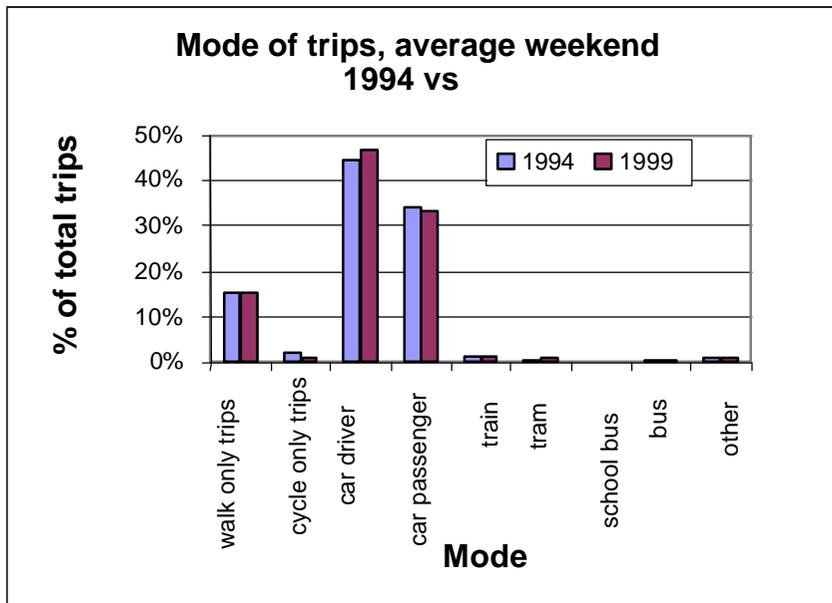
Melbourne is a very car oriented city (see Figures 1 and 2). Car driving is by far the dominant mode of travel, accounting for around 50 per cent of all trips made on weekdays and 45 per cent of trips on weekends. But the overall amount of travel by car is even greater once car passengers are included. Travelling as a car passenger makes up about 23 per cent of travel on weekdays and 34 per cent on weekends, and is the second most important mode of travel. The third most popular mode of travel is *not* public transport, but walking. Trips made by public transport comprise around 6% on weekdays and slightly more than 2% on weekends. By contrast, travel on foot represents around 16 per cent of the total on weekdays, and 15 percent on weekends. In fact the overall amount of walking performed is actually greater than these figures portray, since additional walking often occurs in combination with other types of trips, such as catching public transport. Therefore, if the amount of travel made by different modes is considered on the basis of individual travel movements or *stops*, walking actually accounts for around 24% of the total (Transport Research Centre, 2001). Similarly, the number of public transport "boardings" is higher when estimated on the basis of activity "stops" in the sense referred to earlier.

Figure 1 Mode share on an average weekday, 1994 and 1999



Source: VATS '94 and '99

Figure 2 Mode share on weekends, 1994 and 1999



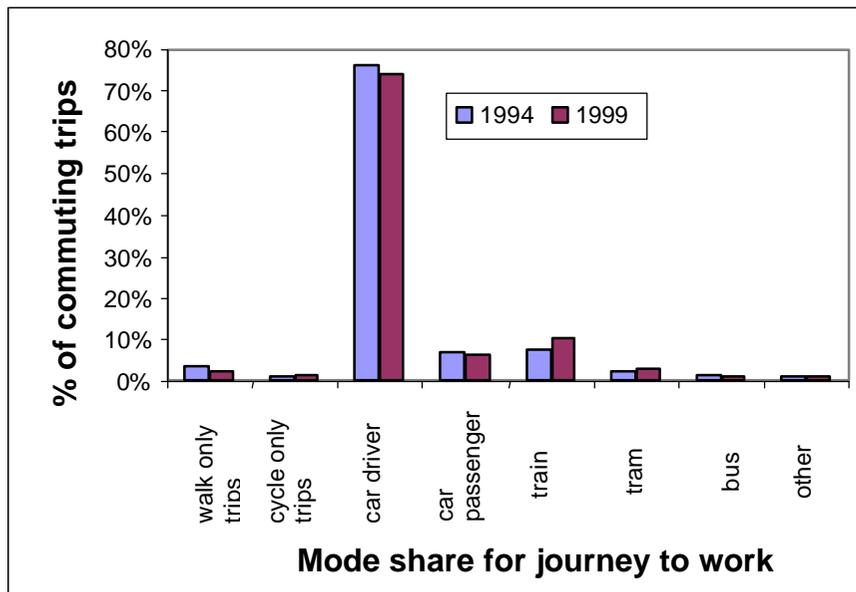
Source: VATS '94 and '99

While there have been some changes in mode usage over the 1994-99 period, there has been little change in public transport's share overall. The proportion of trips made by car drivers on an average weekday has increased marginally, and has increased even more on weekends (Figures 1 and 2). However, comparatively speaking, public transport has done little more than hold its

ground over the six-year period. It has remained at around 6% of the total number of trips made by Melburnians on weekdays, and a little more than 2% on weekends. Similarly, trips made on foot or as a car passenger have remained comparatively steady over the 1994-99 time frame. If expressed as a percentage of motorised trips, public transport's share increases slightly to 7.5% on weekdays and almost 3% on weekends – but both of these are clearly well short of the target set for 2020.

This relative stability at the aggregate level, however, disguises some important localised shifts. Significantly, there has been an increase in public transport usage for work journeys (Figure 3). Specifically, the share of trips made by public transport increased from 11% in 1994 to 14% in 1999, reflecting in large part an increased use of trains (from 7.5% in 1994 to 10.4% in 1999). Conversely, the use of private vehicles for journeys to work declined slightly, to 74 per cent in 1999 (from 76 per cent in 1994). Whilst these changes in mode usage are small, at least the shifts are in the *right* direction and are consistent with an overall strategy to achieve a reduction in car use, and increased public transport patronage. Furthermore, it would appear that the long established trend of declining public transport patronage in Melbourne has been stemmed, if not reversed.

Figure 3 Modal share of work trips, 1994 and 1999



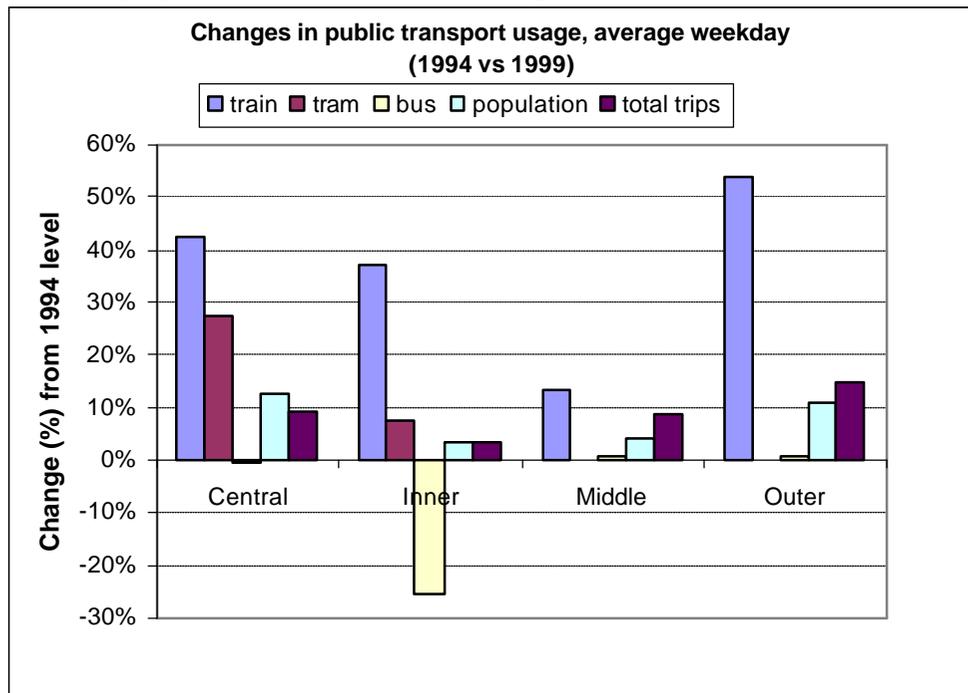
Source: VATS '94 and '99

In comparative terms, weekday train travel for all purposes by Melburnians has grown at a faster rate than the growth in both total travel and total residential population of the city. This holds for residents across the four metropolitan regions of the city, but is particularly strong in the central, inner and outer regions of Melbourne (as shown in Figure 4). The marked increase in train travel among outer suburban residents needs to be interpreted with caution since the absolute number of such trips is still comparatively small. Tram trips

have increased, too, relative to population in the central and inner regions, where the tram services are mainly concentrated. Travel made by tram by residents who live in the middle and outer regions represents less than 1 per cent of the total number of trips they made, and thus relative changes are not presented here for these regions. It would seem that buses have lost patronage overall. Quite a substantial loss of bus patronage from inner area residents is evident over this period, possibly reflecting a combination of the changing socio-economic composition of the inner city, as well as the changing distribution of jobs, described later in the paper.

As indicated earlier in Figure 1, in aggregate terms the percent of trips made by train on an average weekday has increased slightly (from 2.7 per cent in 1994 to 3.3 per cent of total trips in 1999). Added to this overall increase in the modal share for train, the residential population in Melbourne's CBD has increased significantly over this period, and there have been marked changes in the demographic and occupational structures of the central and inner regions, as well. These changes include an increased number of young single people living in shared households and couples without children (BIS Shrapnel 2000).

Figure 4 Percentage changes in public transport usage and residential population in Melbourne regions, 1994-99

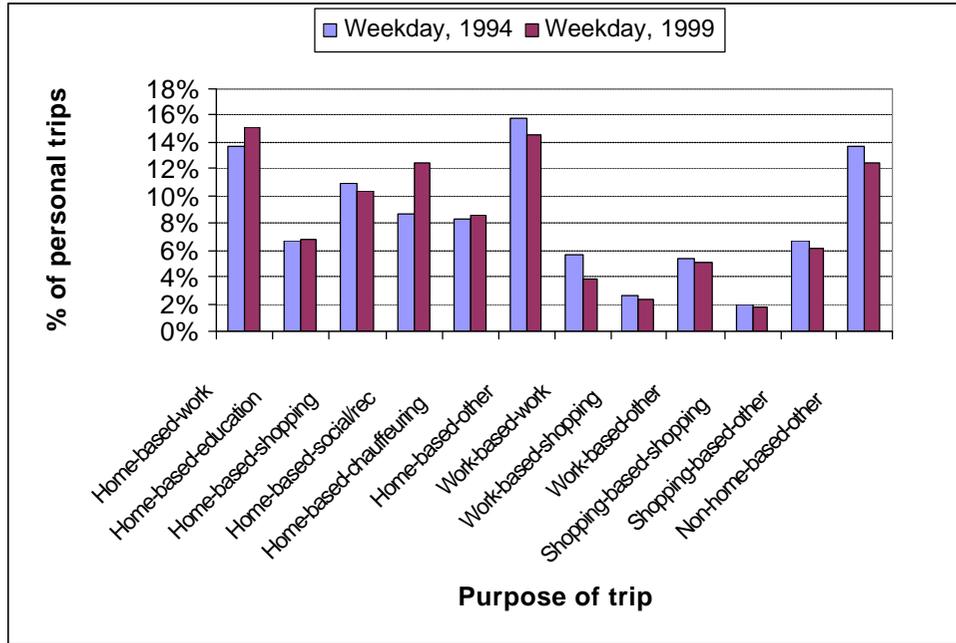


Source: VATS '94 and '99 (excludes trams in middle and outer regions where mode share <1%)

These socio-demographic changes reflect the substantial growth rates in new apartment construction and other medium density developments, together with conversions of non-residential buildings that have occurred in the central and inner parts of Melbourne (Buxton and Tieman, 1999; Burke and Hayward, 2001). Such changes may help to explain the noticeable increases in the absolute number of train trips by inner city residents over this period, and may

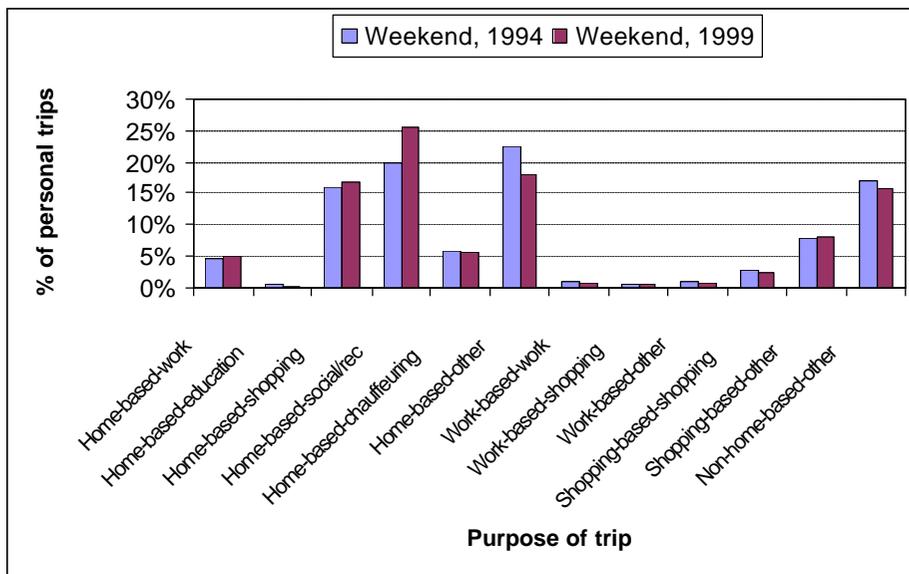
have contributed to the lower relative growth rate of trips overall in these parts of the city.

Figure 5 Purpose of personal trips on an average weekday in Melbourne, 1994 and 1999



Source: VATS '94 and '99

Figure 6. Trip purpose on average weekend in Melbourne, 1994 and 1999



Source: VATS '94 and '99

Getting to and from work is the single most important reason for travelling in most cities, including Melbourne, but this still only represents part of the picture. Significantly, on an average weekday far more trips are made to reach destinations where the activities are **not** work-related (that is, aggregating all

other trip purposes besides home-based work and work-based-work trips). Such other activities include shopping, social and recreational pursuits, chauffeuring, attending educational facilities, and various other activities, such as conducting personal business.

In 1999, trips between work and home accounted for around 15% of all weekday travel while other work-based-work trips accounted for around 4% (Figure 5). The amount of travel for commuting has increased modestly since 1994, whereas trips made in the course of work have declined in comparative terms. Since work trips tend to cover longer distances and have longer durations than other trips (Transport Research Centre, 1996), the overall contribution of work travel to the total transport task is greater than these figures alone suggest. The proportion of travel devoted to shopping and chauffeuring has remained relatively stable in Melbourne since 1994. There has also been a slight reduction in the proportion of travel related to other activities (such as for personal business), regardless of such activities being made from home or not. On both weekdays and even more so on weekends, however, there have been appreciable increases in the share of travel devoted to recreational and social pursuits (see Figures 5 and 6). The fact that social and recreational travel often occurs at night and on weekends and takes place in groups or as couples has important implications for the mode of travel chosen.

Overall it can be inferred that on weekdays there has been a faster growth rate of train travel than car trips across the metropolitan area, and a faster growth rate in tram trips for the central region. Nonetheless there has been a sizeable increase in the number of car trips, particularly on weekends. Hence, the impact of gains that have been made on weekdays by public transport in some parts of Melbourne has been masked or diluted by increasing use of the car in other parts of the city, and at other times, and by the dominance of car travel in general. Thus while there are some encouraging signs of increased usage of public transport, particularly by central and inner city dwellers, public transport still only constitutes a minority of trips. And the major area of travel growth has been in relation to travel to social and recreational activities, which in the main are based around the car (despite the role of trains in catering for social and recreational travel by some population segments on weekends).

The next section outlines changes occurring in the key factors affecting travel choice behaviour, with particular emphasis on areas where opportunities may or may not lie for intervention to reduce car use and to increase public transport patronage. Some of these factors are quite strongly interrelated, although each is discussed in turn.

Key Influences On Travel Demand And How These Are Changing

Large increases in the amount of travel undertaken in general, and the growth of road traffic in particular, reflect the complex interplay of many factors. There have been a number of significant changes in the economic, social and physical fabric of society that have both fuelled and accommodated the growth in travel

demand. There have also been a number of important technological advances and changes in institutional arrangements that have facilitated changes in the pattern of activity and travel behaviour, if not the overall level of travel demand. Undoubtedly, too, demographic factors have played an important role, by contributing to the sheer numbers of people who have a need to move around and who require goods to sustain their increasingly sophisticated lifestyles.

The Victorian population grew considerably in the second half of the 20th century owing to three main contributory factors – the post war ‘baby boom’, high levels of immigration at successive intervals, and increasing life expectancies, particularly in the latter part of the 20th century. Significantly, much of this population growth has been concentrated in Melbourne, and to a lesser extent the regional cities, leading to an increasingly urbanised lifestyle for the majority of the State’s residents.

Over the next 20 years, a slower rate of population growth is predicted for Melbourne. Present estimates indicate a 20 percent increase in Melbourne’s population over the period from 1996 to 2021 at which time Melbourne is expected to reach a population of 4 million. By comparison, in the 25 years to 1996, the growth was 31 percent (Department of Infrastructure, 2000). The slower rate of population growth will impact on travel growth. But the reduced rate of growth will be counter-balanced by other forces, since people these days live longer and lead more individual lifestyles.

Changing family structure

In metropolitan Melbourne, as in many western cities, the number of households has increased at a faster rate than total population in recent times, and single people have come to make up a larger proportion of society. There is now less certainty that people will marry, and also the age that they will do so. Singles can be young or old; they may also have never married, or they may be separated, divorced or widowed. As Blom, Kalfs and Kobben (2000) aptly point out, the status of being single can be temporary, but the expectation is for ‘individualisation’ of society to be a continuing trend, mainly as a result of an ageing population. As such, the average size of Melbourne households is expected to continue to decline. In 1996, the average household size was 2.68. By 2021, the average household size is forecast to be 2.34 (Department of Infrastructure, 2000). *Prima facie*, this could be expected to increase the need for travel in the future, since (with a proportionate increase in the number of independent economic units) more people will need to leave their homes to engage in face-to-face interaction with others. Presently, average household trip rates are comparable once allowance is made for household size. Nevertheless, car ownership levels among single person households are increasing significantly, thereby increasing the likelihood of increased travel in the future, especially by car.

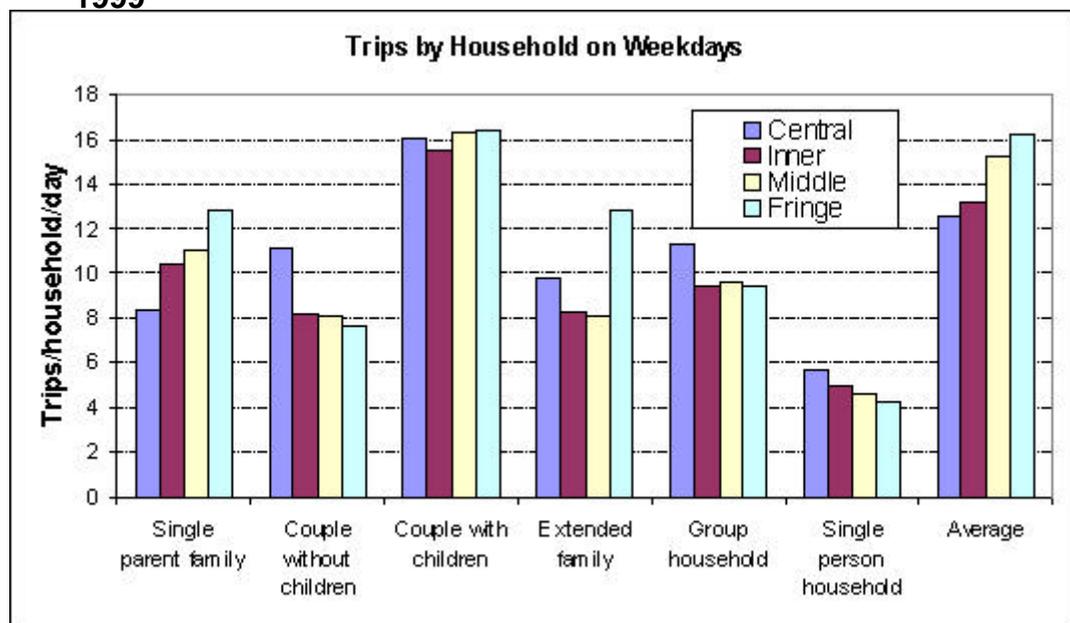
Table 1. Trip rates by household size, average day, Melbourne, 1999

| Type of household | Average size | Average trips per day |
|---------------------------|--------------|-----------------------|
| Single Parent family | 2.9 | 10.5 |
| Couple without Children | 2.0 | 7.2 |
| Couple with Children | 4.0 | 15.7 |
| Extended family Household | 2.7 | 8.6 |
| Group Household | 2.6 | 9.4 |
| Single Person Household | 1.0 | 4.1 |
| Average | 2.6 | 13.5 |

Source: VATS '99

Couples with children make the highest number of trips per day whereas single person households make the lowest. This is primarily because household trip rate is influenced by the size of the household. With an average of 4 persons in a 'couple family with children', these households make about 16 trips a day, while a single person household makes about 4 trips. Many of these trips are made by car, since nuclear families are far more likely than other types of households to own a car. On average, every extra member of a household contributes about 4 trips per day to the total travel that is undertaken (Table 1). On average, households in the central and inner areas make fewer trips than those in the middle and fringe areas, reflecting in large part the distribution of different household types. Overall, regional differences in the rates of trip making by households are less pronounced than are the differences between household types (see Figure 7).

Figure 7 Trip rates by household type by region, average weekday, 1999



Source: VATS '99

Increasing vehicle ownership

As shown in Table 2, households without a car are predominately those comprising only one person. This pattern is consistent regardless of the location of the households. For the most part couples without children are the second largest group not owning a car.

But there have been strong increases in levels of vehicle ownership among Melbourne families, and particularly families in the inner region (see Table 3). On average, for the period between 1994 and 1999 the level of vehicle ownership per household in the MSD increased by 7%, compared with an increase of 9.6% in the central region. Single-person households showed the greatest increase in vehicle ownership (18%) over this period. Significantly, vehicle ownership by single-person households residing in the central city increased by about 20% from 0.60 to 0.72 per household. This is particularly significant given the good levels of public transport that are available in these areas (and hence the need for a car could be considered to be less).

Table 2 Type of households without a vehicle in Melbourne, 1994 and 1999

| Household Type | Percent of Household with No Vehicle | | | | | |
|--------------------------------|--------------------------------------|--------|---------|-----------|--------|---------|
| | 1994 VATS | | | 1999 VATS | | |
| | Central | Fringe | Average | Central | Fringe | Average |
| One parent family | 8.1 | 20.0 | 10.7 | 8.6 | 10.9 | 10.7 |
| Couple family without children | 9.1 | 14.3 | 11.8 | 9.4 | 11.5 | 11.4 |
| Couple family with children | 3.6 | 4.3 | 4.9 | 3.2 | 2.4 | 3.8 |
| Group & extended household | 15.5 | 0.5 | 6.2 | 8.8 | 5.0 | 7.4 |
| Lone person | 63.6 | 60.6 | 65.4 | 70.0 | 70.2 | 66.7 |
| Other (not classifiable) | 0 | 0.3 | 1.0 | 0 | 0 | 0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: VATS '94 and '99

These increases in vehicle ownership may also be attributed in part to increased personal wealth. Not only has there been a buoyant period of economic growth in Melbourne since the mid 90's, but also the central and inner areas have attracted significant numbers of professional and middle-class populations (Colebatch, 2000). This, together with the decreasing household size, means that there will be more households of smaller sizes that can afford to have their own vehicles.

Table 3 Average number of vehicles per household by Melbourne region in 1999, and changes since 1994

| Household Size | Region | | | | 1999 Average | 1994 Average | % increase from 1994 |
|--------------------|-------------|-------------|-------------|-------------|-----------------|-----------------|-------------------------|
| | Central | Inner | Middle | Fringe | | | |
| 1 | 0.72 | 0.78 | 0.84 | 1.02 | 0.84 | 0.71 | + 18.1 |
| 2 | 1.28 | 1.40 | 1.55 | 1.62 | 1.50 | 1.43 | + 5.0 |
| 3 | 1.76 | 1.82 | 2.03 | 2.16 | 2.01 | 1.86 | + 8.0 |
| 4 or above | 1.60 | 2.14 | 2.23 | 2.39 | 2.25 | 2.14 | + 5.3 |
| Average | 1.13 | 1.43 | 1.70 | 1.90 | 1.64 | 1.53 | + 7.2 |
| % in region | +9.6 | +7.1 | +5.0 | +9.0 | | | |

Source: VATS '94 and '99

Ageing Population

Significantly, Melbourne will have an older population in the future. The percentage of people aged 60 and over is forecast to increase from 16 per cent in 1996 to 23 per cent in 2021. The fringe areas of Melbourne will be a high growth area for all age groups but especially for the older age groups. These areas may thus require the provision of special facilities and services catering for older age groups (Steer Davies Gleave, 2000). This is likely to be especially so in the case of transport services, due to the higher incidence of mobility problems arising in old age (Rosenbloom and Morris, 1998).

The travel implications of an ageing society are not entirely clear. Many older people are quite active, especially in their younger years. While the frequency of work trips declines markedly among older people, other activities such as recreational, social and leisure pursuits show a significant increase. There is some evidence to suggest that early retirees travel greater distances than at times when they were working. But as people move further into old age, there is almost invariably a contraction in their travel. Dependence upon car travel is nonetheless evident among older people living in the suburbs (see Table 4).

Table 4. Car use for non work trips, Melbourne, 1994-95 (by percent)

| Adults | Central Melbourne | Inner Suburbs | Middle Suburbs | Fringe |
|----------|----------------------|------------------|-------------------|--------|
| Under 60 | 53 | 70 | 76 | 81 |
| 65-69 | 43 | 60 | 68 | 70 |
| 70-74 | 36 | 56 | 68 | 70 |
| 75-79 | 18 | 61 | 69 | 71 |
| 80-84 | 17 | 48 | 66 | 93 |
| 85+ | 31 | 52 | 61 | 66 |

Source: VATS '94-'95 (After Rosenbloom and Morris, 1998)

With advancing age, more people travel on foot, by public transport and as car passengers; but the trend is different for men and women. Even among the very elderly, a significant number of men continue to drive (see Table 5). Traditionally, women as a group have been characterised by lower levels of

licence holding and reduced car availability. But this, too, has been changing. Although licence holding among older women is still low, the uptake of drivers' licences among young women is now at least equal to that for men (see Morris and Richardson 1996). Other indicators such as car ownership and personal income (Richardson, Morris and Loeis, 1996) point to the increased personal mobility of working age women.

Women presently make more trips per person on weekdays than men up until the age of around 60. Based on a comparison with earlier VATS data for the year 1994 (see Transport Research Centre, 1996), it would seem that the pattern is changing over time. This suggests in part a cohort effect, but also possibly the effect of other factors related to changing lifestyles (e.g. the trend towards delaying child-rearing until an older age, as well as the trend towards engaging in more activities outside the home for entertainment, personal maintenance and fitness, the greater use of services, such as semi-prepared or take-away meals, and so on). Earlier analysis on the 1994 VATS data indicated that the transition point, at which women's trip rates change to a lower value than men's, occurred at around age 45-49, not 55-59 years (as in 1999).

With increasing numbers of elderly people in the community, there will also be an increased incidence of handicaps, and hence a greater demand for more accessible public transport. There will also be greater need for flexible services and improved personal security, to overcome the fear of many older persons when travelling on public transport.

Increasing concerns over safety and personal security in our society have had an important bearing upon the mobility choices of some groups in the population. Such concerns have led to increasing restrictions being placed upon the independent mobility of children and the elderly (which in turn has added to the responsibilities of the working age population, particularly women). Comparatively few trips are made on public transport at night. The principal exceptions are some adult males and teenagers for social and recreational travel.

Concerns over personal security is one important factor underlying the increasing number of children being driven to school; although, as Morris, Wang and Lilja (2001) point out, this trend is also due to several other factors. Such reasons include fear of traffic danger, more women working outside the home and the closure of many local schools and consolidation into larger ones. Given that many of these trips occur over relatively short times and distance, these do not necessarily represent a market for conventional public transport, and more novel solutions (such as *TravelSMART* and the walking school bus) may need to be implemented.

**Table 5. Mode used for non work trips, by gender, Melbourne, 1994-95
(by percent)**

| Adults | Total | Car | | Public Transport | Walking |
|-----------------|-------|--------|-----------|------------------|---------|
| | | Driver | Passenger | | |
| Under 60 | | | | | |
| Men | 74 | 42 | 32 | 5 | 16 |
| Women | 76 | 40 | 36 | 5 | 18 |
| 65-69 | | | | | |
| Men | 68 | 62 | 6 | 7 | 23 |
| Women | 61 | 32 | 29 | 10 | 28 |
| 70-74 | | | | | |
| Men | 64 | 59 | 5 | 7 | 28 |
| Women | 60 | 28 | 32 | 14 | 25 |
| 75-79 | | | | | |
| Men | 69 | 58 | 11 | 7 | 24 |
| Women | 60 | 33 | 27 | 12 | 27 |
| 80-84 | | | | | |
| Men | 59 | 44 | 15 | 7 | 33 |
| Women | 56 | 11 | 45 | 17 | 23 |
| 85+ | | | | | |
| Men | 55 | 41 | 14 | 7 | 36 |
| Women | 51 | 4 | 47 | 17 | 29 |

Source: VATS '94-'99 (After Rosenbloom and Morris, 1998)

Increasing Disposable Incomes

Economic growth (and increased overall wealth) has been an important contributory factor in the growth of personal travel, especially by car. Both levels of trip making and car ownership are related to personal and household income (Transport Research Centre, 1996 and 2002). Figure 8 shows that trip rate per person generally increases as personal income increases. Persons with *nil income* include those in younger age groups, whose trip generations would be part of household travel. (On an average day, salaried females consistently have higher trip rates than males.)

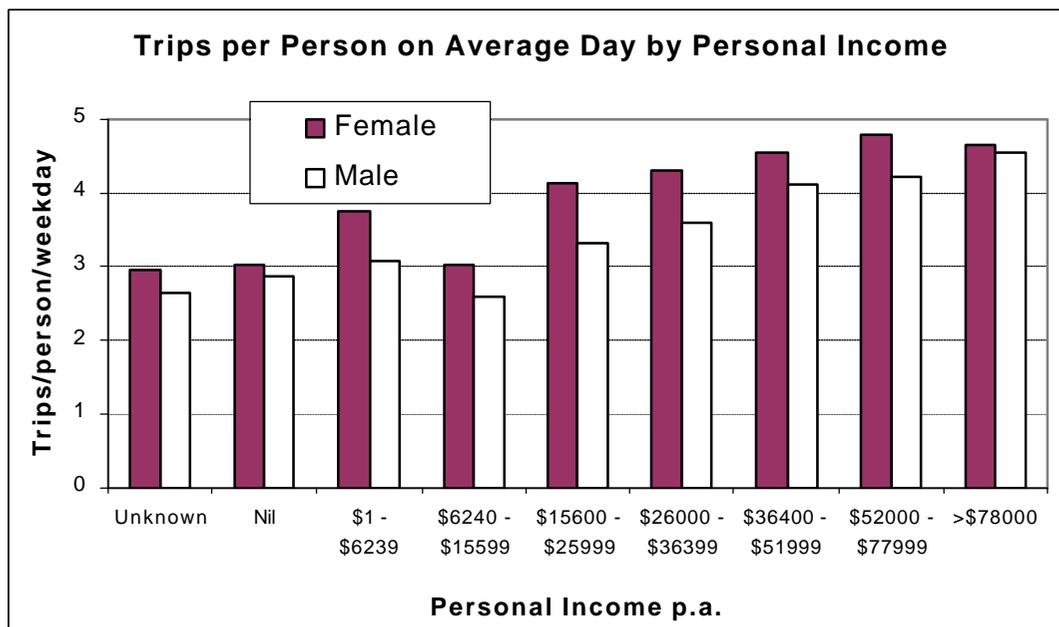
There is some evidence however that the disparity between income levels is increasing rather than decreasing, suggesting that there will be some significant groups in the population who are likely to depend heavily on public transport for their mobility needs. Of importance, in this regard, is the distribution of population groups within the city, and how this may be changing. Significant changes have been occurring in the residential housing market in response to the forces of globalisation, and underlying economic and socio-demographic changes occurring in society.

While most Melburnians own their own homes, people are turning to the rental market in greater numbers than before. The biggest increase in the percentage of households that are renting has been in the outer and middle-ring suburbs, particularly in the southeast of Melbourne (Department of Infrastructure, 2000). Of concern for lower income groups is the loss of public housing from central

areas, with good access to services, including public transport. So, too, is the reduction in the affordability of the private rental market, due to an overall decline in the supply of low-cost rental housing (Yates and Wulff, 2001; Berry and Hall, 2001).

Increases in disposable income are related to the increased share taken by recreational travel, since increased disposable income not only affects car ownership and the ability to withstand the cost of travel, but also the ability to pursue activities that incur monetary expenditures. Travel is, after all, a derived demand.

Figure 8 Trips per person on an average day, by personal income, Melbourne, 1999



Source: VATS '99

Changes in the nature work and participation rates

Changing employment profiles and the nature of work (including the way we work) also exert an important influence on travel patterns. Substantial changes have occurred in the Australian labour force in recent decades. Structural changes to the economy, including the growth of the service sector and the decline of manufacturing, have had important ramifications for the nature of work. Such changes are reflected in the decline of permanent full-time, middle-income jobs for men, the continuing growth of female labour force participation, increased skills demands, increased casualisation of the workforce, the growth in portfolio careers and fragmented patterns of work in the service sector, including in the knowledge-based industries themselves (Watts, 2000; Campbell, 1997; Dunlop and Sheehan, 1998; Pappas, 1998; Burgess and Campbell, 1998). The impacts of economic recession, and then restructuring, have changed the structure of employment across Melbourne and the rest of

the State; and this has resulted in shifts in the balance between occupations and industries, and changes in employment tenure. Other changes have occurred in response to the gradual impact of legislation on equal opportunities for salaries and conditions.

A key change has been the shift towards part-time, casual or contract-based employment. As the Department of Infrastructure (2000) points out, there has been little change in full-time male jobs in Australia since 1973, and the vast majority of employment growth has come from full-time work by women and part-time jobs (to be discussed in the next section). Sectors such as recreation and personal services lend themselves to part-time and casual employment, operating during non-standard working hours and often requiring semi-skilled labour. Outsourcing by many other sectors (such as business services, manufacturing and government) has also led to the growth of the contract-based labour force (Department of Infrastructure, 2000). Such changes provide a very different market place for today's transport systems. These would seem to imply, for instance, a need for greater flexibility and personal security in today's transport systems.

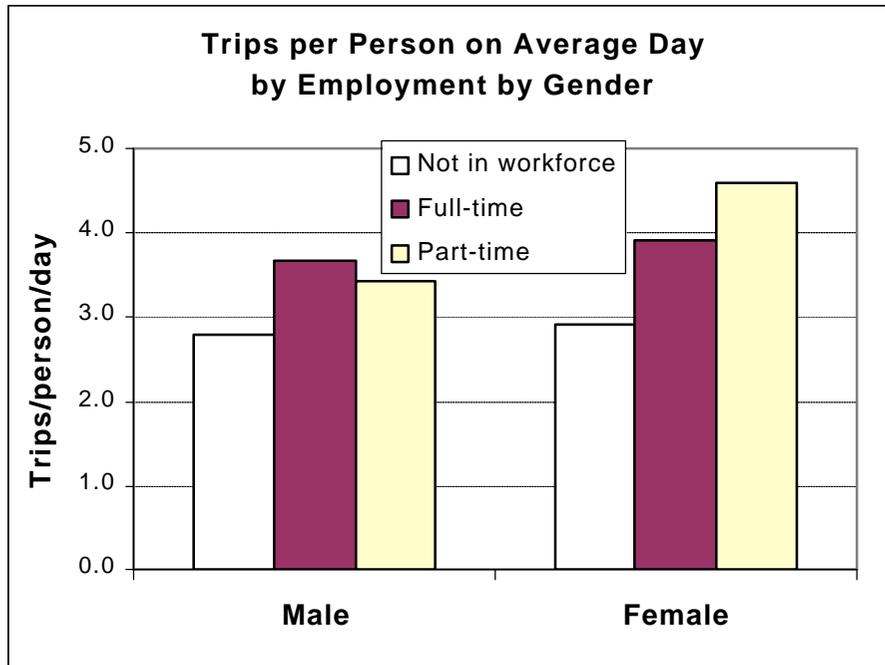
The growth of the service sector is not simply confined to the increased numbers of knowledge workers in central city locations, but includes many lower skilled jobs. Some of these include providing services (such as house cleaning, child care, maintenance, gardening) for other people at their homes. Some recent work in Sydney, as reported by Macken (2002), highlights the growth of this area of work as an important force for change in urban travel patterns.

Significantly, too, the pattern of job losses and gains occurring in Melbourne has not been uniform. Since the early 1980s the share of jobs north of the Yarra River has declined, and has increased south of the river. The inner north and west, as well as the area around Dandenong in the southeast, have been most affected by the decline in manufacturing jobs in Melbourne (Department of Infrastructure, 2000). This raises important questions about the patterns of relative accessibility to jobs in different parts of the city.

Women's Participation in Paid Work

Increased participation in the workforce by women has been a major force for social change. It has contributed to economic and social changes many of which have been evident in changing travel patterns. Traditionally women have been more reliant on public transport and travelling as car passengers. But independent car travel by women has shown a sustained increase over the past few decades, particularly for those in paid employment. Thus, as women's roles in society have changed, so too have their travel patterns.

Figure 9. Trips per person on an average day, by gender and employment status, Melbourne, 1999

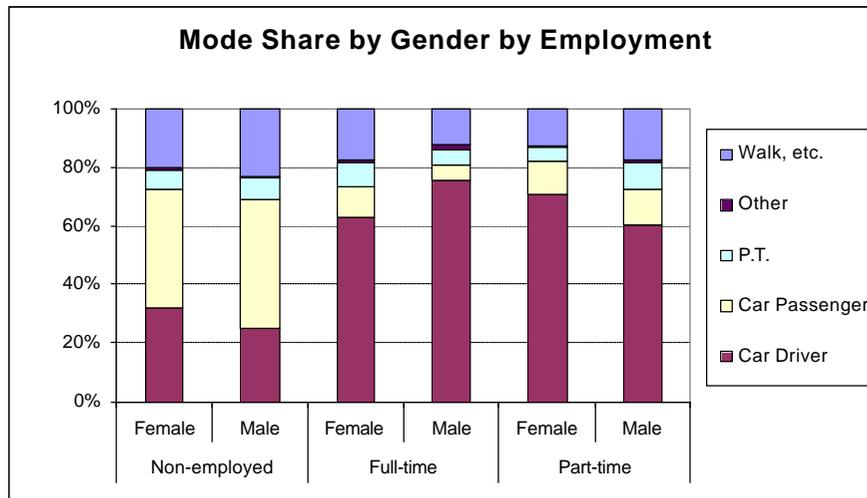


Source: VATS '99

Employment in paid work has effectively added another role in many women's lives since by and large, women continue to have a primary role in managing the home and in looking after children. While women have entered the workforce in greater numbers, the changes in employment patterns have not been uniform. Female employment patterns are clearly discernable from male patterns, with variability in the penetration into different occupations by women, and increasing growth of part-time employment (Richardson, Morris and Loeis, 1996). Morris and Richardson (1996) contend that one of the main reasons why many women work part-time is that 'despite the egalitarian notions of gender equality, women tend to remain responsible for household duties even when they work'. As indicated in Figure 9, females in part-time employment contribute significantly to the increased rates of travel within the population as they have the highest trip rates overall (this is consistent with VATS 1994 findings).

Figure 10 illustrates the modal share of travel undertaken by males and females of working age in Melbourne, based on the VATS 98 survey data. It can be seen that males engaged in full-time employment place heavy reliance upon the car, particularly as a driver. But women engaged in paid work also exhibit high levels of car usage. This is particularly true of women who work part-time (whose combined usage of the car as either a passenger or a driver is the highest over all).

Figure 10. Proportion of trips by gender and employment, Melbourne



Source: VATS '98

Regardless of employment status, both women and men perform more of their trips by walking than they do by public transport. Based on the share of trips made, males who work part-time and women who work full-time make comparatively greater use of public transport than other employment groups.

While women in part-time employment have the highest trip rate among all employment groups (see Figure 9), they tend to make shorter trips on average than other employed people, reflecting the greater number of short-trips performed for shopping and chauffeuring purposes. This has been consistent with earlier work undertaken by Morris and Richardson (1995,1996) on this theme.

To some degree the shifts in travel patterns noted earlier may reflect increasing participation in the workforce by women. On an average weekday during 1994-99, the share of commuting (travel to and from work) increased modestly, while there was also a significant increase in travel to social and recreational activities. It is intuitively plausible that increased participation in the workforce by women may have contributed to this trend, with a corresponding increase in activities such as eating out (classified as social/recreational activities). Engaging in these activities may be a way of compensating for a reduction in the time available to undertake traditional household chores. The increased amount of travel for social and recreational pursuits is also consistent with other documented trends showing that as disposable incomes increase and people are becoming busier, more leisure time is spent outside the home. This can be seen from ABS household expenditure surveys and time use surveys (see, for example, Australian Bureau of Statistics, 1994 and 1995).

Of course, there are likely to be considerable differences in the amount of leisure time available to different groups within the population. For example, a study by Kam and Lau (2000) suggests that female residents living in the central city these days devote large amounts of time to social and recreational

pursuits, and are able to spend more time in this way than either their predecessors or their counterparts in suburban areas of Melbourne. Significantly, central city female residents were also found to have reduced their car use for work and shopping trips during the period 1994-99.

Changes in urban structure and urban form

Changes in residential densities and land-use profiles potentially have an important influence on travel demand, by changing the pattern of origins and destination of activities. Most of the growth in employment over the past decades has been in the suburbs, and many more activities now take place in the suburbs than in the past. There are now many major suburban shopping centres; and many urban services, such as hospitals, show a more decentralised pattern of service delivery than prevailed in the past. Since there are poorer levels of public transport services in suburban areas, many activities that were previously reached relatively easily by public transport may no longer be done so. The central city nonetheless is still the single most important generator of travel, by virtue of its share of employment, shopping and entertainment activities.

Over the past decade, housing densities have increased in Melbourne, reflecting in part strategies aiming to achieve increased urban consolidation and a greater mix of housing styles. For example, between 1992 and 1999, the number of town houses and apartments more than doubled as a percentage of all new residential building. A significant part of the growth in Melbourne's population since the early 1990s has been in the inner city and middle-ring suburbs. Much of this growth has been accommodated in new buildings, but the trend to adapting or recycling old buildings for residential use has also become popular. These central city environments have the advantage of being close to public transport and most services, as well as offering low-maintenance lifestyles (see O'Connor, 2001). Residents in central areas walk, use public transport and cycle significantly more than other Melburnians. The share of non-motorised modes decreases rapidly with greater distance from the central city. In middle and fringe areas, the increasing reliance on private cars is also evident.

Nevertheless, O'Connor and Healy (2002) argue that globalisation is concentrating "new economy" high value jobs in particular subregions of Melbourne, especially in the inner core where the job-resident ratio is much higher than elsewhere in the metropolitan region. Closer access to these jobs by those earning high incomes has fed the rapid growth of medium and higher density housing, segmenting these spatially linked housing and labour markets from other subregions. Increasing spatial segmentation of both labour and housing markets throughout metropolitan Melbourne raises the possibility that average journey to work trips may become shorter, since more people would live closer to jobs for which they are employable. This, in turn, may lead to greater reliance on the car and/or walking at the expense of public transport work trips.

Significantly, too, much of the population growth has occurred on the fringe, where people travel longer distances, have higher levels of car ownership and generally use their cars more. This trend would seem likely to continue. Furthermore, the high growth areas on the metropolitan fringe contain a larger proportion of families with children, and these consistently display high trip rates (see Table 1 and Figure 7 earlier). Hence the growth boundaries of the city will have an important bearing upon the viability of public transport systems and the growth in car travel over the next 20 years or so. Since the 1970s, urban growth on the fringe of Melbourne has been channelled into designated 'growth corridors'. While the established suburbs have witnessed an increase in their popularity in recent years, the fringe areas are forecast to absorb 65 per cent of new homes built during the next 20 years. This will mean that a significant area of predominantly rural land will be encroached by urban development if present trends continue to 2021. For the most part public transport in these areas is severely lacking, and on the basis of past experience, there are very significant lags in the provision of services.

Other Changes

A number of other factors that have also influenced travel patterns in recent years. These are briefly discussed here, since it is these that may possibly bring the greatest changes in travel patterns in the future.

Institutional changes

Since the early 1990s there has been a progressive expansion in the hours when shops and services are open in Melbourne. Extended shopping hours and opening times afford greater flexibility in the time of day that people can engage in activities. This is linked to many of the changes identified earlier, such as an increasing trend to eat out, and to participate in activities away from home. It has also assisted in the transfer of certain activities from weekday to weekend. Saturday is now considered to be one of the busiest shopping days, contributing to the increased growth of weekend car travel (as measured in number of trips, though not necessarily distance travelled). The distinction between various activities has also become 'blurred', as shopping centres increasingly combine entertainment as part of their facilities and services.

The policy of school closures embarked upon by the former State government in the 1990's in Melbourne is another example of an institutional change that may have had an impact on travel patterns (Morris, Wang and Lilja, 2001).

Technological advances

The growth of telecommuting and e-commerce combine the advantages of flexibility in the timing of activities with flexibility in the locations at which activities may be undertaken. Again, these changes have the potential to exert significant impacts on travel patterns. But the precise impacts of e-commerce

on travel patterns may vary, depending upon whether transactions are between businesses, or from business to consumers.

The emergence of e-commerce has the potential to generate small individual savings in personal travel, which may equate to quite significant changes when added up over a large number of people (Golob, 2000). However, the overall effect on road use is uncertain, since there will be corresponding increases in deliveries of goods to people's homes. Moreover, the 'just in time' principles driving much of this consumer behaviour is likely to lead to a changed pattern of deliveries, with many more trips being made by smaller commercial vehicles than by bulk transfer in large freight vehicles. As such the commercial and freight sector is likely to continue to show the greatest rate of growth, and possibly more marked changes in the types of transport used. From a travel demand management point of view, the commercial and freight sector would appear to offer one of the biggest challenges. As such it is now more important than ever that this area of travel activity is addressed by policy makers.

Costs Of Travel

Historically, the monetary costs of car travel have been comparatively low in Australia. This has presented a challenge to public transport, especially since it has long been acknowledged that travellers customarily perceive the cost of car travel to be much less than the actual costs. Many of the fixed costs of private transport (e.g. registration, insurance, etc) are often overlooked when thinking about the cost of making a particular trip. Also, the external diseconomies (like pollution and congestion) are undervalued. Added to this are the car's other advantages – comfort, convenience, flexibility and, often, speed. It should be noted, however, that deficiencies in Melbourne's current ticketing system for public transport have led to a significant problem of fare evasion, and hence there are some public transport users who presently travel for little cost.

Recent sustained increases in the cost of petrol and a comparatively low value of the \$A may be signalling the end of a long era of cheap motoring in Australia. While the short term impact on travel demand may not be large, this can be expected to have a more significant impact in the longer term, through residential location choice, workplace adjustments, and even possibly decisions being made not to replace a car, when damaged or past its useful life. If the cost of travel were to soar suddenly, as in the 1980's 'oil crisis', major shocks would be introduced into the transport system, and these may have an important bearing on modal choice.

Possible impacts of Service Improvements

The privatisation of public transport services that took place within Victoria in recent years has injected additional funds into new rolling stock, development of new services (such as park and ride services for trams), expansion of services and the launch of marketing campaigns designed to lift patronage in line with specific targets. The inclusion of patronage targets in the contracts between the State Government and the recently franchised services is in itself an important

step. However, the level of investment that will be needed to boost patronage to the levels implied by the “20/2020” initiative is clearly an order of magnitude above these recent improvements. There are still large areas of Melbourne, not to mention other areas of the State, without adequate public transport services. This is especially so on weekends in suburban areas of Melbourne (see Brewer and Turnbull, 2002) and much of rural Victoria. Marked variations in access to public transport occur between metropolitan and non-metropolitan cities and between inner and outer suburbs of the larger cities, such as Melbourne.

Clearly important in this regard is a number of large-scale planning projects currently underway within the Department of Infrastructure (and VicRoads) to provide a framework for progressively upgrading and extending the existing public transport services. These include:

- upgrading modal interchanges, including Spencer Street Station as a terminal for interstate, regional and airport rail links;
- improvements to public transport in Melbourne’s growth corridors, including the extension of several suburban rail lines;
- upgrading of rail services to Victoria’s four main regional cities;
- introduction of customer friendly public transport services through the employment of tram conductors and additional station staff;
- improving the operational environment for road-based public transport;
- developing a metropolitan Bus Plan and Tram Plan; and
- implementing behavioural change programs on a trial basis to reduce car use (namely, *TravelSMART*).

Government initiatives, like these currently underway, signal substantial increases in the investment in new infrastructure projects and public transport services in Victoria.

Future outlook

What do these trends suggest in relation to the likely demand for public transport in the future? Based on the foregoing analysis, it is difficult to foresee a marked increase in the demand for public transport in the future, *without* significant changes being made to service levels and policy settings. Certainly, it would appear that modal shift of the size contemplated by current State Government policy is unlikely to occur without radical intervention. The type of changes that are likely to be needed include very significant improvements in the level of public transport services that are available to Melburnians, as well as changes in transport policy (on matters such as the pricing of car travel and parking provisions) and the increased use of “social” marketing.

Given the complex pattern of inter-relationship of many of these factors, a quantitative analysis is likely to be needed to identify the likely long-term impacts. Further research is planned at the Transport Research Centre that seeks to quantify the effects of many of the changes discussed in this paper, and this will undoubtedly provide further insights for planning and policy

initiatives related to the provision of public transport. For the present a qualitative assessment must suffice. A prognosis of the future demand for public transport is presented in Table 6, based on the likely impacts of underlying changes occurring in metropolitan structure and in the socio demographic characteristics of Melbourne's residential population.

Table 6 Prognosis of future demand for public transport: the likely impact of changes in socio demographic characteristics and metropolitan structure

| Underlying Change | Likely Impact on Public Transport Demand |
|---|--|
| Changing Family Structure | |
| • Decreasing % nuclear families | (-) |
| • Increasing % single person households | (+)* |
| Increasing Vehicle Ownership | (-) |
| Ageing of Society | (+)* |
| Increasing Disposable Incomes | (-) |
| Workforce Changes | |
| • Increased % Women in Workforce | (-) |
| • Increased % Service Sector Employment | (-) |
| Changes in Urban Structure | |
| • Urban Consolidation | (+) |
| • Growth at the Fringe | (- -) |

Key: (+)* Increasing demand at decreasing rate
 (+) Increasing demand
 (-) Decreasing demand

Quite simply, the majority of anticipated changes over the next twenty years or so, point to a reduced demand for public transport in the future, rather than an increasing demand. Comparatively few of the underlying changes identified in this paper are indicative of increased demand for public transport in the future. And there is evidence to suggest that in some cases the impact of these changes may be diluted or moderated due to other changes that are occurring. For example, the increased patronage of public transport services made by inner city residents in recent years is a particularly encouraging sign. However, increasing levels of vehicle ownership are also evident among the key demographic groups moving into these areas. This means that the potential gains in modal shift arising from urban consolidation may not be as great as might otherwise be, without more stringent controls (on the amount of residential parking and access to public transport to be provided by these new developments). Linking higher density developments with the provision of innovative transport solutions (such as car sharing schemes) is one area where more could be done to encourage more sustainable transport choices (see

Wang, 2001). Greater spatial segmentation and concentration of jobs and housing markets may, however, further undermine the work-related demand for public transport.

Conclusion

This paper has identified a number of key socio-demographic, economic and physical changes that are likely to occur over the next 20 years in Melbourne that will have a significant impact on the outlook for public transport. These include: changing family structure (including decreasing numbers of nuclear families and increasing numbers of single person households); an overall ageing of society; increasing levels of vehicle ownership; increasing disposable incomes, but greater inequality of incomes; changes in the nature of work and participation rates by particular segments of the population (for example, by women); and changing urban structure and urban form. Many of these would appear to be working against public transport, rather than for it. Under a “no change” scenario - in the fundamental parameters influencing travel behaviour - the goal of increasing public transport patronage presents a huge challenge.

Assuming a continuation of current trends, there seems little reason to speculate that growth in car travel will not continue. This view is supported empirically by recent trends in public transport usage and the factors that have led to increased car use over the past few decades. It is possible that the rate of growth in car travel may be somewhat lower, if car ownership begins to taper off. However, the significant increase in freight travel in recent years and the likelihood of further increases in this sector in the future are of particular importance, and suggest that the growth of road traffic overall is unlikely to moderate without significant policy intervention. Moreover, while there have been some encouraging signs for public transport, the setting of targets will not of itself bring increases in demand of the desired magnitude. There is tentative evidence, at least, that some of the recent strategies are beginning to bear fruit – as witnessed by the small increases in the share of work travel by public transport. Significantly, the long established trend of declining public transport patronage would seem to have been arrested. But, clearly, a massive injection of funds will be needed if significant gains are to be made towards the State Government’s “20/2020” vision. Effort will need to be directed towards enhancing public transport infrastructure *and* modifying people’s behaviour.

Acknowledgements

This paper builds on work by the principal author presented in two unpublished Contract reports (see Transport Research Centre, 2001; Morris and Wang, 2002); accordingly, we wish to thank the Department of Infrastructure and the Department of Premier and Cabinet for allowing publication of this work. The authors would also like to acknowledge assistance provided by RMIT University for this research, through a cross-faculty research grant, namely a VRI Small Research Grant. Finally we would like to acknowledge the useful insights and constructive comments made by Dr Francis McGinley in the course of this work.

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