THE INFLUENCE OF SOCIAL CHANGES ON WORK TRIP MODE CHOICE

Douglas A. Bell
Ministry of Transport, Victoria

ABSTRACT:

This paper examines changes in travel in metropolitan Sydney that occurred in the decade 1971 to 1981. It shows how societal changes in the spatial distribution of the population and jobs, the structural changes in the composition of the workforce and changes in personal mobility have influenced choices of travel modes for the journey to work.

The results are based on two home interview surveys that were conducted in Sydney in 1971 and in 1981. An explanation is given of the difficulty in using survey data that were collected under different guidelines, because substantially different results can occur due to the methodology and techniques used in data collection.

This paper relates the observable changes in society to the mode choice for work trips and concludes that any attempts made to influence mode choice must be cognisant of the societal changes and their implications.

The paper also concludes that considerable care must be exercised when attempting to compare home interview survey data collected under different guidelines.

When this paper was prepared, the author was Senior Research Officer of the State Transport Study Group of New South Wales. The assistance provided by D.G. Keech was considerable and is gratefully acknowledged.

INTRODUCTION

The work journey has traditionally been the focus of transport planners' attention. The heavy concentration of travel within the morning peak tends to make this time period the yardstick for ensuring adequate capacity for all forms of travel. Furthermore the relationship between home and workplace is the basic one behind peak hour transport flows.

From a public point of view, provision for the journey to work is an important item of government expenditure and an important element of political debate. On the average, Sydney workers travel for approximately 60 minutes (or 26 km) in commuting to and from work. The costs in time and money are thus considerable. Most of this travel occurs during the two daily peak periods, straining the capacity of the public transport system and clogging the roads.

The population of Sydney has grown more or less steadily throughout the twentieth century; the same is generally true with the workforce except for declines due to wars etc. In contrast to the continued growth in total work travel, the work trip load on public transport reached its peak during World War II and has steadily declined since then. The decline was brought about by the switch to motoring. The motor car was introduced to Sydney as a serious means of travel during the 1920's. The depression brought a pause in motorisation but the use of the motor car increased during the late 1930's. This was discouraged again by petrol rationing and wartime shortages of new cars. However from the late 1940's, car ownership spread rapidly and the mode share for private vehicle increased. During the 1960's the transition from public transport to motoring was masked by the rapid growth in the workforce. Within a few years however, the young people who had entered the workforce in these years had bought cars and the decline in public transport patronages began again. An indication of these trends can be seen in Table 1.

TABLE 1

WORK TRIP MODE SPLIT IN THE 20TH CENTURY

	1901	1971	1981
CAR	-	56	65
TRAIN	11	21	19
FERRY/BUS	24	15	10
WALK/CYCLE	65	8	6

(SOURCE: 1901 Manning (1983)
1971, 1981 Home Interview Travel surveys)

Manning (1978) concluded that the history of the journey to work in Sydney up until 1971 is one of increasing distance made possible within a constant allocation of average workers time. This has enabled the city to grow geographically with a fall in population density and enabled its people to pursue the suburban Australian ideal of house and garden.

CHANGES IN WORK TRIP MODE CHOICE

The question that has been left unanswered for many years is whether trends already established in the 20th century will continue or whether the changes in society, in addition to policies of subsidised fares and petrol price increases, have or will reverse the trends.

THE DATA

Two home interview surveys, conducted in Sydney in 1971 and 1981, provide an unique opportunity to monitor the travel trends in the seventies and to investigate the underlying causes. Both surveys were in home surveys of household members and recorded travel for a single day. The samples were selected from Electricity Authority records and were between 2% and 3% of the population.

The first of these surveys was undertaken as part of the Sydney Area Transportation Study (SATS) in 1971. Like most surveys of this time the SATS survey was designed primarily to gather information on travel that took place in the problem periods of the day, namely the morning and evening peaks (SATS, 1971). For this reason it focussed on motorised travel to and from work.

During the decade 1971-1981, changes occurred in the population structure, housing type and location choices, car ownership rates, the conditions and location of employment and the composition of the workforce, as well as many changes in the transport infrastructure.

In order to obtain reliable data in a changed environment a major travel survey was commissioned in 1981, in accordance with the survey methodologies available (The 1981 Sydney Travel Survey). Attempts were made to obtain compatability between the two surveys, although improvements in carrying out the survey (both in methodology and content) were of course made to take account of the state-of-the-art in survey techniques. It was not known how significant these improvements would be in terms of the quality and quantity of data collected. It was subsequently determined that the two surveys were not readily comparable (STSG 1984a).

An examination of the reported travel from the 1971 and 1981 surveys reveals that the apparent trip rate (i.e. trips per person aged five years and over) in the Metropolitan Area on the average weekday increased from 2.4 to 3.6 trips per person per day, which is an increase of 50%. This result is not a true indication of the changes in travel behaviour in the decade and needs to be qualified by the considerable differences in the two surveys namely:

* 1981 data includes commercial vehicles trips, which were excluded in 1971.
* 1981 data includes reporting of incidental stops, excluded in 1971.
* severe under-reporting of trips existed in 1971, especially trips in the off peak, non motorised trips (eg. walking) and short trips. By contrast, the 1981 survey methodology ensured that all these trips were collected.

On the other hand, an examination of the full set of peoples activities suggests that both surveys captured similar amounts of out-of-house time despite the large discrepancies in actual number of trips. Figure 1 and 2 shows the total out-of-house time, for 1971 and 1981 respectively, in four major activities namely:

- travel time
- time spent at work
- time spent at education
- time spent at 'other' (shopping, social, etc.)

The general form of the activity graphs in 1971 is very similar to that for 1981. Travel peaks are approximately the same (ie. 8.30 am and 3.30 pm). Work represents the major out-of-house activity between 8 am and 4 pm, together with education. The 'other' activities are spread generally between 10 am and 11 pm. The area not enclosed, up to the population (2.5 million in 1971 and 2.7 million in 1981), represents the number of people at home.

In brief, Figures 1 & 2 suggests that the two surveys captured a similar amount of out-of-house time. In 1971 reported out-of-house time averaged 351 minutes whilst in 1981 it averaged 364 minutes. So although the trip rate increased by 50%, the out-of-house time changed by only 4%. Note: off peak travel showed a large increase as did 'other' activities. This suggests that by careful analysis of the data, a reliable and consistent basis for comparison between 1971 and 1981 can be established by focussing on peak work trips.

The major differences between the two surveys need to be acknowledged in defining a comparable base. These differences refer not only to TRAVEL DAYS, AREA and AGE of respondents but also to the substantial degree of trip under-reporting which occurred in 1971 which related to non motorised travel, off peak travel and incidental stops. A comparative basis for trip making can thus be established by concentrating on those data items that are both definitionally consistent and accurately reported from both the 1971 and 1981 home interview surveys. Table 2 describes the comparative basis which results in "am peak work trips in the Metropolitan Area on an average weekday" as being an accurate and reliable basis for comparison.

TABLE 2

COMPARATIVE BASIS (1971 and 1981)

ITEM	COMPARATIVE BASIS
DAYS	WEEKDAY
AREA	METROPOLITAN AREA
AGE	PERSONS 5 YEARS AND OLDER
TIME	AM PEAK (eg. arriving between 7am and 9 am)
PURPOSE	TRIPS TO WORK (ignoring incidental stops)

In brief, all data are from the home interview surveys unless otherwise stated. Social and demographic data have been checked against census data for validation and have been found to be reliable.

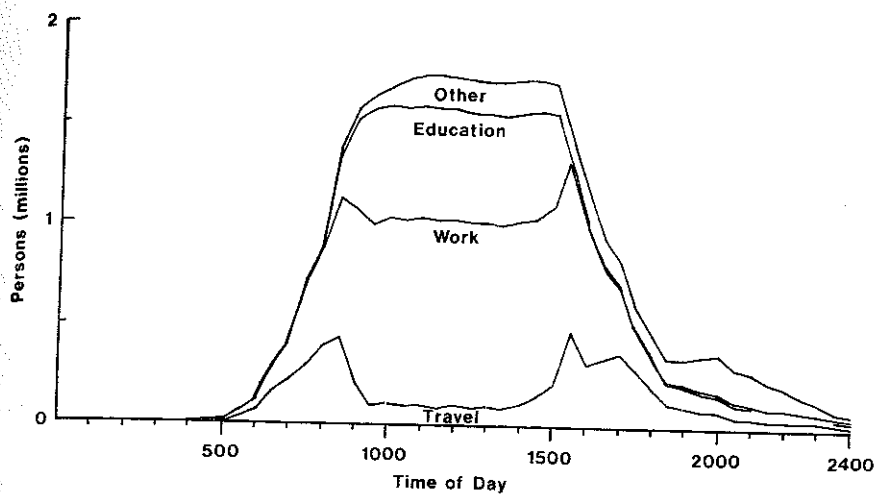

FIGURE 1

OUT-OF-HOUSE ACTIVITIES (1971)

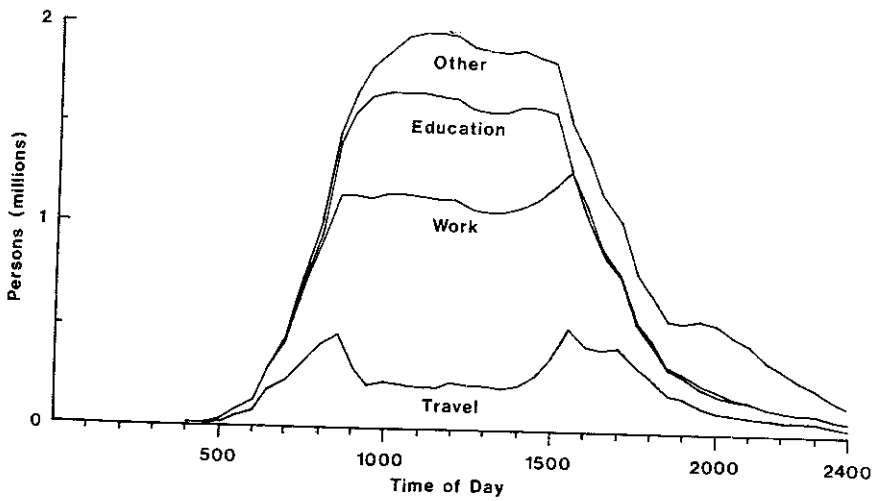

FIGURE 2

OUT-OF-HOUSE ACTIVITIES (1981)

ECONOMIC, SOCIAL AND DEMOGRAPHIC CHANGES

In the decade from 1971 to 1981 several major economic, social and demographic changes occurred in the Sydney Metropolitan Area. These changes, which are discussed below, have had important implications for travel and especially for morning peak travel to work.

(1) Vehicle Ownership and Driving Licence

* There was substantial growth in private vehicle ownership and the availability of company vehicles.

The number of private and company vehicles available for private use in the morning peak grew by 40%, and the number of vehicles available per person grew from 0.31 to 0.40. In 1971, 26% of houeholds did not have a vehicle, but by 1981 this proportion had declined to 20%. The proportion of households with one vehicle also declined from 51% in 1971 to 47% in 1981. By contrast, the proportion of households in 1981 with two or more vehicles was 33%, up from 23% in 1971.

The number of company vehicles available for private use doubled from 67,000 in 1971 (8% of all vehicles available for private use) to 150,000 in 1981 (13% of all vehicles available).

The extent of the changes relating to vehicle ownership overshadow many other changes during the decade. Table 3 reveals the nature and extent of the changes for the Sydney Metropolitan Area. (INNER, MIDDLE and OUTER refer to groupings of LGAs, as shown in Figure 3). Although different areas show substantially different rates of vehicle ownership, the rate of growth in vehicles per household has been fairly constant over the whole area.

TABLE 3

VEHICLE OWNERSHIP

Proportion of dwellings:	1971	1981	Change
0 vehicles	25.9%	19.8%	-24%
1 vehicle	51.1%	46.9%	-8%
2 vehicles	19.3%	26.4%	37%
3+ vehicles	3.8%	7.0%	84%
Total Vehicles	855,000	1,190,000	40%
Company Cars	67,000	150,000	124%
Vehicles per household			
INNER	.81	.97	20%
MIDDLE	1.12	1.31	17%
OUTER	1.15	1.38	20%
TOTAL	1.02	1.22	20%
Vehicles per person	.31	.40	29%

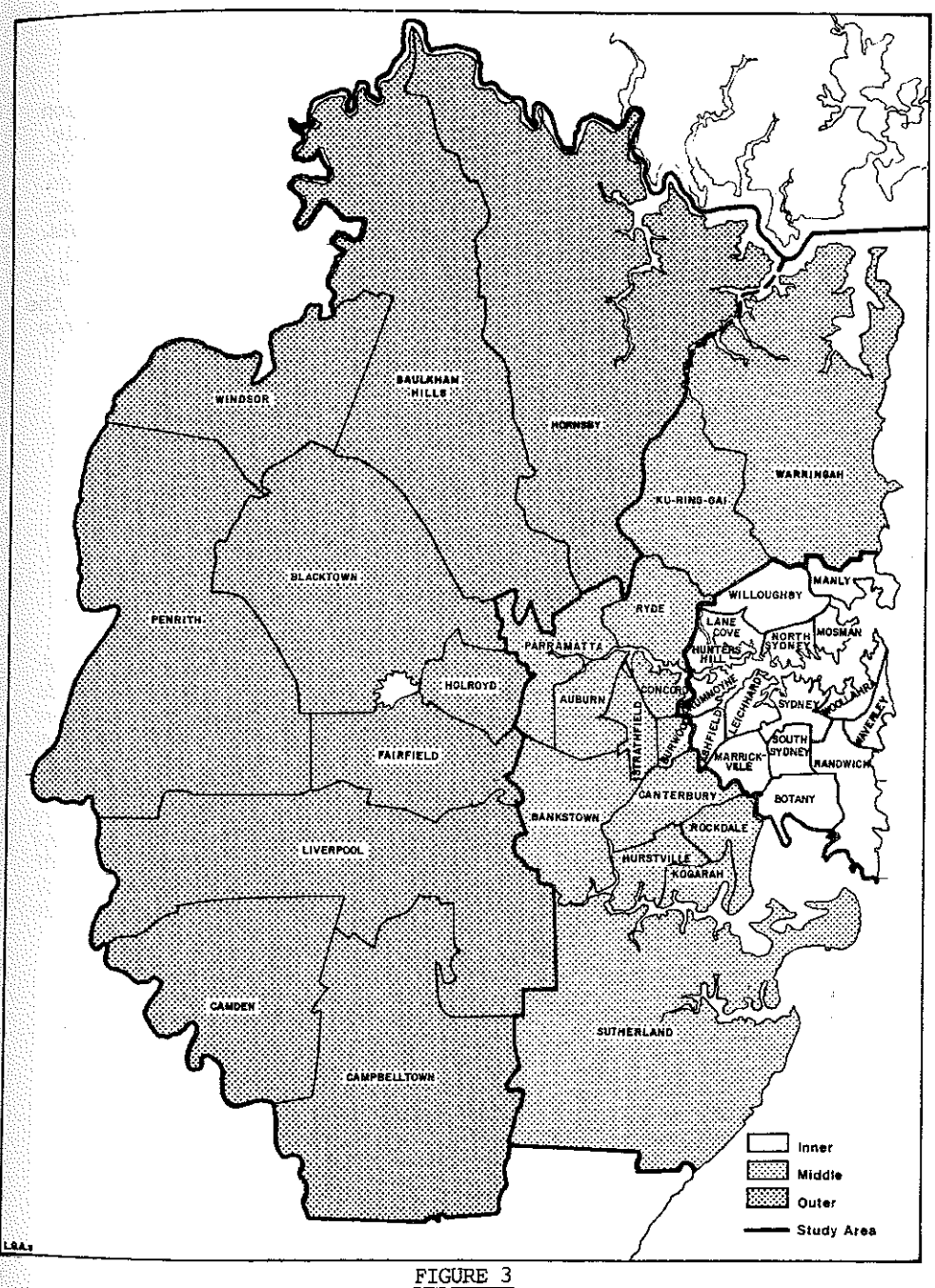

FIGURE 3

SYDNEY LGA BOUNDARIES

* There was significant growth in the number possessing a driving licence, especially among females.

The proportion of males, aged 18 or more, who held a driving licence increased from 81% to 87% over the decade. While the proportion of adult females holding a licence increased from 42% to 60% (See Table 4).

There is a well established link between licence holding and car availability/ownership, which in turn can influence the choice of modes. In this analysis licence holding is used as an indication of potential car usage. Figure 4 illustrates the relationship between a person's age and the proportion holding a driving licence. It further illustrates the stabilisation among males compared to the significant changes in licence holding among females, especially in the younger age categories.

TABLE 4

Proportion (18+) with a DRIVING LICENCE

	1971	1981	Change
Male	81	87	7%
Female	42	60	43%

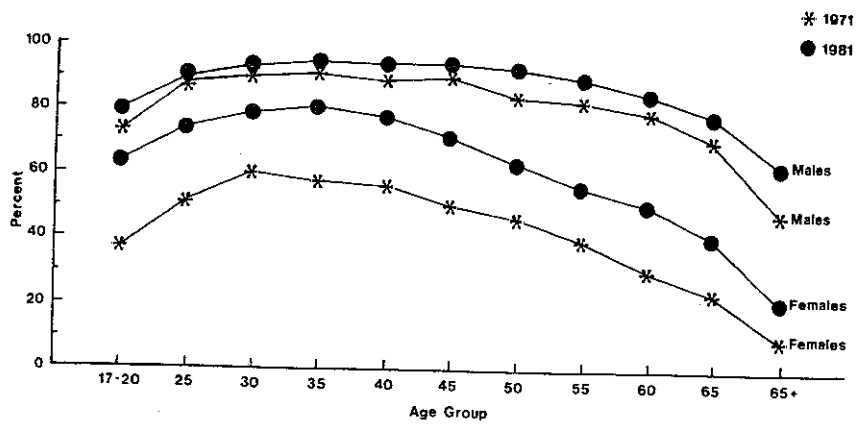

FIGURE 4

LICENCE HOLDING BY AGE AND SEX

(2) Workforce

* The number of males in the full-time workforce declined and the number of females increased.

The number of full-time employed males living in the metropolitan area declined by about 24,000 (or 3%) while the number of full-time employed females increased by about 38,000, a 12% increase. The female proportion of the full-time workforce rose from 28% in 1971 to 31% in 1981 as shown in Table 5.

TABLE 5

SEX OF FULL TIME WORKFORCE

	1971	1981	Change
MALE	817,469 (72%)	793,692 (69%)	-3%
FEMALE	316,574 (28%)	354,758 (31%)	12%
TOTAL	1,134,043 (100%)	1,148,450 (100%)	1%

* There were major changes in the ratio of part-time to full-time jobs. The decade also witnessed the introduction of more flexible working times.

Although the total metropolitan workforce increased by 9% over the decade, the increase in the number of full time workers was only 1% or about 14,000 persons. The part-time workforce (less than 35 hours per week) more than doubled, growing by 94,000 and increasing from 6% of the workforce in 1971 to 13% in 1981.

It is also known that flexible working conditions were far more prevalent in 1981 than in 1971, although data from the travel surveys cannot provide accurate statistics to measure the extent of this change. The effects of flexi-time could include fewer workers travelling to work in the morning peak period and, on any given day, fewer workers going to work because of flexileave, 9-day fortnights or 19-day months.

TABLE 6

FULL TIME & PART TIME WORKFORCE

	1971	1981	Change
Full-time (≥ 35 hrs)	1,134,043 (94%)	1,148,450 (87%)	1%
Part-time (1-34 hrs)	71,048 (6%)	165,100 (13%)	132%
TOTAL	1,205,091 (100%)	1,313,550 (100%)	9%

(3) Employment:

Table 7 shows the destination of am peak work trips. The table is indicative of employment trends within the Sydney region as similar changes are evident if all work trips are considered. A number of major employment trends can be determined, which are discussed below:

TABLE 7

DESTINATION OF AM PEAK WORK TRIPS

DESTINATION	1971	1981	1981-1971	Change
CBD	147,829	126,305	-21,524	-15%
North Sydney Comm. District	10,719	19,581	8,862	83%
Major Comm. Suburban Centre	51,882	61,543	9,661	19%
Non Comm. Centres	499,299	490,594	-8,705	-2%
TOTAL	709,729	698,023	-11,706	-2%

* The number of jobs in the Central Business District (CBD) declined substantially.

Between 1971 and 1981 the number of am peak work trips to the CBD declined by almost 22,000, a 15% decrease from the 1971 level. Overall the CBD declined from 21% of metropolitan am peak trips in 1971 to only 18% in 1981.

* There was substantial growth in full-time employment in the North Sydney commercial district.

The number of peak work trips to this area almost doubled, from 11,000 to 20,000 (See Table 7). Most of this growth was in office/commercial jobs; it drew an increasing proportion of its workers from outer suburbs and its employment density increased while parking became more constrained. Over the decade, North Sydney became more like the Central Business District in these respects.

* There was substantial growth in the number of jobs in the major suburban commercial centres, although the extent of growth and the ratio of full-time to part-time jobs varied from one centre to another.

AM peak work trips to the eleven biggest suburban commercial centres grew by 19%, while total jobs in these areas increased by 27%. Changes in individual centres ranged from 102% growth in Chatswood to 5% decline in Hurstville. Also, unlike North Sydney, none of the centres reached such a scale that employee car parking was excessively difficult to find.

* There was almost no change in the level of employment in suburban shopping centres and industrial estates although such employment declined in inner suburbs and increased in the outer suburbs.

It is easy to understand and focus on jobs in the CBD. North Sydney and the major suburban commercial centres. However, these comprise only about 30% of the metropolitan area's jobs.

Trends in employment are summarised according to the type of employment area (commercial centre, industrial area etc.) in Figure 5, which shows trends in the relative significance of each type of area as measured by their share of am peak trips to work. It can be seen that the CBD continues to be the single most important employment centre, although as a destination for am peak work trips, it declined from 21% in 1971 to 18% in 1981. North Sydney and other major suburban commercial centres increased their share of jobs. The number of jobs located outside the major commercial centres remained almost static.

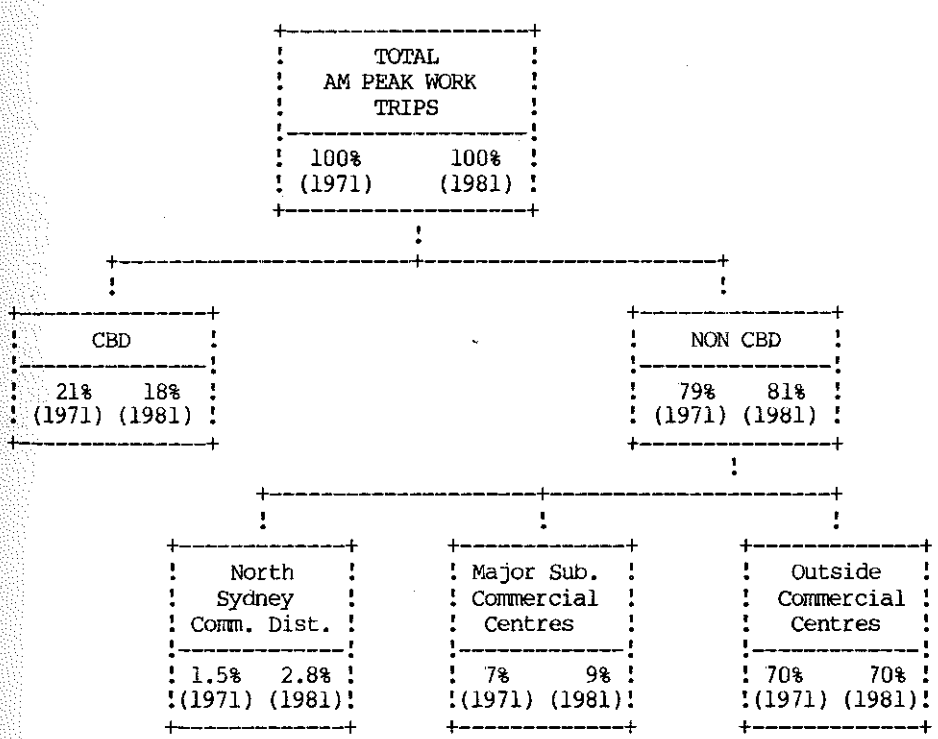

FIGURE 5

DESTINATION OF AM PEAK WORK TRIPS

(4) Population

* The population declined in the higher-density transit oriented INNER areas and grew substantially in the lower-density, car-oriented OUTER suburbs.

In the INNER suburbs, generally up to 12 kilometres from the city, the population declined by 9% (67,000 persons) between 1971 and 1981. The MIDDLE suburbs, generally 12-24 kilometres from the city, had a 4% increase (47,000) in their population, while the number living in the car-oriented, low-density OUTER suburbs (beyond 24 kilometres or so) increased by 223,000 or 36%.

TABLE 8

POPULATION (5+) BY AREA

LGA GROUP	1971	1981	Change
INNER	792,597	725,190	-9%
MIDDLE	1,127,301	1,174,293	4%
OUTER	614,824	837,792	36%
TOTAL	2,534,722	2,737,275	8%

All indicators examined (population, households, workforce and vehicle fleet) which reflect the size of a city have shown an expected increase. What is of particular interest is the relative size of these changes. The population (5+) has increased by 8%; the workforce by 9%; the number of households by 16% whilst the total number of vehicles has grown by 40% and the number of company cars has more than doubled (124%).

Similar trends are shown in the decentralisation and suburbanisation of employment. The biggest gains occurred in Blacktown, Parramatta and Hornsby. Most of the increases were in MIDDLE and OUTER LGAs. North Sydney was the only INNER area to show significant growth in employment whilst significant decreases in employment occurred in South Sydney, Sydney, Marrickville and Leichhardt LGAs.

(5) Other Changes

There are many other factors which could potentially affect morning peak travel. These include public transport fares, the cost of petrol, the costs of owning a motor vehicle, congestion etc.

Between June 1971 and June 1981 metropolitan rail fares declined in real terms (deflated by the Consumer Price Index for Sydney) by about 23%. Fares (1) on Government buses declined by about 13% on the same basis.

During the decade, the real price of petrol increased significantly; that is it has increased faster than income and faster than the Consumer Price Index so that households need to spend a higher proportion of their budget on petrol.

The same ten years have seen changes in the transport system. There have been numerous changes in the road network in the decade (Bureau of Transport Economics 1984), which mostly include operational improvements to a number of major roads.

Eg. Princes Highway (1971-1979) - Sutherland bypass
Great Western Highway (1971-1976) - Parramatta bypass
Warringah Freeway (1973-1979) - 2nd stage, etc.

The emphasis on roads has generally been in improvements in traffic management rather than the construction of new freeways.

In 1979 the Eastern Suburbs Railway was opened, improving public transport in the Eastern Suburbs considerably. There was in addition a substantial modernisation of rail and bus fleets and more recently additions to the ferry fleet.

It is now opportune to observe the impact on work trip mode choice against this background of changes in the urban structure; namely the shifts in population and employment and other socio-demographic changes superimposed on the changes in the transport system.

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(1) These trends are for full fares only, and do not take account of growth in the use of periodical tickets with discounts.

AM PEAK TRIPS TO WORK

Trips to work represent a major part of morning peak travel (54% in 1971 and 50% in 1981). These journeys are considered to be of great significance for planning purposes. Firstly, they are considered mandatory and are generally made most weekdays; secondly, there are normally constraints in the time of day when they can be made; and thirdly, their origins and destinations are relatively fixed. As noted previously, work trips (along with education trips) are most likely to have been well reported in 1971 and so are amenable to detailed assessment of trends.

* There was a major shift from public transport to private transport for the journey to work.

The total number of trips to work in the morning peak was fairly stable, dropping by only 2% or 12,000 trips. The majority of trips to work in the am peak are by private vehicle. Table 9 shows that 'vehicle driver' was the only mode to record an increase over the decade. Since 1971 an additional 65,000 peak work trips were made by vehicle driver, increasing its share from 45% to 55% in the am peak. All other forms of transport declined: rail by 14,000, ferry by 2,000, bus by 36,000(1), walk by 15,000 and vehicle passenger by 8,000(2).

The rest of this paper examines some possible reasons for these shifts.

TABLE 9

AM PEAK WORK TRIPS BY MODE

Priority Mode	1971		1981		1981-1971	Change
Driver	316,409	(44.5%)	381,507	(54.7%)	65,098	21%
Passenger	74,928	(10.5%)	67,070	(9.6%)	-7,858	-10%
Train	149,672	(21.0%)	135,623	(19.4%)	-14,049	-9%
Ferry	10,091	(1.4%)	7,917	(1.1%)	-2,174	-22%
Bus	96,908	(13.6%)	60,431	(8.6%)	-36,477	-38%
Taxi	3,287	(0.5%)	2,417	(0.3%)	-870	-26%
Other, Walk	58,202	(8.2%)	43,058	(6.1%)	-15,144	-26%
Total	709,729	(100%)	698,023	(100%)	-11,706	-2%
Transit share:		36%		29%		-20%

(1) A substantial part of the decreased bus patronage is attributable to the opening of the Eastern Suburbs Railway.

(2) This represents a decrease in vehicle occupancy for peak work trips from 1.24 to 1.18.

REASONS FOR MODE SHIFT

(A) Effect of Working Females:

* Males and females both use public transport less for the journey to work in 1981 compared to 1971. Increase use of private vehicles is much more pronounced among females.

Table 5 showed that the female component of the full-time workforce increased by 12% and the male component decreased by 3%. Detailed analysis of this trend is beyond the scope of this paper but one could argue that this is related to the combined effect of early retirements (among males), the decline of the male orientated manufacturing industries and the general trend of more women entering the workforce.

The entry of women into the workforce is even more noticeable in the am peak, where male workers declined by 9% and female workers increased by 13%. An examination of mode shares confirms previous trends that all modes have declined at the expense of vehicle drivers. The likelihood of a female driving to work has increased from 19% to 40%. This represents a significant change to the overall mode split. In other words 60,000 of the 65,000 increase in vehicle driver trips in the am peak were made by females. (See Table 10).

Table 10 shows these changes in detail. The number of trips to work by male residents of the metropolitan area dropped by about 41,000 while the number by females increased by 29,000. More significantly, most of the decline in work trips by males was in public transport (31,000), although there were 8,000 fewer car passengers and 7,000 fewer walkers. This was offset by an additional 5,000 male drivers. The 30,000 increase in female work trips was actually a combination of 60,000 additional female driver trips and 30,000 fewer females on public transport or walking. There was no change in the number of females being driven to work. Transit mode share has fallen from 52% to 38% for females while the transit share for males has fallen from a high of 29% in 1971 to 24% in 1981.

The underlying reasons for this trend are still unclear. Perhaps women are driving their children to school on their way to work. Perhaps the residential location was chosen to accommodate the man's journey to work and now the female is also working. Perhaps an extra household car allows the women in the household to use it for her work trip. Perhaps, with the breakdown of many family units, the emerging households, each with a breadwinner, and each with its own car are more likely to drive because of the availability of a vehicle. Or, perhaps it is because the new jobs taken by females are outside of the CBD and commercial centres, where public transport does not compete as well with private vehicles. Many more possibilities exist but the trend towards greater use of the private vehicle especially by females is clear and unambiguous.

TABLE 10

AM PEAK WORK TRIPS BY MODE AND SEX
(See Figure 6)

Mode	FEMALES 1971	FEMALES 1981	FEMALES Change	MALES 1971	MALES 1981	MALES Change
Driver	45,312	105,289	59,977	271,097	276,218	5,121
Passenger	38,729	38,414	-315	36,200	28,656	-7,544
Train	62,481	59,871	-2,610	87,191	75,752	-11,439
Ferry	3,264	2,826	-438	6,827	5,091	-1,736
Bus	54,407	35,561	-18,846	42,731	24,870	-17,861
Taxi	1,907	1,547	-360	1,380	869	-511
Other, Walk	27,242	19,188	-8,054	30,961	23,870	-7,091
Total	233,342	262,696	29,354	476,387	435,326	-41,061
Transit Share:	52%	38%		29%	24%	

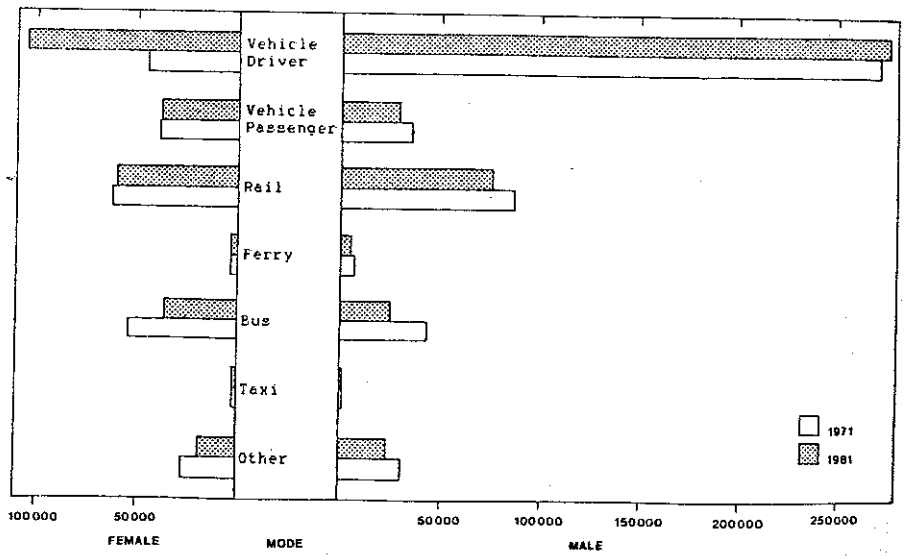

FIGURE 6

AM PEAK WORK TRIPS BY MODE AND BY SEX

(B) Effect of Decentralisation of Jobs

* Public transport trips to jobs in the CBD/North Sydney declined, mostly due to the decrease in jobs; public transport trips to jobs outside the CBD/North Sydney decreased mostly due to a mode shift to private vehicle.

Table 7 has already shown that the CBD lost about 21,000 work trips made in the am peak, while North Sydney gained almost 9,000. To an extent, growth in North Sydney counterbalanced the decline of jobs in the CBD.

The effect of decentralisation of jobs is examined in this paper by treating the combined area of the CBD and North Sydney commercial District as one. The number of trips to work in the CBD/North Sydney in the morning peak declined by about 13,000 or 8%, as shown in Table 11. All of this decline was in public transport trips, which dropped by about 15,000 from the 1971 level and a small decrease in car passenger trips. This was offset by an additional 2,000 vehicle driver trips and 2,000 extra walk trips.

In attempts to identify the additional 65,000 vehicle trips, we note in Table 11 that 63,000 of the 65,000 increase in vehicle driver trips are to non CBD/North Sydney locations. In other words, the transit mode split to the city centre(s) has decreased from 77% to 73% (representing 15,000), but the transit share for other destinations has falled from 25% to 18% (representing 28,000).

The Central Business Districts and the public transport system are strongly inter-related. In 1981 51% of all morning peak public transport trips to work were to the CBD/Nth Sydney, although the area only accounts for 21% of all work trips in the am peak. Any change in the number of jobs in these high density areas, particularly full-time jobs, therefore has a major effect on the number of people using public transport in the morning peak.

It would seem that the transport system should favour centralisation, where the city centre is the point of maximum accessibility; but the switch from public transport to motor car has reduced this centralising power of the radial transport system. In response, department stores have been set up in the suburbs and factories have moved to MIDDLE and OUTER suburbs. If this trend continues, the trend towards lower public transport patronages is sure to follow.

TABLE 11

AM PEAK WORK TRIPS BY MODE AND DESINTATON
(See Figure 7)

Mode	CBD/Nth Sydney 1971	CBD/Nth Sydney 1981	CBD/Nth Sydney Change	NON CBD 1971	NON CBD 1981	NON CBD Change
Driver	22,962	25,003	2,041	293,448	356,504	63,056
Passenger	8,665	8,002	-663	66,263	59,068	-7,195
Train	80,596	76,834	-3,762	69,075	58,789	-10,286
Ferry	6,616	5,425	-1,191	3,476	2,492	-984
Bus	34,349	23,838	-10,511	62,789	36,594	-26,195
Taxi	511	106	-405	2,775	2,310	-465
Other, Walk	4,849	6,678	1,829	53,353	36,381	-16,972
Total	158,549	145,886	-12,663	551,180	552,137	957
Transit Share:	77%	73%		25%	18%	

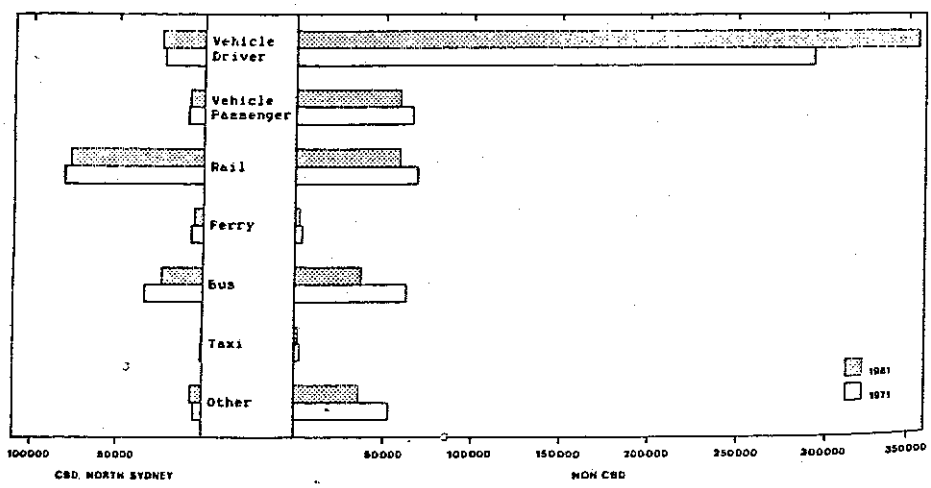

FIGURE 7

AM PEAK WORK TRIPS BY MODE AND BY DESTINATION

(C) Effect of Suburbanisation and Vehicle Ownership

The trend towards suburbanisation has already been noted (Table 8) as had the substantial increase in vehicle ownership (Table 3). It is very difficult to isolate these two trends because they occurred, to a degree, hand in hand. That is, the growth areas are very car orientated and record the highest levels of vehicle ownership (See Table 12).

To test the effect of these changes, all 'fringe' Local Government Areas (LGAs) have been grouped together, that is all those LGAs that form the boundary of the Metropolitan Area (see Figure 3). These LGAs are shown in Table 12 from north to south.

TABLE 12

CHANGES IN VEHICLE OWNERSHIP AND POPULATION (5+)

	---vehicle/household----			---Population(000s)---		
	1971	1981	Change	1971	1981	Change
Warringah	1.28	1.48	16%	141	161	14%
Hornsby	1.27	1.56	22%	87	103	73%
Baulkham Hills	1.47	1.78	21%	49	85	73%
Windsor	1.04	1.31	26%	14	33	136%
Penrith	1.16	1.34	16%	50	86	72%
Liverpool	1.08	1.24	15%	73	85	16%
Camden	1.29	1.57	22%	6	11	83%
Campbelltown	1.09	1.36	25%	30	80	166%
Sutherland	1.21	1.53	26%	136	153	12%
Metropolitan	1.02	1.22	20%	2535	2737	8%

Table 12 shows the large population shift to these 'fringe' LGAs, ranging from 12% to 166%. At the same time, vehicle ownership also increased significantly, so that these LGAs are among the highest in their level of vehicle ownership in the Metropolitan Area.

The effect of these changes on mode split are shown in Table 13, which reveals two trends. Firstly the 'fringe' areas account for 56,000 additional peak work trips at the expense of trips originating in 'other' (non fringe) areas. A closer inspection reveals that most of this increase (49,000) or 88% were made by vehicle driver, although vehicle passenger and train also increased slightly. Altogether 75% of the increase in vehicle driver trips originated in the 'fringe' growth areas. The overall conclusion is that vehicle driver trips have increased from all areas, but the major increases have occurred in the 'fringe' LGAs, attributable as much to the population in these areas as to the relatively high levels of vehicle ownership.

TABLE 13

AM PEAK WORK TRIPS BY MODE AND HOME LOCATION
(See Figure 8)

Mode	'FRINGE' 1971	'FRINGE' 1981	'FRINGE' Change	OTHER 1971	OTHER 1981	OTHER Change
Driver	80,168	129,177	49,009	236,243	252,329	16,086
Passenger	17,572	20,716	3,144	57,357	46,355	-11,002
Train	30,551	35,619	5,068	119,121	100,004	-19,117
Ferry	1,713	1,163	-550	8,378	6,754	-1,624
Bus	9,181	7,527	-2,254	87,957	52,905	-35,052
Taxi	364	589	225	2,923	1,828	-1,095
Other, Walk	7,721	8,041	321	50,481	35,017	-15,464
Total	147,269	202,832	55,563	562,460	495,191	-67,269
Transit Share:	28%	22%		39%	33%	

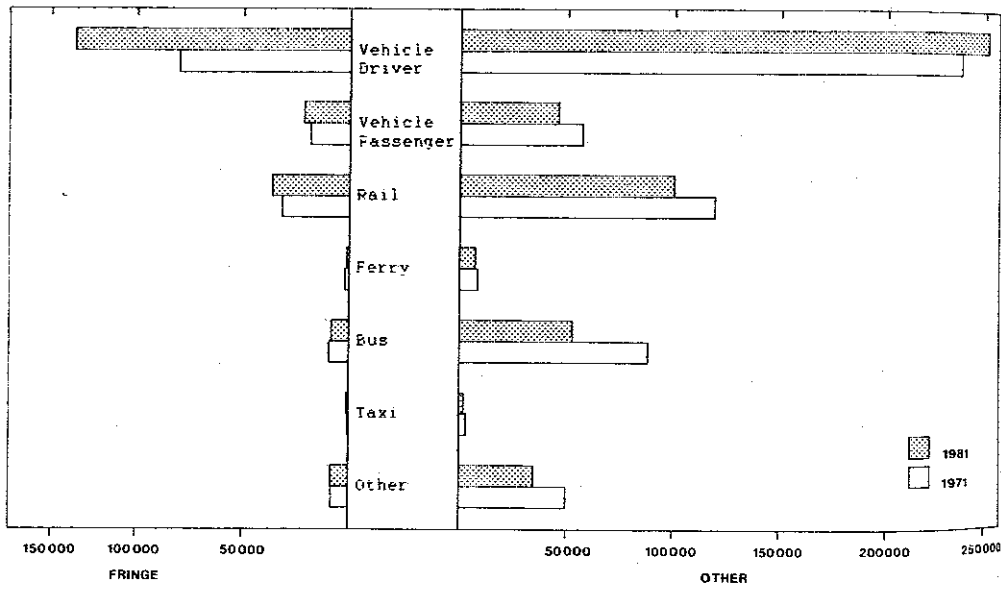

FIGURE 8

AM PEAK WORK TRIPS BY MODE AND BY HOME DESTINATION

(D) Spatial Impact

Figure 9 examines the percentage increase in the use of motor vehicles by LGA to see if there exists a spatial bias. This figure plots the private vehicle share of work trips for 1971 versus 1981. LGAs on the upper left segment indicate increased private vehicle usage in 1981 compared to 1971. The overall trend is an increase in private vehicle trips from 55% to 64%.

It is clear that the trend towards increased use of motor cars is widespread throughout Sydney, although there are a few pockets that show a reversal of the trend (e.g. Camden, Hunter's Hill, which are generally explained by local influences (STSG 1984b). Table 15 summarises the population shifts and Table 16 shows a similar trend in the location of jobs, showing that population and jobs have shifted 'outward' at a similar rate.

TABLE 15

ORIGINS OF AM PEAK WORK TRIPS

Residential Location	1971	1981	1981-1971	Change
INNER	239,123	199,706	-39,417	-16%
MIDDLE	316,121	303,121	-13,000	-4%
OUTER	154,424	195,195	40,771	26%
TOTAL	709,729	698,023	-11,706	-2%

TABLE 16

DESTINATIONS OF AM PEAK WORK TRIPS

Destination	1971	1981	1981-1971	Change
INNER	403,927	358,725	-45,202	-11%
MIDDLE	223,136	225,624	2,488	1%
OUTER	82,666	113,674	31,008	38%
TOTAL	709,729	698,023	-11,706	-2%

In summary, Figure 9 shows that the trend towards the motor car is quite universal, and probably not influenced solely by any one of the previously mentioned causes but more likely by a combination of effects. Actual origins and destinations are of course greatly influenced by the changing locations of households and jobs; however the likelihood of an individual choosing to drive to work has increased fairly constantly over the whole metropolitan area.

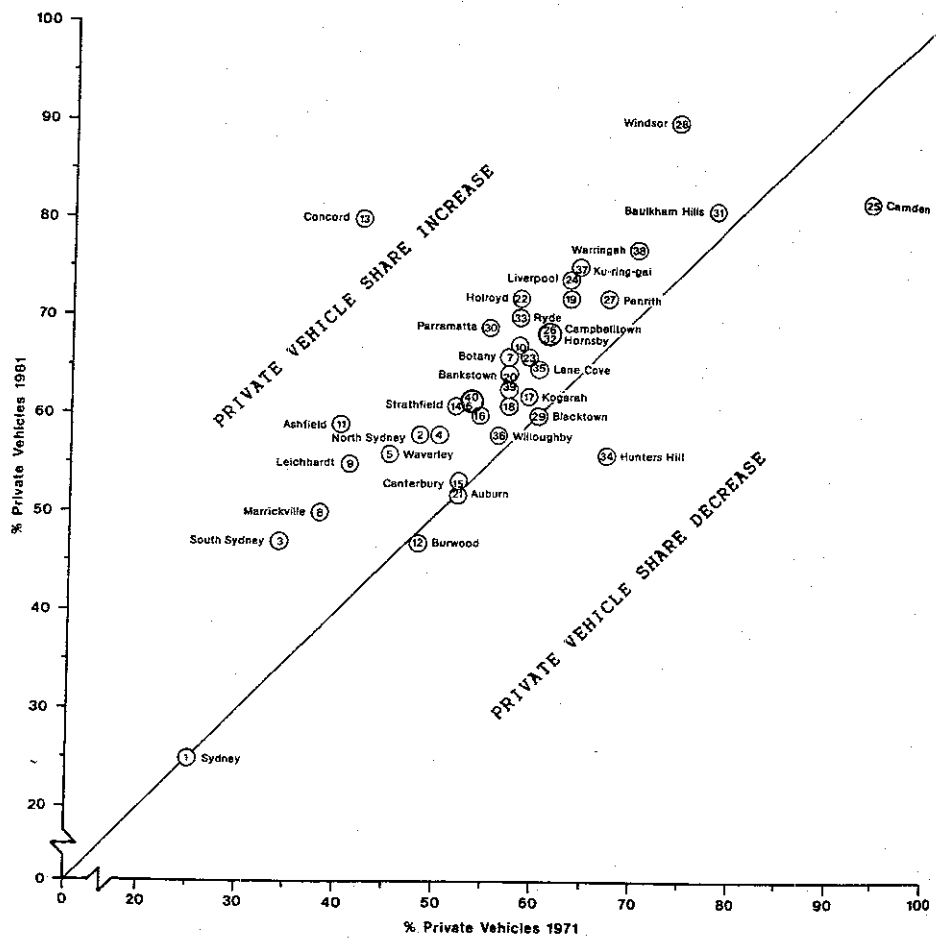

FIGURE 9

PRIVATE VEHICLE SHARE OF WORK TRIPS (1971 vs. 1981)
by LGA of ORIGIN

4 WOOLLAHRA	16 ROCKDALE	23 FAIRFIELD
6 RANDWICK	18 HURSTVILLE	39 MANLY
10 DRUMMONYNE	19 SUTHERLAND	40 MOSMAN

CONCLUSION

The trend towards motorisation or the increased use of the private vehicle for work trips has been evident in Sydney for the greater part of the twentieth century. The continuation of this phenomenon from 1971-1981 has been supported by reference to two travel surveys.

Analysis has show that significant amount of this shift (which corresponds to 65,000 additional vehicle driver trips and 8,000 fewer vehicle passenger trips) can be attributable to major changes in the location of workforce and jobs. In particular

* 63,000 additional driver trips to the non CBD/Nth Sydney locations
* 49,000 additional driver trips from 'fringe' LGAs.

In addition to these spatial changes of where people live and work, there have been two other changes that have greatly influenced mode split:

* there have been 30,000 additional women going to work in the am peak and there are 60,000 additional driver trips by females

* there has been significant increase in the level of vehicle ownership; more importantly perhaps, the number of company owned vehicles has increased dramatically, such that one car in eight is now company owned.

It has been shown that the significant changes which occurred in morning peak travel, especially in the journey to work, can be attributable to social, demographic and spatial trends. There are many other factors which could potentially affect morning peak travel. These include public transport fares the cost of petrol and the costs of owning a motor vehicle. If anything, the increase in the real cost of petrol and the decreases in the real cost of public transport fares would have reduced car use and increased public transport use. It is clear that these changes in petrol prices and public transport costs could not outweigh the major social, economic and demographic changes which caused the significant shift from public transport to private vehicle, for the journey to work.

If public transport is to be encouraged, greater emphasis will need to be given to catering for working women and providing the sort of transport alternatives that are considered necessary. Concern should be raised at the decreasing use of public transport for work trips due to the increasing availability of the motor cars and especially the company owned vehicle. It appears that policies of decentralisation are unlikely to encourage increasing use of the public transport system, which has its focus on the city.

The analysis performed to date has suggested a number of possible explanations to account for the decline in public transport patronages for the morning work trip. The inter-relationships of these 'explanations' with themselves and with others is still unclear and could be the subject of further investigation.

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