

URBAN HOUSEHOLD CAR OWNERSHIP
IN AUSTRALIA

L.C. WADEWA

Associate Professor

Department of Civil and Systems Engineering
JAMES COOK UNIVERSITY OF NORTH QUEENSLAND

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ABSTRACT

The socio-economic data collected in conjunction with the trip data in the home interview surveys conducted in key Australian cities has been used to examine the patterns of distribution of household car ownership. Firstly the proportion of non-car-owning households is analysed with respect to the household's socio-economic characteristics in eight cities. Then the distribution of car ownership level is investigated for three cities ... the largest city, a medium-sized capital city and a large provincial city.

1. INTRODUCTION

The socio-economic data collected in conjunction with trip data in conventional home interview surveys is a rich source for understanding patterns of urban household car ownership. This data, which was collected for all principal cities in Australia during the 1970's was used in this study to

- (i) investigate the effect of various socio-economic variables on household car ownership
- (ii) compare the variations in car ownership among cities.

Data from eight principal cities is used in this research. These are

Sydney	1971	Largest city (Capital, NSW)
Melbourne	1972	Second largest city (Capital, Victoria)
Adelaide	1976	Capital city (South Australia)
Brisbane	1977	Capital city (Queensland)
Canberra	1975	National capital
Perth	1966/1976	Capital city (Western Australia)
Newcastle	1974	Provincial city (NSW)
Wollongong	1974	Provincial city (NSW)

Since time has an important influence on car ownership, the discussion is organised in two time-periods:

- i) 1971-74: Sydney, Melbourne, Newcastle, Wollongong (two large cities and two provincial cities)
- ii) 1975-77: Adelaide, Brisbane, Canberra (three medium-sized capital cities)

Unfortunately for Perth, the car ownership data is available only for 1966, and is, therefore, excluded from this analysis. Furthermore, two measures of car ownership are used in this presentation:

- i) non car-owning households
- ii) proportion of households owning 0, 1, 2 and 3+ cars as affected by households of specific socio-economic groups.

2. NON-CAR-OWNING HOUSEHOLDS

The proportion of non-car-owning households in the various principal cities in Australia is shown below. It is obvious that more households tend to be without a car in larger cities than in medium-sized capital cities or provincial cities.

Table 1. Proportion of Non Car-Owning Households

1971-74 (Large Cities & Provincial Cities)

Sydney	21.3%
Melbourne	22.1%
Newcastle	15.7%
Wollongong	13.8%

1975-77 (Medium-sized Capital Cities)

Adelaide	17.9%
Brisbane	19.2%
Canberra	13.7%

The variation in the proportion of non-car-owning households among Australian cities is shown in Figure 1. The proportion of non-car-owning households is directly proportional to the log of city's population as shown in Figure 2.

2.1 Size of Household

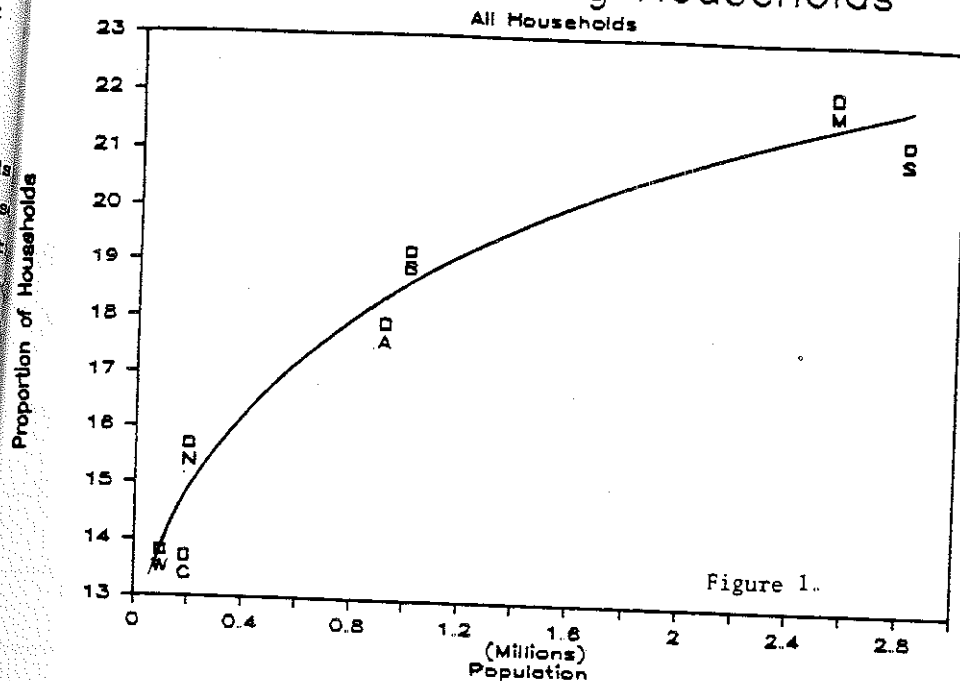
As seen in Table 2 and Figure 3, the proportion of non-car-owning households is very high for one-member households. This proportion decreases with increase in size of household upto a point beyond which it increases again. In addition to exhibiting this information, Figure 3 also shows that for the same household size, the proportion of non-car-owning households is higher for larger cities.

Table 2 Household Size and the Proportion (%) of Non Car-Owning Households

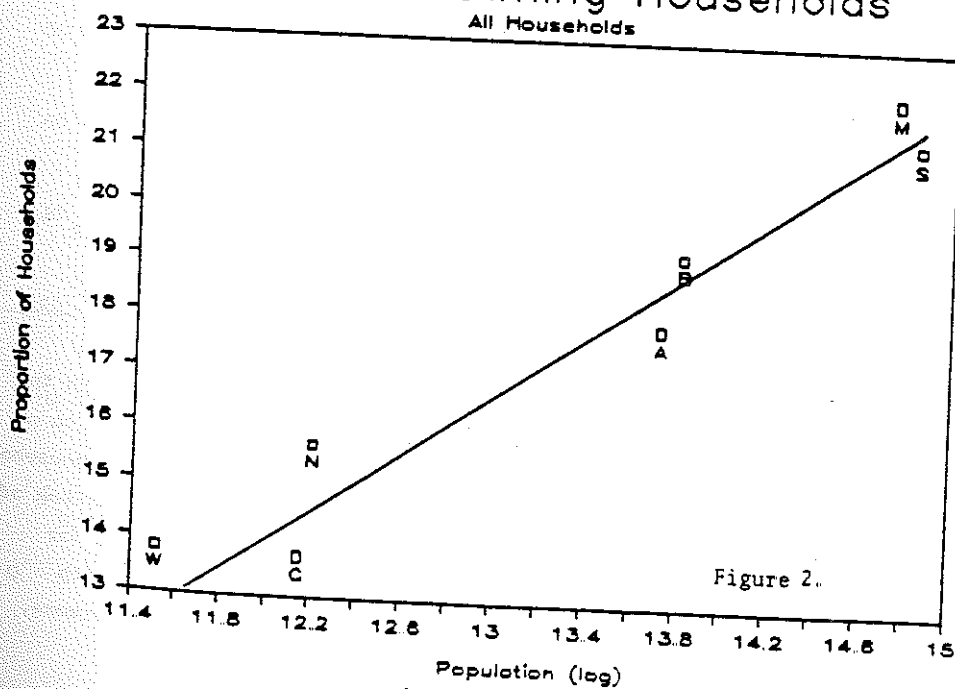
City	Household Size (persons)				
	1	2	3	5	7+
<u>1971-74</u>					
Sydney	66.7	22.1	14.5	11.0	15.6
Melbourne	65.5	28.2	16.5	10.5	15.6
Newcastle	62.6	17.5	10.6	5.8	6.1
Wollongong	59.8	14.2	7.4	8.0	11.3
<u>1975-77</u>					
Adelaide	57.1	18.6	8.1	3.1	6.0
Brisbane	59.9	21.3	11.7	5.9	8.5
Canberra	53.1	11.6	4.0	2.5	5.5

The decrease in the proportion of non-car-owning households with initial increase in household size is believed to be associated with the stage in life

Non-car-owning Households



Non-car-owning Households



cycle and increase in income of the household head. Very large households and low income households are usually correlated explaining high proportion of such households without a car.

2.2 Number Employed

The distribution of non-car-owning households with the number employed in household is shown in Table 3 and Figure 4. As expected, the proportion of non-car-owning households decreases with increase in the number employed.

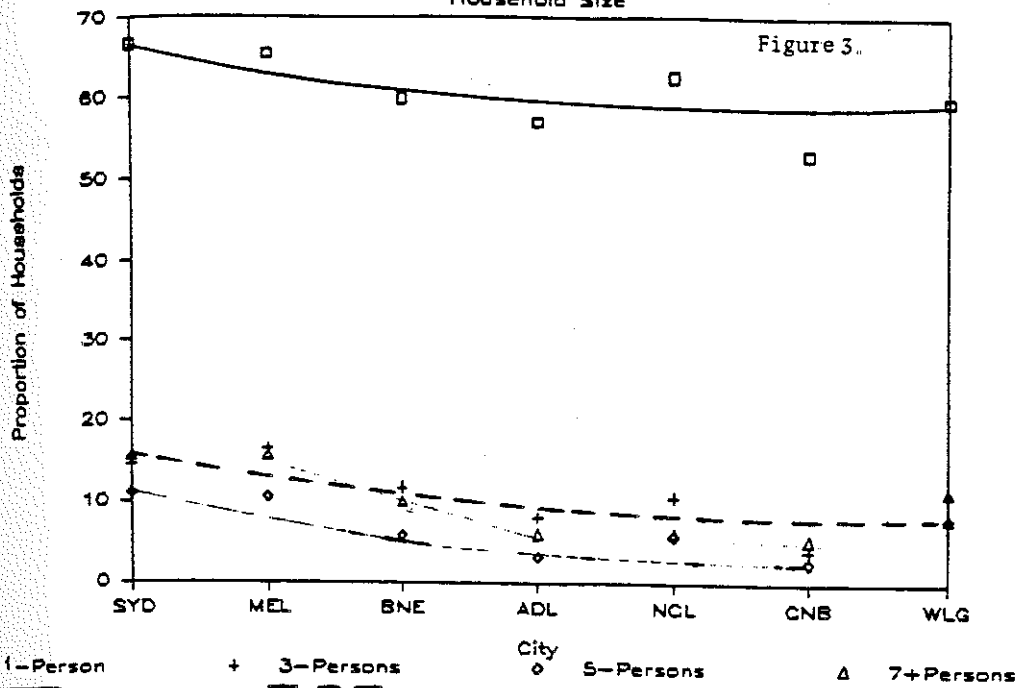
Table 3 Number Employed and Proportion (%) of Non Car-Owning Households

City	Number Employed			
	0	1	2	3+
<u>1971-74</u>				
Sydney	52.9	21.6	15.6	11.5
Melbourne	Not Available			
Newcastle	47.7	11.4	5.5	4.2
Wollongong	52.6	11.3	6.7	5.0
<u>1975-77</u>				
Adelaide	49.8	11.0	4.8	2.1
Brisbane	51.4	11.0	6.1	4.3
Canberra	55.6	10.4	5.2	4.1

It is also seen from Table 3 that there is no significant difference in the proportion of non-car-owning households among cities for households with no employed person. However, the usual higher proportion of car owning households with decrease in city size is obvious for all other groups. A comparison of the proportion of non-car-owning households with the number employed for various cities is also shown in Figure 4. Car ownership decreases with increase in city size for households with same number of employed persons

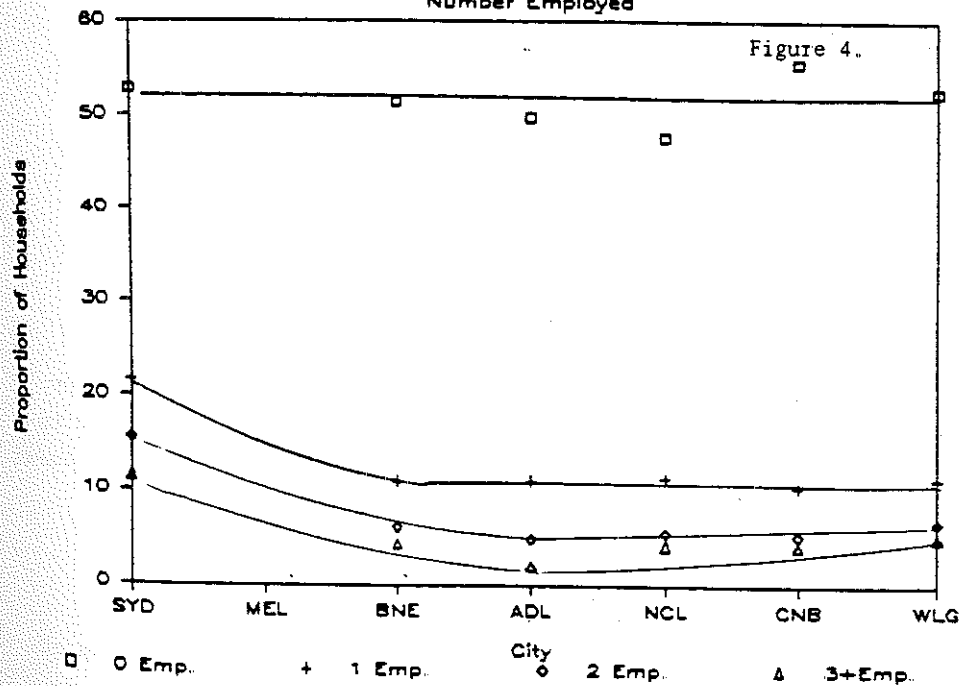
NON-CAR-OWNING HOUSEHOLDS

Household Size



NON-CAR-OWNING HOUSEHOLDS

Number Employed



2.3 Sex of Household Head

Households with female head are four times as likely to be without a car as those with male head. The general trend is clearly seen in all cities (Figure 5).

Table 4. Sex of Household Head and the Proportion (%) of Non Car-Owning Households

City	Sex of Household Head	
	Male	Female
<u>1971-74</u>		
Sydney	15.8	57.8
Melbourne	16.6	57.3
Newcastle	9.9	55.6
Wollongong	10.1	54.7
<u>1975-77</u>		
Adelaide	9.8	51.4
Brisbane	11.3	51.5
Canberra	7.5	46.4

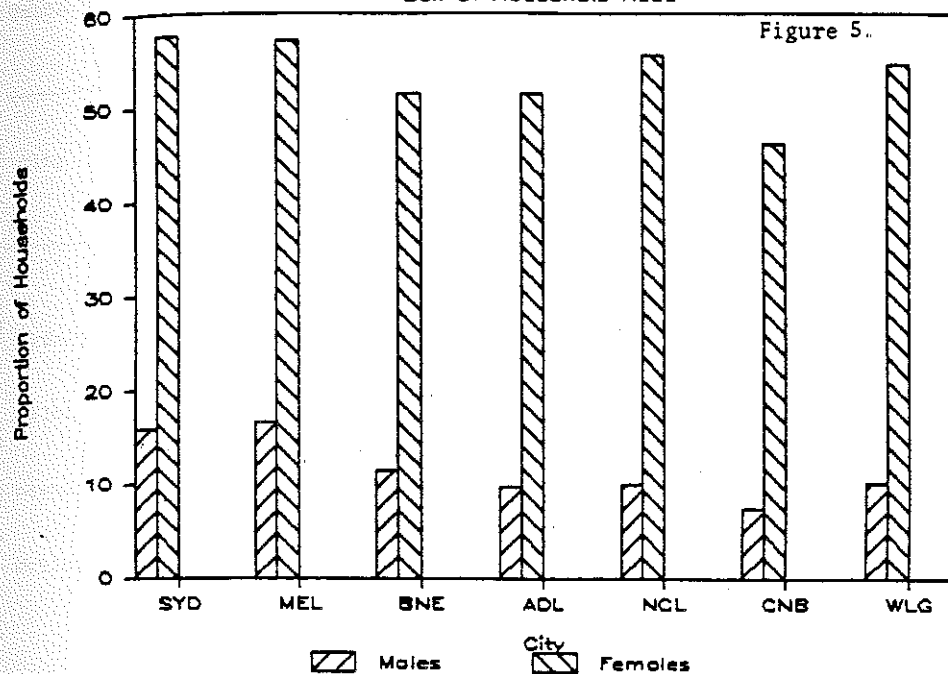
A significant observation in relation to the effect of city size on car ownership is the much higher rate of non-car-owning households in very large cities. However, the effect of city size on the proportion of non-car-owning households with female heads is insignificant although this proportion is lower for medium-sized cities. This is evident from Figure 6.

2.4 Type of Dwelling

The variation in the proportion of non-car-owning households with the type of dwelling is shown in Table 5 and Figure 7.

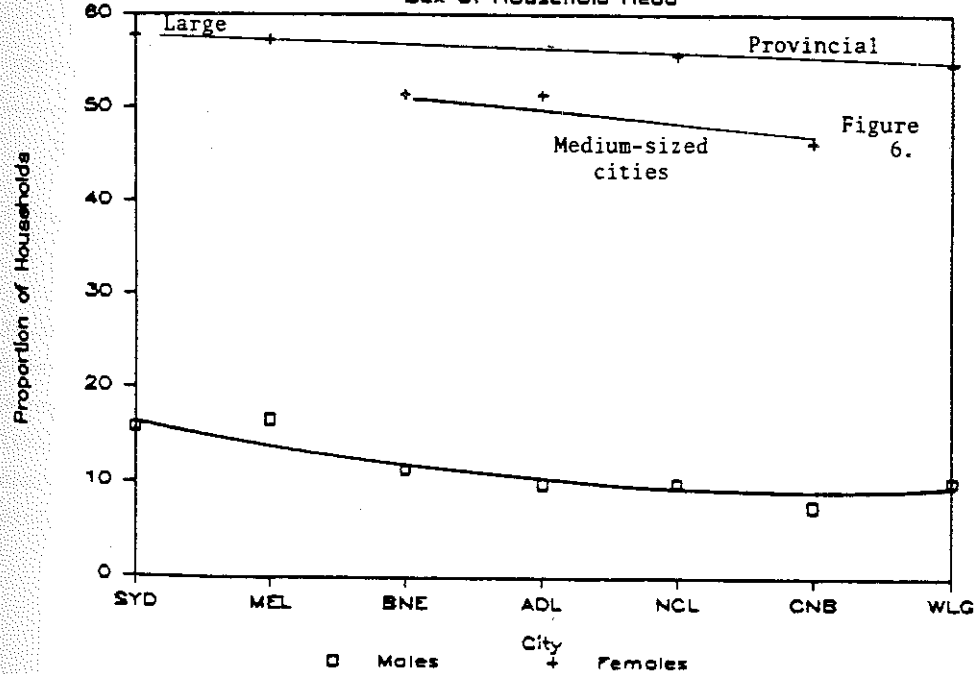
NON-CAR-OWNING HOUSEHOLDS

Sex of Household Head



NON-CAR-OWNING HOUSEHOLDS

Sex of Household Head



NON-CAR-OWNING HOUSEHOLDS

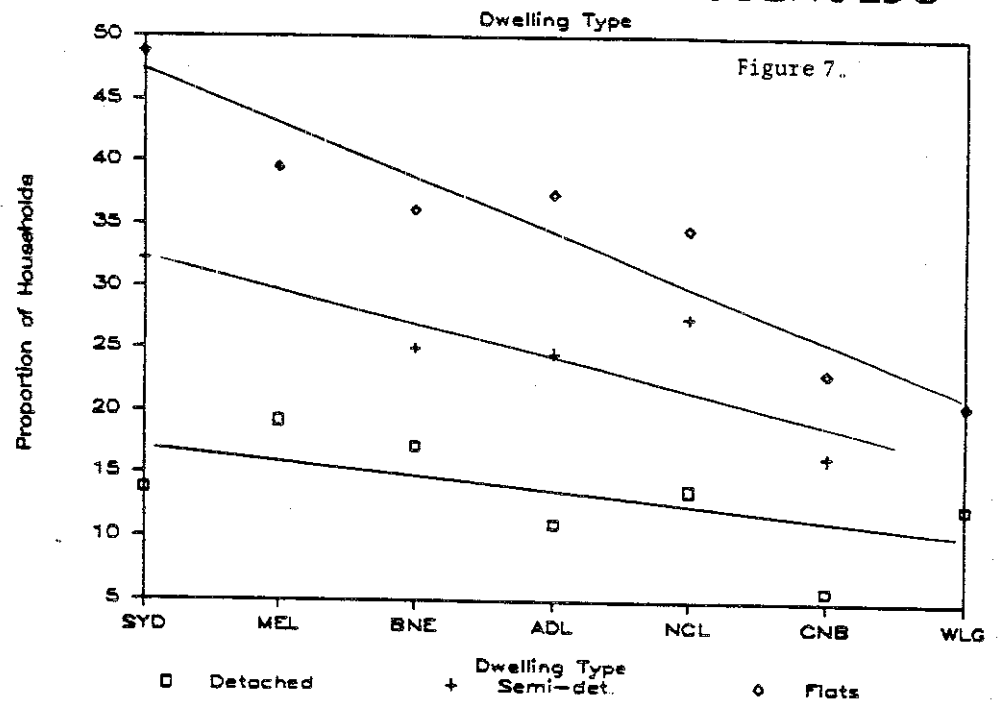


Table 5. Type of Dwelling and the Proportion (%) of Non Car-Ownng Households

City	Dwelling Type		
	Detached	Semi-detached	Flat
<u>1971-74</u>			
Sydney	13.9	32.2	36.2
Melbourne	19.2	*	*
Newcastle	13.8	27.5	34.7
Wollongong	12.5	*	20.6
<u>1975-77</u>			
Adelaide	11.1	24.6	37.5
Brisbane	17.2	25.0	36.2
Canberra	5.8	16.4	23.1

* Insufficient data

It is premised that dwelling type is an important socio-economic parameter with lower income households living in flats and higher income households choosing detached dwellings. This explains why only a small proportion of households living in detached dwelling do not own a car. This proportion increases for semi-detached dwellers and is highest for those living in flats. This trend is evident for all cities.

2.5 Household Income

Four groups for household income were formed such that each group represented approximately a quarter of all surveyed households (rather than forming rigid income brackets) for each city and time period. Table 6 shows the effect of income on the proportion of non car-owning households

Table 6. Household Income and the Proportion (%) of Non-Car-Owning Households

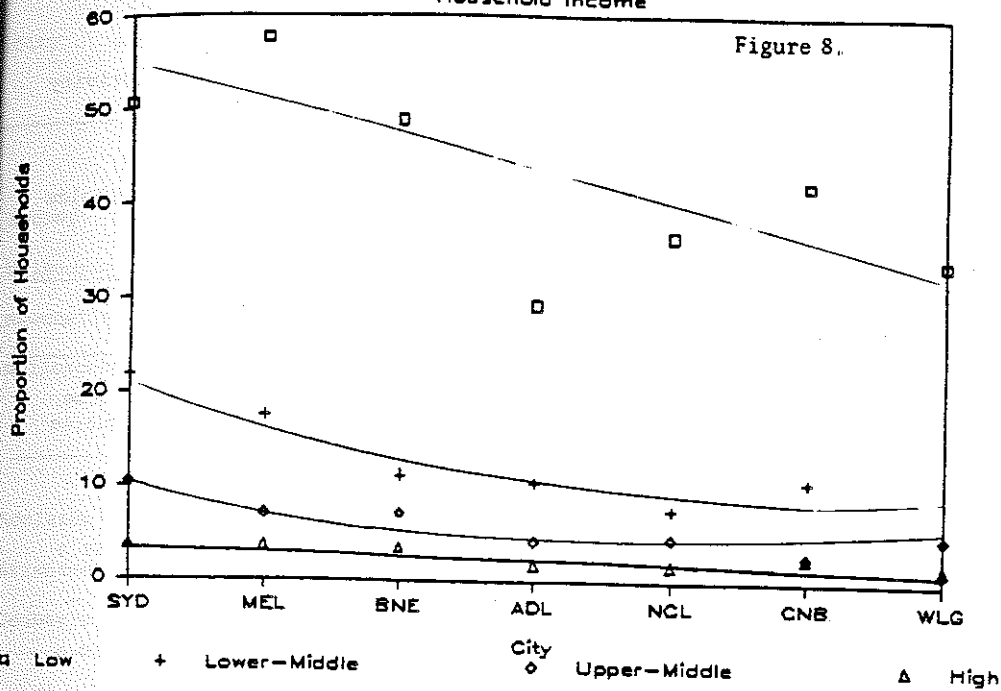
City	Household Income Group			
	Low	Lower Middle	Upper Middle	High
<u>1971-74</u>				
Sydney	50.8	21.8	10.3	3.6
Melbourne	57.8	17.4	7.0	3.5
Newcastle	36.4	7.7	4.6	1.7
Wollongong	34.0	9.0	4.9	1.7
<u>1975-77</u>				
Adelaide	29.2	10.4	4.2	1.7
Brisbane	48.4	11.2	7.2	3.4
Canberra	42.2	10.6	2.7	2.5

As expected, the proportion of non-car-owning households decreases with the increase in household income. For any income group, this proportion is much higher for larger cities. The figures shown in Table 6 support an across the board increase in car owning households with decrease in city size irrespective of income levels.

Figure 8 shows that the effect of city size on the proportion of non-car-owning households is more pronounced for lower income households.

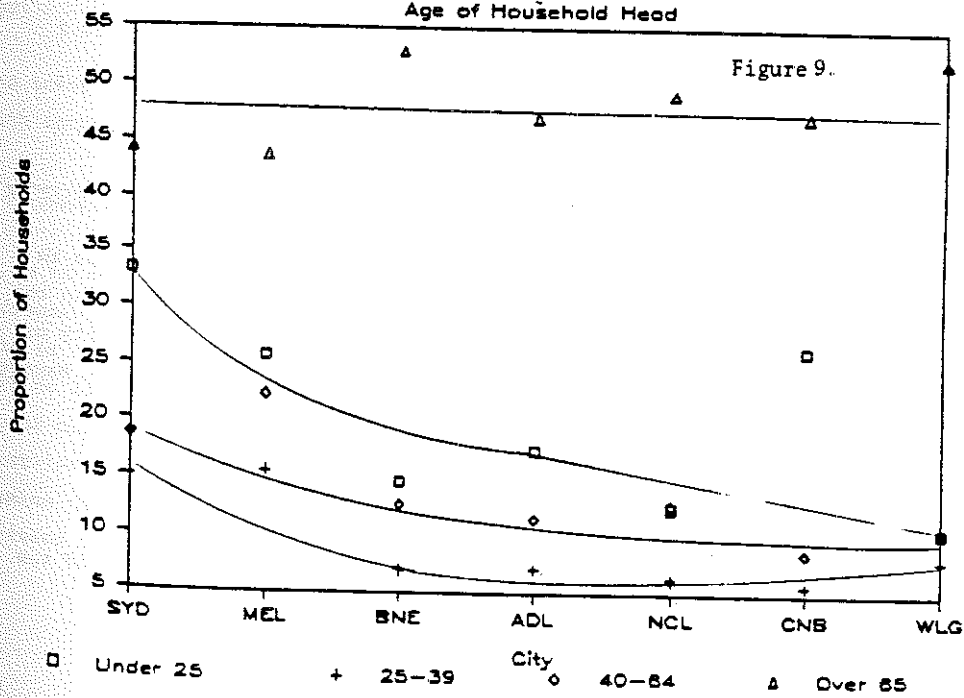
NON-CAR-OWNING HOUSEHOLDS

Household Income



NON-CAR-OWNING HOUSEHOLDS

Age of Household Head



2.6 Major Activity of Household Head

The major activity of a household head is classified as full-time work, part-time work, education, home duties and others. The variation in the proportion of non car-owning households for various cities and major activity of household head is shown in Table 7.

Table 7. Major Activity and the Proportion (%) of Non-Car-Ownning Households

City	Major Activity of Household Head			
	Full-time Work	Part-time Work	Education	Home Duties
<u>1971-74</u>				
Sydney	18.0	30.2	42.9	58.3
Melbourne	14.8	-	20.0	-
Newcastle	7.5	29.4	-	60.6
Wollongong	8.2	-	-	66.7
<u>1975-77</u>				
Adelaide	6.9	-	33.3	58.2
Brisbane	7.9	-	*	60.8
Canberra	8.2	32.1	62.2	60.0

* insufficient data

There appears to be more regularity in the data for households with heads in full-time work and those in home duties. These two groups are extremes in car ownership levels. Figures for households with education as major activity of the households are highly irregular and defy any rational interpretation except probably with regard to the definitional and data size problems.

2.7 Age of Household Head

The proportion of non-car-owning households by groups based on the age of the head of household is shown in Table 8.

Table 8. Age and the Proportion (%) of Non-Car-Ownng Households

City	Age of Household Head			
	20-24	25-49	50-64	>65
<u>1971-74</u>				
Sydney	33.3	15.1	22.0	44.2
Melbourne	23.1	13.7	22.4	43.7
Newcastle	12.6	6.8	16.3	49.2
Wollongong	10.6	8.6	13.4	52.3
<u>1975-77</u>				
Adelaide	17.6	6.4	14.4	47.2
Brisbane	14.8	7.1	16.9	52.9
Canberra	26.5	5.8	11.0	47.4

The general observation is that households whose heads are in the 25-49 years age group are more likely to own a car than in any other age group. Almost one half of the households with heads in the 65 and older age group do not own a car.

The inter-city variation showing higher proportion of non-car-owning households with increase in city size is again evident in Table 8 and Figure 9.

2.8 Licensed Drivers

It is to be anticipated that the proportion of non-car-owning households decreases with increase in the number of licensed drivers in the household. This is clearly evidenced in the data which showed that almost all households with no licensed driver did not own a car whereas over 95 percent of those with two or more licensed drivers did own a car. Unfortunately, only two home interview surveys collected this information. Therefore, it is not possible to examine the effect of city size on car ownership as influenced by the number of licensed drivers in the household.

2.9 Comparison among Sydney, Brisbane and Newcastle

A clear picture of the effect of socio-economic characteristics on the proportion of non-car-owning households is obtained by studying this variation for a city. This pattern is clearly exhibited in Figures 10 to 13.

The effect of household size is shown in Figure 10. The proportion of non-car-owning households decreases with increase in the size of household upto 4-5 persons but then tends to increase marginally. This is shown to be valid for cities of different sizes.

Figures 11 to 13 exhibit the effect of prosperity. The proportion of non-car-owning households decreases with increase in household income and increase in the number of persons employed in a household. Dwelling type is also shown to be a discriminating socio-economic parameter and car ownership for households living in detached dwelling tend to be similar to households with high incomes.

Figures 14 and 15 show the effect of age and sex of household on car ownership. The proportion of non-car-owning households is significantly lower for households with male heads, and heads in the 25-64 year age groups. This pattern is clearly exhibited for the largest city, a medium-sized city and a provincial city. For households of similar characteristics, the proportion of non-car-owning households is higher in larger cities.

3 HOUSEHOLD CAR OWNERSHIP DISTRIBUTION

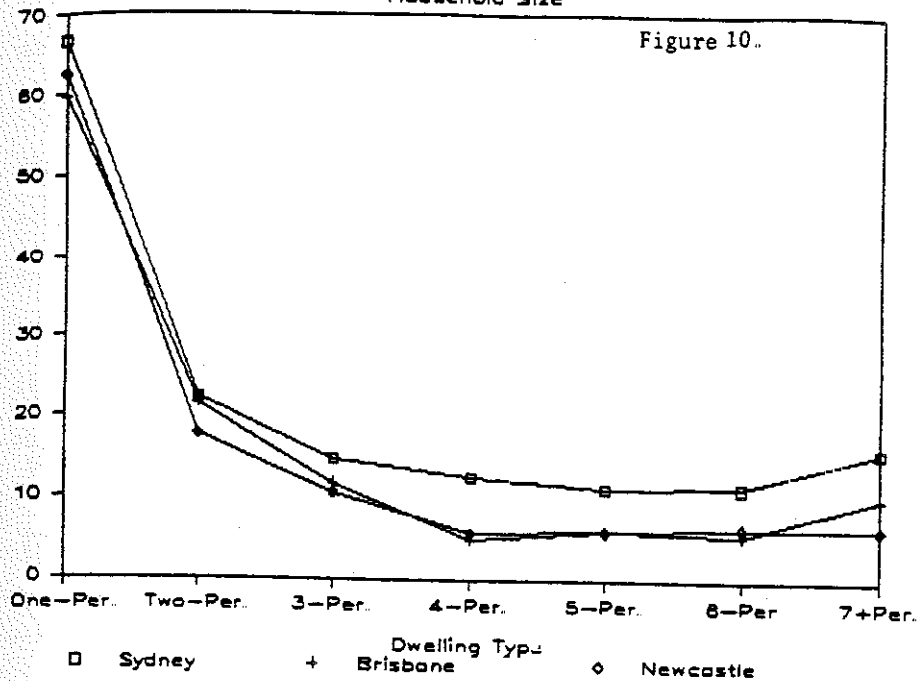
The proportion of households owning 0, 1, 2 and 3+ cars is examined with respect to the socio-economic characteristics of the household. For the purpose of this section, three cities were chosen ... Sydney, Brisbane and Newcastle. In addition to having more complete data sets, these cities represent a good spectrum in terms of city size ... about 3 million (the largest city), about one million (medium-sized capital city) and about 250,000 (a large provincial city) respectively.

The household car ownership distribution for these three key cities is shown in Table 9.

NON-CAR-OWNING HOUSEHOLDS

Household Size

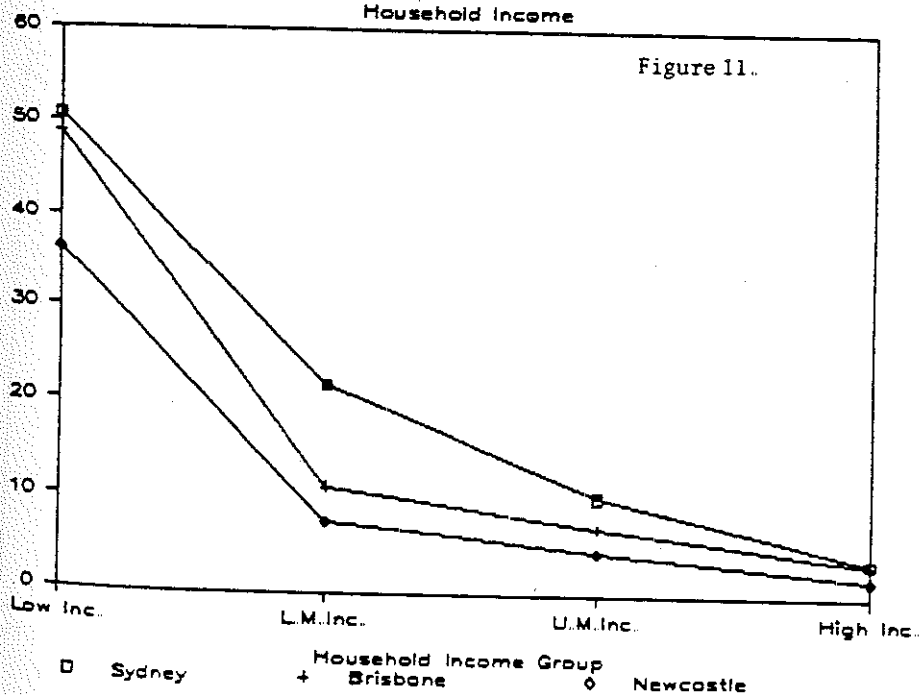
Figure 10.



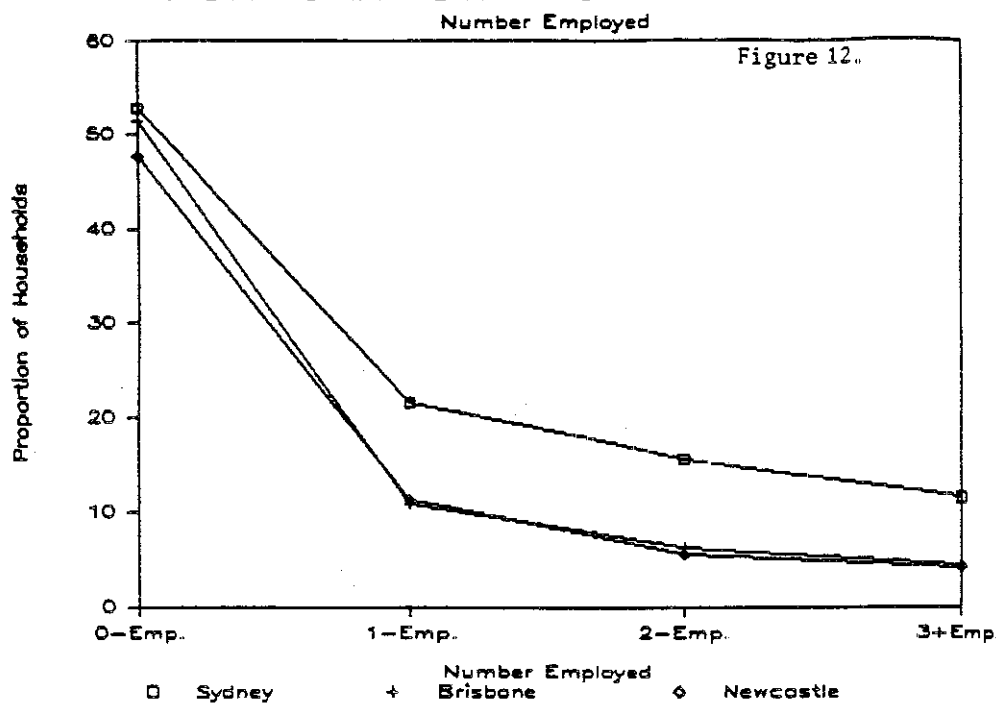
NON-CAR-OWNING HOUSEHOLDS

Household Income

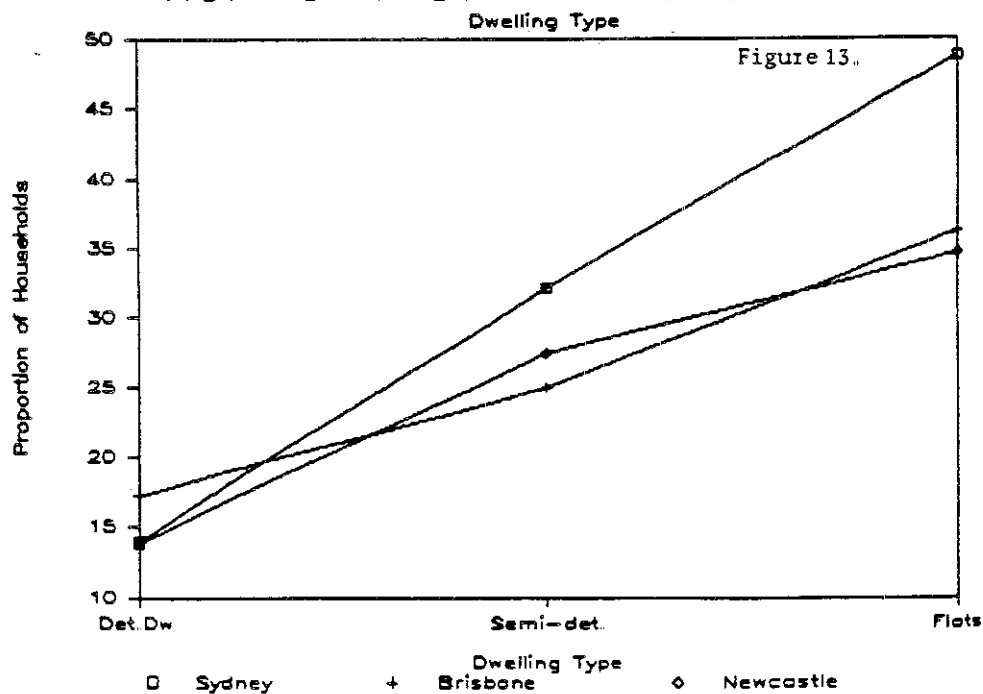
Figure 11.



NON-CAR-OWNING HOUSEHOLDS

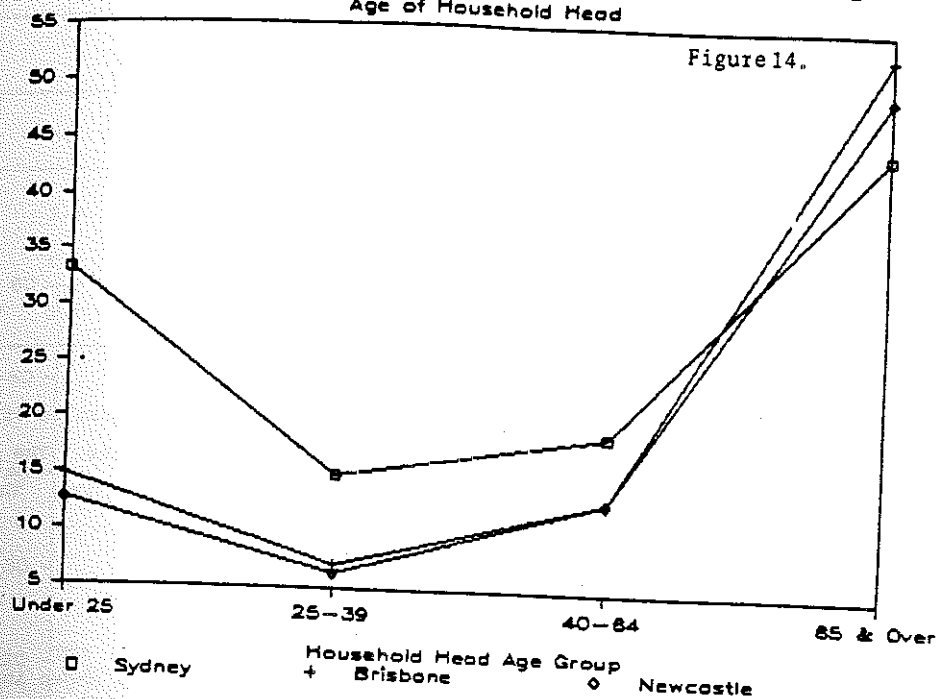


NON-CAR-OWNING HOUSEHOLDS



NON-CAR-OWNING HOUSEHOLDS

Age of Household Head



NON-CAR-OWNING HOUSEHOLDS

Sex of Household Head



Table 9. Car Ownership distribution

City	Proportion of Households Owning Cars (%)			
	0	1	2	3+
Sydney	21.3	53.8	20.8	4.1
Brisbane	19.3	49.1	25.0	6.7
Newcastle	15.7	54.4	24.9	5.0

The only observation that can be made from Table 9 is that the proportion of households which don't own a car decreases with decrease in city size. The proportion of multi-car owning household is lowest for the largest city. This is also shown in Figure 16.

3.1 Size of Household

The distribution of household car ownership with household size is shown in Table 10

CAR OWNERSHIP COMPARISON

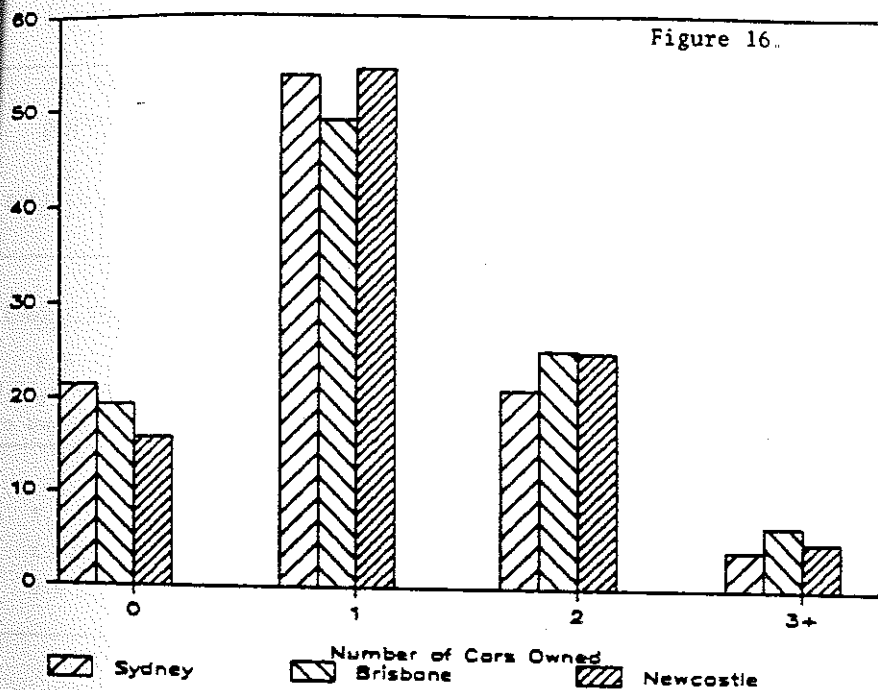


Table 10. Household Size and Car Ownership

Household Size	City	Proportion of Households Owning Cars (%)			
		0	1	2	3+
1	Sydney	66.7	31.9	1.3	0.1
	Brisbane	59.9	38.6	1.4	0.0
	Newcastle	62.6	36.1	0.8	0.4
2	Sydney	22.1	63.8	13.3	0.8
	Brisbane	21.3	60.2	17.4	1.1
	Newcastle	17.5	64.8	16.8	1.0
3	Sydney	14.5	57.3	24.3	4.0
	Brisbane	11.7	46.4	33.6	8.3
	Newcastle	10.6	57.2	28.2	4.0
5	Sydney	11.0	52.4	28.9	7.7
	Brisbane	5.9	47.8	32.0	14.3
	Newcastle	5.8	51.1	33.2	9.9
7+	Sydney	21.3	53.8	20.8	4.1
	Brisbane	19.2	49.1	25.0	6.7
	Newcastle	15.7	54.4	24.9	5.0

A number of observations can be made from Table 10.

- (i) The proportion of non-car-owning households decreases with increase in the size of the household up to a point. This trend reverses for very large households.

The proportion of multi-car owning households increases with increase in the size of household upto a point. This trend reverses for very large households.

) Sydney had the highest proportion of non-car-owning households and the lowest proportion of multi-car owning households. Brisbane had the highest proportion of multi-car households.

) The trends of variation in car ownership with the size of household ((i) and (ii) above) hold good for all cities.

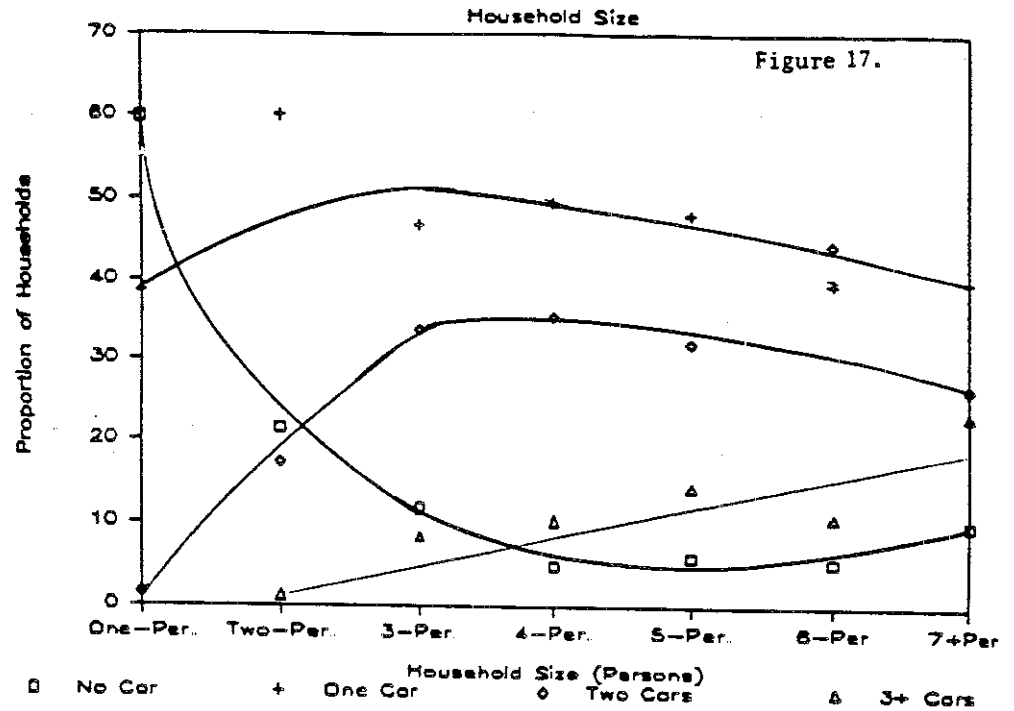
The trends of variation in car ownership with the city size ((iii) above) holds good for all household sizes.

pattern of car ownership is exhibited in Figure 17 for Brisbane.

Number Employed

e 11 shows the distribution of household car ownership with the number of le employed in the household.

CAR OWNERSHIP : BRISBANE



CAR OWNERSHIP : BRISBANE

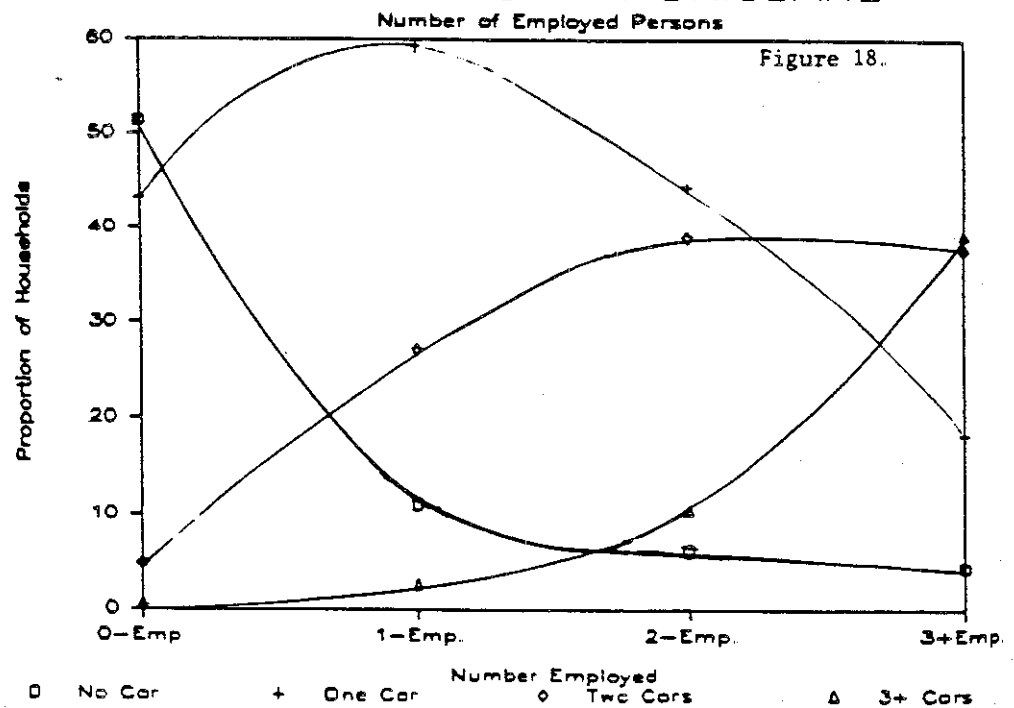


Table 11. Number Employed and Car Ownership

Number Employed	City	Proportion of Households Owning Cars (%)			
		0	1	2	3+
0	Sydney	52.9	42.1	4.5	0.5
	Brisbane	51.4	43.2	4.9	0.5
	Newcastle	47.7	48.4	3.6	0.2
1	Sydney	21.6	59.9	17.3	1.2
	Brisbane	11.0	59.3	27.1	2.6
	Newcastle	11.4	63.4	23.1	2.1
2	Sydney	15.6	54.7	25.8	4.0
	Brisbane	6.1	44.5	39.0	10.4
	Newcastle	5.5	52.7	37.1	5.4
3+	Sydney	11.5	34.7	35.0	8.8
	Brisbane	4.3	18.4	37.8	39.4
	Newcastle	4.2	25.0	40.6	30.2

It is evident from Table 11 that

- (i) irrespective of city size, the proportion of non-car-owning households reduces with increase in the number employed in the household
- (ii) the proportion of households with multiple car ownership increases sharply with increase in the number employed in the household for all cities.
- (iii) irrespective of the number employed, car ownership measured in cars per household is lowest in Sydney and highest in Brisbane. Although Newcastle is smaller than Brisbane, car ownership in Newcastle is not greater than in Brisbane. It is, therefore, hypothesised that it is not

only the city size but its proximity to other major urban centres that could have bearing on car ownership levels.

For Brisbane, the variation of car ownership with the number employed is shown in Figure 18.

3.3 Sex of Household Head

There is a significant difference in car ownership pattern for male and female household heads, as shown in Table 12.

Table 12. Sex of Household Head and Car Ownership

Sex of Household Head	City	Proportion of Households Owning Cars (%)			
		0	1	2	3+
Male	Sydney	15.8	56.8	22.9	4.5
	Brisbane	11.3	52.0	29.0	7.7
	Newcastle	9.9	57.1	27.5	5.5
Female	Sydney	57.8	34.2	7.0	1.0
	Brisbane	51.5	37.2	9.0	2.2
	Newcastle	55.6	36.2	7.2	1.0

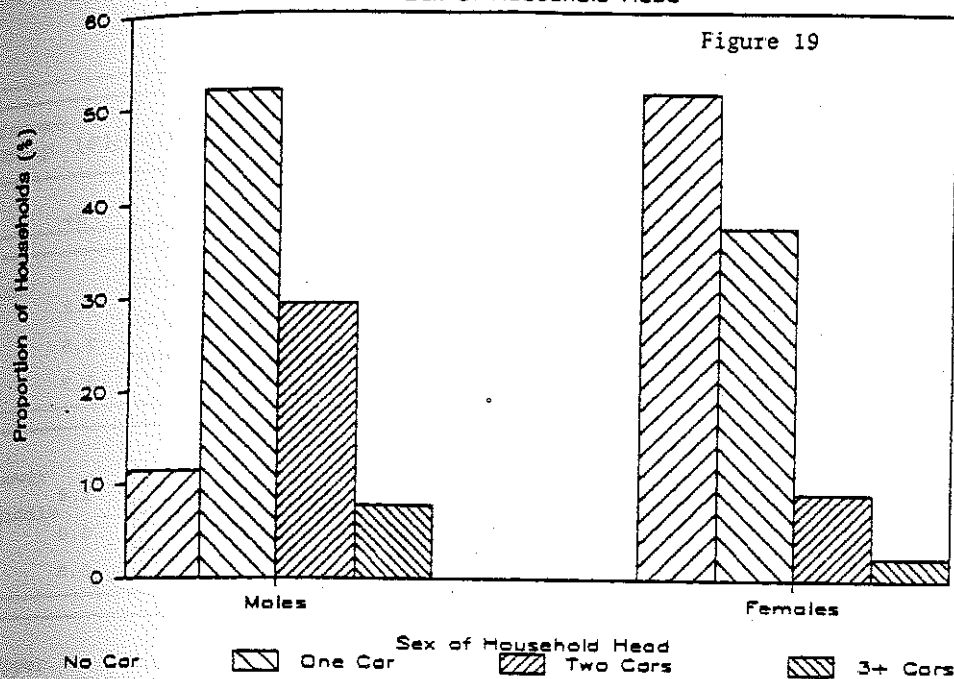
The general effect of city size and location on car ownership is also evident for households segregated by the sex of household. Figure 19 shows this effect for Brisbane.

3.4 Type of Dwelling

The distribution of household car ownership with the type of dwelling is shown in Table 13.

CAR OWNERSHIP : BRISBANE

Sex of Household Head



CAR OWNERSHIP : BRISBANE

Type of Dwelling

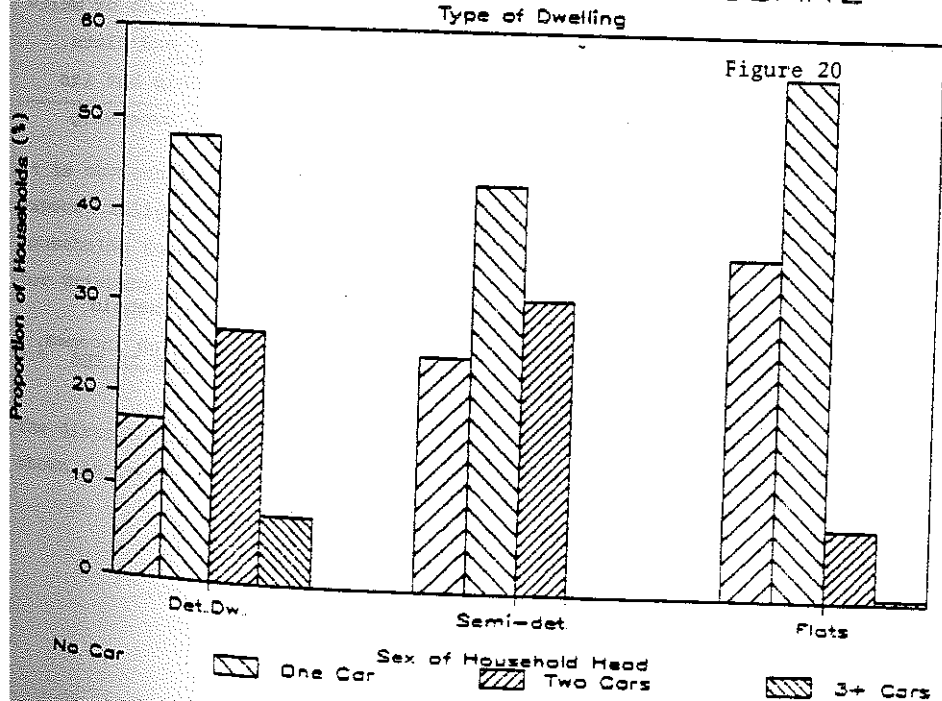


Table 13. Type of Dwelling and Car Ownership

Type of Dwelling	City	Proportion of Households Owning Cars (%)			
		0	1	2	3+
Detached	Sydney	13.9	55.4	25.5	5.2
	Brisbane	17.2	48.1	27.2	7.5
	Newcastle	13.8	54.7	26.2	5.3
Semi-Detached	Sydney	32.2	53.7	12.3	1.8
	Brisbane	25.0	43.8	31.3	0.0
	Newcastle	27.5	45.0	25.0	2.5
Flats	Sydney	48.8	43.2	7.4	0.6
	Brisbane	36.2	55.7	7.7	0.4
	Newcastle	34.7	54.7	9.4	1.2

Households living in detached dwellings tend to have higher proportion of multi-car ownership compared to those living in semi-detached dwellings and flats. Households in flats have the least proportion of multi-car ownership but its variation among cities is not significant. This variation in car ownership with type of dwelling is shown in Figure 20 for Brisbane.

3.5 Household Income

Table 14 shows the distribution of household car ownership with household income which is grouped into low, lower middle, upper middle and high incomes, each representing about a quarter of surveyed households.

Table 14. Household Income and Car Ownership

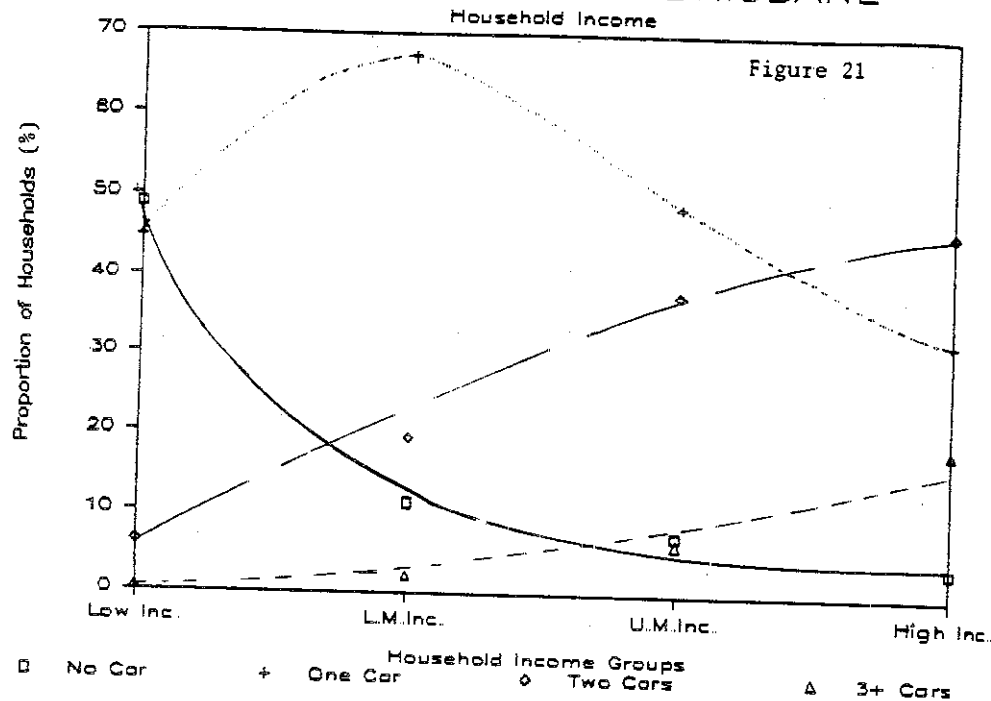
Income Group	City	Proportion of Households Owning Cars (%)			
		0	1	2	3+
Low	Sydney	50.8	44.8	4.1	0.3
	Brisbane	48.4	44.9	6.3	0.4
	Newcastle	36.4	54.3	8.4	0.9
Lower Middle	Sydney	21.8	63.3	13.6	1.3
	Brisbane	11.2	67.3	19.5	2.0
	Newcastle	7.7	67.8	22.9	1.6
Upper Middle	Sydney	10.3	56.9	28.5	4.3
	Brisbane	7.2	48.9	37.7	6.3
	Newcastle	4.6	57.2	33.6	4.6
High	Sydney	3.6	36.5	44.8	15.1
	Brisbane	3.4	32.1	46.0	18.5
	Newcastle	1.7	34.5	45.7	18.1

It is obvious that the proportion of multi-car owning households increases exponentially with increase in income while the proportion of non-car-owning households follows a negative exponential distribution. This is clearly shown for Brisbane in Figure 21

Age of Household Head

The distribution of household car ownership with the age of household head is shown in Table 15.

CAR OWNERSHIP : BRISBANE



CAR OWNERSHIP : BRISBANE

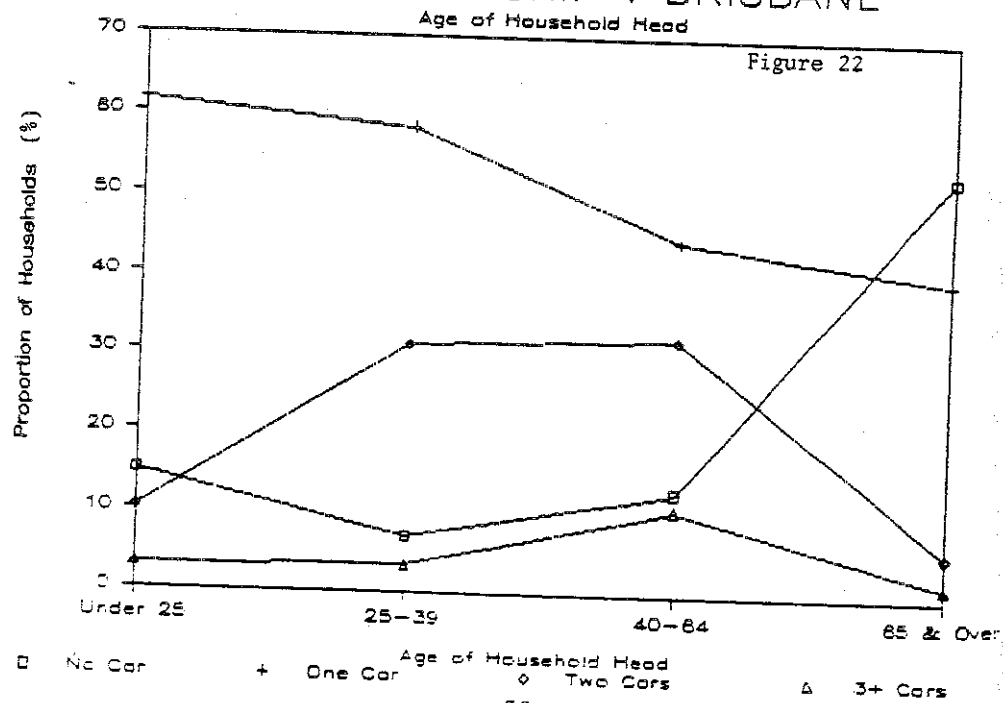


Table 15. Age of Household Head and Car Ownership

Age of Household Head	City	Proportion of Households Owning Cars (%)			
		0	1	2	3+
20-24	Sydney	33.3	54.1	11.1	1.5
	Brisbane	14.8	63.2	18.7	3.2
	Newcastle	12.6	72.6	12.6	2.2
25-49	Sydney	15.1	58.3	23.3	3.3
	Brisbane	7.1	52.4	34.6	5.9
	Newcastle	6.8	56.1	32.3	4.8
50-64	Sydney	22.0	48.0	22.5	7.5
	Brisbane	16.9	46.2	26.0	10.9
	Newcastle	16.3	53.3	22.7	7.8
>65	Sydney	44.2	45.1	9.0	1.8
	Brisbane	52.9	40.0	5.5	1.6
	Newcastle	49.2	44.2	5.7	0.9

Car ownership is highest for households with heads in the 25-49 year age group, and is lowest for those over 65 years. As before, Sydney has lower car ownership except for the >65 age group. Figure 22 shows the distribution of car ownership with age of the heads of households in Brisbane.

4. CONCLUSIONS

Some significant findings of household car ownership analysis are given below:

1. The proportion of non-car-owning households increases with increase in city size.

2. As the household size increases, the proportion of non-car-owning households decreases up to a certain point (approx. 5-person households) beyond which it tends to increase again. Underlying factors in this case are the stage in the life cycle of the household head accompanied by an increase in income.
3. The proportion of non-car-owning households is significantly lower in smaller cities than in larger cities for households with at least one employed person.
4. Households with female head are four times as likely to be without a car as those with male head. This trend is observed in all cities.
5. The type of dwelling is an important discriminating variable in car ownership. Only a small proportion of households living in detached dwellings do not own a car. This proportion increases for semi-detached dwellers and is highest for those living in flats. It is premised that there is a strong casual relationship between dwelling type and economic status.
6. The proportion of non-car-owning households decreases with increase in household income. For any income group, this proportion is much higher for larger cities.
7. Other factors being equal, highest car ownership levels are observed for households whose heads are in full time employment and least for those in home duties. For other activities, no clear pattern is exhibited.
8. Households whose heads are in the 25-49 years age group are more likely to own a car than in any other group.
9. Almost all households with no licensed driver do not own a car while over 95 percent of those with two or more licensed drivers own at least one car.

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