

THE FORGOTTEN PUBLIC TRANSPORT MODE.
MARKET RESEARCH INTO MELBOURNE'S TAXIS

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ABSTRACT:

Taxis are an important part of public transport in Melbourne carrying over 30 million passengers and earning in excess of \$88 million in revenue annually, but there has been relatively little research into the industry. This paper describes some market research on the sociodemographic characteristics of taxi users and non-users in Melbourne. The paper develops a model of the market for taxis and investigates fare elasticities. It provides a basis upon which marketing of the industry may begin and stresses the importance of marketing an integrated public transport system of which taxis are a key part.

Winner of the 10th ATRF prize

This paper was regarded as the paper which best addressed the interface between research and practice in the transport industry.

INTRODUCTION

Taxis have been a long ignored part of public transport planning. Relatively little research has been conducted into the industry and this is certainly true of the taxi industry in Melbourne. Perhaps this is because taxis are rarely perceived as being an integral part of public transport in cities such as Melbourne, even though they carry over 30 million passengers and generate in excess of \$150 million revenue annually.

In order to better understand the taxi market, the Ministry of Transport and the Road Traffic Authority sponsored some basic research into the social and demographic characteristics of taxi users and non-users. The study was conducted in the latter half of 1983 and involved 40 personal interviews and 1,400 telephone interviews. The paper begins by describing the research methodology and briefly examines the question of bias due to the use of telephones. Next the results are discussed in detail and a marketing model is developed based on an in-depth statistical analysis of the data. The key strategic predictors of taxi use are shown to be access to a private vehicle and current public transport experience. The survey also explored price sensitivity and developed rough forecasts of fare elasticities. These results suggest the importance of flat fares as a marketing tool to attract new passengers who are unable to predict a taxi fare.

The paper concludes with a discussion of the marketing implications from the research. The success of taxis is shown to be closely linked to the success of public transport. The paper argues that public transport planners need to begin integrating taxi services into their networks of trains, trams and buses. Taxis may prove to be an important ingredient in the revival of our ailing transit system.

TAXIS IN MELBOURNE

Taxis carry 10% of the public transport load in Melbourne and generate about 50% of the revenue. They employ one third of the public transport work-force and run roughly 10% of the route kilometres (see Table 1).

Disclaimer: This paper represents the views of the authors and does not necessarily represent the views of the Ministry of Transport, Road Traffic Authority, REARK Research or Geoff Alford Research Services.

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The industry is regulated by the Road Traffic Authority which sets fare levels and controls the number of vehicles permitted to be licensed. There are approximately 3,000 taxis operating in the Melbourne metropolitan area. These taxis are organised into 11 depots which control despatching, crewing and maintenance.

The detailed structure of the industry, wage contracts, fare setting, despatching techniques etc. are not covered in this paper, which focusses on the characteristics of taxi users.

TABLE 1

Comparison of Operating Statistics (Metropolitan Services) 1981/82

	<u>Metropolitan Transit Authority</u>				
	<u>Taxis</u>	<u>Private</u>		<u>Public</u>	
		<u>Buses</u>	<u>Buses</u>	<u>Trams</u>	<u>Rail</u>
Vehicle Kilometres (m)	258	220	130	420	1,279
Passengers (m)	29	52	24	103	82
Revenue (\$m)	150	24	10	39	62
Employees	14,000	1,700	4,780		6,800*

(Sources: "Plans and Benefits 1982/83", Ministry of Transport,
"Transport Development Policies and Process", M.O.T.
* 1984 METRAIL estimate)

LITERATURE REVIEW

A large part of the literature on taxis has been written by economists and deregulation has been one of the major themes (Williams 1981, Schreiber 1975, Kirby et.al. 1974, Beasley 1973). However, there has been relatively little research into the market characteristics of taxi users. Except for a few papers exploring taxi demand (Williams and Scorgie 1981, Beimborn 1968, Gilbert 1977) the user remains a mystery. Perhaps this is because of a strong preconceived notion amongst the general population that taxi users are mostly drawn from the wealthy managerial class. The few facts that have emerged indicate this is only a part of the market.

The literature from Chicago (Beimborn 1968), for example, indicates that women and low income households are significant users. Over half of non-CBD oriented trips in that city were made by housewives. This was reduced to one third for CBD oriented trips. New York data indicates that about 40% of taxi users could be classified as low income households (Williams and Scorgie, 1981).

Piecemeal income data on users from Australian cities suggests a large proportion of users come from economically inactive households (pensioners, unemployed).

There appears to be no literature which develops models of the taxi market or seeks to predict future patterns of use. This is in contrast to vast amounts of economic and market research into trains, trams and buses usually provided by government agencies. In the case of the privately owned taxi industry there does not appear to have been any single organisation willing to absorb the costs associated with primary research. Government has largely restricted its effort to understanding the industry rather than its users.

VICTORIAN TAXI STUDY RESEARCH METHODOLOGY

This study was conducted in three stages. Stages I and III were conducted in Melbourne only. Stage II was conducted in Melbourne and Bairnsdale, a Victorian provincial town. The objectives and details of each stage are given below.

Stage I: Market Structure

This preliminary quantitative stage aimed to provide fundamental data on taxi usage. The main objective was:

- * to identify and quantify taxi market segments.

In order to gain an understanding of the market, it was important that a random probability research approach be employed. The research approach chosen was telephone with two call-backs to telephone numbers not answered in order to reduce non-response bias.

Respondents for this study were men and women aged 18 years or more. There was only one interview per household contacted. In the event of two eligible people being available a random selection method (birthday rule) was used to select one respondent.

The only specifications placed upon the sample were age (i.e. 18 years or more) and sex (half of the sample was male and half female). At the outset of the study it was estimated that few adults, (less than 10%), use a taxi once a week or more often. Based upon this hypothesis, it was necessary to interview a large number of people if taxi usage behaviour was to be determined and profiles were to be gained of the various user segments. Hence, 1,000 Melbourne adults were interviewed; 500 men and 500 women.

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The questionnaire aimed to understand taxi usage and attitudes towards taxis. As well as this it was also important to incorporate key variables that were hypothesised as differentiating amongst the market segments. These variables included: demographic attributes (e.g. age, sex, household structure, occupation, income); car ownership and access to a car; public transport usage; and attitudes towards taxi usage.

Stage I interviewing was conducted in August, 1983. The survey later was weighted by age and sex to the Melbourne Adult population.

Stage II: Qualitative Attitudinal Evaluation of Taxi Usage

Stage I had revealed the characteristics of the Melbourne taxi market. The second stage of the study aimed to gain a deeper understanding of the attitudes and motivations surrounding taxi usage (or non-usage).

Given the objectives of this stage, the research approach needed to be qualitative. Personal in-depth interviews were employed (rather than group discussions) as a sequential questioning approach was used. This approach fully explores the respondent's thought processes and behaviour patterns which relate to a given product or situation. The strength of this interviewing approach is that it uncovers the sequential trigger points in the decision-making process.

Twenty in-depth interviews took place in Melbourne and twenty in Bairnsdale, a Victorian provincial town. It was felt that it was necessary to ascertain whether there were qualitative differences in terms of taxi usage and attitudes between Melbourne and a country centre. Bairnsdale was chosen as previous research had been conducted on the taxi industry there. Also, it has been a test market for innovative ideas in taxis.

Respondents were carefully chosen to be representative of the taxi market in terms of: frequency of usage of taxis (frequent, occasional and non-users); sex; age and (respondents varied from 18 to 60 years or more); car usage.

The semi-structured questionnaire covered frequency and reasons for taxi usage (non-usage); attitudes towards new taxi product concepts, and an evaluation of taxis according to a number of attitudinal statements.

Stage II also served to develop and pilot question formats for the third stage.

on-line computer assisted telephone interviewing (CATI) simplified the whole exercise by selecting the appropriate questions based upon the respondents previous answers.

Stage III: Main Questionnaire

The most complex task was questionnaire development. The elasticity of demand for various consumer grocery products has been gauged through marketing research. However, a taxi ride is an intangible product. The actual product parameters are not constant. They are dependent upon: the trip distance; the taxi fare; trip purpose; the weather; the time of day; alternatives (i.e., other transport modes or not making the trip); characteristics of the destination such as available parking.

Stage II revealed that respondents can only relate to a taxi trip situation that they can identify with. Hence, it was necessary to personalise the trips.

Respondents were first asked about taxi usage frequency. They were then asked about:

- * the trips they took "yesterday";
- * whether a taxi was taken for that trip;
- * if not, the extent to which a taxi was considered for the trip;
- * respondents were asked to assume that a taxi had been taken for their trip;
- * the distance of the trip was estimated and the taxi fare for that trip calculated;
- * given the attributes of the trip (i.e., occasion, distance) as stated by the respondent and the calculated cost for conducting the same trip by taxi, the respondent was then asked to state taxi fares at which that trip would have been: very cheap; fairly cheap; rather expensive; far too expensive.

In order to ensure a cross-section of "yesterday" trips, respondents from each of the four sample segments were interviewed over a week.

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Stage II interviews were conducted in September, 1983.

Stage III: Quantitative Evaluation of Taxis

This final stage aimed to establish the elasticity of demand for taxi usage. Stage III was conducted in Melbourne only.

The sample reflected the market segments identified in the previous two stages, viz:

- * 100 adults who use taxis once a week or more often (50 males and 50 females);
- * 100 adults who use a taxi once a week to once a month on average (50 males and 50 females);
- * 100 adults who use taxis every 2 to 3 months on average (50 males and 50 females);
- * 100 less frequent users of taxis:
 - 50 public transport users (25 males and 25 females);
 - 50 own car users (25 males and 25 females).

"Usage" referred to personal usage of taxis, not business related trips.

Stage III: Research Approach

Respondents were first screened by telephone to ensure eligibility. Eligible respondents were invited to take part in the main survey.

If respondents agreed to participate, they were mailed a letter of confirmation, details on the study and prompt cards which they would need to refer to during the interview. They were then telephoned a few days later and an interview conducted.

This research approach proved to be most successful and was significantly more cost efficient than personal interviews.

Further, the main questionnaire was extremely complicated. It would have been possible, but complicated and time consuming, to have administered this questionnaire via personal interview. However,

The research data were analysed by a price-sensitivity technique which yielded the elasticity of demand for taxis.

Stage III was conducted in November, 1983. The weighted sample of Stage I provided the weighting for Stage III with respect to taxi usage, age and sex.

TELEPHONE AS A SURVEY INSTRUMENT

The objectives discussed earlier indicated that a random sample was required for Stage I. This sample could have been chosen using home interview or telephone as the survey instrument. The telephone was chosen because it was cheaper, provided flexibility with respect to sample distribution and ensured thorough training and supervision of the field staff. Results from the United States indicate that telephone survey data is comparable to data obtained by personal interview and that the telephone data has greater potential for good quality data at lower cost (Lucas and Adams 1977; Rogers 1976). However, there was concern that this instrument could introduce systematic (non-sampling) errors into the survey results because the travel behaviour of telephone owners could be different to that of non-telephone owners.

Household telephone connections have been investigated in a survey conducted by the Australian Bureau of Statistics (ABS 1983). From this survey, approximately 91% of households in the Melbourne Statistical Division have the telephone connected, i.e., less than 10% of Melbourne households cannot be contacted by telephone. But these households seem to be characterised by certain socio-demographic characteristics which have implications for the Melbourne taxi study. From the ABS survey, households consisting of married couples with or without children were most likely to have the telephone connected, and persons living alone and single parent families with all children under 15 years were least likely to have the telephone connected. Also from Table 2 it can be seen that people living alone, single parent families with all children under 15 years and "all other households" are over-represented in households with no telephone connected:

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Table 2
Household Type by Whether Telephone Connected

Household Type	Telephone Connected %	Telephone Not Connected %	Total Households %
Person living alone	16.4	31.7	18.2
Married couples only	21.9	15.5	21.2
Married couples all children \geq 15 yrs	11.6	3.6	10.7
Married couple all children $<$ 15 yrs	24.5	17.5	23.7
Married couple children all ages	8.6	5.0	8.2
Single parent all children \geq 15 yrs	3.4	3.5	3.4
Single parent all children $<$ 15 yrs	2.1	4.4	2.4
Single parent children all ages	1.0	1.2	1.0
<u>All other households</u>	<u>10.4</u>	<u>17.6</u>	<u>11.2</u>
<u>Total:</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

Source: Household Telephone connections Survey, March 1983 unpublished ABS data.

Other results from the ABS survey indicate that households without telephones tend to be over-represented with respect to young adults and people with low incomes. From these results, households without telephones are characterised by relatively unstable life-cycle stages and low incomes. From the point of view of the taxi study, the use of telephone as the survey instrument may have produced a slight under-representation of young or single or low income taxi user groups. But even this effect would not be significant from a marketing point of view because these taxi users would have very little flexibility in their disposable income which they could spend on taking more taxi trips. In their domestic travel survey, the Bureau of Industry Economics concluded from supplementary personal interviews that a telephone survey in the metropolitan area would over-estimate tourist travel expenditure by 5% but that there would be no significant bias in the estimated number of trips due to telephone ownership (McCann and Hollander, 1982). Similar findings were also obtained by Alford (1983) in work undertaken for Telecom Australia.

The Stage I sample was weighted by age and sex and then validated against 1981 Census data for a few socio-demographic characteristics. The sample was slightly over-represented with respect to medium to upper household income, white collar workers and multi-car households - the biases traditionally associated with interview surveys. The distribution of respondents across the Melbourne Statistical Division was reasonably close to the 1981 Census population.

STUDY RESULTS : CHARACTERISTICS OF TAXI USERS

From the Stage I survey results about 209,000 adults in Melbourne used taxis at least once a week for personal reasons and 80,000 used taxis for business reasons. Roughly 30% were common users (business & personal) which suggests there were 266,000 people who used taxis in the week before the survey. This is about 14% of the adult population of Melbourne. To place this in perspective with other public transport modes, almost 19% of the adult population claimed to use trams, 14% trains and 13% buses at least once in the corresponding week. In contrast roughly 90% of adults used a car at least once in the previous week. It is a well known fact from market research that these percentages are likely to be inflated since they are based on recall of past behaviour. However, the relativities appear to be consistent with the distribution of trips in table 1.

The taxi market share for incidence of use in a week therefore compares favourably with train and bus users and a little less so with trams. All public transport modes usage rates compare unfavourably with the use of the private car. Of course, in terms of total frequency of use, taxis do not perform as well as trains, trams or buses (see table 1).

The analysis in this paper is based upon taxi trips for personal or private reasons only. Thus it does not include travel for business purposes.

Table 3 describes the age, income, life cycle and car ownership characteristics of taxi user groups for personal taxi trips. Generally, users are drawn from across the socio-economic spectrum. The results show that over one quarter of regular taxi users are drawn from households with combined incomes less than \$15,000 per year. Further, they are likely to be drawn from single people living alone or mature families. Young families with children are clearly under-represented. Regular taxi users are characterised by both high and low access to a car. One half of the regular taxi users had either no car access or could only use a car some of the time.

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Table 3 **

Taxi User Groups - Characteristics for personal trips only

	Age Group				Household Income			
	18-24	25-34	35-59	60+	\$ Under 15,000	\$ 15,000 to 25,000	\$ 25,000 to 40,000	\$ Over 40,000
<u>% OF POPULATION IN GROUP</u>	19%	24%	37%	20%	24%	35%	23%	18%
<u>Incidence of Use</u>								
*Regular	24%	18%	34%	23%	28%	33%	19%	20%
Frequently	31%	13%	28%	27%	31%	26%	20%	23%
Occasional	28%	18%	37%	15%	22%	33%	26%	19%
Rare	16%	26%	38%	20%	22%	36%	23%	19%

	<u>Family Characteristics</u>			<u>Access to Cars (time)</u>			
	Single	Young Family	Mature Family	All	Most	Some	None
<u>% OF POPULATION IN GROUP</u>	20%	31%	49	63%	14%	10%	13%
<u>Incidence of Use</u>							
*Regular	36%	16%	47%	36%	12%	16%	34%
Frequently	32%	10%	56%	47%	8%	15%	28%
Occasional	22%	24%	53%	53%	17%	9%	21%
Rare	16%	35%	48%	69%	15%	8%	8%

Source Table 2 Frequency use of Taxi by Demographics, Taxi Market Survey Stage 3.

- * Regular once a week or more often
- Frequent every two weeks to once a month
- Occasional every two/three months to six months
- Rare less often than six months

** All percentages sum across the tables.

STUDY RESULTS: TAXI TRIP CHARACTERISTICS

The results in this section are drawn from Stage I. About a third of all taxi trips for personal reasons are to the passengers home. Just over one half of all trips were to go home or for recreational purposes (see Table 4). Nearly 60% of passengers travelled alone.

Table 4Taxi Trip Characteristics

<u>Trip Purpose</u>	<u>%</u>	<u>#Passengers in Taxis</u>	<u>%</u>
Going Home	30	Travelling Alone	57
Recreation	23	One Other Person	21
Personal/Business	14	More Than One Other Person	22
Health	9	Total	<u>100</u>
Shopping	7		
Other	<u>17</u>		
Total	<u>100</u>		

The average length of a taxi trip was 7 kilometres and trips were mainly undertaken within the Metropolitan Taxi Boundary. (see figure 1). Table 5 shows that the majority of trips were generated in the South East, City or Eastern areas. Trips out of the central City area were evenly dispersed throughout the inner suburbs. As can be seen from figure 1, almost 60% of all travel was within an area rather than between areas.

Table 5Origin/Destination of Last Taxi Trip Taken
('000 trips)

<u>FROM</u>	<u>TO</u>						Total
	Central City	West	North	East	South East	Outer	
Central City	60	11	15	16	25	4	131
West	21	43	9	10	9	3	95
North	23	6	60	11	1	3	104
East	29	6	1	84	7	2	129
South East	26	9	5	19	112	-	171
Outer	-	-	-	-	-	-	17
Total	<u>159</u>	<u>75</u>	<u>90</u>	<u>140</u>	<u>154</u>	<u>29</u>	<u>647</u>

LAST TAXI TRIP DESTINATION
(% OF TRIPS)

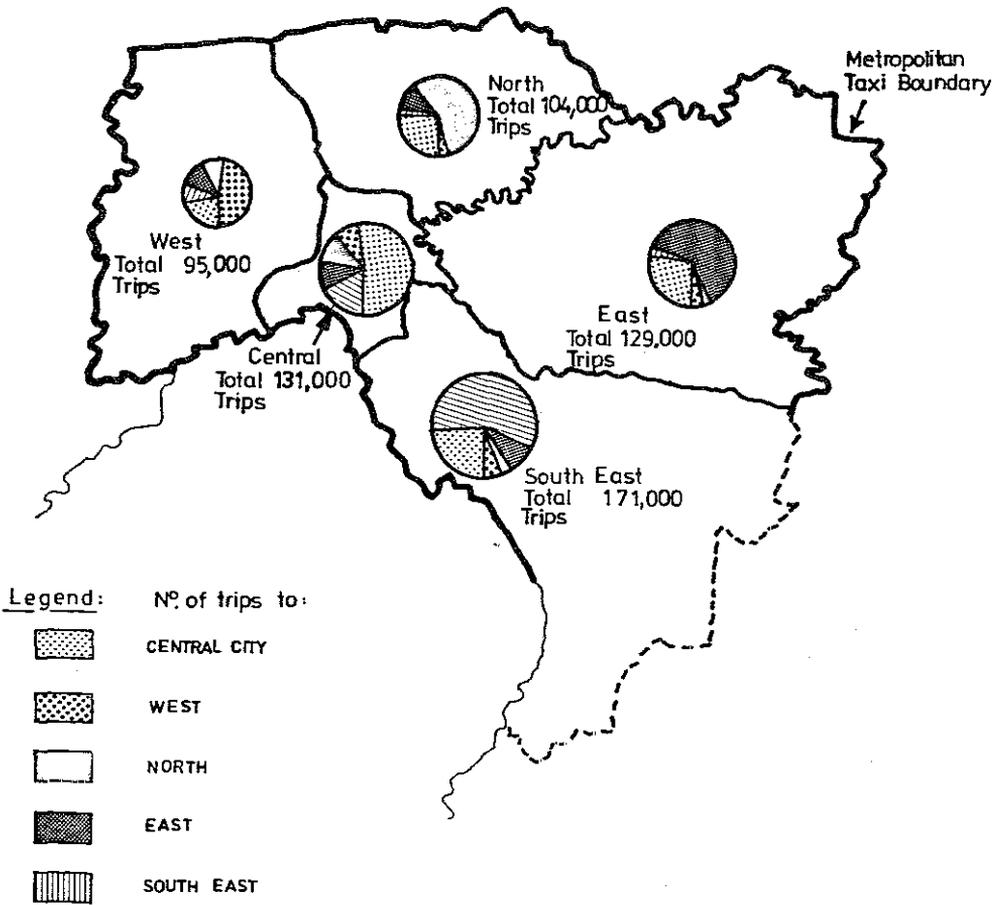


Figure 1

The survey indicated that the average taxi fare was \$4.90. There was a strong correlation between a person's fare and household income. The greater the income, the higher the average taxi fare. (table 6).

Table 6

Household Income and Average Taxi Fare

<u>Household Income</u>	<u>Average Fare</u>
\$15,000	\$ 3.86
\$15,000-\$25,000	\$ 4.69
\$25,000-\$40,000	\$ 5.13
\$40,000+	\$10.33

Regular taxi users had an average fare of \$6.28 which was greater than less frequent users.

People were asked to estimate the cost of a 5 km taxi fare and were given the example of St. Kilda to the city. Most people did not know the cost of a five kilometre taxi trip and more importantly people perceived taxi fares to be higher than they actually were - 67% of the population overestimate the average cost of a five kilometre taxi trip by between \$1 and \$10 (see Table 7).

Table 7

Perceived Cost of a Five Kilometre Taxi Trip
(Actual Cost \$3 - \$4)

<u>Perceived Cost</u>		<u>Direction of Error</u>
\$	%	
Less than 3	5	Underestimated
3-3.99	13	"
4-4.99	20	Correct
5-5.99	21	Overestimated
6-6.99	10	"
7-7.99	7	"
8-8.99	3	"
9-9.99	4	"
10-11.99	1	"
12-15	1	"
Unsure	16	

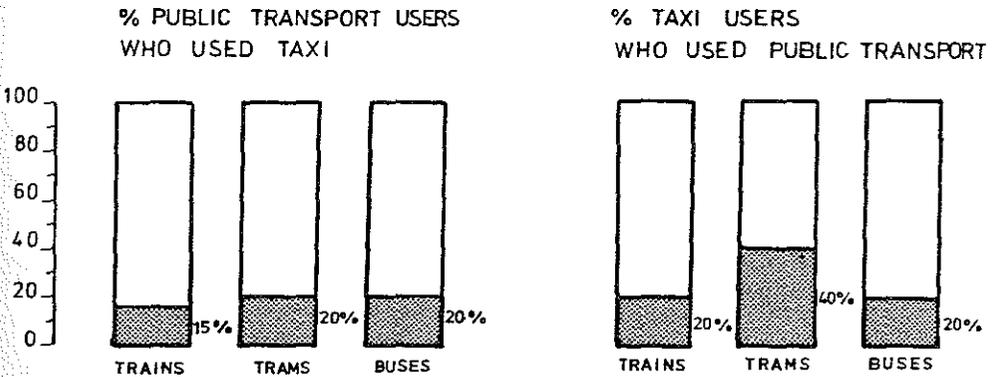
There are two interpretations of this result. The first is that price perceptions act as a barrier to people using taxis. The second is that price perceptions are artefacts of a lack of frequent experience with taxis because people choose other modes. The second interpretation implies that simply telling people taxis are cheaper than they believe may not increase taxi use.

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STUDY RESULTS: TAXIS AS COMPETITION FOR PUBLIC TRANSPORT

It might be expected that each public transport mode competes for passengers with each other mode. To some extent this might be so especially when lines run in parallel as for example between trams and trains and buses. In practice the extent of competition is probably small and there is more complementarity than competition among public transport modes.

About half of the people who use trains and buses at least once a week rarely or never use taxis. The figure is a little less (44%) for tram users. However, about 20% of people who used buses and trams at least once a week also used taxis in the week before the survey and 15% of train users also used taxis in the week prior to the survey (see figure 2).



TAXIS & PUBLIC TRANSPORT MARKET SHARE

Figure 2

These figures suggest that from the perspective of trains, trams and buses, taxi users form a small but nevertheless significant sub-market which is most likely to be complementary to those forms of public transport.

From the viewpoint of the taxi industry, train, tram and bus passengers are also a significant part of their market. For example, about 20% of people who used taxis at least once in the week prior to the survey also used trains and buses at least once a week. Nearly 40% of these taxi patrons used trams in the same week.

The nexus between taxis and public transport is evident. These figures suggest that whatever improves public transport patronage is likely to improve taxi patronage. The corollary is also true, if taxi patronage improves, so must public transport patronage.

MODELS OF THE TAXI MARKET

A series of statistical tests (ANOVA) were conducted on socio-economic and demographic variables in order to determine if they significantly explained taxi usage (Alford 1984). The results indicated that there was no statistically significant difference between taxi trips made by males and females. Similarly, there was no statistical difference for age of people, work status, stage in life cycle or income in each of these variables individual ability to explain taxi trips. A larger sample would probably have yielded significant results but they would still have been too small to be of strategic importance. The major explanatory variable which accounted for nearly 8% of the variance was access to a car. Low access to a car was clearly the single best predictor of taxi usage. The low level of explanation is partly due to collapsing access into two broad categories.

Multi-way analyses of variance were conducted to determine the extent of any interaction effects. The analysis of access to a car with sex explained 12% of the variance. This analysis indicated that males with low car access are very high taxi users. The combination of access to a car and use of public transport explained 8% of the variance and was significant. Although the combination of "access and sex" explained more variance than "access and public transport" from a marketing view point the latter was the one chosen to explore and develop in more detail. The access and public transport combination have the advantage of providing a clearly defined behavioural model with direct implications for marketing strategy. The analysis of variance for access to a car and public transport is presented in Table 8.

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Table 8

ANOVA Analysis Access to Car and Use of Public Transport

		N	%	SUM	%	MEAN	ST D	E2 %
Valid		397.	100.0	3796.	100.0	9.56	32.37	100.0
ACCESS	PUBLIC T	N	%	SUM	%	MEAN	ST D	E2 %
Al/Most	Wk/Mnth	169.	42.5	1407.	37.1	8.34	29.85	0.1
Al/Most	Less/Nev	151.	38.0	388.	10.2	2.57	9.93	1.8
Som/Nevr	Wk/Mnth	71.	17.9	1639	43.2	23.03	53.42	3.1
Som/Nevr	Less/Nev	6.	1.6	362	9.5	55.78	54.50	3.3

ANOVA	DF	SSD	ETA2 %	MSQ	FRATIO	PCHANCE
BETWEEN (K-1)	3.0	34395.4	8.3	11.465	11.838	0.000
WITHIN (N-K)	393.0	380649.6	91.7	968.480		
TOTAL (N-1)	396.0	415045.0	100.0			

The results are summarised in table 9 and are based upon the assumption that a market segmentation based upon car ownership and public transport use may be the most effective model to adopt:

<u>Public Transport Use</u>	<u>Car Ownership</u>	
	High	Low
High	Group 1	Group 2
Low	Group 3	Group 4

Using this framework, the % of households in each category and, average annual taxi trips are:-

Table 9A MODEL OF THE TAXI MARKET

<u>Public Transport</u> <u>Use</u>	<u>Car Ownership</u>	
	High	Low
High	% of Population = 42.5% % of taxi trips = 37 % taxi trips/annum = 8.3	% of Population = 17.9% % of taxi trips = 43.2% taxi trips/annum= 23
Low	% of Population = 38 % % of taxi trips = 10 % taxi trips/annum = 2.6	% of Population = 1.6% % of taxi trips = 9.5% taxi trips/annum= 55

Taking the high access groups first (all/most of the time car access), they divided into:

- (Group 1.) 42% of people with high access to a car, but who often "get out of their car" and use public transport on trips. They had a mean taxi usage rate of 8.3 trips per annum and accounted for 37% of trips.
- (Group 3.) Another 38% with high access to a car, but who rarely, if ever, "get out of their car" and use public transport on trips. They had a mean taxi usage rate of 2.6 trips per annum and accounted for only 10% of trips.

From a marketing point of view, the former group are more likely to be receptive to taxi promotions, since it is evident that they already show a propensity to leave their car behind on some trips.

The low car access groups also split into two:

- (Group 2.) 18% of people with low access to a car and who often use public transport; average of 23.0 taxi trips, accounting for 43% of all such trips.
- (Group 4.) A small group of 2% with low access to a car and who don't often use public transport, i.e. rely solely on taxis; average of 55.8 trips, accounting for 10% of all such trips.

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The latter group is quite small, and we would guess that they already use taxis as often as they can or want to.

In summary, therefore, it would appear that there are two main population groups which are worth consideration, vis-a-vi taxi usage:

- . A "high access to car" group, who often also use public transport. They are 43% of people and account for 37% of trips.
- . A "low access to car" group, who often use public transport. They are 18% of people and account for 43% of trips.

There are good reasons for arguing that increases in taxi patronage are best sought in the former group.

For instance, the latter group of "low access to cars and use public transport" are already in the "total public transport system". Getting them to use taxis more often most likely means switching them from trains, trams and buses for particular trips. Net benefit to the public transport system is zero and would only become positive if they made more public transport trips in total, a doubtful prospect, unless taxi fares were much cheaper.

The former group of "high access to cars and use public transport" could conceivably be motivated to use public transport more (including taxis), since they already show a propensity to do so. Net gains to the public transport system would result.

FARE ELASTICITIES

In order to identify indicators of elasticities, people's perceptions of fares as cheap, fairly cheap, rather expensive or too expensive were examined. The price sensitivity technique is used to identify price thresholds and price elasticity in consumer goods and services (Westendorp, 1979). It was briefly discussed in the previous section on research methods and is expanded here before describing the results.

People were first asked to remember all trips they made yesterday and to consider if they did or could have used a taxi for any of the trips. The distance of the trip that either was or could have been made by taxi was estimated in order to establish the cost of an equivalent taxi trip. The person was then asked "at what costs to you would that same trip by taxi become very cheap (no hesitation using taxi), fairly cheap (usually would use taxi), rather expensive (usually not take a taxi) and far too expensive (would hardly ever use taxi).

The results permitted an examination of how many people described a fare as cheap for a given percentage cut in the actual fare for a trip. This allows the calculation of a rough forecast or prediction of fare elasticity. Of course the calculation of a truer measure of fare elasticity would require observation of actual consumer behaviour in response to fare changes. As the literature review indicated there has been remarkably little work done in this area of public transport planning.

The analysis was conducted in two groups - those whose "trip yesterday" cost (could have cost) less than \$5.50 and those for whom the fare was more than \$5.50. This was because fares over \$5.50 were perceived as expensive. The data showed that there were two different types of fares; short trips, less than \$5.50 and long trips, over \$5.50. This was a significant finding because people perceived fares over \$5.50 as expensive even though the cost per kilometre was constant. It implies people focus on total fare for longer trips rather than the cost per kilometre. There are several marketing implications that can be drawn from this result and these are developed later.

Table 10 shows that with actual fares, one quarter paid up to \$2.00, half up to \$3.00 and three quarters up to \$4.00. On cheap fares, only one quarter considered a fare greater than \$2.75 as cheap; half considered a fare above \$1.75 as cheap and three quarters above \$1.00.

Table 10
DISTRIBUTION OF FARES LESS THAN \$5.50

Low Fare Trips -
Less Than \$5.50

	<u>Lower</u> <u>Quartile</u>	<u>Median</u>	<u>Upper</u> <u>Quartile</u>
Actual fare	\$2.00	\$3.00	\$4.00
Cheap fare	\$2.75	\$1.75	\$1.00

The next figure (figure 3) shows movements in perceptions for a third reduction in actual fares:

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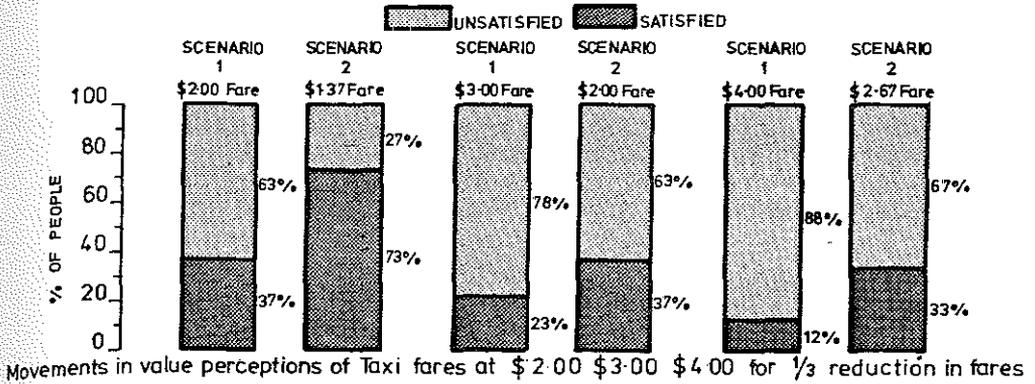


Figure 3

The figure examines reactions to three actual fares (\$2, \$3, \$4) which roughly correspond to quartile levels for "yesterday's trip" which were less than \$5.50.

Taking scenario 1 for the \$2 fare, the figure shows that 37% of people were satisfied paying up to \$2.00 for a taxi fare. On the other hand, 63% paid the \$2.00 but were unsatisfied with the fare. Scenario 2 for the \$2 fare, assumes a 1/3 reduction in fares and shows that 73% of people would be satisfied with that fare. At \$1.33, only 27% of people were unsatisfied. The increase in passengers interest or satisfaction brought about by the fare reduction was 36%.

Generalising across the range of fares (\$2, \$3, \$4) the nett "increase in interest" in a fare, as being cheap (people would have no hesitation using a taxi) is 15-36% given a 1/3 reduction in actual fares. This means the elasticity is between .5 to 1.1.

This is not a precise measure of elasticity because of the wide range of fares actually paid, which is why we have grouped them by quartiles. However, it provides an indication of how fare reductions affect perceptions. A more precise measure is discussed later.

Table 11 presents the results for "high fare" trips; i.e. when the actual fare was \$5.50+.

Table 11
DISTRIBUTION OF FARES GREATER THAN \$5.50

High Fare Trips - \$5.50+

	<u>Lower Quartile</u>	<u>Median</u>	<u>Upper Quartile</u>
Actual fare	\$6.50	\$8.75	\$13.00
Cheap fare	\$6.75	\$4.25	\$3.50

With actual fares, only one quarter considered a fare greater than \$6.75 as cheap, half greater than \$4.25 and three quarters above \$3.50.

The next figure, (figure 4) shows movements in perceptions for a one third reduction in actual fares for \$6.50, \$8.75 and \$13.00.

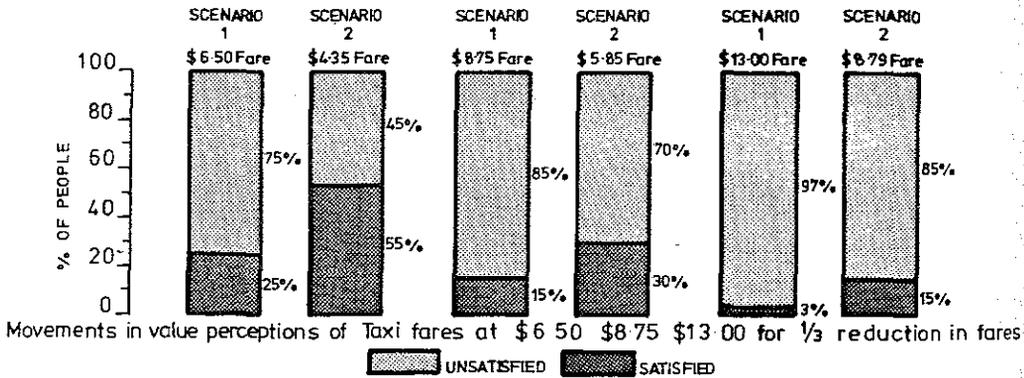


Figure 4

On average, therefore, we again see a net increase in interest in cheaper fares of 15%-30% for the one third reduction in actual fares.

Ideally, we should have everyone considering a particular fare, say \$4.00 or \$10.00, and relating cheap fares to that precise amount, however, this may have meant that respondents could not easily relate to a taxi trip with that fare.

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Taking both sets of results into consideration a one-third reduction in fares shows an improvement in interest in taxis of some 15%-30%; in other words, an elasticity of some 0.6-0.9. The usual elasticity for Public Transport is considered to be 0.3 and studies by the Road Traffic Authority indicate an elasticity of 0.2-0.3 for taxis. One reason as to why the taxi elasticity derived above is so much higher than the generally accepted figure may be that both taxi users and non-users have been involved in its calculation. This implies that non-users may be much more sensitive to price than the actual users.

Value of Rides

An explanation for the apparent correlation between actual fares and the proportional reduction to bring them within a cheap or share-ride bound can be obtained by looking at the apparent value of trips.

A value index was calculated comparing actual fares to perceptions of expensive and cheap fares.

This was done on the actual responses of people relative to the fare they paid or might have paid for "yesterday's" trip. The formula was:

$$\text{Value} = \frac{\text{Expensive} - \text{Actual}}{\text{Expensive} - \text{Cheap}}$$

\$2.00	0.91
\$2.00-\$3.99	0.59
\$4.00-\$5.99	0.49
\$6.00-\$7.99	0.32
\$8.00-\$8.99	0.11*
\$10.00-\$11.99	0.37
\$12.00-\$13.99	0.27
\$14.00+	0.04

* likely sample artefact

An actual fare near what was considered expensive would mean a value near zero. An actual fare near what was considered cheap would mean a value near one.

"Value" was found to be, on average, correlated with actual fare. Clearly, as fares increase, perceived value declines.

Below actual fares of \$4.00, more saw a taxi as offering value; i.e., actual fares were closer to cheap than to expensive. Between

\$6.00 and \$11.00; value was around one third; actual fares were tending to be fairly expensive. Above \$12.00, taxis were seen as definitely expensive.

What this suggests is that people focus on the fare itself, and not on the cost per kilometre travelled which reduces slightly with increasing distance. In other words, it appears that people are concerned with how much money they have to part with, especially once it reaches \$6.00 or more.

MARKETING IMPLICATIONS

The Target Markets

In summary, Group 1 (use public transport and have good access to cars) users are probably the main target to increase taxi use. Although they have cars they use public transport (likely for commuting) and hence indicate a predisposition for public transport. Their current average taxi use is only 8 trips per year or a little less than once per month. There are about 800,000 people over 18 in this category. There is no typical or average social profile (e.g. young/high income etc.), however, they all have good car access and use public transport. Hence these people likely live near train lines or tram/bus routes and a lot probably live in the inner MTA neighbourhood or along the rail corridors. They may commute to work.

Group 2 users already use taxis and public transport. They might be described as captives to public transport because they don't have easy access to a car and hence have no modal choice problem. It is also likely these people may be using taxis to their budget limits and hence would be unlikely to expand use. There are about 340,000 people in this group and they probably constitute a significant segment of public transport users.

Group 3 users have high car access and low public transport use. They probably live in the middle to outer suburbs and have travel patterns that are circumferential rather than radial. This group would be highly unlikely to change their habits and they have about 720,000 people.

Group 4 users are based on a very small sample. They appear to be a disadvantaged, low income group that has neither car access or public transport availability. They may include semi-rural pensioners and low income families.

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From the preceding discussion, marketing needs to concentrate on Group 1 people.

If the preceding analyses and inferences are correct then there are general inferences that follow for marketing and advertising taxis. These may also be equally relevant for trains, trams and buses.

Marketing and Advertising

First, a broad spectrum campaign using T.V. and radio may not be as effective as selective area targeting via local newspapers and direct mailing to specific post codes. The major target (Group 1) will lie in clearly defined corridors or the inner area of the tram network. A broad spectrum T.V. campaign will of course reach Group 1, but will be largely ineffective on Group 3. The results suggest that the advertising needs to be concentrated in areas that fulfil two criteria.

1. a good supply of public transport - likely at least trams and trains.
2. at least one or two cars per household.

Second, the research showed the nexus between taxis and public transport. Both share important feeder roles in a symbiotic or complementary relationship. Thus both would benefit from joint marketing and advertising. Conceptually a package needs to be developed which increases the mobility of individuals at cost effective prices, by offering a range of services such as trains, trams, buses, taxis and rental cars (Pikarsky & Johnson 1984). Such a package stressing complete year round mobility for all members of a family would be viable competition for the second or third family car. It means families could purchase small efficient city run-about and hire taxis or rental cars at weekends and selectively use buses/trains/trams for some of the regular work/school/shopping trips.

Third, the research conclusively demonstrates people overestimate taxi fares. There is also a reluctance to use taxis because people are unable to estimate the cost of a taxi fare. The value analysis suggests people focus more on the fare itself and not the cost/kilometre travelled. People are increasingly sensitive to fares over \$6.00. This means that flat fares within defined areas focusing on major regional shopping centres may be an effective marketing ploy to attract new passengers from Groups 1 and 3.

Although not discussed, attitudes to taxis were generally favourable. They have a good public image. The reasons for people not using taxi therefore does not lay with poor information but rather that people prefer their cars.

CONCLUSIONS

The data presented in this paper appear to be the first comprehensive, valid data set describing taxi usage for Melbourne and may be the first for an Australian city. The analysis undertaken to date has been mostly straightforward and descriptive. The data set, however, is large and contains additional information on train, tram and bus user characteristics. This data has not been analysed and could yield further insight into the public transport market and the interactions between modes.

The marketing model that was developed identified car access and public transport usage as two key strategic variables in predicting taxi usage. Although the statistical explanatory power of the model was low, it was comparable to the results achieved in other marketing studies. Further, the model is theoretically appealing and, logically consistent.

The results have shown that the taxi market is quite complex. It has exploded the myth that taxis are only for wealthy people. Taxi users appear to be drawn from two key groups: low income, public transport dependent households and higher income multiple car families. Effective marketing needs to concentrate only on those higher income, multiple car families that have already shown some propensity toward public transport. They are likely to live close to public transport and therefore have a valid, realistic alternative to using their cars. Rather than advertising public transport to the whole population, many of whom cannot use public transport because it doesn't fit their travel needs, marketing and advertising needs to concentrate on those groups for whom it is a realistic, valid alternative.

The market research highlighted the fact that most people believe taxi fares to be more expensive than they really are. The elasticity analysis, whilst rough, suggests that people's attitude to taxi fares is more sensitive than user's attitudes to train, tram or bus fares. This is not surprising given that they are far more expensive. The elasticity results imply that fare increases may not generate further revenue. There is continual need to generally market the taxi product in more creative ways.

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The consequences of not marketing taxis or trains, trams and buses more effectively are predictable. There is likely to be an erosion of patronage and reduction of revenues. This paper has demonstrated the nexus between taxis and trains, trams and buses. They need to be marketed together, as a package, not independently. Taxis in particular need to be promoted as part of the private car alternative. For many households they may be part of the magic key that induces the shift from sole reliance on private transport to a flexible, increasing use of public transport.

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