

FEDERAL OFFICE OF ROAD SAFETY

DOCUMENT RETRIEVAL INFORMATION

Report No.	Date	Pages	ISBN	ISSN
CR 102	May 1992	34	0 642 51156X	0810-770X

Title and Subtitle

WILLINGNESS TO PAY FOR VEHICLE SAFETY FEATURES
Phase 1: Methodology and Survey Techniques

Author(s)

Dwyer Leslie Pty Ltd
FEDERAL OFFICE OF ROAD SAFETY

Performing Organisation (Name and Address)

Dwyer Leslie Pty Ltd
GPO 1578
Canberra ACT 2601.

Sponsor

Federal Office of Road Safety
GPO Box 594
CANBERRA ACT 2601

Available from

Federal Office of Road Safety
GPO Box 594
CANBERRA ACT 2601

Abstract

The focus of this project is to determine the amount which Australian car buyers are willing to pay for vehicle safety features that protect occupants in the event of a crash. In the phase 1 report methodologies and survey instruments are examined and evaluated with regard to appropriateness. Suggestions for the implementation of the contingency valuation technique are included, and characteristics of a recommended sample for a survey of this type are outlined. It is concluded that given thoughtful development of survey instruments, identification of the necessary sample of respondents and sensitive implementation, willingness to pay could be effectively quantified.

Keywords

WILLINGNESS TO PAY, SAFETY FEATURES, SURVEYS, ROAD SAFETY

NOTES:

- 1) FORS Research reports are disseminated in the interests of information exchange.
- 2) The views expressed are those of the author(s) and do not necessarily represent those of the Commonwealth Government.
- 3) The Federal Office of Road Safety publishes four series of research report
 - (a) reports generated as a result of research done within the FORS are published in the OR series;
 - (b) reports of research conducted by other organisations on behalf of the FORS are published in the CR series.
 - (c) reports based on analyses of FORS' statistical data bases are published in the SR series.
 - (d) minor reports of research conducted by other organisations on behalf of FORS are published in the MR series.

EXECUTIVE SUMMARY

The focus of the current research project is to determine the amount which Australian car buyers are willing to pay for vehicle safety features that protect occupants in the event of a crash.

In a competitive market, the price of a good is determined by the interaction of supply and demand forces. The market price is (theoretically) the economic value of a marginal unit of the good. The demand function for a good represents consumers' aggregated willingness to pay for different quantities of the good.

Vehicle safety features, however, are an unpriced public good. Therefore, in the absence of a market price, a non-market valuation method must be employed.

Contingency valuation is an appropriate technique to estimate non-market values, however, particular care must be exercised in the design of the associated survey instruments to avoid the introduction of methodological bias.

The contingent valuation technique should be implemented through the use of both 'Take It or Leave It' and 'Bidding' questions within a survey instrument. This approach will elicit two willingness to pay values for each particular vehicle safety feature and allow associated demand functions to be estimated.

It is considered that the sample frame for the survey instrument should be persons who have purchased new motor cars or station wagons during the period from 6 to 18 months prior to the commencement of the survey.

As a significant proportion (some 50%) of new cars are purchased by fleet owners, two distinct survey instruments are required: one for individual car buyers; the other for fleet buyers.

There are a range of explanatory variables (for example, respondents age, vehicle cost) that are likely to be significant in explaining a respondents willingness to pay for vehicle safety features. The sample size required for each survey instrument is determined by the maximum number of categories that are used to define an explanatory variable and the magnitude of the acceptable sampling error.

Due to the complexity of the issues involved and the range of safety features to be considered, it is recommended that the survey instruments be implemented through face to face surveys rather than by telephone or mail out techniques.

It is concluded that given thoughtful development of survey instruments, identification of the necessary sample of respondents and sensitive implementation, it should be possible to quantify the amount that people are willing to pay to acquire particular vehicle safety features.

**WILLINGNESS TO PAY - PHASE 1 REPORT
TABLE OF CONTENTS**

EXECUTIVE SUMMARY

1.	INTRODUCTION	1
2.	CONTINGENT VALUATION TECHNIQUES	3
2.1	THE ECONOMIC CONCEPTS	3
2.2	ISSUES AND PROBLEMS	5
2.3	TYPES OF CONTINGENT VALUATION QUESTIONS	6
2.3.1	"Take it or Leave it" Technique	6
2.3.2	Bidding Technique	7
3.	THE INTERVIEW METHOD	9
4.	THE SAMPLE	10
4.1	THE SAMPLE FRAME	10
4.2	SAMPLE SIZE	15
4.2.1	Private Vehicle Purchasers	15
4.2.2	Fleet Vehicle Purchasers	17
4.3	THE PROBLEM OF NON-RESPONDENTS	17
4.4	VEHICLE TYPES TO BE INCLUDED IN THE SAMPLE	17
5.	OUTLINE DESIGN OF SURVEY	19
5.1	INFORMATION REQUIRED FROM RESPONDENTS	19
5.1.1	Individual Purchaser's	19
	Prior Experience of Individual with Motor Vehicle Accidents	21
	Demographic Questions	21
5.1.2	Fleet Purchaser's	21
5.2	SURVEY STRUCTURE	23
6.	OUTPUT REQUIRED FROM WTP SURVEY	25
6.1	INTRODUCTION	25
6.2	STATISTICAL METHODS	25
6.3	DEMAND FUNCTION ANALYSIS	25
6.3.1	"Take It Or Leave It" Question	25
6.3.2	Bidding Question	26
6.4	INTERPRETATION OF WILLINGNESS TO PAY ESTIMATE	27
7.	CONCLUSIONS	29

1. INTRODUCTION

This research project on new car buyers' willingness to pay for vehicle safety features is part of a wider set of Federal Office of Road Safety (FORS) investigations into the introduction of occupant protection counter measures and consequent changes to Australian Motor Vehicle Design Rules.

The occupant protection measures under consideration relate to occupant protection once a crash has occurred, rather than to any measures which may help to avoid a crash altogether. The basis for introduction of such measures is contained in an imminent FORS report on *Feasibility of Occupant Protection Measures* which establishes the benefits of doing so.

The purpose of the current research project is to assess in a rigorous manner the community's "willingness to pay" for such occupant protection measures. As a by-product, the project will provide a community assessment of benefit in contrast to the technical assessment of benefits in terms of reduced risk and hence reduction in injuries and fatalities. The study is focussed on new car buyers, of regular rather than luxury models.

The research project's objective, as stated in the Brief, is to obtain data about the extent to which Australian car buyers would be willing to accept increases in new vehicle costs, in order to reduce the likelihood of death or serious injury in the event of a crash.

The focus of this research project is on determining the **willingness to pay (WTP)** for vehicle characteristics that protect occupants in the event of a crash. Particular focus is on the need to improve the safety of front seat occupants of passenger cars involved in frontal crashes, rather than those measures which may help to avoid a crash altogether.

This research project is to be conducted in two phases.

The objective of Phase 1 is to "canvass in detail the proposed methodology and survey techniques including prototype questionnaires and the methodology of the analysis of the results of the field work". This document reports the results of our investigations of these matters.

The objective of Phase 2 is to prepare and implement suitable questionnaire(s), the responses to which are then analysed to determine the consumers WTP for occupant safety features. The results of Phase 2 of the project, which has yet to be undertaken, will be reported in a separate document.

Chapter 2 of this report describes contingent valuation techniques, how they may be utilised to determine consumer WTP and their economic foundation.

Chapter 3 covers the range of interview techniques available to obtain relevant consumer information.

Chapter 4 covers the sampling issues associated with the proposed survey, including the sample frame which is a particularly difficult area given privacy considerations.

Chapter 5 provides an outline design of the proposed survey instrument.

Chapter 6 explains the method by which the results of the survey are translated into estimates of consumer WTP.

2. CONTINGENT VALUATION TECHNIQUES

2.1 THE ECONOMIC CONCEPTS

In a competitive market, the price of a good is determined by the interaction of the forces of supply and demand. The demand function represents consumers' aggregated WTP for different quantities of a good.

Consumers are assumed to maximise utility and to purchase a quantity of the good up to the point where the utility obtained from the last unit of the good equals the market price.

Suppliers of the good are assumed to be competitive profit maximisers and will continue to supply the good to the market until the price received for the last unit equals the marginal cost of providing that unit.

The market price thus approximates the utility (in terms of dollars) or the economic value of the marginal unit of the good. In a perfectly competitive market, everyone pays the same price, so the value of the good at the margin is the same for every individual consumer and the cost of providing the marginal unit of the good equals the price. Thus, marginal increases or decreases in the quantity of the good can be valued at the market price. The closer the actual market is to the theoretical perfect market, the better the indication of economic value.

The level of utility derived from a good by a consumer depends on the good's characteristics. A good with more desirable characteristics commands a higher price, giving rise to an implicit price of the good's characteristics. For example, one may be prepared to pay \$x for a car without power steering or $$(x + y)$ for the same model with power steering. Demand functions can only be estimated with confidence for prices and quantities close to those currently existing in the market.

Vehicle safety features however, are an unpriced public good, thus there are no market determined prices which can be used to approximate a demand function. In the absence of a market price, a non-market valuation method must be employed.

The WTP technique is one non-market approach that may be used to determine the value that consumers ascribe to a good. In this project, the approach is used to measure the benefits which the community perceives would be achieved by introducing new vehicle safety features.

The proposed WTP survey will attempt to value people's perceptions of the benefits associated with these safety features. These benefits take the form of perceived increased utility or satisfaction accruing to purchasers of vehicles with these features. Unfortunately, because utility is a concept based on individual non-constant preferences, it is not possible to directly obtain a measure of value from the increase in utility, as utility is not directly measurable. Utility is an ordinal rather than cardinal concept, and individuals are assumed to be able to rank bundles of goods in ascending or descending order.

The WTP estimate is an indication of value in the economic sense, i.e., the most an individual is willing to give up in exchange for the good out of the resources the individual controls. Assuming that the individual maximises his/her utility, the utility of the good obtained must be at least equal to the utility of the money foregone. Higher levels of preparedness to forego money therefore indicate higher levels of utility obtained from the good. From an economic perspective, the measure of value obtained is limited because the utility associated with one unit of money varies across income levels and between individuals.

In order to meet the criteria set out in the Brief for this research project, it is proposed that **contingent valuation (CV)** techniques be used for the survey approach. It is suggested that these techniques are the best way to measure directly people's WTP for vehicle safety features.

CV techniques have increasingly been used to estimate the value of unpriced public goods and for the provision of environmental services. The technique is particularly valuable where other methods such as analysis of market behaviour or direct data collection are precluded due to the absence of a market or available data.

CV studies are structured to describe a hypothetical market to the individual in a way that places that individual in an active role in the market - as a bidder for a specific outcome. The valuation questions request bids from individuals for stated changes in a carefully defined commodity. In effect, the person is confronted with the prospect of being able to purchase the change.

There are a number of potential bias problems relating to the use of survey instruments. Methodological bias occurs when the structure and/or implementation of the survey instrument causes the information obtained from the sample to deviate significantly from what would have been obtained with the target population. Those relevant to CV technique, as well as the methods suggested to be used to reduce their impact in this case, are discussed below:

- **Hypothetical bias** - occurs when individuals cannot or will not consider questions in a manner which corresponds to how they would treat the actual situation. The net effect is to increase the statistical variance and to lessen the reliability of the estimated WTP amounts. The potential for hypothetical bias may be reduced through identification of an appropriate sample frame (Refer to Section 4.1).
- **Information bias** - occurs when the amount of information available to a respondent, or given to the respondent, in the survey questionnaire, influences the type of response given. In this case care will be required to define the knowledge basis of the respondents and the degree to which the CV process should (or could) seek to change that informational basis. (Refer to Section 2.2)
- **Strategic bias** - occurs when individuals answer questions according to how much they can obtain with minimal effort and cost. This is known as the free rider problem in public good analysis. This bias should be minimal in this case as the survey

instrument should clearly specify that additional vehicle safety features can only be obtained at some defined cost.

- **Starting point bias** - values initially presented can influence the manner in which individuals respond. This starting point bias can be reduced by using two types of WTP question: a bidding form and a WTP form. The bidding form, using a broad scale, will enable respondents to select a value without reference to a particular (non-zero) starting point. The results for both forms of the question can be compared to ensure that the bidding values are always greater than or equal to the WTP values. (Refer to Section 2.3).
- **Interviewer bias** - occurs when different interviewers or their manner of interview presentation cause variations in individuals' responses. This interviewer bias can best be minimised by the careful briefing and training of interviewers and by ensuring that set procedures are strictly followed.
- **Payment "vehicle" bias** - happens when individuals are influenced by the method of payment selected for a CV study. This bias is unlikely to affect responses in this survey as payment would only be made to a motor vehicle manufacturer/dealer.

The two basic variants of the CV technique which are proposed for use in this instance are **take it or leave it** and **bidding questions**. The fundamental reason for choosing two variants of the technique is validation: the ability to cross-check one set of results against the other. These two variants will act as an indicator for the reliability and validity of the results obtained.

2.2 ISSUES AND PROBLEMS

There are a number of issues and problems associated with CV techniques which need to be resolved before implementation of a survey.

The key issues for this WTP study on vehicle safety features include:

- a) The hypothetical bias problem:

To overcome this situation, the hypothetical situation proposed within the survey must be made as real as is possible. This is the essence of the C.V. technique: respondents must provide an accurate and objective valuation based upon the information provided to them.

- The bias problem is also linked to the need to deal only with people who have :
 - purchased a new car (someone who has never done so would exhibit a major bias)
 - purchased a new car recently (if it was too long ago there will be a recall problem and there will also be a "new model" or technology change problem).

- The techniques for providing information and conducting the survey require face to face interviews because the issues are too complex for an effective telephone or mail-out response in order to remove the 'hypothetical' component of the car purchase decision.
 - Background information will need to be provided to respondents. This information should consider vehicle accident data in context of all causes of trauma and death in the Australian community.
- b) The information bias problem:

To overcome this problem the respondent must be provided with sufficient information to make an objective valuation of a given safety feature.

- The information must only be provided to an appropriate sample - recent new car purchasers - who can consider what extra amount they would be (have been) prepared to pay for the identified safety feature¹.
- The information must clearly identify the type and function of the proposed safety feature.
- The information must clearly identify the effectiveness of the proposed safety features. This will be difficult as, whilst it is essential to inform respondents of the expected reduction in type and severity of trauma, information must be presented in a non-prejudicial format: for example, graphic photographs of accident scenes should be avoided.

2.3 TYPES OF CONTINGENT VALUATION QUESTIONS

Within the C.V. technique there are two basic forms of questions that can be utilised to elicit WTP estimates.

It is proposed that both forms of question be incorporated in the survey instrument as this provides the facility to validate responses through statistical comparison of one set of results with the other. Further, the predictive capacity of the derived WTP (demand) function will increase with the inclusion of a second WTP estimate.

2.3.1 "Take it or Leave it" Technique

The "take it or leave it" technique provides the respondent with a simple choice of accepting (yes) or rejecting (no) a particular WTP value for a hypothetical benefit. Whilst this approach may appear superficial, if correctly implemented it can obviate many bias problems.

¹ Discussions with the Federal Office of Road Safety indicate that most of the proposed safety features are not currently available for general passenger vehicles.

It is proposed that this technique be used to elicit the first WTP estimate.

However, prior to questioning, the respondent must be provided with sufficient information to formulate a true objective value of the benefits of each alternative safety feature.

- The issue of vehicle occupant injury must be placed in context of the causes of accidental injury in Australia. It may be appropriate to utilise simple data to convey the significance of vehicle occupant injury, for example, expressed as X% of total annual accidental deaths.
- The nature of each of the proposed safety features must be identified. Where such measures comprise of a 'package' of components, complementarity should be identified and focus be directed to the 'package'. It is considered that pictorial representation of the safety features should be displayed to facilitate description and ensure common knowledge between different respondents.
- The effectiveness of each proposed safety feature must be identified. As previously noted (see Section 2.2 above), careful consideration of the nature and medium of information is required. A statistical approach is again suggested. For example, respondents may be informed that if a vehicle crash occurs, it has been estimated that installation of safety feature 'A' would reduce the resultant injuries to occupants by Y%.

Once this background information has been conveyed, respondents would be questioned (for each safety feature) that given safety feature 'A' is expected to reduce occupant injuries by Y%, would they be willing to pay \$Z to have safety feature 'A' fitted to their new car (yes/no).

An alternative form of the "take it or leave it" technique may also be considered. This would involve asking respondents whether they would be willing to pay a 'P%' increase in the cost of their new car to fit safety feature 'A' (yes/no).

To estimate what the 'P%' might be, new vehicle costs can be assumed in the range of \$15,000 to \$35,000 and each safety feature assumed to cost \$800. Therefore, 'P' may take values from 2% to 5% depending upon the cost of the car that the respondent had recently purchased.

2.3.2 Bidding Technique

The "bidding" technique provides respondents with the facility to nominate exactly how much they would be willing to pay for a hypothetical benefit.

It is proposed that this technique be used to elicit the second WTP estimate.

In this context, respondents would be questioned (for each safety feature) that given safety feature 'B' is expected to reduce occupant injuries by 'Z%', how much (in \$ terms) would they be willing to pay to have safety feature 'B' fitted to their new car.

This approach has the virtue of allowing respondents to freely express their WTP for a specific safety feature; this amount may well differ from the value nominated in the "take it or leave it" technique.

3. THE INTERVIEW METHOD

The following interview methods are available:

- a) **Postal Interviews** usually result in poor response rates (frequently less than 20%) and provide opportunity for the introduction of serious biases through self selection: only those people who are interested in the subject and understand the survey instrument are likely to reply. Further, questions need to be kept simple as there is limited scope for explanation, and would thus lack the necessary depth. This approach is not recommended as the primary method to implement the WTP survey instrument (see Section 4.1).
- b) **Telephone Interviews** have the advantage that they are cheap and quick and hence the sample can be larger (if the population to be sampled can be identified, see Section 4.1). The disadvantages are that the questionnaire for a WTP survey is likely to be too long, too complicated and too difficult to comprehend for efficient telephone application. Further, it is likely that the packages of proposed safety features will need to be presented visually in order to explain what they are and what their effect will be. This method is not recommended for a rigorous WTP survey.
- c) **Face to Face Interviews** enables the interviewer to establish the context for the survey and for complex issues to be well explained. This in turn allows considered information to be obtained through the use of structured issue specific sets of questions. The interviewer also has a better opportunity to win the confidence of the interviewee and respond to any questions that may arise. Experience from other WTP surveys suggests that the survey proposed for this study can only be effectively administered through face to face interviews.

4. THE SAMPLE

4.1 THE SAMPLE FRAME

In order to lessen hypothetical bias, it is essential to interview recent purchasers of new motor vehicles. This is because the aims of the study are to determine whether, in a new vehicle purchase, people take into account safety features and how much they would be prepared to pay to have additional safety features installed. However, people who have not made a recent purchase are much less likely to have considered the value of vehicle safety features, as they have not faced a real purchase decision with all the contingent factors.

Therefore, the sampling procedure used must be able to identify recent vehicle purchasers. It must also be decided what is meant by "recent". The purchase would need to be sufficiently recent for all of the important elements of the decision to have been retained in the memory of the purchaser. Thus, twelve to eighteen months would be the upper limit. In determining a lower limit the question of whether respondents are likely to be more self-justifying of their actions and decisions, (i.e., not admit that their decision was or could be wrong) immediately preceding a purchase. Psychologists refer to this as "cognitive dissonance". There is strong research evidence (see, for example, Festinger, 1957) to suggest that answers provided up to 6 months from the purchase date would be unreliable as respondents may attempt to justify their recent expenditure. Therefore, the potential for cognitive dissonance must be considered when identifying the sample frame for the survey instrument². It will be possible to cross tabulate "time since purchase" by WTP results, and to check for any differences related to time since purchase.

The conclusion is that the 6 to 18 month time interval after vehicle purchase be used as the sampling frame: it would be feasible, provide reliable results and not unduly strain the memory of the respondents.

RACV Insurance has advised that approximately 50% of new car sales are for fleets (including car hire companies). This figure could be as high as 60% in the current economic climate. The sample frame should therefore be segmented to ensure that this percentage (50 - 60%) is recognised. This high fleet buyer factor is particularly important to note in relation to viewpoints on safety features and cost. Views could differ between fleet buyers and private purchasers.

The following are options for obtaining a sample:

- a) through motor vehicle registry listings to extract new vehicle registrations;
- b) through motor traders associations to access dealers;

² It will be possible to cross tabulate "time since purchase" by WTP results to identify any cognitive dissonance impacts.

- c) through individual dealers to obtain names and addresses of new car purchasers, or other access at dealers' premises;
- d) by requesting that motoring organisations or their insurance companies ask members or policy holders willing to participate to contact FORS or the consultancy undertaking the survey;
- e) through lists held by motor vehicle manufacturers to obtain names and addresses of recent new car purchasers;
- f) by telephoning a randomly selected group of people to establish whether they have purchased a new car recently, and whether they are willing to participate in a face to face interview.

An underlying difficulty with several of these options is that they would involve a breach of confidence between a seller or insurer and a customer or client.

As well, many motor vehicle dealers are also providers of credit. In this regard they will be bound by strict new laws on consumer credit information which came into effect on 25 February, 1992, under the jurisdiction of the Privacy Commissioner. The new laws, *inter alia*³

- " • Limit the type of information that is kept about you on your file;
- Limit access to that information and the way it can be used;
- Require that your information is stored securely
- Require your consent if a credit provider wants to use information about your business activities to decide whether to give you consumer credit. "

Not surprisingly, these laws make credit providers fearful and unwilling to provide names and addresses even for research which could potentially be beneficial to the community.

Each of the sampling options is described below together with any advantages or disadvantages:

Option A Motor Vehicle Registries

Inquiries were made of motor vehicle registries in New South Wales, Australian Capital Territory and Victoria.

³ *Privacy. Consumer Credit Information. What Are My Rights?* Human Rights and Equal Opportunity Commission Pamphlet, December, 1991.

From New South Wales, there was an adamant "no". This is a highly sensitive issue since there was a major Independent Commission Against Corruption inquiry into public officials selling information on motor vehicle registrations.

From Australian Capital Territory, the answer was that this is not physically possible because of the nature of the records system.

From Victoria, approval would be possible but it is not known if it is physically possible to extract the information from the record system.

This option should not be written off but privacy requirements should clearly be respected. If any of the motor vehicle registries are prepared to participate and are physically able to do so, the approach would be to use them to act as agents for a reply paid mail-out in which volunteer participants would advise FORS (or the consultants) that they were prepared to participate in a face to face survey.

Option B Motor Traders Associations as a means of obtaining access to purchasers via dealers

This is really a version of Option C, or a means to effect Option C.

An approach to the President of the Motor Traders Association in the ACT, elicited a desire to help, but an inability to do so because of the credit/confidentiality factor.

Option C Individual Dealers

There are two sub-options here:

- (i) Use of the dealer to obtain access to the names and addresses of recent new car purchasers. This sub-option is ruled out by privacy requirements.
- (ii) With the permission of the dealer, stopping people who have just departed from a dealer's showroom or yard. Clearly, only a proportion of these people would have actually purchased or arranged to purchase a vehicle.

The above option poses the possibility of surveying people who are considering the purchase of a new vehicle rather than those actually purchasing a new vehicle. In such a case however, the survey may be seen to be influencing a person's choice, and also may be seen as potentially threatening to a sale by the dealer.

A further variant is whether to undertake the interview at or near the dealer's premises, or at a later pre-arranged time probably at the person's residence. The former approach would cost less and avoid encroaching further on the person's time. The latter would likely permit a more considered approach by the respondent to the interview and background briefing. On balance,

the former is preferred. The main reservation on this approach is obtaining the dealer's co-operation and/or permission.

Option D Motorists' Organisations or their Insurance Companies

Insurance companies and motorists' organisations are likely to have the same confidentiality difficulties as dealer/credit providers.

However, NRMA Insurance which would be willing to assist, sees other ways to negotiate these difficulties. They would probably be prepared to assist by sending a reply paid mail-out to recent new vehicle purchasers, at the same time expressing their interest in road safety and encouraging the policy holder to respond to the FORS (or consultancy organisation) expressing intention to participate in the face to face survey. Another possibility would be to publicise the survey in the Open Road Journal but this would involve a considerable lead time.

Return rates are notoriously low in postal surveys so that ten to twenty times more letters would need to be sent out than the actual survey sample size.

There may be some difficulties encountered in NRMA Insurance identifying recent new car purchasers from their records. A large proportion of the purchasers already own a car and their existing insurance details need to be altered. This list could be screened to identify those insured who have a different vehicle, and further screened as to new plate issue (although not all of these will have a new vehicle).

RACV would similarly like to co-operate in a survey; they are aware that the numbers of letters to be dispatched could be large; and their records may not so readily identify insured who have changed their vehicle.

This option appears to be workable, but with the reservations described above.

Option E Motor Vehicle Manufacturers

Motor vehicle manufacturers have comprehensive lists of names and addresses of new vehicle purchasers. This option is in effect similar to working through dealers to obtain a list of recent purchasers. It may be less direct but is not subject to the legal strictures on confidentiality which affect credit provider. This option has some difficulties but merits serious consideration. However, FORS decided that all other options should be examined as part of this report.

Option F Telephone Search to Locate an Appropriate Sample (not a telephone survey of recent new vehicle purchasers).

This option would involve calling a randomly selected group of people to locate those who:

- a) have purchased a new vehicle recently;

- b) are willing to participate in a face to face interview.

A large number of people will have to be selected.

For example, the Australian passenger vehicle market for 1991/92 is expected to be 396,000⁴, the population is about 17.5 million and there are about 6.25 million households. On these figures,

- 6.3% of households will purchase a new car this year.
- Assuming an evenly distributed market of new car buyers, 16 households would need to be contacted successfully to find one household that had purchased a new car in the last year.
- If it is assumed that there is a 70% chance of finding the new car buyer at home (and willing to take the call), and a 30% chance of the new car buyer being prepared to participate in a subsequent face to face interview (and actually would), to obtain one interviewable new car purchaser would require:

$$- \quad 16/0.7/0.3 = 76 \text{ calls}$$

To obtain a sample of 500 would require

$$500 \times 76 = 38,000 \text{ calls}$$

If the period were extended to two years, this would reduce to 19,000 evening or weekend phone calls (far more during weekdays).

The conclusions from the assessment above are:

1. Sample frame is individuals and fleet buyers who have purchased a new vehicle(s) during the prior 6 to 18 month period.
2. Face to face interviews are regarded as essential for the complexity of issues involved (refer to Chapter 3).
3. Privacy issues present considerable difficulties for identifying and obtaining a sample. Direct use of name and address lists from dealers, manufacturers, insured and motoring organisations may not be feasible.
4. An indirect approach to name and address lists is therefore required.

⁴ Business Review Weekly, April 17, 1992, p50.

5. The use of NRMA Insurance and RACV Insurance to obtain a potential sample frame would be a reasonable approach. The primary constraint is the likely low response rates associated with mail out surveys.
6. If FORS difficulties (or perceived difficulties) related to approaching motor vehicle manufacturers could be overcome, this represents the most direct approach for obtaining a sample. The survey could then be segmented to represent the most popular vehicle makes and models. This would, in fact, be the preferred method, particularly in relation to separating fleet buyers from private purchasers.
7. Sampling at dealers' yards or show rooms (with the dealer's permission) is another possibility which should not be dismissed at this stage, but it may not capture the 50 - 60% of fleet buyers.
8. Telephone calling to obtain a sample of people willing to participate in subsequent face to face interviews is too unwieldy and impracticable.
9. Further work needs to be done to explore the logistics of obtaining the sample to arrive at the preferred method.

4.2 SAMPLE SIZE

A sample size must be selected which is sufficient to ensure that statistically rigorous analysis of the survey results may be performed. It is the absolute size of the sample that is of most importance here, rather than the size relative to the total population.

It is considered that due to their particular characteristics, private and fleet vehicle purchasers surveys will require different sample sizes.

4.2.1 Private Vehicle Purchasers

In determining sample size, the starting point is taken to be the need to obtain a statistically valid sample for the first WTP question. It is expected that half the sample will give a "yes" answer and half will give a "no" answer to each of the identified costs. The following sample size required at each level of sampling error is presented in Table 4.1.

Table 4.1: Required Sample Size: Private Vehicle Purchasers

SAMPLING ERROR	SAMPLE SIZE
1.0%	10,000
2.0%	2,500
3.0%	1,100
4.0%	625
5.0%	400
10.0%	100

Source: de Vaus, D.A. (1985) Surveys in Social Research, Allen and Unwin, Sydney

Examination of Table 4.1 indicates that very large samples are required to achieve low sampling errors (10,000 individuals for 1% sampling error). Therefore, the minimum sample size is dependent upon the magnitude of the maximum acceptable sampling error: 100 individuals for 10% error, or 400 individuals for 5% error.

If it is considered necessary to examine WTP by various sub-groups, for example:

- awareness and understanding of vehicle safety issues;
- cost of car recently purchased;
- education level of respondent;
- age of respondent; or
- geographic location.

Then it will be necessary to obtain a statistically valid sample in each category of the sub-group.

For example, if the cost of car purchased sub-group is divided into five categories:

< \$15,000
\$15,000 to \$22,000
\$22,001 to \$27,000
\$27,001 to \$35,000
> \$35,000

Therefore, if a sampling error of 10% is acceptable, a sample of 500 individuals is required.

4.2.2 Fleet Vehicle Purchasers

Given that some 50% of new vehicles are purchased by fleet buyers, it is critical that company representatives responsible for such purchases are surveyed.

Whilst sampling errors identified in Table 4.1 are applicable, it is considered that due to the likely higher homogeneity between fleet buyers than between individual car buyers, total sample size should be smaller. For example, it is likely that there will be fewer sub-groups and less categories within each sub-group. Consider again the issue of vehicle purchase cost: most fleet buyers may be classified in two categories:

\$22,000 to \$27,000

\$27,000 to \$35,000

Therefore, if a sampling error of 10% is acceptable, a sample of only 200 is required.

It should be noted, however, that absolute minimum sample sizes are specified by the proposed analytic process.

Estimation of the demand function for a particular safety feature requires that the co-ordinates (WTP, proportion of population) of five (5) points are determined. Therefore, sample populations must be capable of being subdivided into five (5) groups. Each group would be asked (in the first WTP question) whether they would be willing to pay a specified price (\$Z₁, \$Z₂, \$Z₃, \$Z₄, or \$Z₅) for a particular safety feature.

4.3 THE PROBLEM OF NON-RESPONDENTS

Some of the people selected in the initial sample will not be included in the final data set as they chose not to respond to the survey instrument for a (potential) variety of reasons.

Non-response can create two main problems: an unacceptable reduction in sample size; and increased response bias. The problem of sample size can be negated by drawing an initial sample that is larger than needed. Response bias occurs if non-respondents are different in crucial respects from respondents (e.g., age, socio-economic status, education). The difficulty is not so much the bias itself but in working out what the bias is and to what extent it occurs.

4.4 VEHICLE TYPES TO BE INCLUDED IN THE SAMPLE

Examination of Australian statistical data (Appendix A) reveals that in 1990/1991:

- Sedans and station wagons accounted for 86% of all passenger vehicles sold.

- The five major vehicle manufacturers (Ford, Holden, Mitsubishi, Nissan and Toyota) accounted for 82% of all sedans and station wagons sold.
- The majority of sedans and station wagons sold were of the lower priced 'family' models (Falcon, Commodore, Magna, Pulsar and Corolla) rather than 'Luxury' vehicles.

Therefore, to improve homogeneity it is recommended that vehicle types to be included in the sample be limited to sedans and station wagons. Further, it is expected that the cost range for the majority of such vehicles is from \$15,000 to \$35,000.

5. OUTLINE DESIGN OF SURVEY

Because of the (likely) distinct differences in decision criteria between individual and fleet vehicle buyers, it is considered that two (2) separate survey instruments must be developed.

Whilst both survey instruments have identical objectives - quantification of the WTP for vehicle safety features - particular information is required and will be gathered by each.

5.1 INFORMATION REQUIRED FROM RESPONDENTS

5.1.1 Individual Purchaser's

In addition to the actual WTP information, the survey will be designed to obtain a number of different types of additional respondent information. Some aspects of this requirement are identified in the previous Chapter. The basic informational requirements are discussed in the following sections.

Attitudes of Individual Towards Road Safety Issues

Clearly, if a respondent has a negative attitude towards road safety issues, they could be expected to display a low WTP for vehicle safety features. Therefore, the survey must test respondents' attitude.

There will need to be several questions, asking the respondents for a graded response (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree, or don't know) to each question.

Factors determining attitudes will include:

- speed - on freeways, highways, in built up areas and so on;
- maintenance of the vehicle - brakes, tyres etc.;
- registration testing of the vehicle; and
- awareness of within-vehicles factors causing occupant injury.

In relation to vehicle testing, the question might be: which phrase (from the above list) best describes how you feel about the following statement "All vehicles should be thoroughly tested for roadworthiness". Clearly, a respondent who strongly agreed with this statement would have a positive attitude to road safety and almost certainly a positive attitude towards WTP.

Knowledge and Understanding of Individual of Road Safety Issues

Questions designed to test knowledge and understanding of road safety issues should focus on the issues of relevance to this survey, namely the safety characteristics of the motor vehicle itself. Issues

will include those things which should be general knowledge for all motorists. Some examples might be:

- Vehicle maintenance, importance of:
 - tyres - tyre wear, correct inflationary pressures, wheel balancing;
 - steering - wheel alignment; and
 - brakes - types and effectiveness.
- Relationship between impact speed of vehicle and occupant injury level.
- Relationship between driver blood alcohol level and likelihood of vehicle accident.
- Relationship between driver fatigue level and likelihood of vehicle accident.

Vehicle Purchase Criteria for Individual

The respondent would have recently purchased a vehicle. A series of questions designed to elicit information about the particular vehicle and its characteristics will be required, both for analytic purposes and as foundation for later questions. The questions will focus on:

- reason for purchase - replacement, specific requirements;
- purpose of vehicle - work, recreation, family transport
- the vehicle - make, model, price;
- vehicle options - what options were specified and what was their total cost;
- safety features available - what specific safety features were offered with the vehicle (open ended question - also relates to the awareness issue);
- safety features purchased - which of the above features were purchased;
- what additional cost (if any) is known to be associated with these safety features; and
- future purchases - name some considerations which you are likely to take into account in any future purchase of a motor vehicle.

Prior Experience of Individual with Motor Vehicle Accidents

The concept is that those who have had prior experience of motor vehicle accidents are likely to be both more aware of the issues and more aware of the likely consequences of the injury and death minimising effect of various vehicle safety features.

Therefore, a simple set of questions will be asked:

- During the last 5 years, have you or anyone in your immediate family or friends been involved in a motor vehicle accident(s) (Yes/No).
- If yes, did the accident(s) result in:
 - no injuries
 - minor injuries (number affected)
 - serious injury (number affected)
 - death (number affected).

Demographic Questions

Questions will seek information about the following demographic characteristics of the respondent being interviewed.

- Gender - male, female;
- Age - categories to correspond with 1991 Census;
- Education level - primary school, high school, tertiary qualification;
- Income - categories to correspond with 1991 Census; and
- Dependents - number of persons in the household under 17 years of age.

5.1.2 Fleet Purchaser's

In most firms, employees perform defined tasks within a policy and responsibility framework. Therefore, the target respondent in this case is that representative of the firm who is currently responsible for fleet purchase decisions.

Attitudes of Firm Towards Road Safety Issues

If a firm has an indifferent attitude towards road safety issues, they could be expected to exhibit a low WTP for vehicle safety features.

The objective here is to identify the nature of the firm's policy (if any) on road safety issues. The representative will be asked several direct questions.

Components of policy include:

- Driving licences - does the firm check an individual's driving licence prior to initially allocating a vehicle to them;
- Driving lessons - does the firm provide advanced driver training lessons;
- Traffic infringements - does the firm pay any traffic infringement fines for employees.
- Loss of driving licence - does loss of licence by an employee preclude any future driving of firm vehicles.

Vehicle Purchase Criteria of Firm

It is necessary to elicit the selection criteria for vehicles and identify the number and purpose of vehicles purchased during a year. Direct questions will focus upon:

- Does the firm have a defined set of selection criteria for new vehicle purchases;
- If yes, does the set contain each of the following criterion:
 - purchase price
 - warranty period
 - service contracts
 - fuel economy
 - safety features
 - driver preference.
- If yes to safety features, what weighting does this criterion have in the selection assessment (range provided);
- How many sedans and station wagons (make/model) did the firm purchase last year (range provided); and
- Of the vehicles purchased, what proportion are used for country travel (range provided).

Prior Experience of Firm with Motor Vehicle Accidents

It is considered that firms that have had employees involved in work related vehicle accidents are more likely to adopt specific vehicle safety policies or identify particular safety criteria.

Therefore, a simple set of questions will be asked:

- During the last 5 years have any of the firm's employees been involved in a work related motor vehicle accident(s) (Yes/No);
- If yes, did the accident(s) result in:
 - no injuries
 - minor injuries (number affected)
 - serious injuries (number affected)
 - death (number affected).

5.2 SURVEY STRUCTURE

A similar survey structure will be utilised for individual and fleet purchasers. The structure is designed to achieve the following objectives:

- Relax the respondent and gain their confidence - therefore start with questions which the respondent will enjoy answering.
- Ensure that there is a logical flow of questions.
- Ensure that the flow of questions directs the respondent's thinking towards the issues of relevance to this WTP survey - that is, how much is vehicle safety "worth" to this respondent.

With these objectives in mind the following layout and structure will be used for the survey.

- Section 1: An introduction by the interviewer which briefly describes the purpose of the survey and an outline of the questions to follow.
- Section 2: Factual questions concerning the respondent's recent vehicle purchase, It is thought that most respondents will be comfortable to talk about these matters. This section ends with some questions about safety features in the vehicle purchased.
- Section 3: Knowledge and understanding of road safety issues. This section follows on from Section 2 with the factual questions about safety features of motor vehicles generally.
- Section 4: Attitudes towards road safety issues. In this section the questions proceed from the particular (the respondent's vehicle and vehicles generally) to the general (broader issues of road safety).
- Section 5: The first WTP question. This is the "take it or leave it" form of the WTP question. It will show the packages of vehicle safety features and nominate a particular price

for each measure. The respondent will be asked for a simple yes/no answer to the WTP for each identified amount.

- Section 6:** The Demographic Questions. At this stage of the interview it is hoped that the rather more personal nature of these questions will not create a problem for the respondent.
- Section 7:** Prior experience of motor vehicle accidents. This section marks a return to the theme of accidents and vehicle safety and hence a lead back into the second WTP question.
- Section 8:** The second WTP question. This is the "bidding" form of the WTP question. The respondent would again be shown the previous packages of safety features and asked how much they would be prepared to pay for each measure.

6. OUTPUT REQUIRED FROM WTP SURVEY

6.1 INTRODUCTION

The questionnaire will elicit respondents' WTP for various vehicle safety packages as well as demographic and attitudinal information.

The purpose of asking the WTP questions is to enable a demand function for each vehicle safety package to be estimated. The area under the demand function represents the total WTP of the sample. Provided the sample is a statistically valid representation of the population (refer Section 4.2), then the WTP information can be applied to the total population. The population in this case is defined as new car buyers.

The demographic and attitudinal questions are asked for the purpose of identifying whether WTP is affected by factors such as:

- attitudes toward road safety;
- income, age and geographical location;
- knowledge of road safety issues; or
- past experience of motor vehicle accidents.

6.2 STATISTICAL METHODS

The relationship between demographic and attitudinal factors and WTP will be examined using cross-tabulations of WTP by the factor in question and by using a correlation matrix of WTP by the various factors.

When those factors which are correlated with WTP are isolated, regression analysis can be utilised to estimate the WTP when particular factors are present.

6.3 DEMAND FUNCTION ANALYSIS

There are two WTP questions and a demand functions can be drawn using the results of each question.

6.3.1 "Take It Or Leave It" Question

Using the result of the "Take it or Leave It" question, a demand function can be approximated for each package of vehicle safety features. At each amount given the number of "Yes" and "No" answers will be recorded. The cumulative frequency of the "Yes" answers will then be calculated. From this cumulative distribution the demand function for a particular safety feature is approximated. An example of calculations is presented in Table 6.1.

Table 6.1: Estimation of Cumulative Frequency of WTP from 'Take It or Leave It' Question

Willingness to Pay	Yes	No	Cumulative Frequency (Yes answers over total number of respondents)
\$1500	10	90	2%
\$1250	30	70	8%
\$1000	50	50	18%
\$750	80	20	34%
\$500	90	10	52%
\$0*		240	100%

a. Note all respondents who said "No" to an amount given were assumed not to be willing to pay any amount.

The cumulative frequency is then plotted against WTP to estimate the demand curve for the particular package of road safety features (Figure 6.1).

6.3.2 Bidding Question

The bidding question, or second WTP question, serves as a cross-check of the first. In the bidding question respondents are asked to nominate the amount they would be willing to pay for each particular package of road safety features. As in the "Take It or Leave It" question, a cumulative density function can be plotted. In this example the cumulative frequency is plotted against the mid-point of the ranges given in Table 6.2. An example is given below.

Table 6.2: Estimation of Cumulative Frequency of WTP from 'Bidding' Question

Willingness to Pay	Number	Cumulative Frequency (Number willing to pay a certain amount over the total)
\$1500 or more	10	2%
\$1250 - \$1500	35	9%
\$1000 - \$1250	60	21%
\$750 - \$1000	80	37%
\$500 - 750	100	57%
\$1 - \$500	150	87%
\$0	65	100%
	500	

Again the cumulative distribution function will approximate the demand function for the particular package of road safety features (Figure 6.1).

6.4 INTERPRETATION OF WILLINGNESS TO PAY ESTIMATE

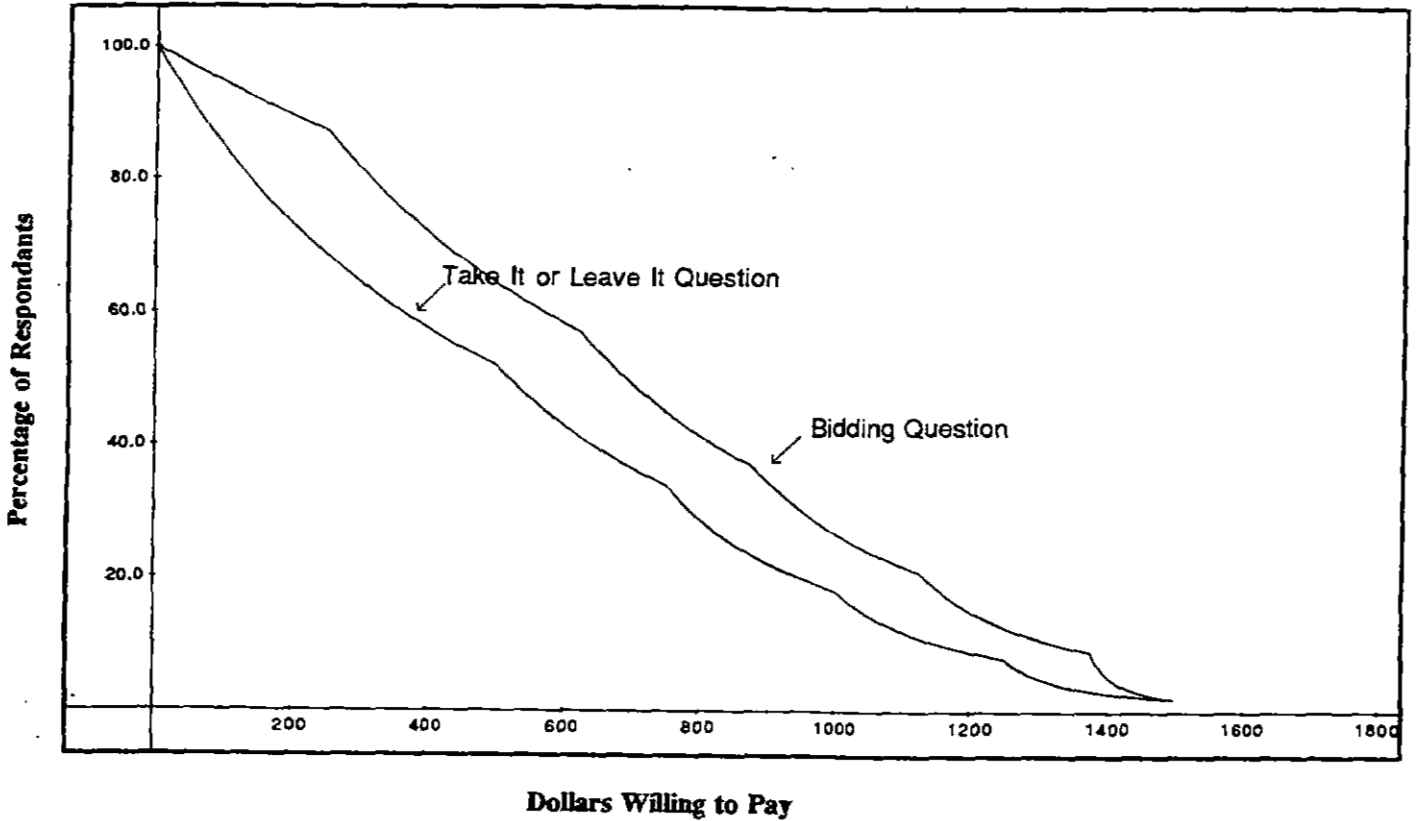
Integrating the areas under the two cumulative distribution functions will give two estimates of total WTP for the sample population. The two functions are plotted in Figure 6.1.

Integrating the take it or leave it question curve gives a total of 55,401 or an average WTP of \$554. Integrating the area under the bidding question curve gives a total of 71,878 or an average WTP of \$719.

There are two reasons for the larger amount under the bidding question. First, there are fewer respondents registering a zero dollar response under the bidding question by definition. Second, respondents are nominating as higher amount as they wish, that is, they are not constrained by the amount given in the question.

The conclusion to be drawn from this hypothetical example is that people would be willing to pay, on average, between \$550 and \$720 dollars.

Figure 6.1: Cumulative Density Functions for the "Take it or Leave it" Question and for the "Bidding" Question



Several caveats need to be added to the WTP analyses. Firstly, it is not possible to separate out the demand for particular components of the vehicle safety packages unless questions are asked specifically on those components. Secondly, whether respondents nominate a different WTP for each package will be directly related to the information they have or are given on how particular packages of safety features will affect them.

7. CONCLUSIONS

On the basis of the results of our research reported above, it is considered that:

- Contingency valuation is an appropriate technique to define the demand function for specific vehicle safety features designed to enhance occupant protection.
- The contingent valuation technique should be pursued through the use of both 'Take It or Leave It' and 'Bidding' questions within a survey instrument. These questions will elicit Willingness to Pay estimates for particular vehicle safety features.
- The sample frame for the survey instrument should be persons who have purchased new motor cars or station wagons during the period from 6 to 18 months prior to the commencement of the survey.
- As a significant percentage of new cars are purchased by fleet owners, two distinct survey instruments are required: one for individual car buyers; the other for fleet buyers.
- The sample size required for each survey instrument is determined by the maximum number of categories that are used to define an explanatory variable and the magnitude of the acceptable sampling error.
- The survey instruments should be implemented through face to face interviews.

It is concluded that given thoughtful development of survey instruments, identification of the necessary sample of respondents and sensitive implementation, it should be possible to quantify the amount that people are willing to pay to acquire particular vehicle safety features.

REFERENCES

de Vaus, D.A. (1985). 'Surveys in Social Research. Allen and Unwin, Sydney, New South Wales.

Dwyer Leslie Pty Ltd (1991). 'Cost Benefit Analysis: Drinking Water Quality Program'. Water Board. Sydney, New South Wales.

Festinger, L. (1957). 'A Theory of Cognitive Dissonance'. Row and Peterson, Evanston, Illinois.

Table A1: New Motor Vehicles by Type of Vehicle

Year	Motor cars and station wagons	Utilities	Panel vans	Trucks			Buses	Total (excludes motor cycles)	Motor cycles
				Rigid	Articulated	Non-freight carrying			
NEW SOUTH WALES									
1985-86	161,568	14,285	18,964	10,779	1,490	868	7,833	215,787	11,689
1986-87	129,700	9,674	11,385	7,990	1,083	611	4,103	164,546	8,044
1987-88	136,761	8,750	10,948	8,804	816	499	3,115	169,693	5,855
1988-89	156,467	13,357	18,296	12,561	1,259	519	4,113	206,572	6,081
1989-90	168,425	14,942	21,822	12,841	1,338	622	4,179	224,169	5,696
1990-91	149,753	13,277	20,229	10,429	800	427	3,971	198,886	6,151
VICTORIA									
1985-86	132,003	6,618	1,186	16,150	1,027	570	1,007	158,561	8,079
1986-87	107,862	5,086	1,142	12,022	840	469	852	128,273	5,294
1987-88	103,907	4,724	1,008	10,620	818	425	659	122,161	3,847
1988-89	119,216	6,717	1,171	12,320	930	426	714	141,494	4,219
1989-90	140,918	8,431	984	16,859	1,121	362	690	169,365	4,786
1990-91	107,645	5,039	649	10,377	523	278	521	125,032	4,513
QUEENSLAND									
1985-86	73,616	13,638	4,813	3,401	547	189	831	97,035	6,752
1986-87	55,552	9,183	2,715	2,239	498	123	636	70,946	4,228
1987-88	59,355	8,584	2,292	2,238	515	260	620	73,864	3,841
1988-89	74,731	13,807	3,318	3,070	706	304	729	96,665	3,922
1989-90	79,824	14,936	3,810	2,785	838	478	660	103,331	4,066
1990-91	78,121	14,295	3,656	2,068	410	448	658	99,656	4,267
SOUTH AUSTRALIA									
1985-86	40,840	3,503	2,584	2,635	394	250	254	50,460	3,782
1986-87	29,788	2,438	1,491	1,755	318	197	231	36,218	1,999
1987-88	29,915	2,214	1,223	1,630	279	221	208	35,690	1,890
1988-89	31,921	2,649	1,462	2,017	277	247	164	38,737	1,364
1989-90	35,211	3,197	1,781	2,115	296	201	216	43,017	1,704
1990-91	34,924	2,991	1,588	1,627	148	357	197	41,832	1,510
WESTERN AUSTRALIA									
1985-86	42,645	4,188	4,086	4,347	265	128	662	56,321	3,350
1986-87	33,642	3,251	2,507	3,572	174	132	562	43,840	2,305
1987-88	36,040	3,358	2,045	4,298	191	113	612	46,657	2,215
1988-89	44,100	4,578	2,798	5,766	256	95	656	58,249	2,522
1989-90	42,728	4,565	3,060	5,135	256	88	631	56,463	2,875
1990-91	36,926	3,899	2,608	3,497	138	74	658	47,800	2,784
TASMANIA									
1985-86	12,811	1,741	684	1,125	180	124	115	16,780	752
1986-87	9,206	1,209	438	687	136	103	94	11,873	526
1987-88	8,597	917	362	591	101	60	75	10,703	279
1988-89	10,009	1,385	471	802	105	47	98	12,917	369
1989-90	10,718	1,474	577	917	115	35	107	13,943	473
1990-91	9,968	1,248	526	769	64	40	102	12,717	446
NORTHERN TERRITORY									
1985-86	4,042	1,873	344	230	117	13	66	6,685	1,046
1986-87	3,037	1,173	197	108	86	19	56	4,676	554
1987-88	2,660	932	139	101	80	13	91	4,016	420
1988-89	3,512	1,246	181	114	116	24	101	5,294	415
1989-90	3,683	1,325	224	114	69	21	36	5,472	503
1990-91	3,407	1,213	193	89	53	12	56	5,023	461
AUSTRALIAN CAPITAL TERRITORY									
1985-86	8,963	653	477	366	9	17	100	10,585	456
1986-87	7,293	471	268	320	14	10	53	8,429	249
1987-88	6,968	342	275	314	11	11	115	8,036	185
1988-89	7,957	521	373	323	20	6	96	9,296	184
1989-90	10,728	534	359	308	32	8	33	12,002	350
1990-91	10,130	537	447	317	6	12	59	11,508	374
AUSTRALIA									
1985-86	476,488	46,499	33,138	39,033	4,029	2,159	10,868	612,214	35,906
1986-87	376,080	32,485	20,143	28,693	3,149	1,664	6,587	468,801	23,199
1987-88	384,203	29,821	18,292	28,596	2,811	1,602	5,495	470,820	18,532
1988-89	447,913	44,260	28,070	36,973	3,669	1,668	6,671	569,224	19,076
1989-90	492,235	49,404	32,617	41,074	4,065	1,815	6,552	627,762	20,453
1990-91	430,874	42,499	29,896	29,173	2,142	1,648	6,222	542,454	20,506

Source: Australian Bureau of Statistics (1992). Motor Vehicle Registrations Australia: 1990-91. Catalogue No. 9304.0

Table A2: New Motor Cars and Station Wagons by Make of Vehicle

Make	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91
Alfa Romeo	2,240	1,426	1,097	888	753	427
Audi	141	169	206	308	607	831
Bentley	6	9	14	33	44	5
BMW	4,507	2,516	2,079	4,144	4,456	3,162
Cadillac	2	—	1	7	3	4
Chevrolet	5	5	5	9	35	10
Citroen	149	153	116	104	170	113
Daihatsu	4,219	2,103	2,368	4,866	8,396	13,061
Daimler	6	37	68	114	61	7
Ferrari	42	56	49	69	38	24
Fiat	599	663	153	292	37	9
Ford	135,377	114,226	110,765	117,329	124,195	97,175
FSM	—	—	—	—	574	223
Holden	101,138	77,689	83,211	87,527	97,800	79,723
Honda	7,675	7,500	10,617	16,460	13,921	12,304
Hyundai	155	2,779	4,344	6,960	6,187	8,382
Isuzu	10	5	2	1	6	3
Jaguar	1,081	766	955	1,016	839	152
Jeep	22	5	6	3	15	3
Lada	174	306	538	2,088	2,156	895
Lamborghini	5	—	1	5	8	1
Lancia	10	1	—	2	—	2
Land Rover	266	170	59	29	29	71
Leyland	13	6	5	8	7	7
Lotus	3	6	7	15	9	2
Maserati	—	3	48	32	31	8
Mazda	21,688	10,764	9,329	14,573	17,023	18,049
Mercedes-Benz	3,544	3,304	3,260	3,544	3,392	1,218
Mitsubishi	63,458	48,962	46,851	54,979	53,546	43,239
Morgan	7	7	3	4	3	2
Nissan	33,173	31,238	37,673	47,270	53,362	51,926
Peugeot	1,153	591	565	707	992	406
Pontiac	2	3	6	11	28	16
Porsche	545	330	282	387	409	134
Range Rover	811	680	623	690	644	192
Renault	726	448	108	170	45	60
Rolls Royce	60	32	39	38	35	13
Rover	733	900	967	640	455	80
Saab	1,498	1,675	1,740	2,073	1,724	951
Subaru	5,771	3,129	2,473	4,068	7,248	8,881
Suzuki	3,373	1,366	994	1,682	3,590	5,442
Toyota	77,379	57,634	58,721	70,476	85,597	81,068
Triumph	1	2	—	2	1	2
Volkswagen	67	29	23	36	144	285
Volvo	4,468	3,434	3,661	3,938	3,014	1,953
Other and unknown	186	953	171	316	606	353
Total	476,488	376,080	384,203	447,913	492,235	430,874

Source: Australian Bureau of Statistics (1992). Motor Vehicle Registrations Australia: 1990-91. Catalogue No. 9304.0

Table A3: New Motor Cars and Station Wagons by Selected Make and Model of Vehicle:
November 1991.

Make/Model	State								Australia
	NSW	Vic	Qld	SA	WA	Tas.	NT	ACT	
Ford									
Falcon/Fairmont	1,511	934	708	321	501	74	17	96	4,162
Laser	861	374	326	180	288	47	20	52	2,148
Fairlane	133	129	79	29	38	10	3	9	430
Other	320	340	224	75	86	22	7	19	1,093
Total	2,825	1,777	1,337	605	913	153	47	176	7,833
Holden									
Commodore/Calais	1,553	1,358	699	564	457	75	26	77	4,809
Barina	202	103	103	47	42	18	1	4	520
Apollo	127	82	41	33	73	26	1	4	387
Other	170	122	79	39	66	16	5	6	503
Total	2,052	1,665	922	683	638	135	33	91	6,219
Mitsubishi									
Magna	572	465	279	344	180	67	16	78	2,001
Pajero	258	106	119	53	62	15	6	9	628
Lancer	252	91	93	31	43	23	—	13	546
Other	229	123	67	56	62	14	4	12	567
Total	1,311	785	558	484	347	119	26	112	3,742
Nissan									
Pulsar	717	548	241	57	186	34	5	45	1,833
Pintara	205	226	90	20	80	23	4	18	666
Patrol	165	107	85	33	48	4	5	6	453
Other	189	104	64	24	52	16	2	15	466
Total	1,276	985	480	134	366	77	16	84	3,418
Toyota									
Corolla	941	399	322	125	249	47	10	33	2,126
Camry	744	431	405	154	204	41	14	43	2,036
Landeruser	228	119	184	65	107	12	28	8	751
Other	795	293	225	94	83	24	16	29	1,559
Total	2,708	1,242	1,136	438	643	124	68	113	6,472

Source: Australian Bureau of Statistics (1992). 'Motor Vehicle Registrations Australia: November 1991'. Catalogue No. 9303.0