The Road Transport Business: A Guide to Some Financial Aspects

Occasional Paper

The Paper describes some of the basic financial considerations associated with entry into the trucking industry and details possible operational strategies. This study is aimed at entrants into the trucking industry but it is also expected to prove beneficial to current operators.

The Road Transport Business:
A Guide To Some Financial Aspects

A. R. Scott

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FOREWORD

This Occasional Paper has been prepared in response to requests from sections of the long distance road haulage industry. As such it forms part of the Bureau of Transport Economics' continuing work on road transport. The Paper describes some of the basic financial considerations associated with entry into the trucking industry and details possible operational strategies. This study is aimed at entrants into the trucking industry but it is also expected to prove beneficial to current operators.

The major work involved in the preparation of this Paper was undertaken by Adrian Scott, with A. Madge contributing to Appendices 1 and 3 and L. Krbavac contributing to Appendices 5 and 6. Valuable assistance was provided by owner-drivers, various industry associations, finance and insurance companies and the heavy vehicle sales industry.

(Mark M. Saad)
Acting Assistant Director
Economic Assessment Branch

Bureau of Transport Economics
Canberra
September 1980

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CHAPTER 1 - INTRODUCTION

AIM OF PAPER

This paper has been prepared as a guide for persons considering entering the road transport industry as owner-operators. It has been prepared in response to extensive opinion within the industry that there is a serious lack of financial knowledge relating to entry requirements into the trucking industry.

OUTLINE OF PAPER

In Chapter 2 some basic requirements to commence as an owner-driver are noted, including the necessary business records and a summary of alternative legal and operational structures.

Chapter 3 emphasises that a demand for the proposed service must be established, while Chapter 4 examines the costs that will be incurred in running a trucking business.

In Chapter 5 operational strategy is discussed with a view to maximising the profitability of the business. This chapter highlights the significance of backloading.

The paper is summarised in Chapter 6. Finally a series of Appendices cover a number of technical background issues.

TRUCKING IS A RISKY BUSINESS

In this paper an attempt has been made to outline some principles associated with successful owner-driver operation. It should be emphasised however, that adherence to these principles is no guarantee of financial success. Road transport is a risky venture and operations which require late-model prime-movers commonly involve an undertaking by the owner-driver to pay fixed sums monthly for some years into the future. Although entry

into the industry can be a viable proposition initially, difficulties can be created by the inability (particularly for individual operators) to:

- predict accurately the demand for road transport over the asset's working life; and

- anticipate price movements in some of the components of total operating costs, e.g. fuel.

CHAPTER 2 - GETTING STARTED: SOME BASIC REQUIREMENTS

ADVICE

Many intending small business owners question whether advice is needed on setting up a business. Perhaps they feel it involves a loss of 'face' to seek help, however some time spent obtaining expert advice is likely to be a wise investment.

In this regard intending owner-drivers are likely to find it very useful to visit the small business agencies operated by a number of state and territory governments where advice is given free-of-charge. A list of these agencies is given in Appendix 1.

Other possible sources of information and advice include:

- existing operators;
- state road authorities;
- banks;
- accountants;
- consultants; and
- industry associations.

It is not the purpose of this paper to inform the intending truck operator about driving skills, but neither is it intended to downgrade the importance of this requirement. A number of heavy vehicle driving schools now exist(1). This booklet does not aim to give a guide to the driving, handling and maintenance

(1) For example, the NSW Road Transport Industry Training Committee Limited (Parramatta, NSW) operates a number of courses.

skills required. It is recommended that intending owner-drivers read 'So You Want To Be A Truckie?' by John Watt(1), for more detailed information on these aspects.

The individual owner-operator must also be fully conversant with the various state road regulations including speed, dimensional and mass restrictions. A long distance road haulier is also restricted as to the number of hours worked. The Australian Road Transport Federation (A.R.T.F.) publishes an annual 'Year Book'(2) which is a comprehensive guide to taxes, fees and regulatory legislation in every state and territory in Australia. In addition, this book contains other valuable information, such as the weights of various materials and a guide to the tank haulage of bulk liquid products. This guide is also best complemented with current information from the relevant road transport authorities.

DIFFERENT WAYS OF DOING BUSINESS

There are many ways in which owner-drivers contribute to the nation's haulage task. They may operate a *direct service* for client firms or may undertake various forms of *sub-contracting* to freight forwarders or others. Possibilities include:

- a *tow operator*, where the owner-driver supplies the prime-mover and is sub-contracted to tow a trailer from terminal to terminal;

- a '*painted*' sub-contractor whose equipment bears the name and colour scheme of the freight forwarder or shipper and who is employed on a semi-permanent basis;

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(1) Watt, J., 'So You Want To Be A Truckie?', *Construction and Road Transport*, Thomson Publications, Sydney, N.S.W. Reprinted copies of this publication are available at nominal cost from Thomson Publications (Australia) Pty. Ltd., 47 Chippen Street, Chippendale, NSW, 2008.

(2) *Year Book 79*, Australian Road Transport Federation, 30 Carrington Street, Sydney, NSW, 2000.

- an *independent sub-contractor* who usually works a single route and is employed on an itinerant basis; or

- a *specialist sub-contractor* who supplies specialised equipment for the carriage of particular commodities such as cement, sand or beer.

It should be noted that an operator may, in fact, be classified as supplying a direct service to a client on one leg of a journey, but operate as an independent sub-contractor on other parts of the journey.

LEGAL STRUCTURE

Initially, the alternative legal structures need to be considered. The effective choice is to operate as a sole proprietor, a partnership or a private company. The advantages and disadvantages of each structure are discussed, below.

Sole proprietorship

A sole proprietor has complete control over the business. It costs very little to establish the business and a sole proprietor takes the profits and incurs the losses.

Unfortunately, a sole proprietor has to meet all the pressures of management and must bear the full cost of taxation as an individual. Also, and this is often cited as a major disadvantage, a sole proprietor must accept unlimited liability for all the actions of the business. Finally, a sole proprietor may become short of capital for the operations or expansion of the business.

Partnership

A partnership in the trucking industry would consist of between two and twenty people agreeing to share ownership, responsibilities and management[1]. The responsibilities and workload can be shared, while a pooling of funds may allow a better class of vehicle to be purchased for the job. A partnership has separate legal status but individual partners will be held responsible for all actions of the partnership.

Thus the fact that partners must assume unlimited liability for the partnership business is a disadvantage. It may also be difficult to divide the workload on a mutually agreed basis and to effectively manage the partnership unless there is one clear 'boss'. The admission of new partners or withdrawal of present partners can cause significant upheavals in the business. However, a high percentage of owner-drivers operate as partnerships, most often as a husband/wife combination to reduce taxation liability.

Company

A proprietory company is a separate legal entity and shareholders have limited liability. The shareholders (owners) are therefore protected by law. Additional capital can be raised from shareholders and this should mean that growth potential is not restricted. Transfer of ownership is also relatively simple.

However, a proprietory company does cost more to establish and details of the financial performance of the company would be available to the public. It may also occur that a business operating as a company will pay more tax than if it was operating as a partnership.

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(1) Under Companies legislation certain professional partnerships may have more than 20 partners.

When financing new trucks, the limited liability advantages of a company are often nullified by bank or finance company demands for personal guarantees from the owners. In other words, a company structure may be chosen to limit liability but a finance company or bank will require personal guarantees (e.g. a mortgage on the borrower's home when purchasing the vehicle).

A person entering road transport as an owner-driver is, in effect, setting up a business. It needs to be emphasised that no general statement can be made about the most desirable business structure. It should be stressed that advice from small business agencies, accountants, consultants, banks, solicitors and road transport associations is necessary concerning legal structure, taxation aspects and other finance matters.

BUSINESS RECORDS

Business records are necessary for taxation purposes but, more importantly, the information they provide enables effective monitoring of performance, control and profit planning. If a trucking business is making losses, the solution is not necessarily to spend more hours behind the wheel. Spending time on a few simple records may allow identification of the reasons for losses. Corrective action can then be undertaken.

The basic records normally necessary include:

- driver's daily work sheet;
- consignment note/delivery docket;
- invoice;
- employee records;
- cheque butt;
- duplicate receipt book;
- cash book;
- vehicle record card; and
- invoice summary.

The above list may appear formidable but these records are not that difficult to develop. A useful reference in this area for potential truck operators is 'Keeping Ahead In The Road Freight Business'(1) in which record-keeping is fully explained. A personal copy of this publication is likely to prove highly beneficial.

A business may be profitable but still fail if sufficient cash cannot be found to meet debts as they fall due. Naturally the immediate concern of most truck operators is whether they have enough cash at the end of each month to cover truck loan payments, fuel and tyre bills and so on. A cash budget enables consideration of whether receipts cover payments while a profit plan enables consideration of whether revenue covers costs.

It should be emphasised that a healthy bank balance does not necessarily mean a profitable business. Cash and profit are not the same and watching the bank balance alone is not a sure way to avoid financial disaster. Planning is the key and records are the base from which to work.

If a potential owner-driver cannot do the bookwork alone then (as usually happens) the spouse, a friend or an accountant must help. Firms exist which provide complete book-keeping services at moderate cost. If one enters business with the intent of ignoring records then perhaps one should not enter business at all.

To maintain the profitability of a business requires careful planning. This planning requires consideration of three basic factors:

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(1) 'Keeping Ahead in the Road Freight Business', *Managing the Small Business Series*, Department of Industry and Commerce, Australian Government Publishing Service, Canberra, 1977.

- the work - what work is sought and how much is available (i.e. the market demand for the transport service);
- the costs - what costs will be incurred in running the trucking business and how can they be controlled (i.e. the supply of a transport service); and
- the price - what rates will attract customers but be sufficient to earn a desired profit.

Each of these factors form the basis of the three following chapters.

CHAPTER 3 - THE MARKET

TYPE OF MARKET SERVED

An intending entrant into the trucking industry will probably have some idea of the wide variety of services offered by small carriers. Services can be classified by type (e.g., livestock, refrigerated, car transport or general) or by the area served or distance travelled. Interstate, intrastate (long haul) and intrastate (local) are three commonly identified segments of the road freight sector. Some operators confine their operations to one of these markets exclusively, but many switch from one to another according to fluctuations in demand. For instance, many interstate operators may work intrastate on the cartage of grain over the summer months (despite the fact that intrastate operation incurs additional registration fees).

Once an operating segment has been chosen from the variety of transport activities available, an estimate of potential workload must be made. It is difficult to predict the volume of work available in the road transport industry and, for some operators, contracts will be necessary in order to obtain finance for the vehicle. Some operators may see an opportunity or 'gap' in the market and trust to luck that the service they provide attracts enough work to be profitable. In general, it is unwise to trust to luck alone, especially where the intended operation involves significant financial commitments.

INFORMATION SOURCES

It is in the owner-driver's best interest to obtain as much information as possible about the market in which it is intended to operate. Mention has been made in the previous chapter of the sources of advice available when setting up the business. Sources of information include:

- existing operators;
- industry associations(1);
- state small business agencies(2);
- freight forwarders(3);
- loading agents; and
- personal canvassing of prospective client firms.

To commence as a truck operator the individual concerned must be confident that a demand exists for the services he proposes to offer. In many cases it is appropriate to obtain contracts before the purchase of a vehicle.

It is emphasised that it is highly risky to reverse this procedure. In general it is poor business practice to purchase a truck simply because of its looks, handling or cabin comfort in the hope that work can later be found to fit the truck. Such an approach has resulted in severe financial difficulties for owner-drivers in the past.

(1) A list of some owner-driver organisations is provided in Appendix 1.
(2) A list of the various small business advisory centres in each State and Territory is provided in Appendix 2.
(3) Major Australian freight forwarders are documented in Appendix 3.

CHAPTER 4 - COSTS OF OPERATIONS

Once a decision has been made regarding the legal structure of the business (e.g. a partnership) and a demand for the intended service has been identified, the profitability of the business must be established. This requires an estimation of the costs of operating the trucking business. It is likely that trucks made by several different manufacturers will be suitable for the proposed operation, so prices should be negotiated with as many dealers as possible to obtain the cheapest quotation consistent with the truck quality required. At the same time, a choice must be made whether to buy a new or used vehicle(1).

Once the most suitable vehicle has been selected for the transport task, alternative methods of financing the vehicle need to be considered. The cheapest method of finance should then be calculated and added to all other cost components to determine the total operating cost.

THE FINANCE DECISION

The alternative methods of financing the truck investment are usually:

- cash;
- hire purchase; or
- lease.

Opinion within the transport industry is divided on the relative merits of each form of financing and it would be unwise to be dogmatic on this subject. The cheapest way to finance the will depend on the operator's particular circumstances, in particular:

(1) It is often easier to obtain finance on a new vehicle rather than a used one. In fact most finance companies will not undertake to finance a truck more than two years old. Some bias in the investment decision may therefore be induced (i.e. the purchase of new versus used vehicles).

- the size of the cash flows;
- the timing of the cash flows; and
- what could be earned if the cash were to be invested in some other way (i.e. the 'opportunity earning rate').

A mathematical model of these forms of financing is explained in Appendix 5. The BTE has also developed a computer program for assessing the relative merits of the various forms of financing, which is presented in Appendix 6. While it is not anticipated that all owner-drivers will be fully conversant with this particular approach to financial analysis, it is hoped that some of the trucking industry owner-driver associations will be able to operate the program and offer it as a service to their members.

Technically, the program calculates the net present value of alternative cash flows. While the results are particular to each set of circumstances, the following example is provided as an illustration.

FINANCIAL ANALYSIS - AN ILLUSTRATIVE EXAMPLE

The total cost of the prime-mover and semi-trailer to be purchased is $87 500. The forms of financing to be considered are to pay cash, hire purchase or lease the vehicle. It is assumed that the rig is purchased (by the operator or lessor) on June 30, with first and subsequent tax payments being made in the following March months. The financing term is 48 months, a necessity if the investment allowance is to be available under the lease. Payments are monthly, in arrears for hire-purchase and in advance for lease.

It is assumed that, in the lease option, title is taken when the residual is paid at the end of the forty-eighth month and that, at the same time (in all cases) the vehicle is sold or traded-in. Depreciation is allowed at 22.5 per cent (reducible balance) with a tax rate of 46 cents in the dollar. A monthly

hire purchase payment of $2 190 is assumed, while the lease payment is $2 196.

The results are presented in Table 4.1 and are dependent on the 'opportunity earning rate' - in other words, how much a dollar invested today will be worth to you in the future. For owner-driver operations, perhaps building society or bank term deposit rates are most applicable. It is up to the owner-operator to determine the rate at which funds conserved (by not paying cash) can earn income elsewhere - either in the business or some other form of investment. In Table 4.1 the alternatives are ranked 1, 2 or 3 in order of preference for each interest rate.

The results of Table 4.1 are interesting. At lower interest rates cash is the cheapest way to finance the vehicle, whereas at higher rates leasing becomes the most preferred alternative. Although it is not possible to generalise the results, accountants, consultants or owner-driver associations should be able to use this computer program (e.g., in programmable electronic calculators) to rapidly determine the cheapest method of finance for each particular set of circumstances. The program also calculates the minimum monthly net revenue required to break-even over the four year period, where net revenue is defined as gross revenue minus all operating costs apart from interest and depreciation charges for the rig. These estimates are presented as Table 2 in Appendix 6 and illustrate quite clearly that at opportunity earning rates of 7 to 12 per cent (pre tax) the operator leasing equipment must earn an extra $400 to $600 per month more than an operator who has paid cash for his rig(1). For many would-be owner-drivers, of course, no such choice is possible. With inadequate knowledge and little capital, these potential entrants into the industry lease their vehicles. The effective choice in this case is to lease the equipment or not enter the industry at all.

(1) It should be noted that these results stem from the particular set of circumstances being analysed.

TABLE 4.1 - FINANCING ALTERNATIVES: RANKING FOR EACH DISCOUNT RATE

Discount Rate (Before Tax)	Discount Rate (After Tax)	Finance Alternative By Net Present Value: Cash	Hire Purchase	Lease
10	5.4	1	2	3
11	5.9	1	2	3
12	6.5	1	2	3
13	7.0	1	2	3
14	7.6	1	2	3
15	8.1	1	2	3
16	8.6	1	2	3
17	9.2	1	2	3
18	9.7	1	3	2
19	10.3	1	3	2
20	10.8	1	3	2
21	11.3	2	3	1
22	11.9	2	3	1
23	12.4	3	2	1
24	13.0	3	2	1
25	13.5	3	2	1

Source: Results are based on the financing terms and assumptions outlined in Appendix 6.

A major conclusion to be drawn from the above is that persons considering an investment in the trucking industry should obtain professional advice to determine the least-cost method of finance. Once this has been established the remaining operating costs need to be estimated.

VARIABLE AND FIXED COSTS

Finance payments are only part of the total operating costs. Total costs will naturally vary according to the type of vehicle deemed necessary for the transport task. Various cost estimates have been made for a variety of truck sizes and operations(1). Costs can be estimated and grouped in a number of ways. The following definitions are used here:

- *variable* costs relate to the distance travelled (often called running costs); and

- *fixed* costs are those that are incurred regardless as to whether the truck is used or idle (often called standing and/or overhead costs).

To illustrate the estimation of operating costs consider the following example where a prospective owner-driver is considering the operation of a 22 tonne capacity six-axle semi-trailer (i.e. a bogie-drive prime-mover with a tri-axle trailer) on interstate work(2). Variable costs vary with the use of the vehicle whereas fixed costs do not. Estimates of yearly fixed costs

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(1) The Long Distance Road Transport Association (L.D.R.T.A.) regularly publishes heavy vehicle operating cost tables for articulated and rigid vehicles. The Professional Transport Drivers Association (P.T.D.A.) also calculates costs (and earnings) for long distance road transport.

(2) For an example of cost estimation of metropolitan delivery see 'Keeping Ahead in the Road Freight Business' *Managing the Small Business Series*, Department of Industry and Commerce, Australian Government Publishing Service, Canberra, 1977.

and variable costs per kilometre for interstate operation are presented in Table 4.2. It is emphasised that costs may vary according to the vehicle specifications, routes travelled or driving style. Furthermore, the wise operator should realise that costs are estimated on an historical basis. Even if yearly earnings are sufficient to cover replacement costs measured on an historical basis, in times of inflation revenue earned will be insufficient to replace the vehicle.

TABLE 4.2 - ESTIMATES OF FIXED AND VARIABLE COSTS FOR INTERSTATE OWNER-DRIVER OPERATION OF A SIX-AXLE ARTICULATED VEHICLE (APRIL, 1980)

Fixed Costs per annum (dollars)		Variable Costs per kilometre (cents)	
	$		c
Registration and third party	261	Fuel	18.39
Insurance	5 250	Tyres	5.45
Lease payments (prime-mover and semi-trailer)	26 352	Maintenance and repairs	5.50
Living allowance	10 400		
Administrative & sundry expenses	2 500		
Ancillary equipment (depreciation and interest)	964		
TOTAL	45 727		29.34

Source: Estimates based on assumptions and calculations detailed in Appendix 7.

TOTAL OPERATING COSTS

Fixed costs are illustrated in Figure 4.1, with variable costs graphed on Figure 4.2. Once variable and fixed costs have been estimated, total annual costs per vehicle kilometre can be calculated, depending on the annual distance travelled by the vehicle. Fixed and variable costs are added as illustrated in Figure 4.3. Increasing annual distance travelled increases total vehicle costs per kilometre. But, as shown in Figure 4.4, the average vehicle cost per kilometre falls as annual distance travelled increases. This fact is reflected in the industry through attempts by operators to maximise annual distance travelled, even though this may not always be the most profitable strategy.

Depending upon the main routes adopted, hours worked, and so on, most long-distance interstate owner-driver vehicles travel approximately 150 000 kilometres each year. At this rate an owner-operator may be consistently working 80 hours per week. Table 4.3 together with Figure 4.5 details total operating costs per kilometre under the assumption that an owner-operated vehicle travels 150 000 kilometres annually.

Having completed an estimate of total annual costs, the potential owner-driver can now answer the crucial question: will the proposed business be profitable?

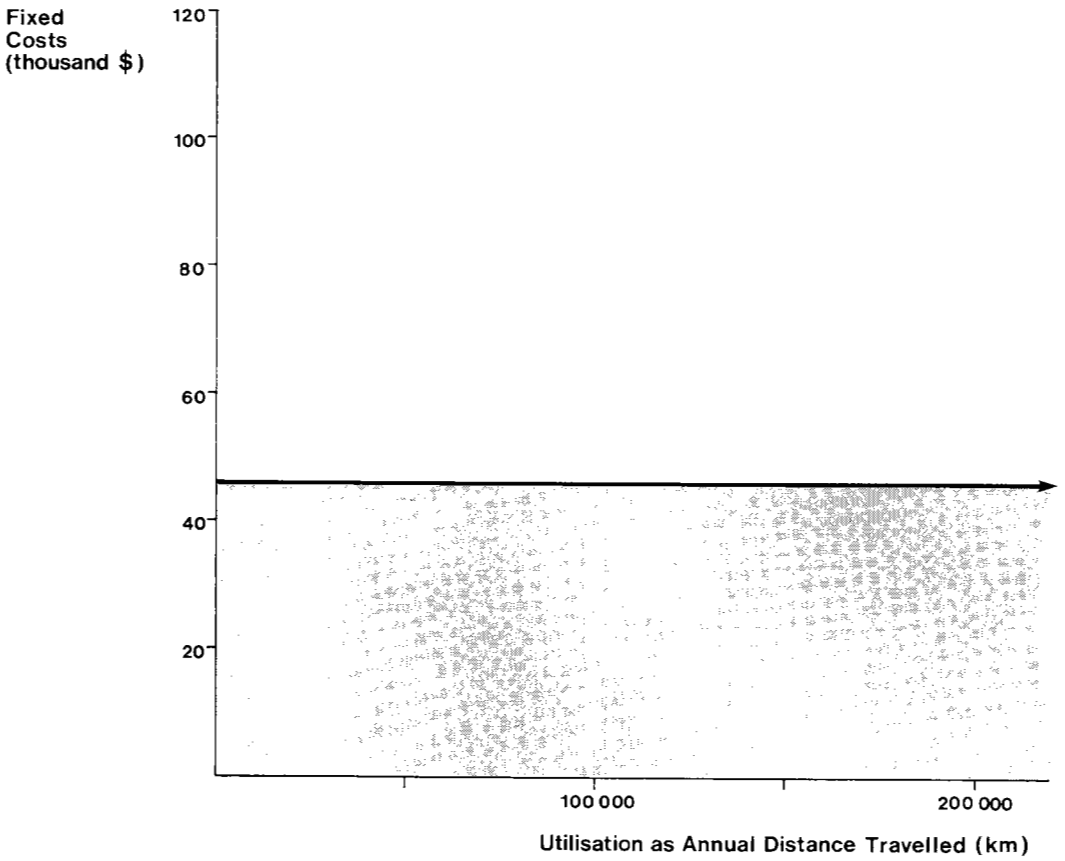

FIGURE 4.1
ESTIMATED ANNUAL FIXED COSTS:
INTERSTATE OWNER-DRIVER OPERATION
OF A SIX-AXLE ARTICULATED VEHICLE
(APRIL, 1980)

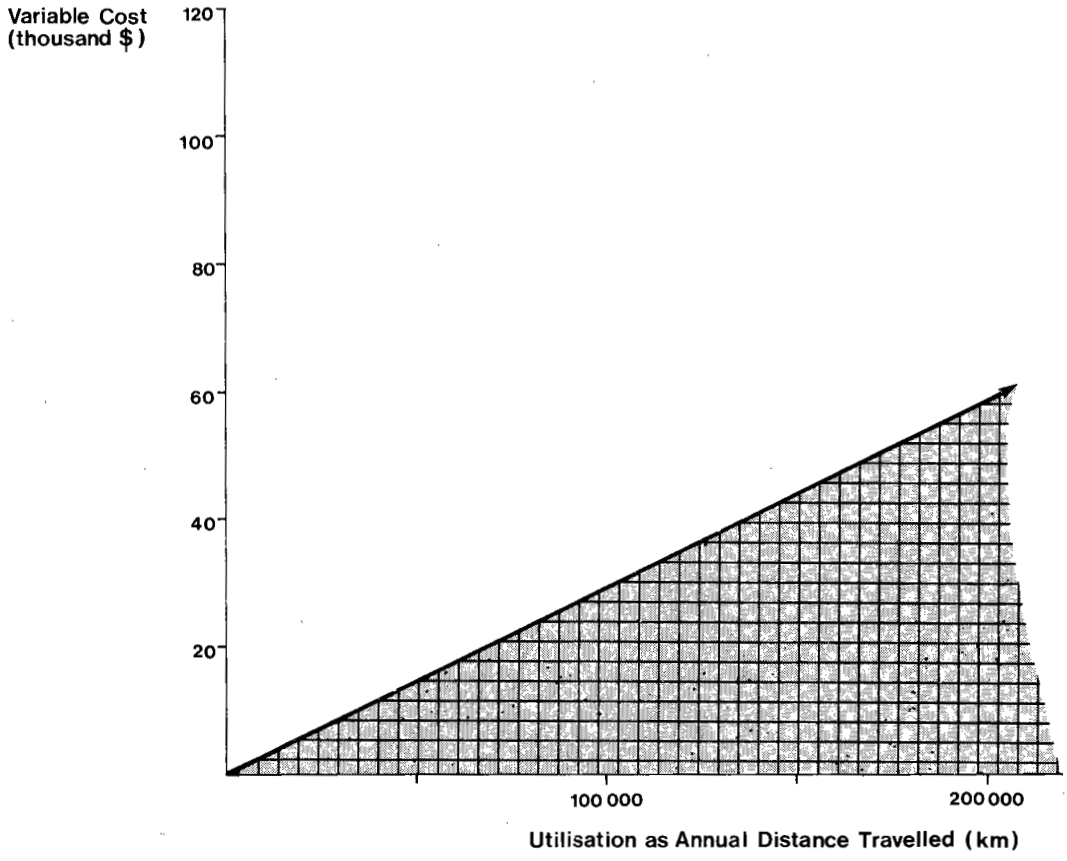

FIGURE 4.2

ESTIMATED VARIABLE COSTS: INTERSTATE OWNER-DRIVER OPERATION OF A SIX-AXLE ARTICULATED VEHICLE (APRIL, 1980)

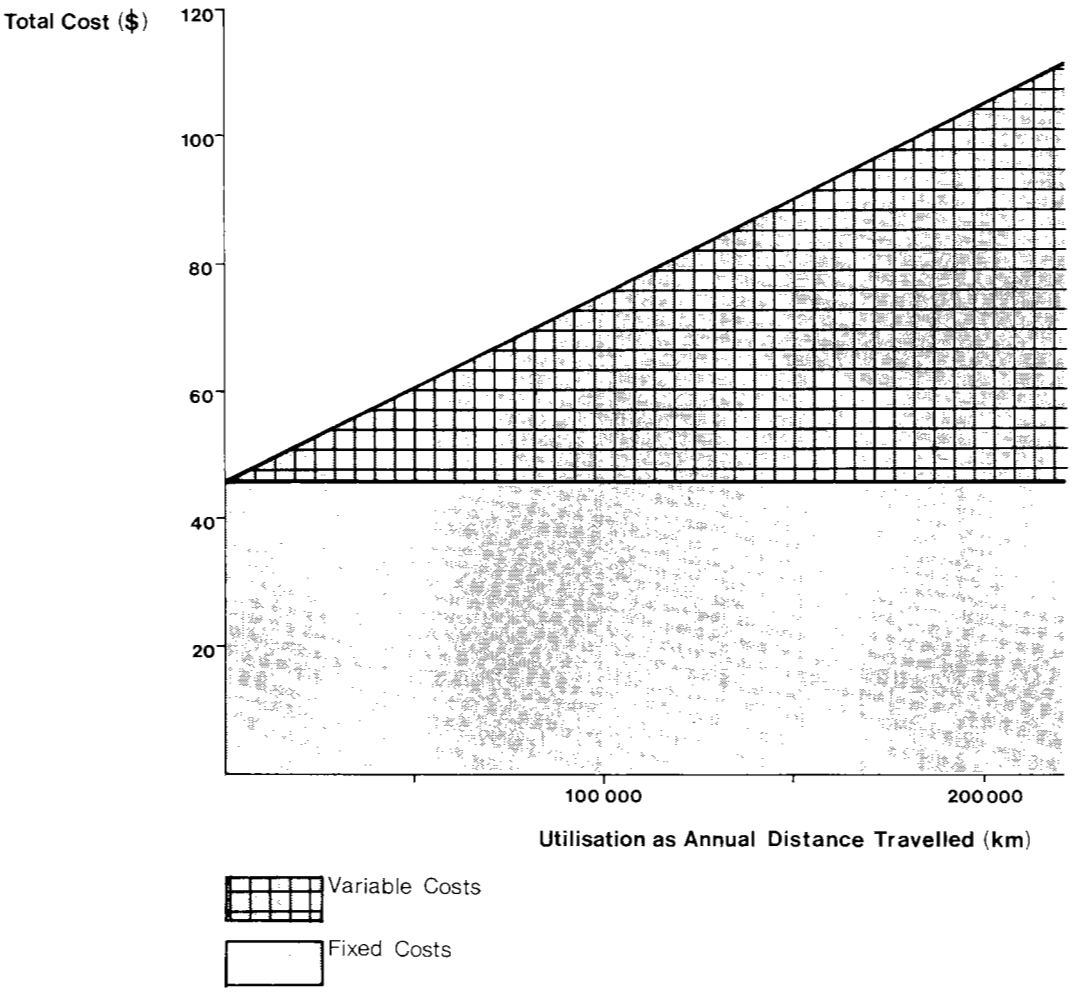

FIGURE 4.3
ESTIMATED TOTAL ANNUAL OPERATING COSTS: INTERSTATE OWNER-DRIVER OPERATION OF A SIX-AXLE ARTICULATED VEHICLE (APRIL, 1980)

Source: Appendix 7

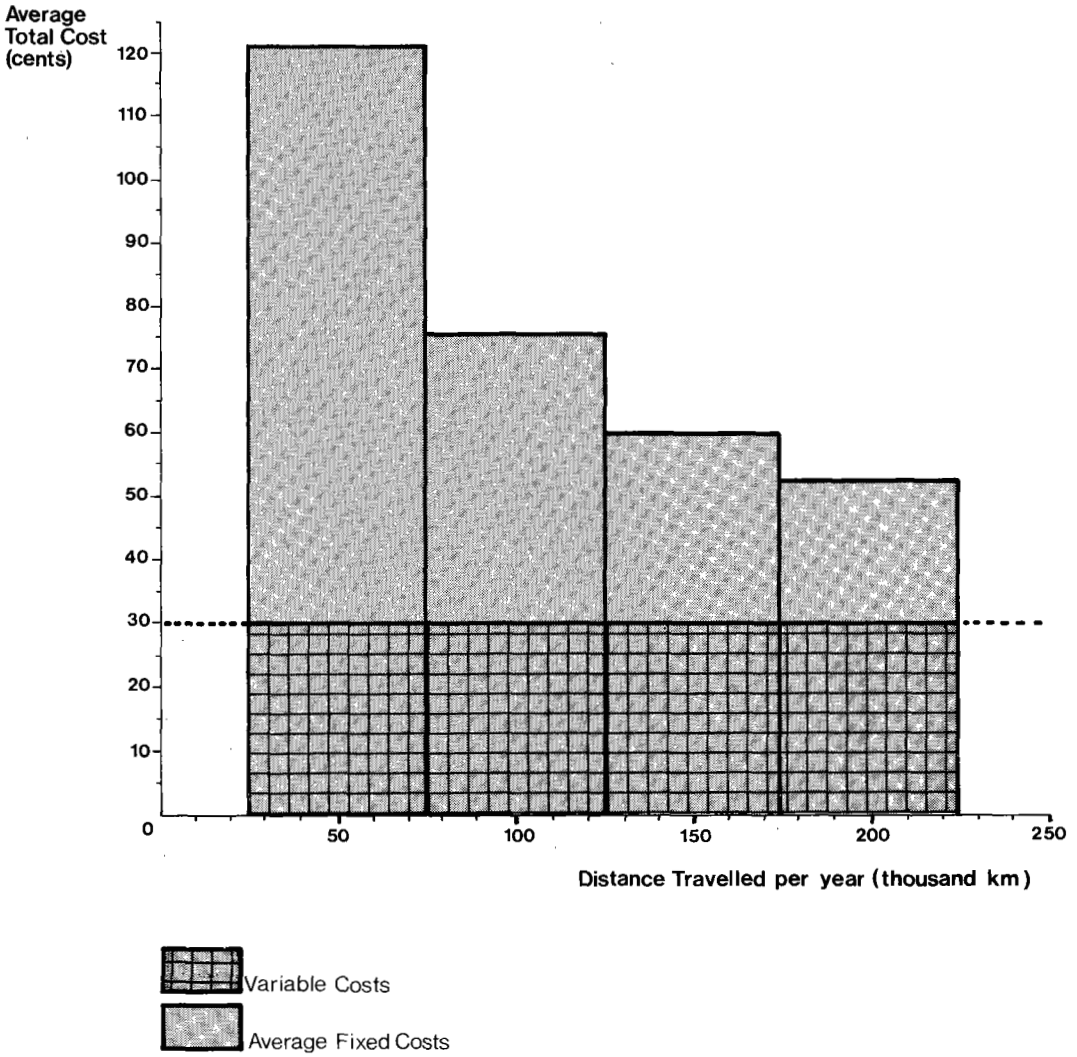

FIGURE 4.4

AVERAGE ANNUAL OPERATING COSTS PER KILOMETRE, APRIL 1980. (LONG DISTANCE OWNER-DRIVER OPERATION OF A SIX-AXLE ARTICULATED VEHICLE)

Source: Appendix 7

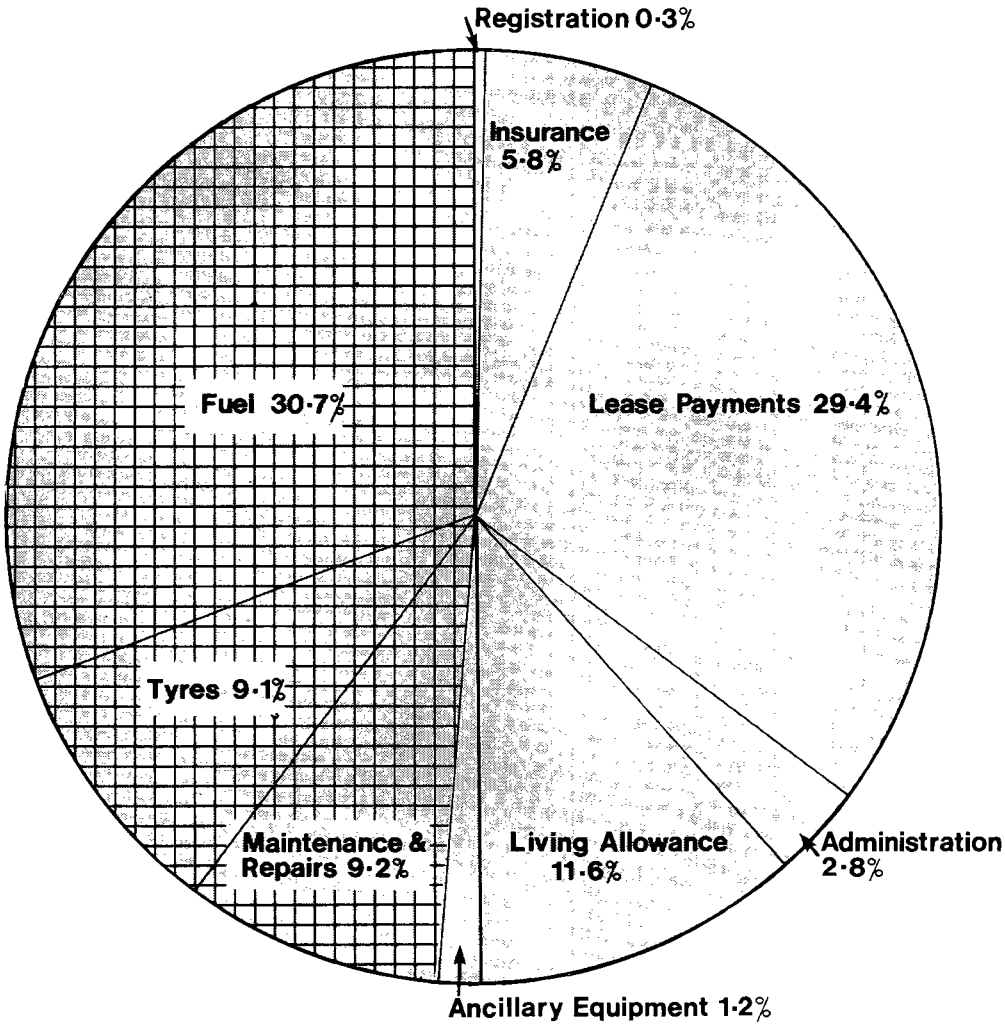

FIGURE 4.5

FIXED AND VARIABLE COSTS AS A PERCENTAGE OF TOTAL COSTS (LONG DISTANCE OWNER-DRIVER OPERATION OF A SIX-AXLE ARTICULATED VEHICLE TRAVELLING 150,000 KM PER YEAR, APRIL 1980)

Source: Appendix 7

TABLE 4.3 - ESTIMATED ANNUAL OPERATING COSTS PER KILOMETRE: INTERSTATE OWNER-DRIVER OPERATION OF A SIX-AXLE ARTICULATED VEHICLE TRAVELLING 150 000 KILOMETRES PER YEAR (APRIL, 1980)

Operating Costs	Cost per km	Percentage of total
	c	%
Fixed Costs		
Registration and third party	0.17	0.3
Insurance	3.50	5.8
Lease payments (prime-mover, semi-trailer)	17.59	29.4
Administration	1.67	2.8
Living allowance	6.93	11.6
Ancillary equipment (depreciation & interest)	0.64	1.1
Total fixed costs	30.50	51.0
Variable costs		
Fuel	18.39	30.7
Tyres	5.45	9.1
Maintenance and repairs	5.50	9.2
Total variable costs	29.34	49.0
TOTAL COSTS	59.84	100.0

Source: Estimates based on assumptions and calculations detailed in Appendix 7.

CHAPTER 5 - OPERATIONAL STRATEGY AND PROFITABILITY

The financial viability of an owner-operator depends on many inter-related factors. These factors include the total costs of operations, pricing strategies and the extent to which the capacity of the vehicle is utilised.

OPERATING EXAMPLES

Consider the following example: a potential owner-driver is contemplating the operation of a bogie-drive/tri-axle rig on the Sydney to Adelaide run and return. The potential owner considers that one return trip per week is possible and that 4 weeks of the year the rig will be idle. Table 5.1 details estimates of costs incurred.

TABLE 5.1 - ESTIMATED ANNUAL OPERATING COSTS - SYDNEY/ADELAIDE AND RETURN (APRIL 1980)

Round-trip distance (kilometres)	2 864
Average number of trips per year	48
Estimated annual distance (kilometres)	137 472
Variable cost per kilometre (cents)	29.34
Fixed cost per kilometre (cents)	33.26
Total operating costs per kilometre (cents)	62.60
Total operating costs per annum ($)	86 061

Source: Based on estimates made in Chapter 4 and Appendix 7. Where loading agents are to be used, their fee must be added to these cost estimates. Distance estimates include an allowance for intra city empty running to collect the next load.

Suppose rates per tonne for each leg of the journey are:

- Sydney-Adelaide: $30 per tonne;
- Adelaide-Sydney: $32 per tonne[1].

With *full* loading both ways (22 tonnes), a round trip will yield total revenue of $30 x 22 plus $32 x 22, or $1364. Table 5.2 compares estimates of annual operating costs and revenues for this proposal.

TABLE 5.2 - COMPARISON OF ESTIMATED COSTS AND REVENUES: OWNER-OPERATED SIX-AXLE RIG, SYDNEY/ADELAIDE RUN (1980)

	Per year ($)	Per kilometre (c)
Total Costs	86 061	62.60
Total Revenue	65 472	47.63
Estimated Annual Loss	20 589	14.97

Source: Based on estimates made in Chapter 4 and Appendix 7. Trip distances are given in Table 5.1.

By analysing proposed road transport ventures in this manner, profitabilities can be estimated. Clearly, the potential operator should not proceed with the purchase of the vehicle as the operation is not profitable at 48 trips per annum (or one per working week), even though revenue estimates assumed full loading for each and every round trip.

(1) Rates obtainable by Professional Transport Drivers Association members (April 1980).

The question then to be considered is: how many trips per annum are necessary to break-even? Stated another way, how many vehicle kilometres per year, (assuming maximum legal loads and operating on the Sydney-Adelaide and return journey) are necessary before the operation begins to make a profit?(1)

A standard tool to help solve this problem is the break-even chart, which combines a graph of total cost and a graph of total revenue. The chart thus shows the annual profit or loss resulting from each annual distance travelled. Figure 5.1 illustrates this situation and immediately answers the original question; the proposed operation is not profitable until an annual distance of approximately 250 000 kilometres is reached(2). This represents a minimum utilisation of 88 trips per year to break-even, far in excess of the proposed 48.

Alternatively, we can illustrate the break-even positions in terms of rates per tonne. In Figure 5.2, rates per tonne for the Adelaide-Sydney leg are shown on the vertical axis, with rates for the Sydney-Adelaide leg on the horizontal axis.

Thus, for example, at 48 fully loaded trips per year rates of $40 per tonne Adelaide to Sydney and $41-60 per tonne Sydney to Adelaide could enable the operator to just break-even.

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(1) The accountancy and taxation concept of profit is well known but can be misleading. The term 'profit' is used here to denote the excess of income over 'costs' where costs *include* a wage or living allowance paid to the owner-operator as well as a return on the owner's capital investment.

(2) We have assumed here that the graph of total cost is a straight line. However, as the owner-operator's driving capacity would probably be exceeded before the break-even point, the graph of total cost cannot be assumed to be a straight line. This is explored more fully in Appendix 6.

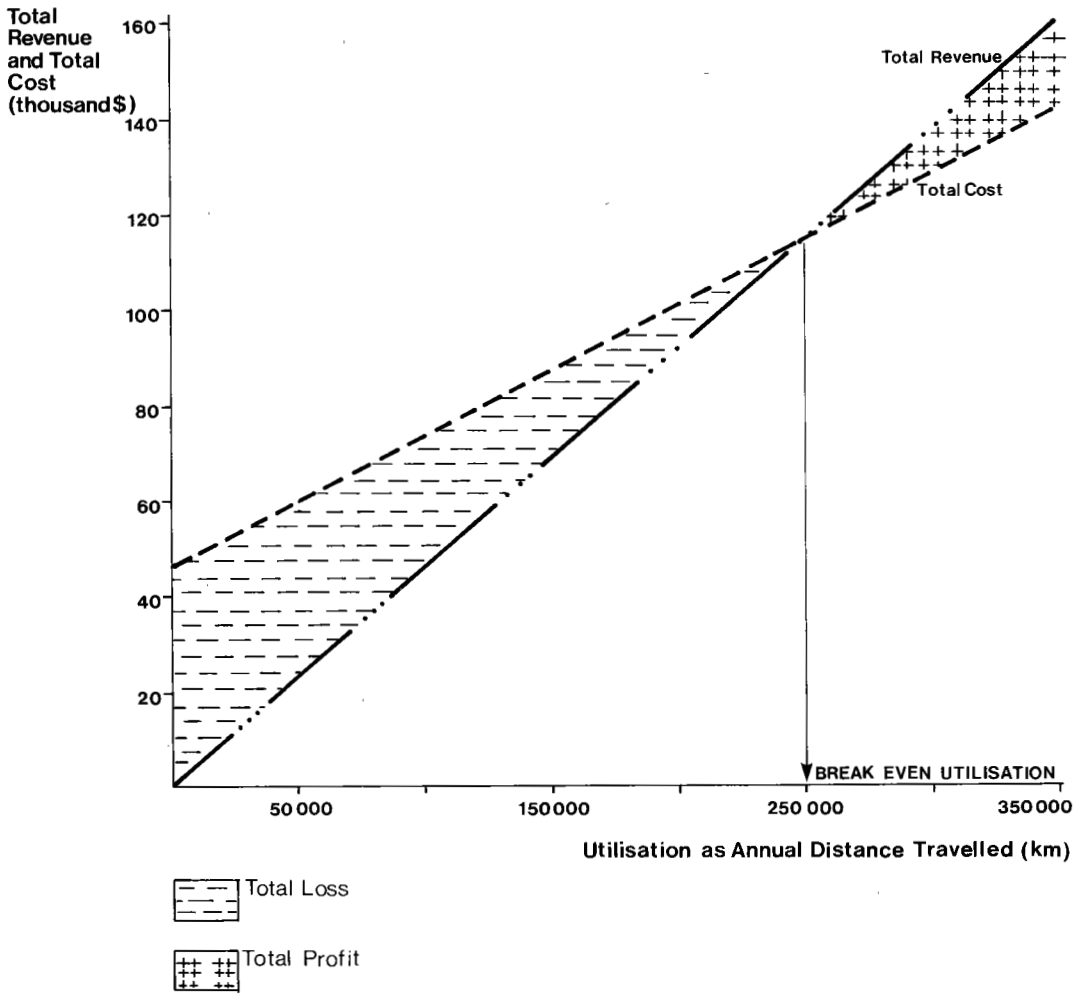

FIGURE 5.1

BREAK-EVEN CHART: TOTAL REVENUE AND TOTAL COST FUNCTIONS, 1980 PRICES (OWNER-DRIVER OPERATION OF SIX-AXLE RIG — SYDNEY/ADELAIDE RUN)

Source: Chapter 4 and Appendix 7

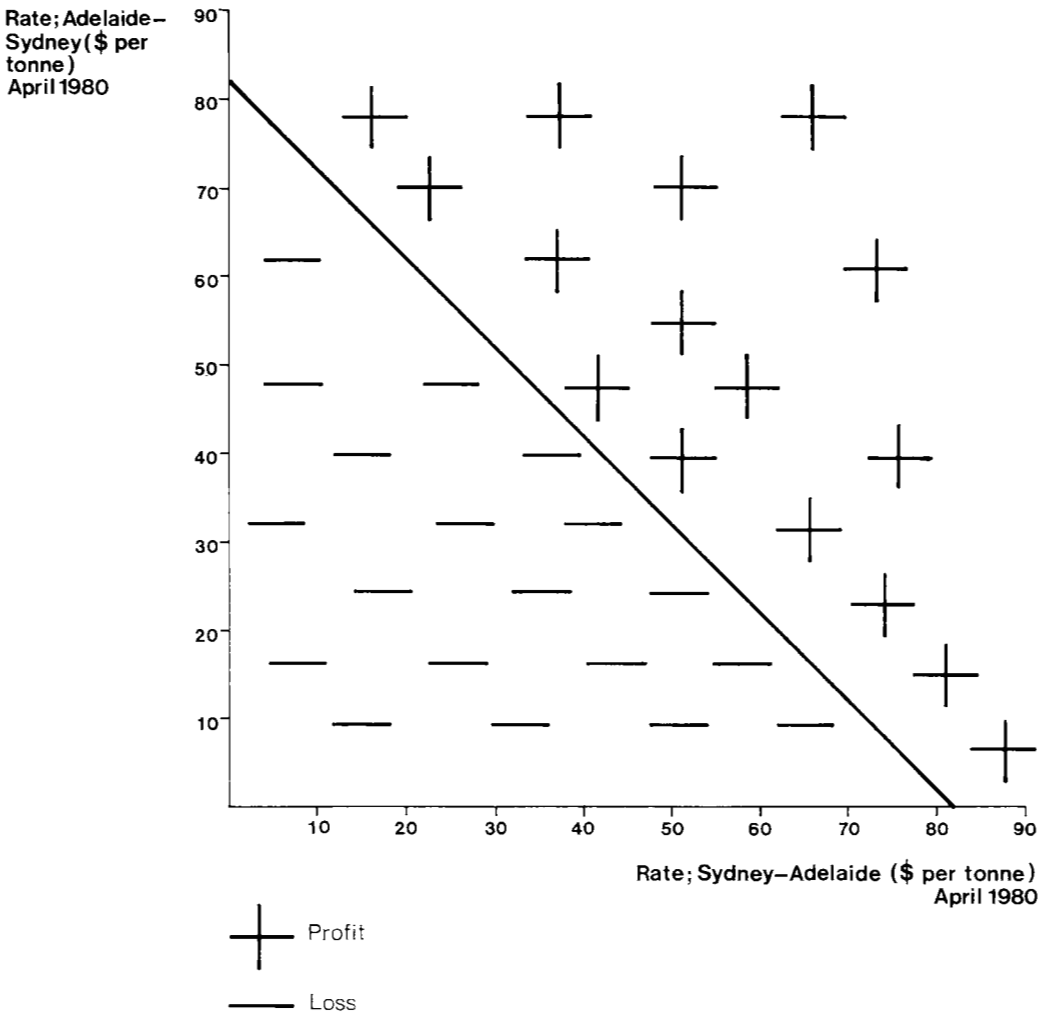

FIGURE 5.2

RATES PER TONNE REQUIRED TO BREAK-EVEN SYDNEY/ADELAIDE OWNER-DRIVER OPERATION OF A SIX-AXLE RIG. (TRAVELLING 48 FULLY LOADED TRIPS PER YEAR)

Moreover, if a rate of $30 per tonne, Sydney to Adelaide, prevailed in the market place, a rate of at least $51-60 per tonne would be needed (on all Adelaide-Sydney return trips) to break-even. It can be seen that a combination of $30 and $32 falls short of the break-even line.

In the above example, it was assumed that the owner-driver is not in a position to set the rate for any leg of the journey and as such is a price-taker. Although empty running has been minimised, there is no possibility for freight consolidation(1) or the freedom to set rates for any leg of the journey.

In some cases, a road haulier may operate on routes where possibilities exist for rate setting, in the short run. The BTE has developed freight rate pricing strategies to assist operators in this position(2). It must be emphasised that this situation is unlikely to be a continuing one. Given the highly competitive nature of the road transport industry the market as a whole will set rates and the operator is obliged to accept or reject these market rates(3). The essence of this strategy is to minimise empty running and maximise returns per trip kilometre. This involves 'backloading', which has long been a source of argument in the industry. Backloading enables an operator to return home with capacity fully utilised. It is not necessary to return directly to home base. Examples of truck operation in the Riverina indicate triangular route patterns as shown in Figure 5.3.

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(1) Although the prime contractor may consolidate freight, the sub-contractor normally cannot.

(2) 'A Break-Even Cost Model for the Financial Analysis of Road Haulage Operations in the Riverina', Annex B, *A Study of Intersystem Railway Freight Rating Practices*, Bureau of Transport Economics, Australian Government Publishing Service, Canberra, 1976.

(3) However, some degree of 'monopoly power' may be exploited by a shrewd operator, either because of geographical separation from competitors or the fact that the urgency of the consignment precludes the freight buyer from searching for more vehicles.

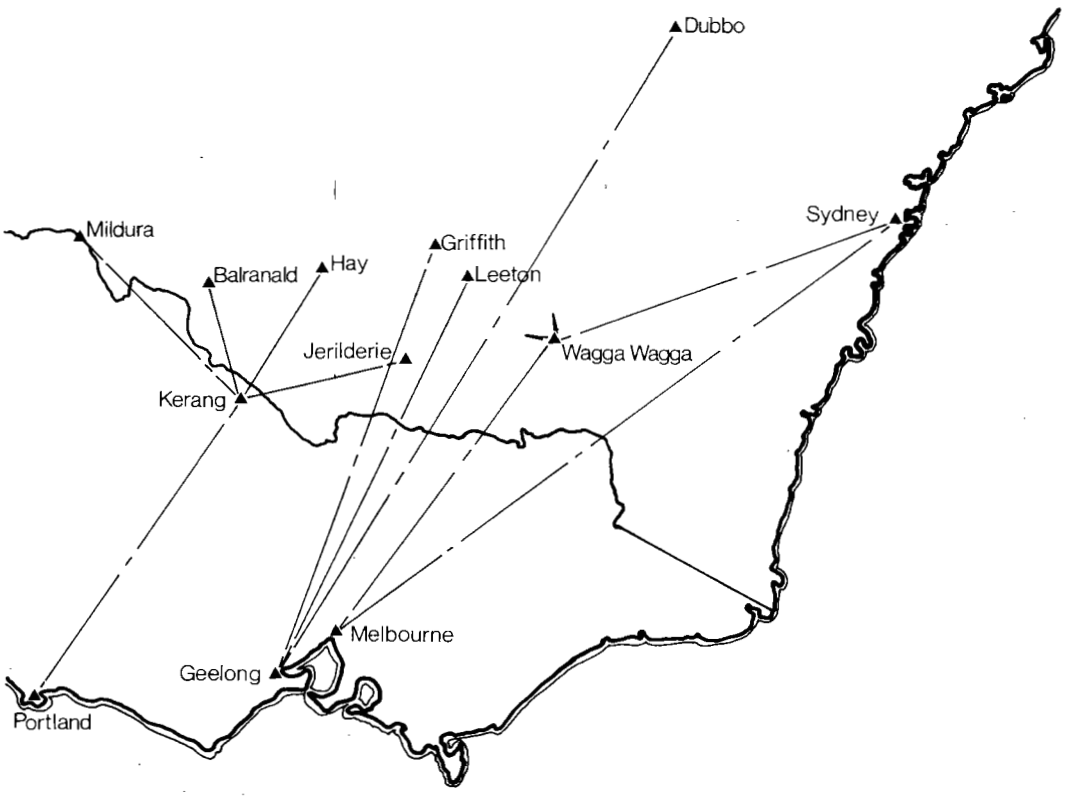

FIGURE 5.3
ROAD TRANSPORT OPERATION CENTRED ON THE RIVERINA AREA OF NEW SOUTH WALES

Source: A Study of Intersystem Railway Freight Rating Practices, Bureau of Transport Economics, Australian Government Publishing Service (Canberra, 1976) Figure 7.1

The following example is used to illustrate how an effective pricing strategy can capture freight by the owner-driver pricing himself into the freight market on certain legs of a round trip. Indeed such a strategy is vital to the continued existence of owner-operators(1).

Consider operator Fred Smith based in Finley, New South Wales. Fred has secured a 22 tonne load of fertiliser from Geelong to Finley at $12 per tonne which is not an urgent consignment. Fred also has the opportunity to quote on a consignment of potatoes from Finley to Adelaide, but he is aware that other quotations are being obtained for the job. However, Fred knows it is not difficult to obtain loading from Adelaide to Melbourne from a loading agent at $17.50 per tonne. Thus Fred knows the revenue obtained from two legs of the proposed journey.

The total distance travelled is estimated at 1977 kilometres (see Figure 5.4). With operating costs similar to those calculated in Chapter 4 and 150 000 kilometres per annum utilisation, Fred can calculate his total long-run round trip costs at (59.84 cents per km x 1977 km) $1183(2). The amount of revenue necessary for total trip costs to be covered is thus a minimum of $1183. With known revenue of $649 from 2 legs of the journey, Fred can thus quote a rate upward of $534 (i.e. $1183 less $649) for the Finley-Adelaide leg, or $24.27 per tonne(3), to break-even.

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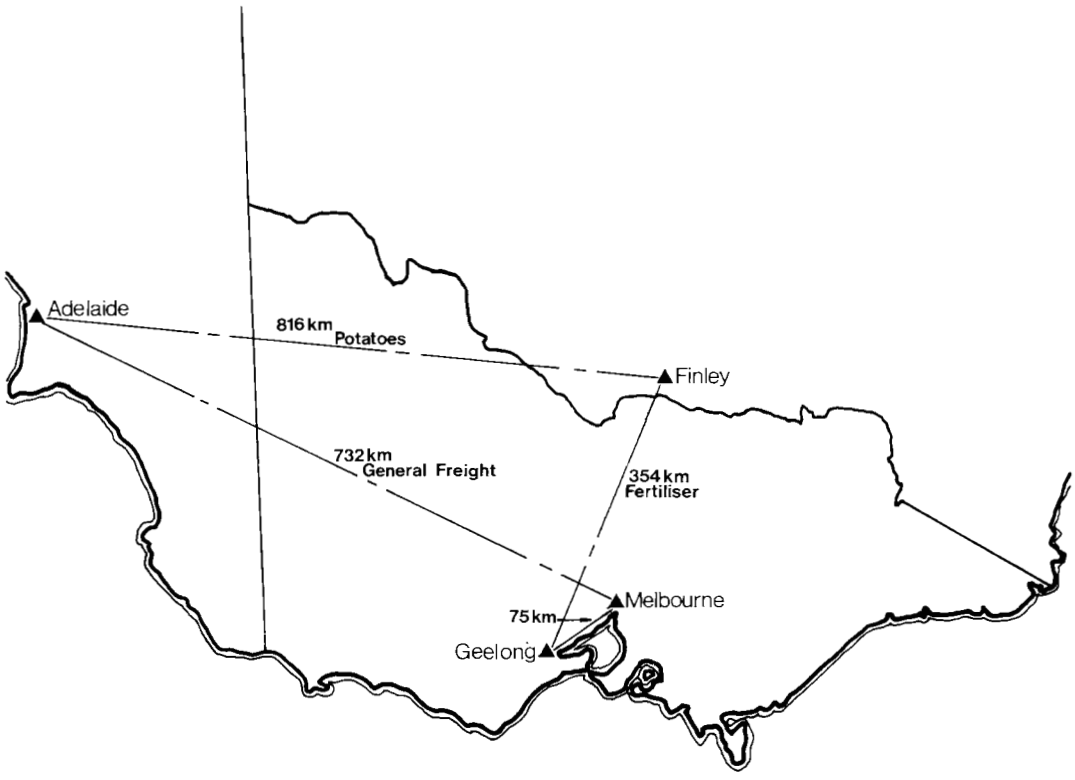
(1) For further examples see *A Study of Intersystem Railway Freight Rating Practices*, Bureau of Transport Economics, Australian Government Publishing Service, Canberra, 1976.

(2) The term 'long-run round trip costs' is used here to include variable costs plus fixed costs as depicted in Table 4.3.

(3) Assuming a full 22 tonne load.



Total Round Trip Distance 1977 km

FIGURE 5.4
EXAMPLE OF ROUTE CONFIGURATION TO MAXIMISE TOTAL TRIP RETURN

In fact, if Fred is a shrewd operator he would have a good idea of likely quotations from other operators for this leg of the journey and may in fact be able to earn a profit over the entire trip[1]. A sound pricing policy for any leg of the trip is one which charges what the freight market will bear on that leg - provided that rate yields revenue in excess of the additional cost of carrying the freight. However, *the freight rate is not determined by the total average cost of operating over any one segment of the route*, viewed in isolation. Rather, *the total 'base-to-base' trip must be considered*.

Fred's route-strategy and rate setting has an effect on his competitors. An operator with similar costs based in Adelaide without freight on the Geelong-Finley leg of the journey cannot compete because a rate of $32.18 per tonne is required on the Finley-Adelaide leg to cover round trip costs[2].

BACKLOADING

The analysis highlights the significance of backloading to the competitive position of road haulage operators. The financial viability of such operators over time can be very much dependent on consistent utilisation of vehicle capacity throughout the year.

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(1) In fact, current quotations (April 1980) for this journey are $28 per tonne.

(2) This assumes the Adelaide based operator has similar costs and can also obtain freight Adelaide to Melbourne for $17.50 per tonne, but drives empty from Melbourne to Finley. It should be noted that if potatoes were consigned on a regular timetable basis from Finley to Adelaide, then the Adelaide based operator may be in a relatively better position, since funds could be invested to locate contacts to provide freight for the Melbourne to Finley leg of the journey. A round trip distance of 1827 kilometres gives total costs of $1093. With revenue of $385 from Adelaide to Melbourne, the Finley-Adelaide leg must generate revenue of at least $708 (i.e. $32.18 per tonne) to cover round trip costs.

The significance of these characteristics of road transport operation have been observed by the more successful road hauliers. Many owner-drivers and firms operate on what, at first sight, seem "illogical" route patterns, with rate quotations set at extremely low levels on certain legs of the journey. However, by making use of total carrying capacity, total operating costs can be distributed over freight carried on a circular route which regularly generates cargo.

The BTE has devised a break-even analysis which enables an operator to quickly calculate maximum returns per trip kilometre by comparing costs and revenues over different journeys. This model is described in Appendix 9 and could easily be adapted for use in pocket calculators.

INCOME FLUCTUATIONS

It is well known that seasonal variations exist in the demand for transport services. It is important that potential new entrants to the industry understand market peculiarities. Local concrete or tip-truck operations, for instance, peak in fine weather and slacken during the winter months. Interstate work is often slack in January as industries close down over the holiday period.

Industrial disputes may affect transport services. For instance, a curtailment of beer production in one state may necessitate trucking beer interstate to meet demand. This may improve the position of interstate operators capable of operating over the relevant routes. By way of contrast, specialist operators (e.g. brick carriers or fuel distributors) may be completely without work if an industrial dispute closes the plant from which they operate.

Road transport has the ability to move extremely quickly in response to demand changes. However, there is no guarantee that work is readily available. Any reduction in the annual growth of the overall Australian economy or particular sectors within it, can result in excess capacity in the road transport fleet.

SURVIVAL

At the time of writing, excess capacity existed in certain sectors of the road transport industry. This, combined with increasing costs, has created a great deal of hardship amongst many owner-operators. A business may be potentially profitable in the long run, and yet fail, if it cannot find sufficient cash to meet its debts as they fall due. An operation which has a high level of monthly payments may be in financial difficulty if demand for the services provided drops unexpectedly even for relatively short periods.

In other words, the firm is confronted with the common problem of a cash flow deficiency so often associated with many small business undertakings due to under-capitalisation of the venture. Conversely, those owner-drivers who have greater equity in their operations, and consequently smaller monthly debt commitments are in a much better position to survive short-term downturns in demand for their services.

The calculation of minimum revenue levels acceptable for operator survival (in the short-term) is detailed in Appendix 10. Table 5.3 compares the 'survival rates' for an owner-operator entirely self-financed (A) with one operating a leased rig (B). The table illustrates that those operators with large lease commitments are in a much riskier financial position should demand for their transport services slacken unexpectedly.

The reasons for this were alluded to above. In the case of the self-financed operators the inescapable costs (i.e. those costs which cannot be avoided even when the vehicle is not being used such as registration and insurance)[1] are significantly lower, 4.5 cents per km, compared with operator B where inescapable costs (which include lease payments) are 22.9 cents per kilometre.

Thus, with greater equity in his operations the owner-driver is in a much better situation to survive short term adverse fluctuations in market demand.

TABLE 5.3 - MINIMUM SHORT-TERM 'SURVIVAL RATES' FOR OWNER-DRIVERS UNDER DIFFERENT METHODS OF FINANCE (APRIL 1980)

Operator	Inescapable costs per annum $	Inescapable costs per km[a] c	Total costs per km[b] - 150 000 km per annum c
A (self-financed)	6 698	4.5	33.8
B (lease)	34 363	22.9	52.2

(a) Based on an annual vehicle utilisation of 150 000 km.
(b) Includes inescapable costs plus variable costs of 29.3 cents per kilometre for both operations.

Source: Details of calculations and assumptions made appear in Appendix 10.

(1) These costs are not strictly inescapable in an economic sense. This analysis is concerned with financial outflows only. These costs are inescapable provided the operator wishes to remain in business.

CHAPTER 6 - SUMMARY AND SOME CONCLUDING REMARKS

This paper has concentrated on the financial considerations associated with entry into road transport. It has outlined some key factors in business success and introduced some simple techniques through case studies to assist trucking profitability.

Some basic requirements to commence as an owner-driver were noted, including the necessary business records and a summary of alternative legal and operational structures. It was emphasised that:

- a demand for the proposed service must be established; and
- the costs incurred in running a trucking business must be examined.

Operational strategy was discussed with a view to maximising the profitability of the business and the significance of backloading was highlighted.

However, all businesses are not winners - many do fail. Unfortunately, very few statistics exist to enable a comparison of failure rates across business classifications. It is not possible to present figures for the liquidation of transport companies. While the following bankruptcy statistics are provided, it must be realised that, in themselves, these figures present only a very small part of the total picture. Many businesses fail without the necessity of liquidation or bankruptcy. Road transport operators were second only to shopkeepers in total Australian business related bankruptcies for 1978-79. Road transport driver bankruptcies represented

15 per cent of total 'business related' bankruptcies in Australia in 1978-79(1). This should be a sobering thought.

But for many truck operators financial matters seem to be only a secondary consideration. The attractive lifestyle and the glamour of driving a 'big rig' often outweigh the question: how profitable is the operation?

This attitude can only lead, in the longer term, to increased potential for serious financial difficulty and perhaps even total business failure. It is therefore highly desirable that a potential owner-operator gets help, assistance and advice from as many sources as possible *before* committing life savings toward the purchase of a truck.

(1) *Reports on Bankruptcy by the Minister for Business and Consumer Affairs*, Twelfth Annual Report, Australian Government Publishing Service, Canberra, 1979, Schedule 9 - Part A.

APPENDIX 1 - MAJOR OWNER-DRIVER ORGANISATIONS

The following owner-driver associations are organised on a state-wide or national basis:

- the Long Distance Road Transport Association of Australia (LDRTA)[1];
- Australian Transport Association (ATA);
- the Professional Transport Drivers Association of Australia (PTDA);
- the Transport Workers Union of Australia (TWU);
- the Independent Truckers Association;
- Road Transport Associations (six state branches);
- Australian Road Transport Federation (ARTF)[2];
- the Commonwealth Vehicle Owners Association; and
- the Association of Australian Transport Operators.

In addition to the state and national owner-driver organisations there are a number of associations organised on a regional or specific purpose basis:

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(1) As of August 30, 1980, negotiations are proceeding for a merger of the LDRTA, The Professional Transport Drivers Association, The Australian Association of Transport Operators, the Victorian branch of the Australian Transport Association and the Hunter Valley Owner Drivers Association.

(2) The ARTF is a federation of independent organistions. Its constituent members, all derived from the private sector of the road haulage industry, include freight forwarder, bus proprietor and other specialist organisations. At present the LDRTA is affiliated with the ARTF.

- the Hunter Valley Owner-Drivers Association;
- the Eastern Australian Stock Carriers Association;
- the United Transport Owners Association;
- the Bulk Hauliers Owner-Drivers Association; and
- the Transnational Hauliers Co-operative Limited.

APPENDIX 2 - STATE AND TERRITORY SMALL BUSINESS AGENCIES

STATE	NAME AND ADDRESS	TELEPHONE
New South Wales	Small Business Agency, 139 Macquarie Street Sydney NSW 2000	(02) 2337177
Victoria	Small Business Development Corporation 100 Exhibition Street Melbourne Vic 3000	(03) 639825
Queensland	Department of Commercial and Industrial Development 160 Ann Street Brisbane Qld 4000	(07) 2278382
South Australia	Commercial Division Department of Trade and Industry 44 Pirie Street Adelaide SA 5000	(08) 2125562
Western Australia	Small Business Advisory Service 12 St Georges Terrace Perth WA 6000	(09) 3253388
Tasmania	Department of Planning and Development 39 Murray Street Hobart Tas 7000	(002) 303561
Northern Territory	Small Business Advisory Service Northern Territory Development Corporation 41 Cavenough Street Darwin NT 5790	(089) 816233
Australian Capital Territory	Commercial Practices Section Department of the Capital Territory Alinga Street Canberra City ACT 2601	(062) 462054

APPENDIX 3 - MAJOR AUSTRALIAN FREIGHT FORWARDERS

The following table lists the major Australian freight forwarders in descending order, by market capitalisation(1).

TABLE A3.1 - MAJOR AUSTRALIAN FREIGHT FORWARDERS

Firm	Market Capitalisation ($ million)(a)
Thomas Nationwide Transport Ltd	364
Brambles Holdings Ltd	218
Ansett Transport Industries Ltd	185
Mayne Nickless Ltd	140
P & O Australia Ltd	70
McIlwraith & McEacharn Ltd	33
Transport Development Australia Ltd	9
Fleetways (Holdings) Ltd	9

(a) Market capitalisation rounded to nearest million dollars Australian.

Source: Sydney Stock Exchange Information Service, September 8, 1980.

(1) Market capitalisation is the market value of a company's issued share capital i.e. the quoted price multiplied by the number of shares.

APPENDIX 4 - HEAVY VEHICLE LICENCE REQUIREMENTS FOR STATES AND TERRITORIES (APRIL, 1980)

NEW SOUTH WALES

The classifications of licences needed to enable the holders to drive heavy motor lorries in New South Wales are classes 3, 4 and 5.

A class 3 licence entitles the holder to drive any motor vehicle *except* a motor cycle, a public passenger vehicle, an articulated vehicle and a motor lorry which weighs more than two tonnes unladen and is hauling a pole trailer or a trailer with more than one axle which is not an implement or caravan. An applicant for a class 3 licence must be not less than 18 years of age.

A class 4 licence entitles the holder to drive any motor vehicle *except* a taxicab or articulated vehicle registered under the Transport Act, 1930, as amended, a motor cycle, an articulated vehicle or a motor lorry, which weighs more than two tonnes unladen and is hauling a pole trailer or a trailer with more than one axle which is not an implement or caravan. Applicants for a class 4 licence must be not less than 21 years of age. A licence to drive or the equivalent issued elsewhere must have been held for a period of at least twelve months prior to the date of application.

A class 5 licence entitles the holder to drive any motor vehicle (except a motor cycle and a public passenger vehicle). Applicants must be not less than 19 years of age. If under 21 years of age, a licence to drive or the equivalent issued elsewhere must have been held for a period of at least two years prior to the date of application. If aged 21 years or more, a licence to drive must have been held for at least twelve months.

VICTORIA

There are three types of relevant licences in Victoria. The 'H' endorsement entitles the licence holder to drive a heavy vehicle weighing more than three tonnes unladen. The 'T' endorsement entitles the holder to drive a larger trailer combination, which is a heavy vehicle towing a trailer weighing more than 750 kilograms unladen. The 'A' endorsement entitles the holder to drive an articulated motor car, which is a semi-trailer type of vehicle. Any applicant for any of the above licence endorsements must be at least 19 years of age, and must have held an ordinary licence for at least twelve months.

QUEENSLAND

In Queensland a class 'A' licence entitles the holder to drive any motor vehicle or motor utility truck up to two tonnes net. A class 'C' licence entitles the holder to drive any motor truck other than an articulated vehicle or trolley vehicle up to four tonnes net, while a class 'E' licence entitles the holder to drive any articulated vehicle. An applicant for all three classifications must be not less than 17 years of age.

SOUTH AUSTRALIA

Before a person can legally drive a heavy vehicle in this State, he/she must be 18 years of age and the holder of a current Class 2 or 3 South Australian driver's licence, or if a visitor in this State an equivalent interstate licence. The Class 2 licence authorises the holder to drive any motor vehicle except an articulated motor vehicle, a motor cycle or a bus, whilst a Class 3 licence authorises the holder to drive any motor vehicle except a motor cycle or a bus. In other words, a Class 3 licence is necessary to drive a prime-mover/semi-trailer type combination, but a Class 2 licence is sufficient to drive rigid trucks.

WESTERN AUSTRALIA

A Class 'B' licence is required for rigid vehicles with an aggregate mass in excess of 4350 kilograms. The minimum age is 18 years. For articulated vehicles, a Class 'C' licence is required, for which the minimum age is 20 years.

TASMANIA

In Tasmania a heavy rigid goods vehicle licence is required to drive rigid trucks with an unladen mass which exceeds two tonnes. An applicant for this class of licence must be at least 19 years of age. To drive articulated vehicles a combination goods vehicle licence is required. An applicant for this class of licence must be at least 21 years of age.

NORTHERN TERRITORY

The classification to drive heavy transport vehicles utilised in the Northern Territory is one which covers all vehicles in excess of 2 tonnes net.

Such licences may be granted to an applicant who is 17 years or more of age.

AUSTRALIAN CAPITAL TERRITORY

There are two classes of truck licences in the Australian Capital Territory. A Class 4 licence is required to drive lorries over two tonnes, while a class 6 licence is required to drive semi-trailers. Applicants for both classes must be at least 21 years of age and must have held a driver's licence for at least one year.

APPENDIX 5 - MATHEMATICAL MODEL OF THE VARIOUS FORMS OF FINANCING

The truck operator is assumed to start off with capital equal to the value of a new truck. He then finances the use of a new truck for 4 years exactly, either by paying cash, by hire purchasing or by leasing. If paying cash, the initial capital is exhausted at the time of buying, but under hire purchase the operator retains the initial capital minus the deposit. Under leasing all of the initial capital is retained. The residual capital is assumed to be invested in assets which yield a monthly interest return. At the end of 4 years, the truck is sold; under both cash and hire purchase financing, the value of the truck at that time returns entirely to the operator while under leasing the operator is entitled to buy the truck at the previously agreed residual value. Hire purchase and lease payments are due monthly. Tax is due once a year, nine months after the end of the financial year.

The cash inflow and outflow can then be characterised as follows:

(i) once the financing decision has been taken, cash outflow (hire purchase or lease payments) and cash inflow (net revenue and interest payments from accummulated assets) takes place every month; and

(ii) tax is due only once a year, but nine months after the end of the year for which it is paid. Tax is paid on total net income, i.e. on net revenue earned over the year plus all interest earned during the year, but an allowance is made for depreciation of the equipment. Note that the lessee is not entitled to this allowance which instead is claimed by the lessor. The investment allowance is taken directly by the user of the vehicle in all cases.

Given these characteristics, the question is: what is the best (i.e. least-cost) method of financing the trucking operation? A computer model which takes the above considerations into account was developed for this study and is reported in Appendix 6.

It would be advantageous to determine mathematically what are the main characteristics which make one method of financing better than another. To this end, a simplified model has been developed and is reported below. This has the advantage of concentrating on the essentials of the situation, so that the main determinants of the financing decision can be extricated. The computer model described in Appendix 6 which simulates the more complex cash flows described above can be used to analyse the determinants of that case. A comparison is then possible to see how the results of the simplified model are replicated in the more complex situation. Indeed a brief comparison shows that the main conclusions from the simplified model are applicable to the more complex case with only minor adjustments.

THE ONE-PERIOD MODEL

The operator has initial capital of V_o. Some of this is used to finance the use of a truck for one period only. The truck comes into use at the beginning of this period and is disposed of at the end of it. Tax is due at the end of the period. For tax purposes deductions are allowed for depreciation. Interest earnings are taxed but interest payments are allowed as deductions, so that the obtainable after-tax interest rates are reduced by the factor (1-t). The notation is as follows:

r = pre-tax interest rate obtainable by the truck operator;
r' = interest rate sought by the hire purchase financier;
r" = interest rate sought by the leasing financier;
R = r(1-t), R' = r'(1-t), R" = r"(1-t) are the corresponding after-tax interest rates;

V_o = value of truck at beginning of period;
V_1 = value of truck at end of period;
V_1^* = value of truck at end of period imputed for tax purposes;
P = hire purchase deposit;
S = residual left at end of leasing period, to be paid by operator if he decides to retain the truck (it is then assumed that the truck is sold immediately for V_1);
t = tax rate applying to all participators;
Y = net revenue from truck operations for the one period;
Y* = Y(1-t) = 'net of tax' revenue from truck operations for the one period;
Y_o = net income at end of period preceding the current one, i.e. at beginning of current period;
Y_1 = net income at end of current period; and
D = depreciation allowance for tax purposes (this entitlement is due to the operator under cash buying or hire purchasing agreements or to the lessor under leasing agreements)
$= V_o - V_1^*$.

Then, Present Value (PV) = $Y_o + \dfrac{Y_1}{1+r(1-t)}$

The reason for the r(1-t) in the denominator is now explained.

An investment, V_o, is made at the beginning of the year at interest rate r. At the end of the year, the gross value of the investment is $V_o + rV_o$; but, tax on the 'taxable income' is still due and this is $t(rV_o)$(1). Hence, the net value of the investment is

$$V_1 = V_o + rV_o - t(rV_o) = V_o\left\{1 + r(1-t)\right\}.$$

(1) 'Taxable income' = wealth at end of year
= wealth at beginning of year
= $(V_o + rV_o) - V_o$
= rV_o

The discount rate applicable in this case is that interest rate, r', which discounts V_1 to V_o i.e.

$$\frac{V_1}{1+r'} = V_o$$

Hence, it can be shown simply that $r^1 = r(1-t)$.

Cash buying

$Y_o = 0$

$Y_1 = Y-t(Y-D)+V_1$

$$..PV = 0 + \frac{Y-t(Y-D)+V_1}{1+r(1-t)}$$

$$= \frac{V_1 + tD}{1+r(1-t)} + \frac{Y(1-t)}{1+r(1-t)}$$

$$= V_o + \frac{V_1 + tD}{1+r(1-t)} + \frac{Y(1-t)}{1+r(1-t)} - V_o\left\{\frac{1+r(1-t)}{1+r(1-t)}\right\}$$

$$= V_o + \frac{V_1 + D^*}{1+R} + \frac{Y^*}{1+R} - V_o\left\{\frac{1+R}{1+R}\right\}$$

Hire purchase buying

The hire purchase financier lends (V_o-P) for one period. At the end of the period, he receives the hire purchase repayment H, but has to pay tax on the interest component of this, i.e. on the difference between H and V_o-P. Hence, for the financier, the PV calculation is

$$V_o - P = \frac{H - t(H-(V_o-P))}{1+r'(1-t)}$$

$$..H = r'(V_o-P) + (V_o-P)$$

So, for the operator

$$Y_o = V_o - P$$

$$Y_1 = Y + V_1 - H - t(Y-r'(V_o-P)-D)$$

$$..PV = (V_o-P) + \frac{Y + V_1 - r'(V_o-P)-(V_o-P)-t(Y-r'(V_o-P)-D)}{1+r(1-t)}$$

$$= \frac{V_1 + tD}{1+r(1-t)} + (V_o-P)\left\{1 - \frac{1+r'(1-t)}{1+r(1-t)}\right\} + \frac{Y(1-t)}{1+r(1-t)}$$

$$= V_o + \frac{V_1 + tD}{1+r(1-t)} + \frac{Y(1-t)}{1+r(1-t)} - V_o\left\{\frac{1 + kr(1-t)+(1-k)r'(1-t)}{1+r(1-t)}\right\}$$

$$= V_o + \frac{V_1 + D^*}{1+R} + \frac{Y^*}{1+R} - V_o\frac{(1+kR+(1-k)R')}{1+R}$$

where $k = P/V_o$

and $R^* = kR + (1-k)R'$, which is a weighted interest rate, relevant to the operator who hire-purchases, because part of the financing is cash, via the deposit.

Leasing

The lessor lends V_o for one period. At the end of the period he receives a payment of L, and a residual sum of S. Tax is due on L, but a deduction of D is allowed; also tax is due on the difference between R and V_1^*, where this is the deduced value of the truck at the end of the period. Hence the PV calculation for the lessor is

$$V_o = \frac{L + S - t(L-D) - t(S-V_1^*)}{1+r''(1-t)}$$

and so

$$L = r''V_o + \frac{(V_o - S) + t(S-V_1^*)-tD}{1 - t} = r''V_o + (V_o - S)$$

For the operator, the following considerations apply. At the end of the period, he receives income Y, but pays out tax on this, after a deduction of L is allowed, and tax on the difference between V_1^* and S.

$$Y_o = V_o$$

$$Y_1 = Y + V_1 - S - L - t(Y-L) - t(V_1^* - S)$$

Hence,

$$PV = V_o + \frac{Y + V_1 - S - L - t(Y-L) - t(V^* - S)}{1+r(1-t)}$$

$$= \frac{V_1 + tD}{1+r(1-t)} + V_o\left\{1 - \frac{1+r''(1-t)}{1+r(1-t)}\right\} + \frac{Y(1-t)}{1+r(1-t)}$$

$$= V_o + \frac{V_1+tD}{1+r(1-t)} + \frac{Y(1-t)}{1+r(1-t)} - V_o\left\{\frac{1+r''(1-t)}{1+r(1-t)}\right\}$$

$$= V_o + \frac{V_1 + D^*}{1+R} + \frac{Y^*}{1+R} - V_o\left\{\frac{1+R''}{1+R}\right\}$$

The results of the analysis above demonstrate that:

(i) taxation makes no difference to the financing decision; and

(ii) the financing decision is dependent only on the interest rates relevant to the financing.

Both results are due to the fact that in the final form of the PV formulae, the PV formula for each method of financing differs only in the last term, which depends only on the after-tax interest rate, paid by the operator for different forms of financing. Since the after-tax interest rate differs from the pre-tax interest rate by a constant factor (1-t) only, the financing decision depends on the pre-tax interest rate. The preferred financing method is that which has the lowest interest rate.

APPENDIX 6 - COMPUTER PROGRAM FOR ASSESSING THE RELATIVE MERITS OF VARIOUS FORMS OF FINANCING

This program enables a rapid comparison of the various forms of vehicle financing most usually considered. These are to pay cash, hire purchase or lease the vehicle. The following assumptions have been made. The prime-mover and semi-trailer is purchased (by the operator or the lessor) on June 30, with first and subsequent tax payments being made in the following March months. The financing term is 48 months, a necessity if the investment allowance is to be available under the lease. Payments are monthly; in arrears for hire-purchase and in advance for lease.

It is assumed that, in the lease option, title is taken when the residual is paid at the end of the forty-eighth month and that, at the same time (in all cases), the vehicle is sold or traded-in.

Depreciation is based on the reducing balance method. The following example is used to illustrate the notation and the information required to operate the program:

Depreciation Rate	D = 0.225 (22.5 per cent reducing balance)
Tax Rate	TR = 0.46 (46 cents in the dollar)
Number of months	N = 48 (4 year term)
Hire Purchase Payment	HP = 2190 (monthly payment in dollars)
Lease Payment	RLS = 2196 (monthly payment in dollars)
Purchase Price	CTRUCK = 87 500 (initial purchase price of rig in dollars)
Hire purchase deposit	DEP = 17 500 (dollars)
Trade-in Value	TRDIN = 40 000 (dollars)

Initial Cash Balance in Hire Purchase Option	CB = CTRUCK - DEP = 70 000 (dollars)
Lease residual	RLSRD = 26 000 (dollars)

The program calculates:

- the pre-tax interest rates that are implicitly charged in the hire purchase and lease options;

- the net present values for a range of interest rates (the least-cost method of finance being the maximum net present value for each interest rate); and

- the minimum monthly net revenue required to break-even and cover interest and depreciation charges for the vehicle, i.e. gross revenue minus all other fixed and variable operating costs.

As an example consider a discount rate of 13 per cent (pre-tax). From Table 1 it can be seen that the cash option (with a net present value of -27 178) has the maximum net present value and is therefore the least-cost method of finance for this interest rate. This fact is further reflected in Table 2, which illustrates that for the 13 per cent example the following monthly net revenues are required to break even:

- cash, $1197;
- hire-purchase, $1518; and
- lease, $1583.

In the analysis 'net revenue' (defined as the revenue required to cover the capital charges on the vehicle) has been set to zero and all costs appear as negative values. This is the reason why the net present value figures in Table 1 are negative. Thus for any given discount rate the preferred method of financing

is the option with the highest net present value. Alternatively, ignoring all the negative signs, the most preferred option is the one with the lowest value (as this value is the present value of the cost of financing the vehicle).

The following program has resulted using the above data:

```
LUCIO,P5000.
BANNER,TRUCKIE.
COMMENT. PROGRAM IS TRUCK ON DTEEAD.
COMMENT. CALCULATION INCLUDES TAX PROVISION.
FUSE.
MNF,L=OUTPUT,T.
LGO.

      PROGRAM FIN(INPUT,OUTPUT,TAPE60=OUTPUT)
      DIMENSION C(200),CHMON(200),HPMON(200),RLMON(200),CHERN(200),
     1HPERN(200),RLERN(200),CHERNY(200),HPERNY(200),RLERNY(200)
     2,RINT(200),RLINT(200),CT(200),CHTOT(200),HPTOT(200),RLTOT(200)
     3,IRR(50),RRR(50),RNPVCH(50),RNPVHP(50),RNPVRL(50),YCH(50),
     4YHP(50),YRL(50)
      D=.225
      TR=.46
      N=48
      HP=2190.
      RLS=2196.
      CTRUCK=87500.
      DEP=17500.
      TRDIN=40000.
      CB=CTRUCK-DEP
      C(1)=CB
      CD=CTRUCK
      RLSRD=26000.
      Y1=0.
      Y2=0.
      NI=49
C
C        THIS PART OF PROGRAM CALCULATES THE PRE-TAX INTEREST RATES
C        THAT ARE IMPUTED TO BE CHARGED FOR HP,LEASE.
      DO 101 J=1,40
      R=J
      R=R/100.
      R=(1.+R)**0.0833333-1.
      CA=(1.+1./R)*(1.-(1./(1.+R))**N)*HP
      IF(CA.LT.CB) GO TO 102
101   CONTINUE
102   CONTINUE
      LOF=J-1
      LOF1=J+10
      R2=LOF
      DO 103 L=LOF,LOF1
      R2=R2+0.1
      R1=R2/100.
      R=(1.+R1)**0.0833333-1.
      CA=(1.+1./R)*(1.-(1./(1.+R))**N)*HP
      IF(CA.LT.CB) GO TO 104
103   CONTINUE
104   CONTINUE
      DO 171 J=1,40
      RL=J
      RL=RL/100.
      RL=(1.+RL)**0.0833333-1.
      CA=(1.+1./RL)*(1.-(1./(1.+RL))**N)*RLS+RLSRD/(1.+RL)**N
      IF(CA.LT.CTRUCK) GO TO 172
171   CONTINUE
172   CONTINUE
```

```
      LOF=J-1
      LOF1=J+10
      RL2=LOF
      DO 173 L=LOF,LOF1
      RL2=RL2+.1
      RL1=RL2/100.
      RL=(1.+RL1)**0.0833333-1.
      CA=(1.+1./RL)*(1.-(1./(1.+RL))**N)+RLSRD/(1.+RL)**N
      IF(CA.LT.CTRUCK) GO TO 174
173   CONTINUE
174   CONTINUE
C        THIS PART OF PROGRAM CALCULATES THE PRESENT VALUES (PV) AND THE
C        NET PRESENT VALUES (NPV) FOR A RANGE OF INTEREST RATES.
C        IRR=PRE-TAX INTEREST RATE
C        RRR=POST-TAX INTEREST RATE
C        CH,HP,RL ARE PREFIXES FOR 'CASH','HIRE PURCHASE','LEASE'
C        CHMON(J) IS MONTHLY NET REVENUE
C        CHTOT(J) IS ACCUMULATED BALANCES UP TO MONTH (J)
C        CHERN(J) IS MONTHLY EARNINGS FROM INTEREST ON CHTOT(J-1)
C                 AND FROM TRUCK OPERATIONS-USED IN TAX CALCS ONLY
C        CHERNY(LAN) IS YEARLY EARNINGS
C        RINT(LAN) IS YEARLY INTEREST COMPONENT OF HP PAYMENTS
C        R LINT(LAN) IS YEARLY LEASE REPAYMENT
      NN=N+12
      II=7
      DO 999 IR=7,NI
      RO=IR/100.
      X1=Y1
      X2=Y2
      IRR(II)=IR
      RRR(II)=IR*(1.-TR)
      IF(IR.GT.10) GO TO 979
      WRITE(60,900) IR
900   FORMAT(*1*,30X,21H****** INTEREST RATE ,I3,9H PER CENT)
979 XHP=HP
      XRLS=RLS
      DO 998 IN=1,200
      RINT(IN)=0.
      RLINT(IN)=0.
      CHERNY(IN)=0.
      HPERNY(IN)=0.
      CHTOT(IN)=0.
      HPTOT(IN)=0.
      RLTOT(IN)=0.
998   RLERNY(IN)=0.
      CHTOT(1)=0.
      HPTOT(1)=CTRUCK-DEP
      RLTOT(1)=CTRUCK-RLS
      X=X1
      DISC=1.
      RS=(1.+RO)**0.083333-1.
      RSD=RS*(1.-TR)
      DO 100 J=1,NN
      RRINT=R*C(J)
      C(J+1)=C(J)-(HP-R*C(J))
      LAN=(J-1)/12+1
      RINT(LAN)=RINT(LAN)+R*C(J)
      IF(J.EQ.N) GO TO 50
      RLINT(LAN)=RLINT(LAN)+XRLS
50    CONTINUE
```

```
      IF(J.LE .N) GO TO 49
      X=X2
      XHP=0.
      XRLS=0.
49    DISC=DISC*(1.+RSD)
      CHMON(J)=X
      HPMON(J)=X-XHP
      RLMON(J)=X-XRLS
      IF(J.EQ.N) RLMON(J)=X
      IF(J.LE.12) GO TO 85
      LL=MOD(J,12)
      IF(LL.EQ.9) GO TO 81
      GO TO 83
81    LL=(J-21)/12+1
      CT(LL)=CD*(1.-D)**(LL-1)
      TAXDEP=D*CT(LL)
      CHMON(J)=CHMON(J)-TR*(CHERNY(LL)-TAXDEP)
      HPMON(J)=HPMON(J)-TR*(HPERNY(LL)-TAXDEP-RINT(LL))
      RLMON(J)=RLMON(J)-TR*(RLERNY(LL)-RLINT(LL))
      IF(J.NE.N+9) GO TO 83
      CT(LL+1)=CD*(1.-D)**LL
      CHMON(J)=CHMON(J)-TR*(TRDIN-CT(LL+1))
      HPMON(J)=HPMON(J)-TR*(TRDIN-CT(LL+1))
      RLMON(J)=RLMON(J)-TR*(TRDIN-RLSRD)
83    IF(J.NE.N) GO TO 85
      CHMON(J)=CHMON(J)+TRDIN
      HPMON(J)=HPMON(J)+TRDIN
      RLMON(J)=RLMON(J)+(TRDIN-RLSRD)
85    IF(J.NE.9) GO TO 82
      CHMON(J)=CHMON(J)+TR*0.2*CTRUCK
      HPMON(J)=HPMON(J)+TR*0.2*CTRUCK
      RLMON(J)=RLMON(J)+TR*0.2*CTRUCK+TR*RLS
82    CHERN(J+1)=RS*CHTOT(J)+CHMON(J)
      HPERN(J+1)=RS*HPTOT(J)+HPMON(J)
      RLERN(J+1)=RS*RLTOT(J)+RLMON(J)
      CHTOT(J+1)=CHTOT(J)+CHERN(J+1)
      HPTOT(J+1)=HPTOT(J)+HPERN(J+1)
      RLTOT(J+1)=RLTOT(J)+RLERN(J+1)
      CHERNY(LAN)=CHERNY(LAN)+RS*CHTOT(J)+X
      HPERNY(LAN)=HPERNY(LAN)+RS*HPTOT(J)+X
      RLERNY(LAN)=RLERNY(LAN)+RS*RLTOT(J)+X
      IF(J.LE.N) GO TO 99
      CHERNY(LAN)=0.
      HPERNY(LAN)=0.
      RLERNY(LAN)=0.
99    CONTINUE
100   CONTINUE
969   NO=N+12
      DISCI=(1.+RSD)**NO
      RNPVCH(II)=CHTOT(61)/DISCI-CTRUCK
      RNPVHP(II)=HPTOT(61)/DISCI-CTRUCK
      RNPVRL(II)=RLTOT(61)/DISCI-CTRUCK
      RYTOT=0.
      DISCR=1.
      DO 130 K=1,N
      DISCR=DISCR*(1.+RSD)
      RY=(1.-TR)/DISCR
```

```
130   RYTOT=RYTOT+RY
      YCH(II)=-RNPVCH(II)/RYTOT
      YHP(II)=-RNPVHP(II)/RYTOT
      YRL(II)=-RNPVRL(II)/RYTOT
      II=II+1
999   CONTINUE
      WRITE(60,949)
949   FORMAT(*1*,30X,*TABLE 1 : NET PRESENT VALUES (WITH NET REVENUE
     1 ZERO)*,//)
      WRITE(60,950)
950   FORMAT(* *,5X,*DISCOUNT RATE ( PRE-TAX)*,7X,*( AFTER-TAX )*,7X,
     1*CASH*,7X,*HIRE PURCHASE*,7X,*LEASE*,/)
      DO 952 II=7,NI
      WRITE(60,951) IRR(II),RRR(II),RNPVCH(II),RNPVHP(II),RNPVRL(II)
951   FORMAT(* *,15X,I4,20X,F5.1,8X,F10.,4X,F10.,4X,F10.)
952   CONTINUE
      WRITE(60,953)
953   FORMAT(*1*,30X,*TABLE 2 : MINIMUM MONTHLY NET REVENUE REQUIRED TO
     1BREAK EVEN*,//)
      WRITE(60,954)
954   FORMAT(*0*,30X,*NOTE: NET REVENUE=GROSS REVENUE-OPERATING COSTS*)
      WRITE(60,950)
      DO 956 II=7,NI
      WRITE(60,955) IRR(II),RRR(II),YCH(II),YHP(II),YRL(II)
955   FORMAT(* *,15X,I4,20X,F5.1,8X,F10.0,4X,F10.0,4X,F10.0)
956   CONTINUE
      STOP
      END
```

TABLE 1 : NET PRESENT VALUES (WITH NET REVENUE ZERO)

DISCOUNT RATE (PRE-TAX)	(AFTER-TAX)	CASH	HIRE PURCHASE	LEASE
7	3.8	-23198.	-35142.	-38742.
8	4.3	-23909.	-35075.	-38314.
9	4.9	-24600.	-34989.	-37870.
10	5.4	-25272.	-34887.	-37412.
11	5.9	-25925.	-34767.	-36939.
12	6.5	-26560.	-34630.	-36451.
13	7.0	-27178.	-34476.	-35948.
14	7.6	-27779.	-34306.	-35431.
15	8.1	-28363.	-34119.	-34899.
16	8.6	-28931.	-33916.	-34353.
17	9.2	-29484.	-33696.	-33791.
18	9.7	-30021.	-33461.	-33216.
19	10.3	-30545.	-33210.	-32626.
20	10.8	-31054.	-32943.	-32021.
21	11.3	-31549.	-32661.	-31402.
22	11.9	-32032.	-32363.	-30769.
23	12.4	-32501.	-32050.	-30121.
24	13.0	-32958.	-31722.	-29459.
25	13.5	-33402.	-31379.	-28782.
26	14.0	-33835.	-31021.	-28091.
27	14.6	-34256.	-30648.	-27386.
28	15.1	-34667.	-30261.	-26666.
29	15.7	-35066.	-29859.	-25932.
30	16.2	-35454.	-29442.	-25184.
31	16.7	-35833.	-29011.	-24422.
32	17.3	-36201.	-28565.	-23645.
33	17.8	-36560.	-28105.	-22853.
34	18.4	-36909.	-27631.	-22048.
35	18.9	-37249.	-27143.	-21227.
36	19.4	-37580.	-26641.	-20393.
37	20.0	-37902.	-26124.	-19544.
38	20.5	-38215.	-25594.	-18681.
39	21.1	-38520.	-25049.	-17803.
40	21.6	-38817.	-24491.	-16911.
41	22.1	-39107.	-23919.	-16004.
42	22.7	-39388.	-23333.	-15082.
43	23.2	-39662.	-22733.	-14147.
44	23.8	-39928.	-22119.	-13196.
45	24.3	-40188.	-21492.	-12231.
46	24.8	-40440.	-20851.	-11252.
47	25.4	-40685.	-20196.	-10257.
48	25.9	-40924.	-19528.	-9248.
49	26.5	-41156.	-18846.	-8225.

TABLE 2 : MINIMUM MONTHLY NET REVENUE REQUIRED TO BREAK EVEN

NOTE: NET REVENUE=GROSS REVENUE-OPERATING COSTS

DISCOUNT RATE (PRE-TAX)	(AFTER-TAX)	CASH	HIRE PURCHASE	LEASE
7	3.8	964.	1460.	1609.
8	4.3	1003.	1471.	1607.
9	4.9	1042.	1483.	1605.
10	5.4	1081.	1493.	1601.
11	5.9	1120.	1502.	1596.
12	6.5	1158.	1510.	1590.
13	7.0	1197.	1518.	1583.
14	7.6	1235.	1525.	1575.
15	8.1	1272.	1530.	1565.
16	8.6	1310.	1535.	1555.
17	9.2	1347.	1539.	1543.
18	9.7	1383.	1542.	1531.
19	10.3	1420.	1544.	1517.
20	10.8	1456.	1545.	1502.
21	11.3	1492.	1545.	1485.
22	11.9	1528.	1544.	1468.
23	12.4	1564.	1542.	1449.
24	13.0	1599.	1539.	1429.
25	13.5	1634.	1535.	1408.
26	14.0	1669.	1530.	1385.
27	14.6	1703.	1524.	1361.
28	15.1	1737.	1516.	1336.
29	15.7	1771.	1508.	1310.
30	16.2	1805.	1499.	1282.
31	16.7	1838.	1488.	1253.
32	17.3	1871.	1477.	1222.
33	17.8	1904.	1464.	1190.
34	18.4	1937.	1450.	1157.
35	18.9	1969.	1435.	1122.
36	19.4	2002.	1419.	1086.
37	20.0	2033.	1402.	1049.
38	20.5	2065.	1383.	1009.
39	21.1	2097.	1363.	969.
40	21.6	2128.	1342.	927.
41	22.1	2159.	1320.	883.
42	22.7	2189.	1297.	838.
43	23.2	2220.	1272.	792.
44	23.8	2250.	1246.	744.
45	24.3	2280.	1219.	694.
46	24.8	2309.	1191.	643.
47	25.4	2339.	1161.	590.
48	25.9	2368.	1130.	535.
49	26.5	2397.	1098.	479.

APPENDIX 7 - COST CALCULATIONS FOR INTERSTATE TRUCK OPERATION (APRIL 1980)

LEASE PAYMENTS

Typical lease payments on a bogie-drive prime-mover with a purchase price of $70 000 are $1754 per month, assuming a four-year lease term with a residual value of $21 000. The monthly lease payments on a new tri-axle trailer with a purchase price of $17 500 are $442 per month, assuming a four year lease term with a residual value of $5000. Total annual lease payments for the whole unit are thus $26 352(1).

ANCILLARY EQUIPMENT

Ancillary equipment (not included in the leases) are tarpaulins, ropes, dogs and chains and tools. A total purchase price of around $2400 for this sundry equipment is fully depreciated over three years. In addition, the owner-driver should expect some return on capital. In this analysis an acceptable return is assumed to be 10 per cent per year. Thus the annual capital recovery charge on ancillary equipment totals $964.

ADMINISTRATION AND SUNDRY EXPENSES

Most owner-drivers operate from their own homes. In many cases unpaid family labour is used for administrative tasks. Strictly speaking, values should be imputed into the analysis to cover these contingencies. However, for this financial analysis only cash expenditure has been included to cover telephone charges, postage, stationery, accounting fees and personal accident insurance. A sum of $2500 per annum has been assigned to cover these costs.

(1) Information provided on a confidential basis from private industry.

REGISTRATION

The annual costs of registration and third party insurance for use in interstate trade are given in Table A7.1, for a vehicle with the following specifications:

Prime-mover

Type	Bogie drive 6 x 4
Horsepower	305 b.h.p.
RAC Rating	60
Purchase price	$70 000
Tare weight	7.0 tonne

Semi-trailer

Type	Tri-axle
Tare weight	6.5 tonne
Purchase price	$17 500

TABLE A7.1 - REGISTRATION AND THIRD PARTY FEES FOR EXCLUSIVE INTERSTATE OPERATION (APRIL, 1980)

State or Territory	Annual Fee ($)
N.S.W.	260.65
Vic.	216.00
S.A.	131.00
W.A.	55.90
Tas.	67.50
Qld	870.20
A.C.T.	920.00
N.T.	500.00

Source: Various State and Territory registration authorities.

Operators who desire to work intrastate at any time must pay additional registration fees and stamp duty on the third party insurance. In addition, stamp duty on the value of the vehicle must be paid on initial registration only. This can be substantial (e.g. for the above unit, stamp duty of $2595 is required in South Australia). As interstate operators are exempt from payment of stamp duty these costs are not relevant to examples used in this study. However, operators considering some intrastate operation should include these items in cost estimates. Table A7.2 details fees by state for vehicles operating intrastate (these vehicles may also travel interstate when so registered).

TABLE A7.2 - REGISTRATION AND THIRD PARTY FEES FOR INTRASTATE OPERATION[a] (APRIL, 1980)

State or Territory	Annual Fee ($)
N.S.W.	1 337.30
Vic.	1 348.00[b]
S.A.	1 089.00
W.A.	1 234.99
Tas.	969.38
Qld	870.20[c]
A.C.T.	920.00
N.T.	500.00

(a) Stamp duty payable on initial registration is not included here. Vehicles so registered may also operate interstate.
(b) Assuming garaged in the country.
(c) Assuming prime-mover and trailer registered separately.

Source: Various state and territory registration authorities.

The registration fees used in Chapter 4 are those applicable for New South Wales interstate registrations as at April, 1980.

INSURANCE

Comprehensive insurance premiums for heavy vehicles operating interstate are generally based on 4.5 to 6 per cent of the value of the vehicle, depending on the degree of risk. Membership of some industry organisations may provide access to lower insurance premiums. For example, a member of the L.D.R.T.A. can obtain insurance for 4.5 per cent if assessed as a 'good' risk. However, a potential entrant into the trucking industry can be expected to pay of the order of 6 per cent of the value of the vehicle and this figure has been adopted in Chapter 4. Details of these annual costs are given in Table A7.3.

TABLE A7.3 - ANNUAL AVERAGE COMPREHENSIVE ACCIDENT PREMIUMS FOR OWNER-DRIVERS WITH 22 TONNE CAPACITY VEHICLES (APRIL, 1980)

Percentage of Value of Vehicle	6%	4.5%
	$	$
Prime-mover	4 200	3 150
Trailer	1 050	787
Total	5 250	3 937

LIVING ALLOWANCE

It has been arbitrarily assumed in the analysis that the owner-operator pays himself a wage of $200 per week, although in practice many operators pay expenses first and do not make regular specific drawings from the business.

VARIABLE COSTS

Fuel

The price of fuel varies with the place of purchase and the discount given to different owner-operators and firms. The price of distillate used in this analysis is 32.19 cents per litre, a figure which industry associations consider to be that typically paid by an owner-operator in April 1980.

Based on information provided by the L.D.R.T.A. and P.T.D.A., fuel consumption ranges from 1.6 km per litre to perhaps 1.9 km per litre (under favourable conditions) for 22 tonne capacity units. For the example in Chapter 4, a consumption of 1.75 km per litre has been postulated. Thus, the cost per kilometre for fuel in April 1980 was estimated at 18.39 cents.

Tyres

The average length of life of a tyre, including two recaps is estimated at 240 000 kilometres, assuming operation of steel radial tyres. The price of a tyre and tube, plus two recaps, in April 1980, is taken at $595[1]. The resultant tyre cost estimate for the bogie-drive/tri-axle example (with 22 tyres on the road) is 5.45 cents per kilometre.

Maintenance

The costs of periodic maintenance are relatively easy to estimate. However, provision should also be made for unexpected costs arising as a major breakdown can be costly[2]. Maintenance cost estimates should include allowances for this

(1) This assumes a discount off list price for the owner-operator of 20 to 25 per cent.
(2) For instance, supply and installation of a new motor in the upper horse-power class could cost $15 000.

eventuality. For new or near-new vehicles, maintenance costs can be expected to be less than those of older vehicles. Thus, there is a trade-off between the capital cost (purchase price) of the rig and the repair and maintenance costs of the unit.

Maintenance estimates for the late-model prime-mover and trailer used as an example in Chapter 4 are postulated at 5.50 cents per kilometre(1).

(1) The P.T.D.A. estimates maintenance costs at 4.62 cents per kilometre in 1980 for a bogie/tri combination, while the L.D.R.T.A. gives a figure of 10.36 cents per kilometre.

APPENDIX 8 - TOTAL REVENUE AND TOTAL COST FUNCTIONS

In this appendix total revenue and cost functions are derived for a particular long-distance operation - Sydney to Adelaide and return.

TOTAL REVENUE FUNCTION

TR = Total Revenue
R_i = Rate per tonne on the ith leg of the journey
r_i = rate per tonne-kilometre for leg i
d_i = distance in kilometres of leg i
N = number of round trips per annum
t_i = tonnage moved on the ith leg of the journey
D = total distance operated each year

$$TR = \sum_{i=1}^{n} Nt_i(R_i)$$

$$= N\sum_{i=1}^{n} t_i(r_i d_i)$$

Now, for this particular proposed operation:

R_1 = rate from Sydney to Adelaide = \$30 per tonne
R_2 = rate from Adelaide to Sydney = \$32 per tonne
d_1 = distance from Sydney to Adelaide (including an allowance of 40 kilometres for empty running on each leg to pick-up the next load) = 1432 kilometres
d_2 = distance from Adelaide to Sydney
= $d_1 = d$
r_1 = 0.0209497 dollars per tonne-kilometre revenue Sydney to Adelaide
r_2 = 0.0223463 dollars are per tonne-kilometre revenue Adelaide to Sydney
$t_1 = t_2 =$ 22 tonnes each trip x f

where f is defined as a load factor and
f = average load / total capacity

$$TR = N f(t_1 r_1 d_1 + t_2 r_2 d_2)$$
$$= 22Ndf\ (r_1 + r_2)$$

Now $D = 2Nd$

Thus $TR = 11Df(r_1 + r_2)$
$= 11Df(0.0209497 + 0.0223463)$
$= 11f(0.0432960)D$

i.e. $TR = 0.476256Df$

TOTAL COST FUNCTION

The cost function developed here assumes that the owner-driver leases the prime-mover and the semi-trailer. All cost estimates are fully explained in Appendix 5.

TC = Total fixed and variable costs per annum ($)
FC = Total fixed costs per annum ($)
VC = Total variable costs per annum ($)

Now $TC = FC + VC$
$= 45\ 727 + (0.2934)D$

BREAK-EVEN POINT

The proposed operation is expected to break-even when Total Revenue equals Total Cost.

i.e. $TR = TC$
i.e. $0.476256Df = 45\ 727 + 0.2934D$
then $D\ (0.476256f - 0.2934) = 45\ 727$
If $f = 1.00$, $D = \dfrac{45\ 727}{(0.476256f - 0.2934)}$

i.e. $D = \dfrac{45\ 727}{0.182856}$
$= 250\ 071.09$

But if f = 0.75, the break-even distance D is

$$\frac{45\ 727}{0.063792} = 716\ 814 \text{ km!}$$

Thus, on the Sydney-Adelaide run, the break-even point is not reached until annual distance travelled reaches approximately 250 000 kilometres, with full capacity used on all trips, or approximately 717 000 km if the average load is three-quarters of capacity.

Take the case of full loads of 22 tonnes. If the break-even distance is divided by the round trip distance (2864 kilometres), the number of trips per year needed to break-even can be calculated. This reveals that at least 88 trips per year are required, which is eight trips every month (assuming the rig is idle for 4 weeks of the year).

RELAXATION OF THE ASSUMPTION OF A LINEAR COST FUNCTION

Variable costs have been assumed proportional to distance travelled and in this case the total cost function is 'linear'. This "linear" situation may not be appropriate if the owner-driver reaches his maximum physical capacity. It is inconceivable that an owner-driver could consistently undertake two round trips per week Sydney to Adelaide.

We can adapt the total cost function to this capacity constraint in two ways. If we assume that the owner-operator employs a driver to undertake some of the trips, the driver could be employed on either a trip basis or permanently.

Wages as a variable cost

Information provided by the L.D.R.T.A. suggests that many operators pay trip money of $300 per round trip Sydney to Adelaide (April 1980), which may be treated as a variable cost.

However, workmen's compensation and provision of annual leave can be expected to add approximately 20 per cent to this estimate.

If drivers' wages are included in the total cost function as a variable cost then the total cost function becomes

$$TC = FC + VC$$
$$= 45\ 727 + (0.2934)D + 360k$$

where k is number of trips undertaken by the driver.

If the driver undertakes alternate trips then $k = 0.5N$

$$\text{Thus } TC = 45\ 727 + 0.2934D + 360\ (0.5N)$$

$$\text{Now } N = \frac{D}{2d}$$

$$\text{Therefore } TC = 45\ 727 + 0.2934D + \frac{360}{2}\left(\frac{D}{2d}\right)$$
$$= 45\ 727 + 0.2934D + 0.0628D$$
$$= 45\ 727 + 0.3562D$$

The theoretical break-even point now occurs when

$$TR = TC$$

$$\text{i.e. } 0.476256D = 45\ 727 + 0.3562D$$
$$\text{i.e. } D = \frac{45\ 727}{0.120056}$$
$$= 380\ 880.58$$

That is, the operation will not become profitable until the annual distance travelled reaches approximately 381 000 kilometres. Once again, a capacity constraint has been reached, as travelling this distance entails 134 trips per year. With

the owner-operator and the driver each completing one trip per week, the operation reaches capacity at 96 trips per year, or approximately 275 000 kilometres.

By employing another driver each time this labour capacity constraint is reached, a stepped cost function is developed, the step at intervals of the distance equivalent of 48 trips (i.e. 137 472 kilometres).

To complete the analysis, it must be realised that a second capacity constraint exists - the *absolute* constraint of the number of hours which the rig can operate. This cut-off point may be expected to occur much earlier for an owner-operator than for a firm which can, by using 'quick-hitch' techniques, decrease turn-around time and hence increase the number of trips possible per annum.

APPENDIX 9 - BREAK-EVEN COST MODEL TO DETERMINE MINIMUM BACKLOADING RATES

In this Appendix a formula is derived to calculate the minimum backloading rate required to break-even in the long run, where all variable and fixed costs are to be met[1]. To calculate the minimum acceptable backloading rate, total revenue is set equal to total cost.

TR = Total round-trip revenue
TC = Total round-trip cost
c = Average annual total cost per kilometre (i.e. an annual utilisation figure is assumed)
d = Total round-trip distance
t_i = Tonnage moved on the ith leg of the journey
R_i = Rate per tonne on the ith leg of the journey
n = Number of legs of the journey

Let the nth leg be the backloading leg under examination.

$$\text{Now} \quad TR = \sum_{i=1}^{n} t_i R_i$$

$$\text{i.e.} \quad TR = t_n R_n + \sum_{i=1}^{n-1} t_i R_i \qquad (A)$$

$$TC = cd \qquad (B)$$

Setting Equation (A) = Equation (B)

$$t_n R_n + \sum_{i=1}^{n-1} t_i R_i = cd$$

(1) This formulation is based on *A Study of Intersystem Railway Freight Rating Practices*, Bureau of Transport Economics, Australian Government Publishing Service, Canberra 1976, Annex B.

Therefore,

$$t_n R_n = cd - \sum_{i=1}^{n-1} t_i R_i \qquad (C)$$

where $t_n R_n$ equals the revenue required on the backloading leg required to break-even for the round trip

Thus

$$R_n = (cd - \sum_{i=1}^{n-1} t_i R_i)/t_n \qquad (D)$$

The following example illustrates the use of the formula:

An owner-operator has obtained a 22-tonne load of freight at $32 per tonne and wishes to calculate the minimum revenue required on the return leg of the journey to break-even. The annual average total operating cost of his vehicle is 70 cents per kilometre. In this example, the journey consists of two legs only. Total round-trip distance is calculated at 2000 kilometres.

Substituting in Equation (C) above

$$t_n R_n = cd - \sum_{i=1}^{n-1} t_i R_i$$

$$\text{i.e. } t_2 R_2 = 0.7(2000) - 22(32)$$
$$= 1400 - 704$$
$$= 696 \qquad (E)$$

That is, the minimum revenue that must be earned on the backloading leg of the journey is $696. If the owner-driver is expecting to obtain a payload of 15 tonnes on the return journey then substituting in (E)

$$15R_2 = 696$$
$$\text{i.e. } R_2 = \$46.40$$

Thus the owner-operator must obtain at least $46.40 per tonne for the return journey (with a payload of 15 tonnes) if he is to break-even in the long run.

If members of the trucking industry wish to use equation (D), it is a simple matter to program an electronic pocket calculator to produce the required backloading rate. Trucking industry associations could approach firms which market calculators to provide information about suitable programmable calculators.

APPENDIX 10 - CALCULATION OF SHORT-TERM SURVIVAL RATES UNDER DIFFERENT METHODS OF FINANCE

It is assumed that owner-operators can, for a short time, forego their living allowances in both the self-financed and externally financed situations if monthly incomes are suddenly reduced. However, self-financed operators are not required to part with cash each month to cover interest on their funds invested in the vehicle, nor are they required to part with cash each month to cover the depreciation on the vehicle. However, the owner-driver with a leased vehicle is firmly committed to making these monthly payments to the lessor (finance company or bank), unless the lessor defers monthly loan commitments, which has occurred in exceptional circumstances. For example, the April 1979 truck 'blockades' placed many operators in a position where they could not meet payments. In some cases, finance companies accepted restructuring of payments, such as seven normal monthly payments over a six calendar month period.

Estimates of annual 'inescapable' costs[1] follow for both the self-financed and leased situations. Both cases assume identical operations and variable costs (as in Chapter 4 and Appendix 7).

(1) These costs are not strictly unavoidable in the economic sense - it is possible to obtain refunds on registration, etc, if the vehicle is not to be used. However, it is assumed that the operator wishes to continue in business and in this sense these costs become inescapable.

LEASED EQUIPMENT

	$
Total fixed costs	45 727
Less foregone living allowance	10 400
	35 327
Less foregone depreciation and interest on ancillary equipment	964
Inescapable costs per year[1]	34 363

SELF-FINANCED EQUIPMENT

Inescapable costs per annum for an owner-operator are:

	$
. registration and third party	261
. insurance	3 937[2]
. administration and sundry expenses	2 500

Total inescapable costs for the self-financed operator are thus $6698.

(1) These fixed costs comprise registration, insurances and lease payments.

(2) Comprehensive insurance for the self-financed operator is estimated at 4.5 per cent of the value of the equipment, rather than 6 per cent in the case of the operator with leased equipment, as insurance companies determining premiums assume that the owner-driver who is entirely self-financed is a better risk.