Transport of Slaughter Cattle in Australia

Report

This Report presents the results of an investigation of the market conduct and performance of that part of the road haulage industry which undertakes the transportation of cattle intended for slaughter at abattoirs for human consumption. In addition, an assessment of the costs of transhipping beef from processing points to retail outlets is made. The Ministerial terms of reference for the study are contained in Appendix I.

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Transport of Slaughter Cattle in Australia

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FOREWORD

In 1978 the Prices Justification Tribunal (PJT) published the Report 'Beef Marketing and Processing'. The Tribunal examined the charges and margins associated with the marketing and processing of beef in Australia. The study arose out of the general concern of the community about price relativities between producers and consumers. However, because of the time constraint under which the study was conducted, it was not possible for the Tribunal to consider in detail the impact of transportation costs on beef prices.

In response to a Ministerial reference the Bureau of Transport Economics (BTE) undertook a study in which the economic factors associated with road transportation of cattle destined for slaughter at meatworks were examined. The study supplements the work of the PJT by analysing the margins existing in the road haulage industry in 1977-78 and the incidence of an increase in transport costs on producers and consumers. The study also addressed the possible implications of road/rail freight rate differentials on competition between the two modes of transport.

The study was carried out by a project team from the BTE's Economic Assessment Branch. The study team consisted of D. Short, L. Krbavac, L. Walker and R. Campbell.

A survey of road movements of slaughter cattle and the estimation of the road transport task were undertaken by Hassall and Associates, Agricultural Farm Management and Environmental Consultants. Rail data were supplied by the State Rail Authorities and the Australian National Railways Commission. The Bureau and the Consultants also held discussions with numerous bodies and individuals associated with the beef cattle industry in Australia. The BTE wishes to express its appreciation for the assistance given by all those involved in this study.

G.K.R. REID
Director

Bureau of Transport Economics
Canberra
February 1982

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SUMMARY

This study supplements the work of the Prices Justification Tribunal (PJT) (1978) relating to the margins applying to beef marketing and processing in Australia. While the PJT only cursorily examined the transport sector of the beef marketing chain, the general conclusion of the PJT was that beef marketing and processing operated in a competitive environment.

The analysis of road transportation of cattle from farmgate to abattoir undertaken for this Report indicated that, in 1977-78, this sector of the marketing chain was highly competitive. There was no evidence to suggest that abnormal profits were widespread in the industry. Tas was the only State where estimates of average revenues were substantially above those for average total costs. The Tasmanian situation may reflect special circumstances such as the dominance of relatively short haul movements and the area licensing arrangements for road transport operations in that State. The study did not extend to an examination of the apparent impact on market structure and entry of the licensing arrangements which applied in Tas and some other States in 1977-78.

The road sector was the dominant mode of transport in the movement of slaughter cattle in 1977-78 particularly over short to medium line haul distances. Road transport accounted for over two-thirds of the Australian transport task of 5200 million cattle-kilometres.

An analysis of intermodal competition on the mainland, over routes where there was the potential for road and rail transport to compete, revealed that rail rates were significantly lower over all distances in Qld and Vic. However in terms of the transport task, road was still the dominant mode in these States for distances up to 500 kilometres despite its price disadvantage. In the remaining States road transport had a price advantage over rail for distances ranging from 150 to 500 kilometres, but held the major share of the market over distances considerably greater than those for which it had a price advantage. In SA and WA road transport dominated the movement of cattle up to a distance of 600 kilometres, while in NSW the range extended to 1000 kilometres.

The conclusion arising out of the analysis of intermodal competition is that there appears to be little opportunity for the railway systems on the mainland to increase their share of the market over the short to medium line haul range under the existing relative price regimes unless there is a significant increase in road freight rates relative to rail transport or a marked increase in the quality of rail services.

The estimated expenditure on the transportation of slaughter cattle from farmgate to abattoir in 1977-78 was $108 million, approximately 10 per cent of the saleyard value of cattle. Expenditure on road transport amounted to $89.3 million while outlays on rail transport were $18.5 million. Freight charges for the movement of livestock to abattoirs comprised, on average, five per cent of the retail price of the carcass. The total freight charges, encompassing the movement of livestock to processing points and transhipment of the carcass to retail outlets, was estimated to be $22.64 per beast, approximately 11 per cent of the retail value of the carcass.

An evaluation of the likely incidence of an increase in the costs of transporting beef from farmgate to retail outlets revealed that producers would bear at least half, and probably more, of any increase. This arises because the demand for beef products is more responsive to price increases than the supply of these products. Finally, the likely decrease in demand for beef products, resulting from a 10 per cent increase in transport charges between the farmgate and retail outlets, was estimated to be less than one per cent.

CHAPTER 1—SCOPE AND PURPOSE OF THE REPORT

This report presents the results of an investigation of the market conduct and performance of that part of the road haulage industry which undertakes the transportation of cattle intended for slaughter at abattoirs for human consumption. In addition, an assessment of the costs of transhipping beef from processing points to retail outlets is made. The Ministerial terms of reference for the study are contained in Appendix I.

STRUCTURE OF THE REPORT

Chapter 2 provides a review of past research into the transportation of cattle in Australia. Previous studies are few. However, in addition to the PJT report, studies by the BTE and Bureau of Agricultural Economics (BAE) are reviewed.

The economic factors influencing the transportation of cattle are described in Chapter 3. Trends in the demand and supply of cattle, and the factors which underlie them, are examined for the period 1970 to 1980.

In Chapter 4, the magnitude of the transport task in Australia in 1977-78 based on the movement of slaughter cattle from farmgate to saleyard, farmgate to abattoir and from saleyard to abattoir, is presented. The task is subdivided into movements by road and rail for each State and the NT.

Based on a survey of a representative group of road hauliers, Chapter 5 contains an analysis of the market conduct and performance of the road transport industry. In particular, this chapter examines costs, revenues and freight rates for the movement of slaughter cattle in 1977-78.

In Chapter 6, the significance of expenditure on the transportation of slaughter cattle relative to their value is analysed. The importance of transport costs in relation to the retail price of beef is also discussed.

In Chapter 7, the potential for either road or rail transport to increase its share of the market to transport cattle to meatworks is investigated. Finally, the incidence of an increase in transport costs on producers and consumers and the impact on demand due to a rise in transport costs is presented.

Chapter 8 contains the conclusions of the report.

CHAPTER 2—OVERVIEW OF PREVIOUS STUDIES

The pattern of cattle movements has attracted scant attention from Australian researchers. In the few instances where cattle movements have been considered, they were typically compounded with a number of similar commodities and the resulting flows then considered in aggregate. The principal sources of information have been research reports and information bulletins prepared by the BTE and BAE, and the recent report of the PJT. These are outlined briefly below.

STUDIES BY THE BTE AND BAE

The BTE carried out interregional freight movement studies covering all transport modes for 1971-72 and 1975-76 and, although cattle movements were included in both studies, in neither case were cattle identified as a separate commodity group (BTE 1976, 1978). For 1975-76, the BTE carried out a separate study of rail freight movements but cattle movements were included in 'other freight' (BTE 1979).

More recently, the BTE commissioned a study of the transportation of specified rural products for the year 1975-76 (BTE 1981). All principal freight flows were identified and the costs to freight originators for the transportation of their products from farmgate to processing point or final destination were estimated. Both intra and interregional commodity flows were examined[1]. Although cattle movements were identified separately, the degree of generality of the study meant that individual stages of journeys were not distinguished and slaughter and non-slaughter cattle were not identified separately. Furthermore this study did not collect the cost and price information which is needed for an economic analysis of the cattle transport industry.

The BAE has also carried out a number of studies on the geographic movements of cattle (BAE 1971, 1974, 1976; Girdlestone and Parsons 1973). The magnitude and type of inter-property movements analysed in these studies point to the increasingly important role of transport in the development of the beef cattle industry. The BAE has identified 26 distinctive regions of cattle production in Australia and the regional inputs and outputs in terms of cattle purchased and slaughtered. These industry data are helpful in determining the need for transport facilities.

REPORT BY THE PJT—BEEF MARKETING AND PROCESSING

In December 1978 the PJT presented the report of its inquiry into beef marketing and processing in Australia to the Ministers for Business and Consumer Affairs and Primary Industry (PJT 1978). The terms of reference of this inquiry directed the PJT to examine, *inter alia*, the charges and margins applying to beef marketing and processing.

In its report the PJT recognised the close association between transport and livestock production and selling procedures. Its consideration of transport was necessarily limited by the time constraint under which it was operating and no attempt was made to identify the flows of beef cattle.

The PJT noted the difficulty in obtaining meaningful estimates of road transport charges. However, it compiled representative freight charges in the various States for both road and rail transport. The PJT commented that, in general, transportation of cattle by rail was cheaper than by road.

1. Details of interregional movements of cattle (including calves) by regional origins and destinations for 1975-76 are available in microfiche on application to the BTE.

The representative rail freight charges compiled by the PJT revealed a considerable disparity between rates for similar journeys. While recognising the complexities involved in the determination of freight rates, it argued that this was an area requiring periodic assessment by Commonwealth and State authorities. The PJT also noted difficulties arising from inadequate rail capacity in central Australia and northern Qld. Several problems relating to the road transportation of cattle were recognised, the most significant of which was the increased incidence of bruising.

The PJT concluded that, in general, there is wide competition at all stages of the beef marketing chain and that it had discovered no significant area of excessive margins or abnormal profits. However it did not report on the margins of road operators or of the railways.

This study by the BTE provides an extension to the PJT study in that it identifies the major flows of slaughter cattle in Australia and analyses the margins of road hauliers in the movement of these cattle.

CHAPTER 3—FACTORS INFLUENCING DEMAND AND SUPPLY FOR CATTLE TRANSPORT SERVICES

The objective of this chapter is to outline the factors affecting the demand and supply for slaughter cattle transport in Australia. Four main points are discussed—trends in the beef cattle industry, cyclical factors, seasonal factors and the regulatory framework affecting the transportation of cattle.

TRENDS IN THE BEEF CATTLE INDUSTRY

Tables 3.1 and 3.2 summarise Australian beef cattle production and slaughtering in the 1970s. The tables show that Australian beef cattle numbers increased rapidly in the first half of the 1970s, peaked in 1976 and have subsequently declined sharply. Cattle slaughterings reached a peak in 1978 at more than double the 1970 level, but have since declined.

TABLE 3.1—CATTLE AND CALVES (BEEF)—LIVESTOCK NUMBERS AS AT 31 MARCH

('000 head)

Year	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
1967	3 075	1 575	6 023	441	1 159	271	1 096	11	13 654
1968	3 518	1 526	6 529	466	1 236	314	1 129	10	14 730
1969	3 892	1 931	6 913	633	1 364	342	1 189	11	16 277
1970	4 726	2 501	6 812	792	1 500	406	1 178	13	17 929
1971	5 654	3 099	7 281	966	1 604	496	1 145	16	20 261
1972	6 624	3 520	8 379	1 263	1 801	595	1 165	18	23 365
1973	7 164	3 488	9 191	1 357	2 004	660	1 237	18	25 117
1974	7 772	3 906	9 767	1 482	2 153	664	1 320	17	27 082
1975	8 294	4 235	10 364	1 654	2 376	694	1 434	17	29 066
1976	8 507	3 996	10 844	1 683	2 487	691	1 602	22	29 833
1977	7 765	3 423	11 036	1 423	2 313	626	1 663	18	28 269
1978	6 828	2 963	11 059	1 073	2 137	558	1 681	15	26 314
1979	5 976	2 619	10 462	926	1 964	496	1 784	14	24 241
1980	5 612	2 725	9 957	910	1 938	493	1 730	13	23 378

Sources: ABS (1980a and earlier issues).
ABS (1980b and earlier issues).

TABLE 3.2—CATTLE AND CALVES SLAUGHTERED—PASSED FOR HUMAN CONSUMPTION, YEAR ENDED 30 JUNE

('000 head)

Year	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Aust
1967	1 455	1 706	1 677	265	301	170	67	10	5 650
1968	1 447	1 713	1 664	245	333	172	74	10	5 656
1969	1 417	1 514	1 823	220	366	178	80	10	5 672
1970	1 545	1 709	1 680	249	402	178	83	15	5 921
1971	1 573	1 845	1 590	264	348	162	69	19	5 870
1972	1 717	2 074	1 708	291	389	185	77	20	6 461
1973	2 349	2 560	2 005	393	478	261	78	25	8 148
1974	1 925	2 260	1 740	359	487	259	67	24	7 120
1975	2 389	2 638	2 046	465	541	262	62	34	8 297
1976	3 002	3 298	2 521	549	791	348	67	39	10 615
1977	3 499	3 594	2 830	656	915	358	89	40	11 981
1978	3 841	3 856	3 148	745	845	363	127	45	12 968
1979	3 256	2 928	3 296	658	747	281	142	39	11 348
1980	2 476	2 237	2 606	502	610	218	204	35	8 887

Sources: ABS (1980a and earlier issues).
ABS (1980b and earlier issues).

The importance of Australia's export markets is illustrated in Table 3.3. During the decade to 1980 exports of beef and veal ranged from 40 per cent to 59 per cent of total production.

TABLE 3.3—SUPPLY AND UTILISATION OF BEEF AND VEAL—AUSTRALIA, YEAR ENDED 31 MARCH

Year	Production[a] ('000 tonnes)	Exports[a,b] ('000 tonnes)	Exports as proportion of production (per cent)
1970	1 003	484	48.3
1971	1 103	515	46.7
1972	1 322	728	55.1
1973	1 569	889	56.7
1974	1 268	505	39.8
1975	1 696	740	43.6
1976	1 899	849	44.7
1977	2 149	1 087	50.6
1978	2 133	1 148	53.8
1979	1 765	1 043	59.1
1980	1 553[p]	845[p]	54.4[p]

a. Carcass weight.
b. Excluding beef and veal used in canning.
p. Provisional.

Source: BAE (1981 and earlier issues).

The saleyard prices for cattle over this period are shown in Table 3.4. Following a sharp decline in prices in 1974 and 1975, cattle auction prices exhibited an upward trend over the remainder of the decade. With the decline in livestock numbers after 1976 (Table 3.1) and widespread drought, production of beef and veal declined in 1979 and 1980 and contributed to the rise in prices.

TABLE 3.4—SALEYARD PRICES OF CATTLE—AUSTRALIA, 1970 TO 1980

(cents per kilogram)[a]

Year	Yearling	Ox	Cow
1970	66.3	61.4	53.7
1971	67.5	63.3	55.7
1972	66.5	65.4	57.0
1973	82.7	88.5	74.9
1974	67.7	53.7	46.5
1975	37.6	32.2	22.9
1976	46.8	48.3	31.9
1977	53.7	49.6	42.2
1978	72.7	70.4	60.8
1979	157.6	148.5	135.9
1980	162.5	149.3	132.7

a. Prices are on an estimated dressed-weight basis and, with the exception of yearling, are for export-quality stock. Quotation is the monthly average of fat-stock prices in each capital city market, weighted by monthly production of each meat in the respective States.

Source: BAE (1981 and earlier issues).

The marked variability in the volume of slaughterings from year to year and the generally unpredictable nature of slaughter rates has made it extremely difficult for the cattle transport industry to plan the supply of appropriate transport capacity for this industry. An oversupply or undersupply of transport facilities can easily occur depending on the responsiveness of the transport industry.

THE BEEF CYCLE

The BAE and others have identified a cyclical nature in deviations from trends in cattle numbers, slaughterings and prices both in Australia and overseas (Reynolds 1977; Reeves and Hayman 1975; Smith and Smith 1979). These deviations are attributed to two basic forces.

- Internal forces based upon producers' reactions to market trends, within the bounds of biological and technical constraints. Producers' expectations regarding supply, demand and price movements are reflected by their withholding or releasing breeding stock. In turn this determines after significant time lags the supply of cattle available for slaughter and the level of domestic beef production.
- External forces based on supply, demand and price movements in the export market. Australia, being a major exporter of beef, is sensitive to changing circumstances both within importing and competing export nations. Internal cyclical factors operating in these nations may reinforce, negate or redirect Australia's internal cycle.

The estimated length of these cycles varies from 7-13 years (Smith and Smith 1979). Seasonal conditions, structural changes in the industry and changes in regional distribution of production may all affect the cycle. Also the export market orientation of Australia's beef cattle industry makes it particularly vulnerable to factors associated with changes in export demand.

These cyclical forces affect turnoff and contribute to the variations in the level and composition of slaughtering activity over time. This in turn affects the level and composition of demand for cattle transport.

SEASONAL AND OTHER FACTORS

In the shorter term the geographical distribution of good and poor seasons can result in abnormal or subnormal demands on transport facilities. Variations in seasonal conditions may generate cattle flows from areas suffering poor conditions to those with relatively better fattening conditions, and also are a vital factor in producers' decisions as to the timing of turnoff for slaughter. As seasonal conditions vary so greatly throughout Australia, they tend to contribute to short-term regional imbalances between the demand for and supply of transport services for cattle.

The demand for cattle transport is also affected by switches in production from beef to wool or wheat and vice versa. The scope for such switches is greatest in southern Australia and least in the specialist beef areas in the north.

The buying strategies of abattoirs and stock agents, and to a lesser extent the marketing strategies of producers, may also influence the pattern of cattle movements. Where cattle are moved to more distant saleyards and abattoirs, the differential in transport prices between rail and road gains significance.

REGULATORY FRAMEWORK

The factors outlined in the previous sections influence the demand for slaughter cattle transport. The supply and price of transport services depends on several factors[1] including government regulations applying to transport operators. This section discusses some of the regulations facing cattle road hauliers in Australia in 1977-78; these regulations can be conveniently placed into three categories: regulation of standards, revenue raising regulations[2] and economic regulations[3].

Regulation of standards

Regulation of standards varied from State to State, but in general they encompassed:

- load restrictions, both on the vehicle as a whole and fixed maximum weights per axle;
- road worthiness requirements;
- safety regulations (including periodic inspection of vehicles, restricted hours of driving, and the keeping of drivers' log books); and
- animal health requirements for road transportation of livestock.

Revenue-raising regulations

The three main revenue-raising regulations in 1977-78 were registration fees and associated taxes, road maintenance contributions and Commonwealth fuel excise.

Annual registration fees and associated taxes varied from State to State according to the mass/power of vehicles. Thus no useful generalisations can be made regarding the level of these charges.

Commonwealth fuel excise in this period was 5.155 cents per litre on motor spirits and distillate. However, in non-metropolitan areas the Commonwealth Government subsidised fuel under the Petroleum Products Freight Subsidy Scheme.

A road maintenance contribution charge was operative in all mainland States in 1977-78. The charge did not apply in Tas, NT or ACT. The road maintenance charge was imposed on all commercial journeys whether laden or unladen and was levied at the rate of 0.17 cents per tonne-kilometre based on the tare weight plus 40 per cent of the

1. Chapter 5 analyses the operating costs incurred by road hauliers of cattle in 1977-78.
2. Such as road maintenance contributions, the revenue from which was earmarked for road maintenance after deducting administration costs; and imposts which are paid into consolidated revenue.
3. In this context, economic regulations are those primarily designed to influence the modal share of traffic between road and rail, or to protect existing road operators against potential entrants. Some of these regulations have a subsidiary revenue-raising component.

load capacity of the vehicle. However, the class of vehicles upon which the charge was levied varied. In NSW, Vic and Qld the charge applied to all commercial vehicles with a carrying capacity greater than 4.1 tonnes. In SA and WA the limits were 8.15 tonnes and 8.13 tonnes respectively[1].

Economic Regulations

In 1977-78, SA and NSW followed a policy of open road competition while all other States followed policies of economic regulation to varying extents.

In Qld, permits were necessary for the road transportation of goods over distances of more than 40 kilometres in competition with rail. Before November 1977 a maximum fee of 1.8 cents per tonne-kilometre was charged based on load capacity and distance travelled. For the carriage of cattle a maximum charge of 0.3 cents per tonne-kilometre applied. However, primary producer owned vehicles with a load capacity less than 4.1 tonnes were exempt. Also a large section of western Qld, approximating the area west of a line connecting St George in the south and Cape York in the north, was exempted from the permit system for the carriage of cattle. After 1 November 1977 fees for permits were abolished. More recently the necessity to obtain a permit for general goods carriage has been waived in Qld.

WA followed a licensing system for commercial operation where licences were distance restricted, on a radius from the capital city GPO or the base of the road operator. Permits involving a fee were generally necessary if a journey was to exceed the permissible distance. However, the carriage of livestock was free of this restriction. In 1977-78, trip fees in WA ranged from $0.10 per tonne to $6.00 per tonne depending on the goods carried and distances moved.

A radial based licensing system also operated in Vic in 1977-78. Trip permit fees were applicable to the main 'as of right' licence which covered a radius of 80 kilometres from Melbourne. Trip permit fees ranged from $2.50 to $11.00 within this area depending upon the load capacity of vehicles, and were from $3.00 to $28.25 for journeys beyond 80 kilometres. However, State-wide licences for an annual fee were available for specific purposes, where a vehicle was used solely to carry any or some of certain specified products, including livestock. Since 1 July 1981 the permit system has been waived in Vic, except for several bulk items.

The Tasmanian transport regulatory system is unique in Australia. For the purpose of regulatory control the State is divided into eight areas and three different types of licences are available:

- carrier licences, which authorise carriage on specific routes and are usually limited to remote areas not in competition with rail;
- cart licences for the carriage of goods within each of the eight areas, a permit fee must be paid to carry designated goods outside each area; and
- ancillary licences in cases where the transport activity is subsidiary to the main commercial operation.

Fees for the carriage of goods outside the established areas ranged from 0.5 to 4.0 cents per tonne-kilometre in 1977-78. Meat in carcass form was subject to a permit fee in Tas of 0.5 cents per tonne-kilometre in 1977-78 while the movement of livestock was not subject to permit fees.

In summary, cattle carriers in 1977-78 were subject to a specific regulatory impost based on the movement of cattle in only one area—the eastern parts of Qld. In addition licensing arrangements applied to cattle carriers in Tas and Vic. Finally, the regulatory imposts in a number of States which applied to a range of other goods will have indirectly raised the total costs of carriers who transport both cattle and other goods.

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1. Road maintenance contributions were abolished in 1979.

CHAPTER 4—TRANSPORTATION OF SLAUGHTER CATTLE IN AUSTRALIA 1977-78

During the financial year 1977-78, 10.4 million cattle were slaughtered in Australia for the domestic and export markets. While the treatment of cattle for these markets occurred in all States and Territories, over 80 per cent of slaughterings took place in NSW, Vic and Qld[1].

The purpose of this chapter is to illustrate the magnitude of the transport task of moving slaughter cattle to processing points throughout Australia during the financial year 1977-78. The task comprises the movement of cattle by either road or rail transport from farmgate to abattoir, farmgate to saleyard and saleyard to abattoir, but excludes the movement of calves.

Before outlining the transport task there is a brief discussion of the procedure used to estimate the task and the data sources employed.

ESTIMATION PROCEDURE FOR SLAUGHTER CATTLE TRANSPORT TASK

To facilitate comparison of the relative shares of the task performed by road and rail transport and to demonstrate the significance of the variation in the task between States, the cattle transport task is defined in terms of cattle-kilometres[2].

To assist in the description of the transport task each State was divided into regions[3] based on the 1975-76 statistical divisions or statistical subdivisions. The NT regions are based on the BTE rural products study (BTE 1981).

Transport flow matrices for slaughter cattle movements were developed for each State and mode of transport as a precursor to estimation of the transport task.

Derivation of the transport task required estimation of cattle movements and the distances cattle were moved. In many situations the transportation of cattle to abattoirs involves multi-movements of stock, and therefore cattle movements exceed the number of cattle slaughtered.

Consequently two 'average' distance calculations are important in the description of slaughter cattle movements to processing points. The average distance can be described either for the number of cattle movements or for the number of cattle turned off for slaughter. The former method estimates the average trip length per cattle movement while the latter method estimates the average distance which cattle moved from farmgate to abattoir. Both methods have been employed in this report to assist in describing the transport task.

Rail movements of cattle in 1977-78 were derived from data obtained from the State rail authorities and the Australian National Railways Commission (Australian National). It was not possible to identify, and therefore to exclude from the rail data, cattle moved for either agistment or for sale other than to meatworks. Insofar as these movements occurred on any railway system, the estimate of the rail transport task for slaughter cattle is overstated. The transport task for rail movements of cattle in each State was calculated by aggregating the products of distance moved between rail stations by cattle flows.

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1. Details of cattle production and slaughterings by States and the NT are contained in Appendix II.
2. An alternative approach would have been to express the transport task in terms of tonne-kilometres. Because of the lack of consensus, both within and between States, regarding the average weight of beasts transported, this method was not adopted.
3. For details of regions refer to Appendix III.

Estimates of road movements of cattle were derived from abattoir slaughter statistics and a survey of abattoirs, road transport operators, stock and station agents, saleyards and institutional organisations associated with the beef cattle industry[1]. The interregional cattle-kilometres by road were estimated using distances between regional centres. The regional centres were based on the nodal points used in the BTE study of rural products (BTE 1981). The intraregional cattle-kilometres for road were based on survey estimates of the number of cattle moved within regions and the distances travelled.

ESTIMATED SLAUGHTER CATTLE TRANSPORT TASK

Table 4.1 and Figure 4.1 summarise the estimated transport task for the movement of slaughter cattle in Australia in 1977-78, by State and Territory and by mode[2].

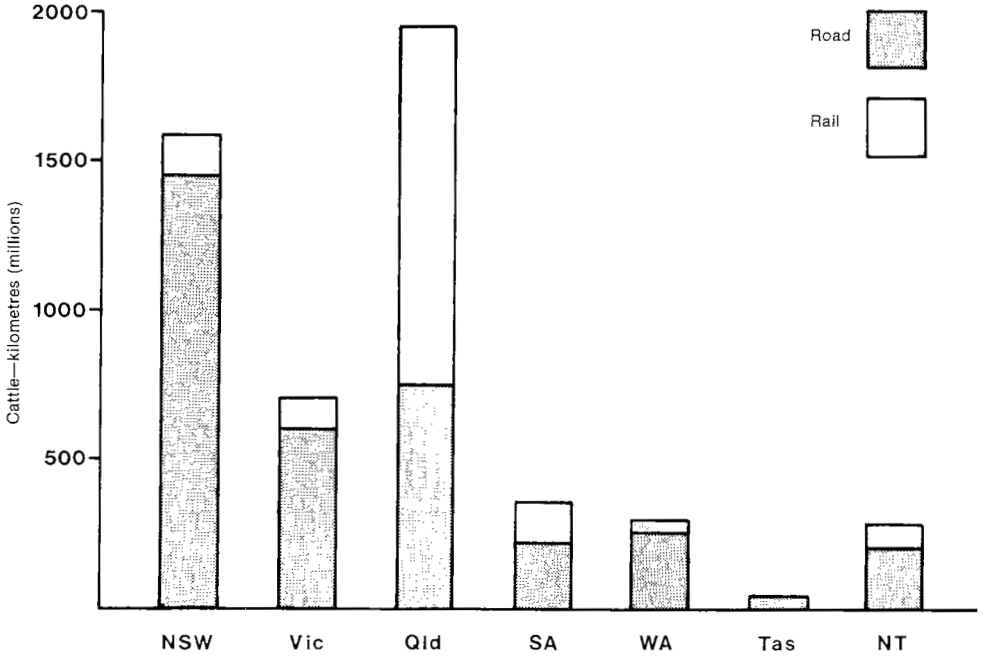
TABLE 4.1—TRANSPORT TASK FOR SLAUGHTER CATTLE BY STATE/TERRITORY OF ORIGIN, 1977-78

	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Aust[a]
No turned off for slaughter (millions)	3.57	2.26	2.57	0.73	0.73	0.30	0.23	b	10.39
No of cattle movements (millions)									
Road	6.14	4.23	2.08	1.09	1.18	0.36	0.17	na	15.25
Rail	0.18	0.36	1.83	0.25	0.02	c	0.06	d	2.70
Total[a]	6.31	4.60	3.90	1.34	1.20	0.37[c]	0.23	na	17.95
Cattle-kilometres (millions)									
Road	1 462.5	595.4	751.8	229.3	265.4	27.3	192.0	na	3 523.6
Rail	113.2	116.11	204.8	123.2	19.1	0.7	90.2	0.2	1 667.4
Total[a]	1 575.7	711.41	956.5	352.6	284.5	28.0	282.2	0.2	5 191.0
Average distance per cattle movement (trip length) (kilometres)									
Road	238	141	362	210	225	75	1 143	na	231
Rail	646	318	660	497	850	240	1 483	381	618
Average distance travelled per beast from farmgate to abattoir (kilometres)	442	314	761	481	390	95[e]	1 234	na	500

a. Figures may not add to totals due to rounding.
b. Turnoff from ACT not identified separately from survey of abattoirs. Consequently road movements from ACT not available separately.
c. Approximately 3000 head only were moved on Australian National, Tasmanian Region rail system.
d. Approximately 400 head railed from ACT on PTCNSW rail system.
e. The cattle-kilometres and calculation of average distance moved for slaughter cattle from Tas farms excludes the distances moved by sea of intrastate fat cattle from Flinders and King Islands to Tas and interstate fat cattle from Flinders Island, King Island and Tas to Melbourne.
na not available.

Source: BTE.

1. Further details of the road estimation methodology are contained in Appendix III.
2. Extensive road and rail transport data for slaughter cattle movements in each State and Territory and for interstate movements are contained in Appendix IV.



a. Road movements from ACT not available separately. Cattle—kilometres performed for rail movements from ACT were 0.2 million in 1977-78.

Source: BTE

Figure 4.1 Transport task for slaughter cattle by State/ Territory of origin and by mode[a], 1977-78

The 10.4 million head turned off for slaughter in 1977-78 involved 18 million cattle movements for which the total transport task amounted to 5191 million cattle-kilometres. While the largest turnoff of slaughter cattle was from NSW properties in 1977-78 the largest transport task (in cattle-kilometres) was for movements originating in Qld. Queensland cattle destined for slaughter travelled on average, 760 kilometres between farmgate and abattoir, while NSW cattle were moved approximately 440 kilometres. Although NT slaughter cattle travelled the longest distances to abattoirs, the associated transport task represented only five per cent of the Australian slaughter cattle transport task due to the relatively small number of cattle movements in the NT.

Of the total transport task nearly 70 per cent was for the movement of cattle originating in Qld and NSW. This was due to the combination of the relatively larger number of cattle movements and the generally longer distances per cattle movement that occurred on both modes of transport in these two States. For cattle originating in Vic, the associated 4.6 million cattle movements in 1977-78 represented nearly 26 per cent of total cattle movements in Australia. However, cattle were moved on average, over shorter distances in Vic compared with movements in the other mainland States and the NT. Consequently the transport task of 711 million cattle-kilometres accounted for less than 14 per cent of the Australian transport task in 1977-78.

The road transport task of 3524 million cattle-kilometres represented over two-thirds of the total transport task. Road was the dominant mode of transport in the NT and all States except Qld, where rail accounted for the major share of the transport task.

CHAPTER 5—FREIGHT RATES AND COSTS—ROAD TRANSPORTATION OF SLAUGHTER CATTLE IN AUSTRALIA 1977-78

This chapter describes the organisation of the beef cattle road transport industry and analyses its financial structure. A comparison is made between costs incurred and revenues obtained by enterprises involved in the movement of slaughter cattle.

A survey of a representative group of road hauliers forms the basis of the BTE analysis. The survey group was selected from a list of operators engaged in the transport of beef with a view to making it broadly representative with respect to regional dispersion of base operations and size of enterprise. It was not possible to employ statistical sampling techniques for the survey as information on the total population of cattle hauliers and their size of enterprise was not available. Hence a level of statistical confidence cannot be attached to the survey results and care should be taken with their interpretation.

SURVEY RESULTS

A total of 76 hauliers involved in the road transportation of cattle in 1977-78 and 1979-80 was surveyed[1]. The composition of the hauliers by scale of enterprise by vehicle type in 1979-80 is outlined in Table 5.1. The number of all types of vehicles was collected for 1979-80 while only the number of prime movers was obtained for 1977-78.

Table 5.1 shows that most hauliers in the survey owned between one and five vehicles in 1979-80 that had cattle carrying capacity (that is tray top trucks, single deck trailers and double deck trailers). Double deck trailers constituted approximately 69 per cent of all cattle transport units and single deck trailers 24 per cent.

TABLE 5.1—COMPOSITION OF ROAD HAULIERS—SCALE OF ENTERPRISE BY VEHICLE TYPE, 1979-80

Scale of enterprise by number of cattle transport units[a]	*Number of hauliers*	*Vehicle type*			*Total cattle transport units*
		Tray top truck	*Single deck trailer*	*Double deck trailer*	
1-5	41	17	63	45	125
6-10	23	11	35	122	168
11-15	3	1	7	29	37
16-20	5	9	19	66	94
21+	3	3	15	133	151
Total	75[b]	41	139	395	575

a. Cattle transport unit refers to a vehicle with cattle carrying capacity. Included in this definition are tray top trucks, single deck trailers and double deck trailers. Prime movers as such are excluded.
b. One haulier did not provide sufficient detail to be included in this analysis.

Source: Surveys undertaken by Hassall and Associates and BTE.

1. A total of 70 road hauliers in all mainland States was surveyed by Hassall and Associates. A further six operators in Tas were interviewed by officers of the BTE. The survey results are described further in Appendix V.

The number of trailers per enterprise varied from one to as many as 100 with the most common trailer fleet size being two units. In general, the smaller enterprises employed single deck trailers while the larger firms preferred the double deck unit.

In addition to single and double deck trailers, hauliers used tray top trucks and road trains to transport cattle. Road trains are formed from combinations of single and/or double deck trailers and those in the survey generally had a capacity of up to two double deck trailers.

In Table 5.2 the scale of enterprises in 1977-78 is indicated by the number of prime movers operated by hauliers in each State. The table illustrates that in 1977-78 approximately 34 per cent of the hauliers in this survey operated two or less prime movers and that 69 per cent operated five or less. The highest proportion of small scale operations occurred in Tas followed by Qld where hauliers operating two or less prime movers represented 67 per cent and 47 per cent respectively of the groups surveyed in those States.

TABLE 5.2—COMPOSITION OF ROAD HAULIERS—SCALE OF ENTERPRISE BY NUMBER OF PRIME MOVERS, 1977-78

Scale of enterprise by number of prime movers	*Number of hauliers by State*						*Total*
	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	
1-2	5	5	7	—	3	4	24
3-5	4	7	6	3	3	2	25
6-10	6	6	2	—	3	—	17
11-15	1	1	—	—	—	—	2
16-20	—	—	—	—	1	—	1
21+	2	—	—	—	—	—	2
Number of hauliers operating prime movers	18	19	15	3	10	6	71
Number of hauliers surveyed	19	21	16	3	10	6	75[a]

a. One haulier did not provide sufficient detail to be included in this analysis.
Source: Surveys undertaken by Hassall and Associates and BTE.

The average capacity of each type of cattle transport unit (that is tray top truck or prime mover/trailer combination) in each State is outlined in Table 5.3[1]. The lower average load carried in Vic is due to lower maximum allowable load limits operating in that State. The table also presents the estimates of average liveweight per beast used by the BTE as the basis for comparing costs and revenues per tonne-kilometre in the remainder of this chapter.

TABLE 5.3—AVERAGE CAPACITY BY VEHICLE TYPE AND AVERAGE BEAST LIVEWEIGHT—ALL STATES

State	*Number of beasts per loaded:*			*Average liveweight per beast (tonnes)*
	Tray top truck	*Single deck trailer*	*Double deck trailer*	
NSW	13	26	50	0.35
Vic	13	24	40	0.35
Qld	13	26	50	0.30
SA	13	26	50	0.35
WA	13	26	50	0.30
Tas	13	26	a	0.30

a. Double deck trailers are not extensively used in Tas.
Source: Surveys undertaken by Hassall and Associates and BTE.

1. The road cattle transport units and rail wagons employed in the carriage of cattle in 1977-78 are described further in Appendix VI.

All firms surveyed were engaged in road haulage activities other than the transportation of cattle in 1977-78. The survey indicated that nationally approximately 60 per cent of the vehicle utilisation was for cattle carrying operations and 40 per cent for other purposes. Cattle carrying was above this proportion in Tas and NSW and below it in Vic and SA.

Table 5.4 details the average utilisation of prime movers by hauliers for all purposes in each State during 1977-78. A possible reason for the relatively high average utilisation of prime movers in NSW of 196 000 kilometres compared with 120 000 kilometres in Qld may have been the use of more than one driver per vehicle on a shift basis. As noted in Table 5.2 there was a greater proportion of large transport firms in the group of hauliers surveyed in NSW than in Qld.

TABLE 5.4—ESTIMATED KILOMETRES PERFORMED PER PRIME MOVER OWNED BY HAULIERS—ALL STATES, 1977-78

State	*Number of hauliers*	*Average kilometres travelled per vehicle*	*Standard deviation*
		('000 kilometres)	
NSW	15	196	45
Vic	16	154	38
Qld	14	120	66
SA	3	160	76
WA	10	125	56
Tas	6	102	59
Aust	64[a]	162	59

a. Some hauliers did not keep a record of the total kilometres performed. Of the 71 hauliers who operated prime movers, seven did not provide sufficient data to enable estimation of 1977-78 kilometres.

Source: Derived from surveys undertaken by Hassall and Associates and BTE.

The smaller scale enterprises, represented by owner driver operations, generally do not achieve the higher rates of vehicle utilisation associated with larger companies operating a fleet of vehicles and employing drivers on different shifts. Indeed, those operators owning two or less prime movers achieved an average utilisation of only 125 000 kilometres per year or 77 per cent of the average utilisation for the whole group. The number of small operators or owner-drivers included in the survey may therefore influence the comparisons of vehicle utilisation by State[1].

Revenue

In regard to transport charges, the survey results indicated that customers were most commonly charged on a per kilometre basis for vehicle loads, with differential rates for tray top, single deck, double deck and road train operations. Occasionally contracts were drawn in which the customer was charged on a per head basis. However, this occurred relatively infrequently. A minimum charge, applying to cattle movements of less than 30 to 50 kilometres, was also levied by most hauliers.

As the double deck trailer was the unit most commonly used for the road transportation of cattle, Table 5.5 documents the rates charged for these vehicles in 1977-78 for distances greater than 320 kilometres. Average rates charged per kilometre for loaded double deck trailers varied between States, ranging from $0.88 in WA to $1.90 in Qld. It was general practice in Qld to quote rates on a K-wagon basis, as used by the Qld Railways. The equivalent rate per loaded double deck trailer was obtained by raising

1. The information provided by the hauliers was not sufficiently detailed to allow stratification of the data by type of enterprise.

the Qld survey rate data by 2.5 to account for the higher load factor on road vehicles. The most extensive variation in rates, in both absolute and relative terms, occurred in Qld while rates charged by NSW hauliers demonstrated the greatest uniformity. The Australian average rate per kilometre for loaded double deck trailers in 1977-78 was $1.06 with standard deviation of $0.33.

TABLE 5.5—RATES PER KILOMETRE FOR LOADED DOUBLE DECK TRAILER[a,b], 1977-78

State	Average rate ($)	Standard deviation ($)
NSW	1.04	0.09
Vic	0.96	0.17
Qld	1.90	0.41
SA	0.94	c
WA	0.88	0.17
Average for mainland States	1.06	0.33

a. Rates are for distances greater than 320 kilometres.
b. Rates for Tas have not been included since charges were set mainly on a single deck load basis.
c. Only one haulier using double deck trailers in SA volunteered this information.

Source: Derived from survey undertaken by Hassall and Associates.

Costs

In this section, the structure of the costs of the hauliers is outlined[1]. The average cost for the hauliers in this survey was obtained by weighting the individual haulier's costs by the total kilometres performed in 1977-78. As these average costs relate to total operations of cattle hauliers, they will reflect the regulatory imposts applied in several States to range of commodities other than cattle.

The breakdown of costs per kilometre for the hauliers is documented in Table 5.6. The dispersion of costs about the average for each cost item is also presented. Costs varied significantly between the hauliers, particularly in the category of fixed costs, due primarily to the extensive range of equipment employed in the industry (refer to Appendix VI).

From an average cost per kilometre of 44.7 cents, fixed costs amounted to 18.8 cents and variable costs 25.9 cents. The three major cost elements of haulier operations—capital charges for vehicles (13.0 cents), fuel (7.9 cents) and wages (7.7 cents)—together accounted for over 60 per cent of the average cost per kilometre.

The costs incurred by firms in providing road transport services varied markedly for a number of reasons. Generally, costs were related to the structure of individual enterprises. The sophistication of road haulage enterprises in this survey displayed great diversity ranging from larger companies with newer rigs operating out of depots and with drivers on the payroll, to smaller owner-driver operations which operated relatively old rigs, supplemented by home made crates. The larger companies tended to have higher total costs than the owner-drivers operating from their own homes.

The level of vehicle utilisation is a primary determinant of unit (per kilometre) costs and as such was perhaps the most significant reason for cost variations between operators. This is due to the indivisibility of capital costs. While total costs rise with an increase in vehicle utilisation, unit costs fall. The principal reason for the relatively low utilisation of some of the hauliers appeared to be the comparatively short cattle turnoff period (approximately six to eight months) and the seasonal weather conditions in certain areas.

1. The cost structure of the beef cattle road transport industry is examined further in Appendix V.

TABLE 5.6—AVERAGE COSTS PER KILOMETRE FOR HAULIERS, 1977-78

(cents per kilometre)

Operating costs	*Average*	*Standard deviation*
Fixed		
Registration, third party and insurance	2.1	0.34
Capital charges on vehicle fleet	13.0	3.5
Capital charges on buildings and support plant	0.7	0.4
Capital charges on land	0.5	0.5
Sundry costs	2.6	0.7
	18.8	4.9
Variable		
Wages	7.7	2.3
Fuel	7.9	2.5
Tyres	4.6	1.7
Maintenance and repairs	3.6	1.1
Road tax	2.1	1.3
	25.9	7.7
Total	44.7	12.5

Source: Derived from surveys undertaken by Hassall and Associates and BTE.

Variations in repairs and maintenance procedures were also a source of operational cost differences between operators. For example, some of the smaller enterprises undertook the repair and maintenance of prime mover and trailer on residential properties with makeshift facilities, while larger enterprises tended to carry out regular repair and maintenance procedures in established garages.

Another source of variation in average costs relates to the topography of the region of operation. For example, respondents cited the rough road surfaces in outback Qld as a cause of increased tyre and engine maintenance expenses, as well as for other truck maintenance expenditure.

The extent of capital investment was a further source of variation in average costs. There were considerable differences in the values reported for the capital costs of the rigs which were operated (some rigs were reported as being valued at under $25 000 while others were quoted at about $90 000 in 1977-78 prices). The main source of difference between operators was related to the average age of vehicles operated. Problems in valuing rigs at market prices were also encountered due to the historical accounting methods used by some operators and some discounting of rig prices.

A further complication arose in relation to the extent of operator equity in the enterprises. The survey generally did not reveal the level of haulier equity as respondents were reluctant to disclose the source of their financing. In the cases of hauliers who completed responses however, it was apparent that equity capital was fairly low. Most of these hauliers had acquired at least some of their equipment through either hire-purchase or leasing agreements.

Comparison between costs and revenues

Table 5.7 compares costs and revenues in 1977-78, in terms of cents per tonne-kilometre, for the road hauliers' cattle carrying operations[1]. The cost data were derived by weighting the average costs per haulier by the loaded tonne-kilometres performed in carrying cattle. (*Note:* this differs from the average cost data in Table 5.6 where costs

1. Most hauliers reported that no freight was carried on the pick-up or return section of a cattle carrying trip. Thus, the overall costs incurred in the carriage of cattle are almost twice those incurred for the cattle carrying leg of the trip.

are weighted by the total kilometres performed). The revenue data were derived in a similar manner by weighting the revenue per haulier by the loaded tonne-kilometres performed in carrying cattle.

TABLE 5.7—COMPARISON OF COSTS AND REVENUES PER TONNE-KILOMETRE FOR SURVEYED HAULIERS FOR THE TRANSPORTATION OF CATTLE, 1977-78

State	Average variable cost per tonne-kilometre at 50 per cent load factor	Standard deviation	Average cost per tonne-kilometre at 50 per cent load factor	Standard deviation	Average revenue per tonne-kilometre	Standard deviation	Breakeven load factor
	(cents per tonne-kilometre)						(per cent)
NSW	3.7	1.3	6.7	3.0	6.3	5.8	53
Vic	4.5	1.4	7.6	2.8	7.4	4.7	51
Qld	5.9	1.8	10.0	3.3	11.6	2.9	42
SA	3.5	1.6	5.3	2.8	5.4	0[a]	a
WA	3.6	1.2	6.1	2.6	6.1	6.4	50
Tas	5.2	2.9	7.4	4.7	12.8	1.3	29
Aust	3.9	0.9	6.8	2.1	6.8	3.9	

a. Revenue figures for SA were available for one operator only.

Source: Derived from surveys undertaken by Hassall and Associates and BTE.

The comparison indicates that the hauliers in this survey on average just broke even on their cattle operations during 1977-78, that is their average revenue was approximately equal to their average costs. The national weighted average revenue per tonne-kilometre was 6.8 cents (standard deviation 3.9 cents) compared with an average cost of 6.8 cents (standard deviation 2.1 cents).

The close approximation between average revenue and average total costs of road transport applied in all States except Tas. Apart from Tas, the required average vehicle load factors in each State for cattle transport operations to break even financially, fell in a fairly narrow band ranging from 42 per cent in Qld to 53 per cent in NSW. In all States road hauliers covered their average variable costs in their cattle carrying operations.

The comparatively high revenue per tonne-kilometre in Tas may reflect the special characteristics of the road transport industry in that State. For instance, there is a higher proportion of short haul cattle movements in that State compared with the mainland—as reflected in the average length of haul in Tas of 75 kilometres, and the effects of the area licensing system in that State may be reflected in a higher apparent margin per tonne-kilometre.

CONCLUSIONS

The main conclusion which emerges from this analysis of the financial structure of the beef cattle road transport industry is that the surveyed hauliers on average just managed to cover costs associated with their cattle carrying operations. However, two points should be kept in mind when interpreting the results. First, the data used in this study can only be interpreted as indicative, rather than fully representative, of the likely state of the beef cattle road transport industry. Second, the composition of road transport operations in terms of firm size, and the significance of owner-operator varies from State to State and both factors will influence comparisons of average costs.

CHAPTER 6—EXPENDITURE ON THE TRANSPORTATION OF SLAUGHTER CATTLE IN AUSTRALIA

In this chapter, the significance of expenditure on moving cattle to abattoirs relative to the saleyard value of slaughter cattle is analysed. In addition, the importance of transport costs relative to the retail price of beef is discussed.

TRANSPORT EXPENDITURE

In this section expenditure on transport is reviewed from two aspects: first, the estimated expenditure associated with slaughter cattle movements within each State and the NT; and second, outlays by producers for the overall movement of slaughter cattle from farmgate to abattoir which involves allocating border crossings to State of origin.

Transport expenditure by State/Territory

The estimated expenditure on the transportation of slaughter cattle in Australia in 1977-78 was $108 million (Table 6.1). Expenditure on road transport amounted to $89.3 million while outlays on rail were $18.5 million.

Table 6.1 also shows the average expenditure on road and rail transport per cattle movement, and per cattle-kilometre, within each State and the NT. The most notable feature of road expenditure for cattle movements is the relatively high charges incurred in the NT and Qld. This reflects the relatively adverse location of cattle properties in the NT and Qld with respect to market outlets and the relatively higher road freight rates (per cattle-kilometre) in Qld.

TABLE 6.1—ESTIMATED EXPENDITURES ON TRANSPORTATION OF SLAUGHTER CATTLE WITHIN EACH STATE/TERRITORY—BY MODE OF TRANSPORT, 1977-78

Origin	*Total expenditure road and rail transport*[a]	*Total expenditure road transport*	*Total expenditure rail transport*	*Average expenditure per cattle movement*		*Average expenditure per cattle-kilometre*	
	($'000)	*($'000)*	*($'000)*	*Road ($)*	*Rail ($)*	*Road (cents)*	*Rail (cents)*
NSW	34 177.8	32 431.5	1 746.4	5.29	7.13	2.22	1.31
Vic	16 979.6	15 536.6	1 442.9	3.67	3.42	2.61	1.18
Qld	38 893.2	26 135.9	12 757.4	12.58	7.12	3.48	1.06[b]
SA	5 766.8	4 397.3	1 369.6	4.03	6.64	1.92	1.36[c]
WA	5 024.2	4 874.0	150.2	4.13	6.45	1.84	1.29
Tas	1 052.4	1 043.4	9.0	2.87	2.99	3.83	1.24
NT	5 949.4	4 905.6	1 043.9	29.20	17.17	2.55	1.16
Total[d]	107 843.4	89 324.2	18 519.4	5.86	6.73	2.54	1.11

a. Based on road transport tasks outlined in Table 4.1 and rail 'system' transport tasks estimated from rail cattle census data.
b. After deduction of 35 per cent rebate applying to railway charges in 1977-78 for drought affected stock.
c. The rates per cattle-kilometre applying on the AN (Northern Region) and AN (Central Region) systems, were 1.08 and 1.63 cents respectively in 1977-78.
d. Figures may not add to totals due to rounding.

Source: BTE.

The variation in the average rail rates per cattle movement was due to the differences in both the average length of haul and pricing schedules on each railway system. The rate per cattle-kilometre ranged from 1.06 cents in Qld to 1.36 cents in SA. The relatively low rate in Qld was due principally to the 35 per cent government rebate that applied to intrastate movements of drought affected cattle in 1977-78. The rate in SA is the average of the two scheduled rates that applied on the railway system in that State, that is 1.08 cents on the Australian National (Northern Region) and 1.63 cents on the Australian National (Central Region).

Generally, rates per cattle-kilometre were higher for road transport than rail transport, which partly reflects the shorter average haul per beast for road movements. The greatest differentials between road and rail rates in 1977-78 occurred in Tas and Qld followed by Vic.

Transport expenditure by producers

An alternative approach to illustrate expenditure on transport is from the viewpoint of cattle producers. This method takes into account origin-destination movements of cattle involving border crossings.

The significance of expenditure on transport by producers can be gauged from Table 6.2[1]. During 1977-78, the estimated expenditure on transportation of slaughter cattle in Australia approximated 10 per cent of the total value of cattle slaughterings. Qld producers made the largest outlays, a total of $38.9 million, expending $26.1 million on road and $12.8 million on rail transport. The breakdown for NSW producers was $32.4 million on road and $1.5 million on rail transport and for Vic producers, $15.5 million and $1.4 million on road and rail transport respectively.

TABLE 6.2— ESTIMATED TRANSPORT EXPENDITURES[a] BY PRODUCERS AS PERCENTAGE OF THE SALEYARD VALUE OF SLAUGHTER CATTLE, 1977-78

Origin	Total expenditure road/rail transport[a] ($'000)	Total expenditure road transport[a] ($'000)	Total expenditure rail transport[a] ($'000)	Value of cattle slaughterings[b] ($'000)	Transport expenditure as percentage of saleyard value of cattle slaughterings
NSW	33 927.4	32 431.5	1 496.0[c]	346 022.9	9.8
Vic	16 959.8	15 536.6	1 423.1	240 847.4	7.0
Qld	38 908.8	26 135.9	12 772.9	259 375.2	15.0
SA	6 005.8	4 397.3	1 608.5	79 490.1	7.6
WA	5 105.8	4 874.0	231.8	66 884.5	7.6
Tas	1 052.4	1 043.4	9.0	30 661.9	3.4
NT	5 949.4	4 905.6	1 043.9	21 603.3	27.5
Total[d]	107 843.4	89 324.2	18 519.3	1 044 885.3	10.3

NOTE: State figures for rail expenditure differ from those in Table 6.1 because border crossings are allocated to the State of travel in Table 6.1 and to the originating state in Table 6.2.

a. Based on the transport tasks outlined in Table 4.1.
b. Based on ABS unpublished data regarding average saleyard prices for slaughter cattle and BTE estimates of interstate slaughter cattle movements.
c. Includes cattle movements ex ACT.
d. Figures may not add to totals due to rounding.

Sources: ABS (unpublished data).
BTE.

1. The figures in this table for road expenditure, and for total Australian rail expenditure, correspond to those in Table 6.1. The State figures for rail expenditure differ between the two tables because the number of cattle moved interstate were recorded on each rail system over which they travelled in Table 6.1 but in Table 6.2 were allocated to the originating State.

Transport expenditure by producers as a percentage of the saleyard value of slaughterings averaged 10.3 per cent for Australia as a whole, and ranged from 3.4 and seven per cent respectively in Tas and Vic up to 15.0 and 27.5 per cent respectively in Qld and NT.

Based on these expenditures by producers for the turnoff of slaughter cattle from each State/Territory, Table 6.3 illustrates the average rates for the overall journey from farmgate to abattoir per beast and per cattle-kilometre. In transporting their cattle to abattoirs beef growers outlayed on average, $10.38 per beast. The outlays ranged from $3.56 by Tasmanian producers for the relatively shorter journey from Tasmanian properties to abattoirs, to approximately $26 by NT producers. However, the average rate per cattle-kilometre was highest in Tas at 3.76 cents, while on average it cost beef producers 2.08 cents per cattle-kilometre in 1977-78 to transport cattle from farmgate to abattoirs.

TABLE 6.3—ESTIMATED AVERAGE TRANSPORT CHARGES PAID BY PRODUCERS FOR THE MOVEMENT OF SLAUGHTER CATTLE FROM FARMGATE TO ABATTOIR, 1977-78[a]

Origin	*Average distance from farmgate to abattoir (kilometres)*	*Average charge per beast turned off ($)*	*Average rate per cattle-kilometre (cents)*
NSW	442	9.51	2.15
Vic	314	7.49	2.38
Qld	761	15.15	1.99
SA	481	8.20	1.70
WA	390	6.99	1.79
Tas	95	3.56	3.76
NT	1 234	26.01	2.11
Aust	500	10.38	2.08

a. Based on Tables 4.1 and 6.2.

Source: BTE.

ESTIMATED MARKETING COSTS FOR SLAUGHTER CATTLE AND BEEF

The marketing process for slaughter cattle and beef involves the transportation of cattle from farmgate to abattoirs, treatment of the livestock at meatworks and finally, transhipment of beef from abattoirs to retail outlets. The process not only encompasses a diverse marketing chain but also encompasses both product and market differentiation.

The marketing chain extends from the wholesale butcher, who may organise all activities from the purchase of livestock to the sale of beef to final customers, through to arrangements involving varying degrees of specialisation in each segment of the chain. Generally, specialisation tends to be relatively more intensive in the distribution of beef from meatworks to retail outlets, thus compounding the complexities of the marketing process.

Product differentiation varies according to age, sex, quality and the degree of processing of the carcass. Market outlets include butcher shops, supermarkets and restaurants.

Because of the diversity in the marketing process, especially in the distribution for retail sales, marketing costs will vary according to the particular activities undertaken. Consequently, it is extremely difficult to generalise on marketing costs of beef associated with the distribution to market outlets.

The terms of reference for this study directed the BTE to undertake a detailed examination of the economic factors associated with road transportion of cattle and, provided the necessary information was readily available, the movement of beef from processing points to domestic retail outlets. The BTE has been unable to obtain information on transport from processing to retail outlets on a national basis.

However, the report of the PJT provides estimates of the distribution costs associated with the marketing of beef. Another study (Milligan 1977) provided broadly similar estimates. In the former study the Tribunal based its estimate on survey data relating to the marketing of a 176 kilogram dressed weight yearling. The estimates in the latter work were based on a case study, but classification of the beast is not specified. Both studies relate to marketing costs in NSW.

Based on the assumption that the PJT estimate is indicative of the distribution cost for beef throughout Australia, estimates of the marketing costs per beast for each State and the NT in 1977-78, and the significance of transport costs in relation to retail prices, are illustrated in Table 6.4. However, it is noted that this assumption is a major approximation and hence the figures for post-abattoir marketing costs in the areas other than NSW should be treated with caution.

The table shows that transport charges for the task of moving beef from the producer through to the retailer in 1977-78 averaged $22.64 per beast which accounted for approximately 11 per cent of total beef costs to the consumer of $202.02. Cattle freight charges averaged five per cent of total costs and beef delivery charges amounted to six per cent. The largest freight charges were almost 20 per cent for NT produced beef while total freight charges for cattle turned off from the States ranged from approximately eight per cent in Tas to 14 per cent in Qld.

TABLE 6.4—AVERAGE MARKETING COSTS FOR BEEF PER BEAST, 1977-78

($)

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*Aust*
Estimated farmgate price of beast[a]	87.47	98.91	86.29	100.30	84.61	100.14	68.42	90.32
Freight charges								
— farmgate to abattoir	9.51	7.49	15.15	8.20	6.99	3.56	26.01	10.38
— delivery charge to retail outlet[b]	12.26	12.26	12.26	12.26	12.26	12.26	12.26	12.26
Other costs[c]	21.68	21.78	21.72	21.80	21.63	21.75	21.66	21.72
Cost to butcher	130.92	140.44	135.42	142.56	125.49	137.71	128.35	134.68
Retail markup[d]	65.46	70.22	67.71	71.28	62.75	68.85	64.18	67.34
Cost to consumer	196.38	210.66	203.13	213.84	188.24	206.56	192.53	202.02
Total freight charges	21.77	19.75	27.41	20.46	19.25	15.82	38.27	22.64
Freight as proportion of cost to consumer (per cent)	11.1	9.4	13.5	9.6	10.2	7.7	19.9	11.2

a. BTE estimate based on ABS unpublished data for average saleyard prices in 1977-78.
b. Derived from PJT (1978) analysis which estimates for NSW, a charge from abattoir to wholesaler of $6.80 and a charge from wholesaler to retail outlet of $5.46. A study by Milligan (1977) provides similar estimates. These costs were assumed to apply to other States.
c. Other costs include buyer's commission, drafting and branding charges, the service fee for killing and chilling, State inspection fee, cattle compensation tax and slaughter levy. These are offset to some extent by the value of the hide and edible offal which is retained.
d. The retail markup is assumed to be 50 per cent of the cost to the butcher as per PJT (1978).

Sources: PJT (1978).
ABS (unpublished data).
BTE.

CHAPTER 7—INTERMODAL COMPETITION AND IMPACT OF AN INCREASE IN TRANSPORT CHARGES

An important objective in economic analysis is the prediction of changes in supply and demand which occur as a result of variations in price. In the previous chapter it was shown that transport costs ranged from eight per cent to 20 per cent of the final costs of beef to consumers. Changes in freight charges will in general flow through to the price of beef, and consequently affect consumer demand. Variations in price will similarly affect the number of cattle turned off by producers. In this chapter the effect of an increase in transport charges on prices paid by consumers and to producers as well as on demand is discussed.

The choice of mode of transportation for slaughter cattle depends on several factors, including the freight rate, transit times, the possibility of injury to livestock and the availability of transport facilities[1]. As freight rates influence modal split, the extent of intermodal competition is examined to evaluate the potential for either mode to increase its share of the market.

INTERMODAL COMPETITION

In moving beef cattle to markets there are some routes where road transport is the only mode available. However, on most major routes to cattle markets and to abattoirs, a choice of road and rail transport is available for much of the route. For off-farm movements, the choice is between road and a road/rail combination, as rail is not generally available from the farm.

Because of the different organisational arrangements associated with the provision of road and rail services, the relative flexibility of road vis-a-vis rail transport and differentials in the relative cost structures for each mode, it is likely that the cost structures of the two modes will differ over different line haul distances. Since freight rates impact on the choice of transport mode, the aim of this section is to assess the potential for substitution between modes[2] by identifying the extent of intermodal competition under the pricing regimes existing in 1977-78[3].

To identify the distances over which each mode has a cost advantage a comparison of the freight rates applying to the most common road and rail transport units, that is the double deck road trailer and the typical rail wagon used in each State, was undertaken. This was supplemented by an analysis of cattle movements by mode of transport where there was potential for competition between the modes.

The areas of potential modal competition were identified by comparing the road and rail matrix tables presented in Appendix IV and by excluding the apparent 'captive' markets as represented by those journeys where only a single mode was involved in the movement of slaughter cattle. A series of histograms was developed for the distribution of the remaining cattle movements by mode. These histograms and the road and rail freight rates for cattle are detailed in Appendix VII.

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1. The report of the PJT (1978) identified several factors which are likely to affect a grower's choice of mode. These relate to claimed inadequacies of rail facilities, including the shortage of cattle trucks. The increased incidence of bruising which is said to occur with greater use of road transport may be a further factor.

2 It has not been possible for the Bureau to derive estimates of cross price elasticities of demand since time series data relating to road transport are not available.

3 An analysis of road/rail competition in Tas was not undertaken since rail transport of cattle in Tas was discontinued in September 1978.

The analysis in Appendix VII of road and rail line haul rates per cattle-kilometre over similar route lengths, shows that rail rates were significantly lower than road rates over all distances in the States of Qld and Vic. In the remaining States, road freight rates for cattle transport were below rail rates over distances ranging from 150 kilometres to at least 500 kilometres.

However, an examination of the distribution of cattle movements by mode of transport, where there was the potential for road/rail competition, shows that despite the higher road rates in Qld and Vic, road transport was the dominant mode in terms of the number of cattle moved, for distances up to 500 kilometres. In SA and WA road transport dominated the movement of cattle up to a distance of 600 kilometres, while in NSW the range extended to 1000 kilometres.

Examination of freight rates and cattle movements by mode leads to several observations. First, freight rates are clearly not the sole criterion in determining modal selection, since in all States, even though rail rates were significantly lower over many routes, road transport was still the dominant mode used to move cattle. Second, this dominance of the road haulage industry over the short to medium line haul distances, despite a price disadvantage in some situations, suggests that for most cattle producers, road transport has a quality of service advantage over rail which offsets the price differential. Third, in all States rail had an advantage over road only over the relatively longer line haul distances, where the price advantage of rail offset any perceived or actual quality differential between the modes. The observed modal shares relate to 1977-78 and the subsequent moves to open road policies in Qld and Vic could be expected to have improved road's competitive position in the transportation of cattle in those two States.

More generally, there appears to be little opportunity for rail to increase its market share over the short to medium line haul range, unless there is a significant increase in road freight rates relative to rail or a marked increase in the quality of rail services under the existing relative price regimes.

IMPACT OF AN INCREASE IN TRANSPORT CHARGES

An increase in freight charges will, in the long run, affect both consumers and producers[1]. The sharing of the incidence (or burden) of an increase in freight charges between consumers and producers will depend on the elasticities of demand and supply for beef products. Australian researchers have devoted considerable attention to investigations of the magnitude of the coefficients of both the elasticity of demand and the elasticity of supply of beef.

Estimates of own price elasticities of demand for beef and veal products at retail outlets in Australia range from -0.96 (Gruen 1967) to -1.71 (Greenfield 1974). The high absolute magnitude of the latter figure is due in part to the specification of the model employed by Greenfield. Other estimates of own price demand elasticities are -1.38 (Main 1976) and -1.33 (Marceau 1967). Thus the majority of research findings indicate the demand for beef products is elastic with respect to its own price.

Freebairn (1973) reports a direct beef supply elasticity estimate of 0.11. This was computed for a four year period. It is somewhat lower than the one year elasticity estimate reported by Powell and Gruen (1967) of 0.16. Vincent *et al* (1977), in developing estimates of the CRETH[2] supply system in Australian agriculture provided much higher estimates of own price responsiveness. The response in the planned output of slaughter cattle resulting from a 10 per cent price change was investigated for each of three agricultural zones—the pastoral zone (10.08), wheat/sheep zone (3.43) and high rainfall zone (4.83).

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1. See Appendix VIII for both a diagramatical and algebraic presentation of the incidence of an increase in transport charges.
2. Constant ratio of elasticities of transformation, homothetic (CRETH).

The above evidence suggests that the likely value of the elasticity of supply lies in the range of 0.1 to 0.5 and that of the elasticity of demand in the range -1.0 to -1.4[1]. Based on these values it is possible to determine the extent of the incidence on both producers and consumers of an increase in transport costs. For the purposes of the analysis, it is assumed that all other factors contributing to the marketing margin remain unchanged and that producers and consumers together bear all of any transport cost increase.

Table 7.1 illustrates the incidence of an increase in transport charges on a national basis for the range of values for demand and supply elasticities cited above. Based on these estimates producers would bear at least 50 per cent, and probably more, of any increase in transport charges.

An important consequence of the increased price paid by consumers is the resulting change in demand for beef products. Based on the range of values for demand and supply elasticities stated above, the table also illustrates the most likely change in consumer demand when transport charges between farmgate and retail outlets rise by 10 per cent. The table shows that for a 10 per cent increase in transport charges, the change in demand would be less than one per cent in 1977-78.

TABLE 7.1—ESTIMATES OF THE INCIDENCE AND IMPACT ON DEMAND OF AN INCREASE IN TRANSPORT COSTS, 1977-78

Values of elasticity of demand and supply	*Proportion of transport cost increase borne by*		*Change in demand*[a]
	Producers (per cent)	*Consumers (per cent)*	*(per cent)*
Es = 0.5, Ed = -1.0	49.9	50.1	-0.6
Es = 0.3, Ed = -1.3	68.3	31.7	-0.5
Es = 0.2, Ed = -1.3	76.4	23.6	-0.3
Es = 0.1, Ed = -1.4	87.4	12.6	-0.2

a. Change in demand in response to a 10 per cent increase in transport costs.

Source: BTE.

1. The PJT suggested that the value of the elasticity of demand is close to -1.3 while the value of the elasticity of supply is probably less than 0.3.

CHAPTER 8—CONCLUSIONS

This concluding chapter reports the main findings of the Bureau's analysis of the transportation of slaughter cattle in Australia in 1977-78. The emphasis in the Report has been on the financial margins that existed in the road haulage industry. This analysis complements the work of the PJT (1978) on beef marketing and processing in Australia. The study has also considered the extent and possible implications of road/rail freight rate differentials, the incidence of an increase in transport costs and the impact of transport cost increases on beef prices.

The analysis of the performance of the transport industry in the movement of cattle from farmgate to abattoir indicated that in general, this sector of the marketing chain was highly competitive. This reflects two main features of the cattle transport system:

- the availability of both road and rail services over the majority of the major cattle transport routes; and
- the generally highly competitive nature of the road transport industry.

The competition in road transport reflects the ease of entry into this industry, and with regard to cattle carrying capacity, the ease of converting trucks from other uses to cattle carriage. Any abnormal profits in the cattle carrying business would be expected to rapidly attract new capacity and hence be temporary in nature.

The financial analysis of a representative group of road cattle hauliers throughout Australia in 1977-78 indicated that most were operating close to the financial breakeven (or normal profit) point. In each of the mainland States, average revenue from the transportation of cattle approximated the average costs of road haulage operators. However, in Tas estimates of average revenues exceeded those for average costs. The Tasmanian situation may reflect special circumstances associated with the dominance of relatively short haul movements, and perhaps effects of the area licensing arrangements for road transport operations in that State.

Analysis of intermodal competition on the mainland revealed that rail rates were significantly lower than road rates for the transportation of cattle over all distances in the States of Qld and Vic. In the remaining States road transport had a price advantage over rail for distances ranging from 150 to 500 kilometres and rail had a price advantage over longer distances. However, road's share of the cattle transport task was greater than that indicated by a comparison of road/rail price differentials. Where there was potential for competition between the two modes, road transport was the dominant mode used for the movement of cattle in 1977-78 over distances up to 500 kilometres in Qld and Vic, up to 600 kilometres in SA and WA and up to 1000 kilometres in NSW.

Economic regulation of the road haulage industry would appear to have had the greatest effect in Tas and Qld and to a lesser extent in Vic in 1977-78. However, subsequent moves to open road policies in Qld and Vic could be expected to have improved road's competitive position in the transportation of cattle in these two States. More generally, there appears to be little opportunity for the railway systems on the mainland to increase their share of the market over the short to medium line haul range, unless there is a significant increase in the road freight rates relative to rail transport, or a marked increase in the quality of rail services under the existing relative price regimes.

Examination of transport costs relative to the retail price of beef revealed that total transport charges for the task of moving beef from the producer through to the retailer

in 1977-78 approximated 11 per cent of total beef costs to the consumer. Freight charges for the movement of slaughter cattle to abattoirs averaged five per cent of the retail price.

Evaluation of the incidence of the burden of an increase in the costs of transporting beef from farmgate to retail showed that producers would bear at least half of transport cost increases. The reason for this is that the demand for beef products is more responsive to price increases than the supply of these products.

Finally, the impact on the demand for beef products, resulting from a 10 per cent increase in transport charges between the farmgate and retail outlets, was estimated at less than one per cent in 1977-78.

APPENDIX I—TERMS OF REFERENCE

Minister for Transport
23 September 1979

Director
Bureau of Transport Economics

TERMS OF REFERENCE FOR BTE STUDY OF ROAD/RAIL TRANSPORTATION OF CATTLE IN AUSTRALIA

I direct the Bureau of Transport Economics to undertake a detailed examination of the economic factors associated with intra and interstate road transport of cattle.

The study should include transport from farmgate to saleyards; from farmgate direct to processing points; and, on the basis of readily available information, from processing points to domestic retail outlets.

In conducting the study the Bureau should consider the extent and possible implications of road/rail freight differentials.

The Bureau should report on these matters by 3 March 1980.

P.J. NIXON

APPENDIX II—BEEF CATTLE PRODUCTION AND SLAUGHTERINGS IN AUSTRALIA 1977-78

Since the mid 1960s the beef cattle industry in Australia has experienced rapid expansion. From 1966 to 1978 the Australian cattle population increased from 17.9 million to 29.3 million head. Over the same period beef production increased from 897 000 tonnes to 2.2 million tonnes.

The following discussion outlines the geographical distribution of beef cattle production and slaughterings in each State/Territory. However, details of slaughterings by region in each State have not been included due to confidentiality requirements.

Table II.1 details the State and the NT breakdown of the Australian cattle population in 1977-78. The major beef producing States of NSW, Vic and Qld together supported approximately 80 per cent of the national beef herd.

TABLE II.1—AUSTRALIAN CATTLE POPULATION AS AT MARCH 1978[a]

(million head)

State	*All cattle*	*Beef cattle*
NSW[b]	7.5	6.7
Vic	4.6	3.0
Qld	11.4	11.2
SA	1.3	1.1
WA	2.2	2.1
Tas	0.7	0.6
NT	1.6	1.6
Total[c]	29.3	26.3

a. Includes calves.
b. Includes ACT.
c. Figures may not add to totals due to rounding.

Source: ABS (1980a and earlier issues).

Table II.2 shows total slaughterings by State/Territory in 1977-78. In this year 10.4 million cattle and 2.5 million calves were slaughtered in Australia. Slaughterings occurred in all States and Territories, generally reflecting the distribution of the beef herd. The three eastern States, NSW, Vic and Qld were of principal significance and together accounted for more than 80 per cent of total slaughterings.

TABLE II.2—AUSTRALIAN CATTLE SLAUGHTERINGS—1977-78

('000 head)

State	Cattle	Calves	Total
NSW	3288.4	552.6	3841.0
Vic	2683.8	1172.2	3856.0
Qld	2587.7	560.3	3148.0
SA	644.0	100.4	744.4
WA	777.5	66.9	844.4
Tas	293.8	68.7	362.5
NT[a]	125.5	1.6	127.1
ACT	33.7	10.6	44.3
Total[a,b]	10 434.5	2533.3	12 967.7

a. Includes buffalo.
b. Figures may not add to totals due to rounding.

Source: ABS (1980a and earlier issues).

In NSW the coastal and tableland regions[1] supported almost half of the total cattle population of the State at March 1978. Slaughterings in NSW totalled 3.8 million head in 1977-78 with slaughterings occurring throughout most of the eastern half of the State.

The statistical divisions of Southwestern, Goulburn and Central Gippsland were the principal beef producing areas in Vic, accounting for 48 per cent of the total beef herd. Slaughterings in Vic totalled 3.9 million cattle in 1977-78 with almost 70 per cent of these being killed in the Melbourne Region.

In Qld, beef cattle were distributed throughout the State with the greatest concentrations occurring in coastal regions. More than three million cattle (including calves) were slaughtered in Qld in 1977-78 and 30 per cent of slaughterings occurred in the Brisbane area.

The heaviest concentrations of beef cattle in SA occurred in the southeast regions of the State in 1978. However cattle were slaughtered in all areas with the Adelaide Region accounting for almost 60 per cent of total killings of 744 400 head in 1977-78.

Beef cattle production in WA occurred throughout the State but was mainly concentrated in the southwest corner and the north where the influence of winter rainfall and the northern wet season respectively are greatest. Of the 844 400 head slaughtered in WA in 1977-78, almost 40 per cent of slaughterings were in the Perth Region and another 40 per cent in the southwest and south coastal areas of the State.

The Tasmanian cattle population at March 1978 included 558 000 beasts maintained for purposes of meat production. The beef herd was distributed throughout the State with the north western area supporting the greatest population. Slaughtering of cattle was concentrated in the northwestern and central northern areas and the Hobart Region of the State. Total slaughterings in Tas in 1977-78 were 362 500 head.

Beef cattle numbers in the NT totalled 1.6 million in March 1978 with the pastoral districts north of Tennant Creek supporting more than one million head. However only 127 000 head were slaughtered in the NT in 1977-78 which was only one per cent of national total slaughterings.

1. For regions in each State and the NT see Appendix III, Figures III.1 to III.7.

APPENDIX III—METHODOLOGY FOR ESTIMATING THE ROAD TRANSPORT TASK

The BTE engaged the services of a consultant to undertake a survey of road hauliers and to estimate the slaughter cattle road transport task in 1977-78 for the mainland States and Territories[1]. Tas was surveyed by the BTE. The approach for determining the road movements involved surveying major abattoirs in Australia, road transport operators, stock and station agents, saleyards and institutional, government and semi-government organisations associated with the rural sector.

In order to establish the major flows of interregional and intraregional slaughter cattle by road in Australia, slaughterings at abattoirs by region for 1977-78 were used as a base. The regions used for the States were the statistical divisions and subdivisions of the 1975-76 Census of Population and Housing. The NT regions were the two regions used in the BTE study of rural products for 1975-76 (BTE 1981). Figures III.1 to III.7 outline the regions for each State and Territory[2].

The survey of abattoirs included privately owned, State and council controlled, and co-operative abattoirs including export licensed works. The abattoirs covered in the survey accounted for approximately 70 per cent of the national throughput of slaughter cattle and the information collected related to the origin of cattle processed at the abattoir and the mode of transport used. Table III.1 presents the percentage of each State's total cattle killed at abattoirs contacted by the consultant and the BTE. Table III.2 shows the regional destinations of slaughter cattle, the proportion of cattle moved to processing points by road transport and the proportion of livestock movements originating at farms or saleyards.

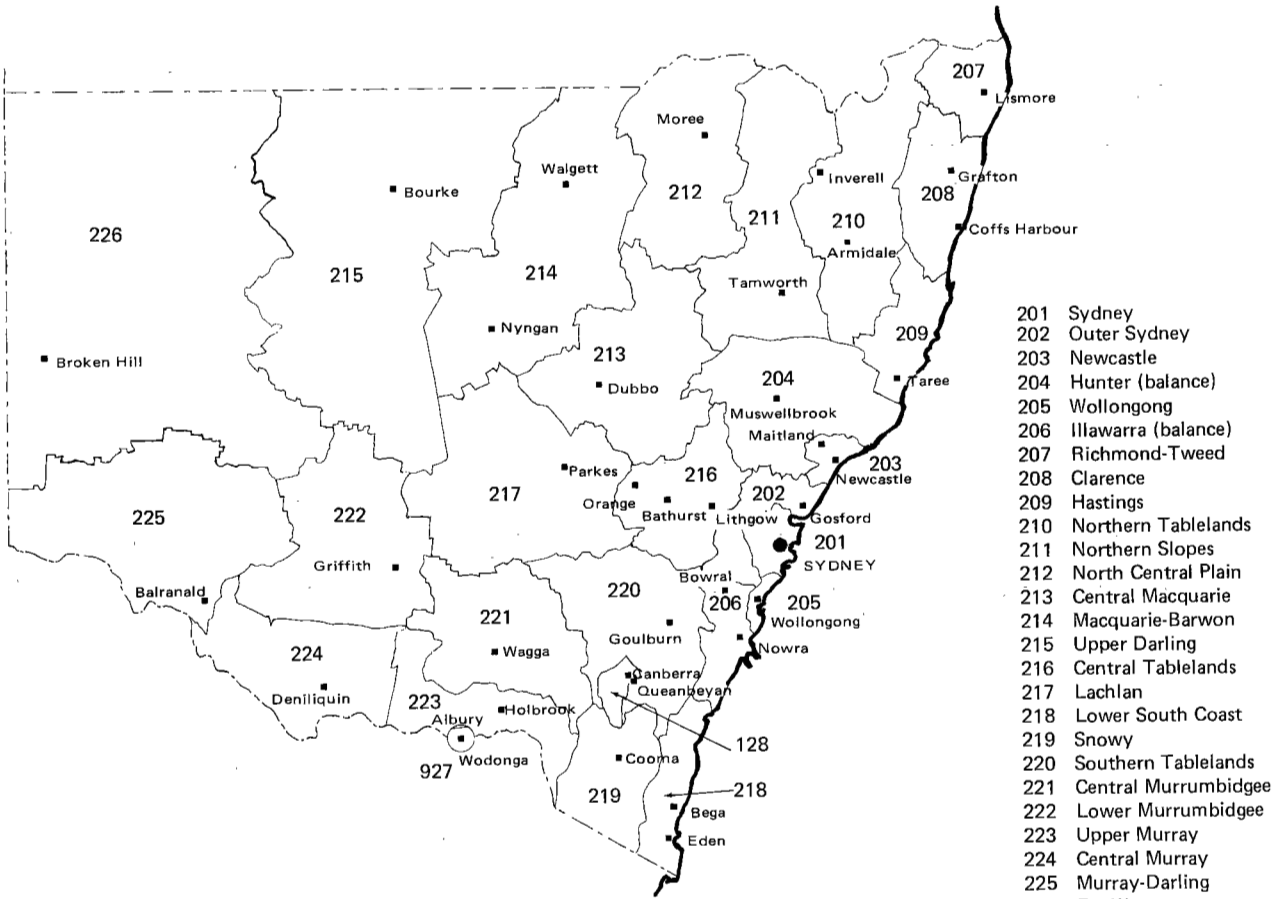
TABLE III.1—CATTLE KILLED AT SURVEYED ABATTOIRS AS PROPORTION OF TOTAL STATE/TERRITORY CATTLE SLAUGHTERINGS, 1977-78

State	*Proportion*
	(per cent)
NSW	73
Vic	97
Qld	75
SA	70
WA	32
Tas	85
NT[a]	100

a. Data regarding movements to NT abattoirs were supplied by NT Department of Primary Products.

Source: Surveys undertaken by Hassall and Associates and BTE.

1. Hassall and Associates: Agricultural Farm Management and Environmental Consultants, Goulburn, NSW, *Transportation of Fat Cattle in Australia, 1977-78*, unpublished report to BTE, May 1980.
2. Qld, Vic, SA and WA regions—statistical divisions: NSW and Tas regions—statistical subdivisions; NT regions—BTE.

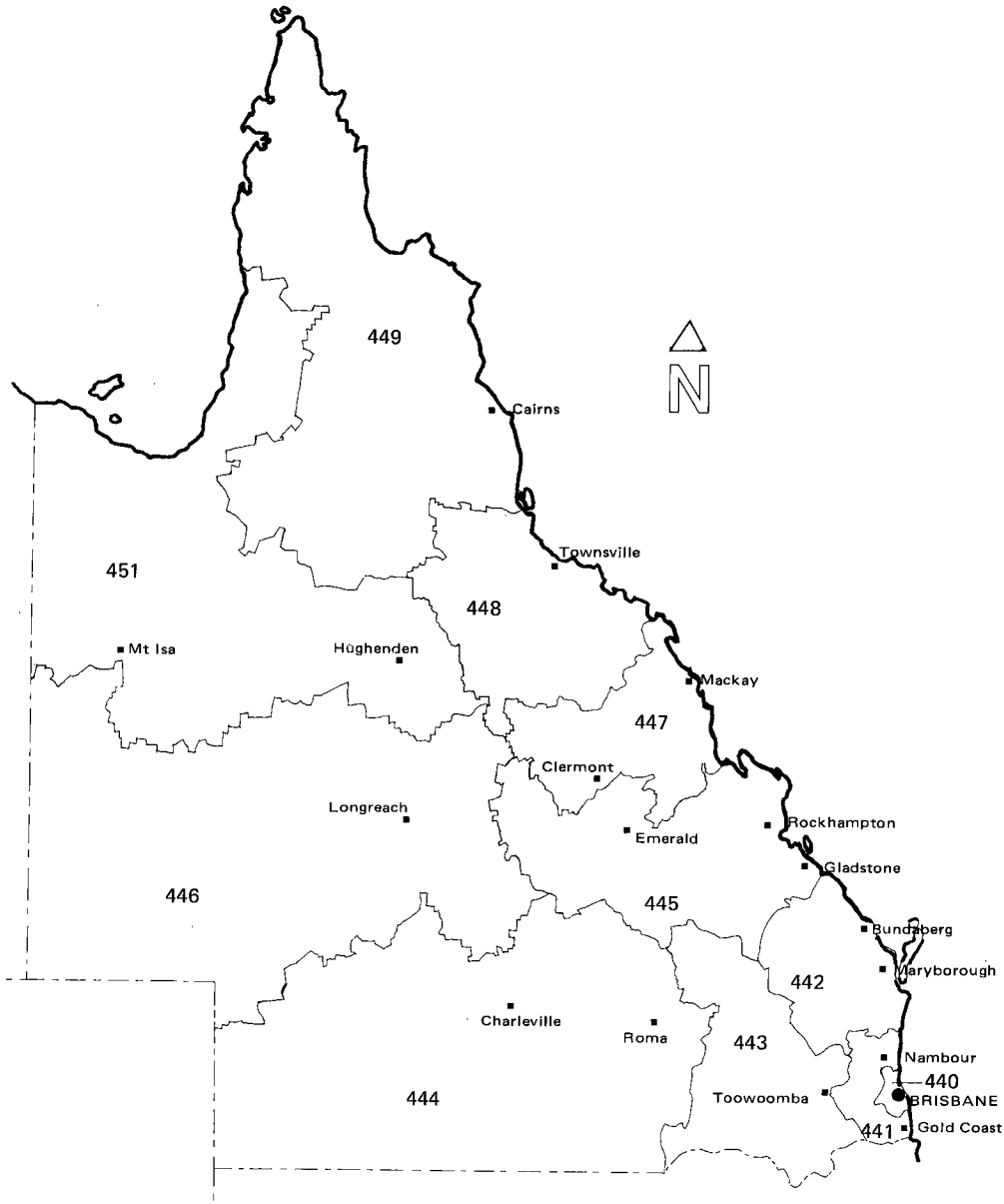


201 Sydney
202 Outer Sydney
203 Newcastle
204 Hunter (balance)
205 Wollongong
206 Illawarra (balance)
207 Richmond-Tweed
208 Clarence
209 Hastings
210 Northern Tablelands
211 Northern Slopes
212 North Central Plain
213 Central Macquarie
214 Macquarie-Barwon
215 Upper Darling
216 Central Tablelands
217 Lachlan
218 Lower South Coast
219 Snowy
220 Southern Tablelands
221 Central Murrumbidgee
222 Lower Murrumbidgee
223 Upper Murray
224 Central Murray
225 Murray-Darling
226 Far West
927 Albury-Wodonga
128 Canberra-Queanbeyan

Figure III.1 New South Wales regions

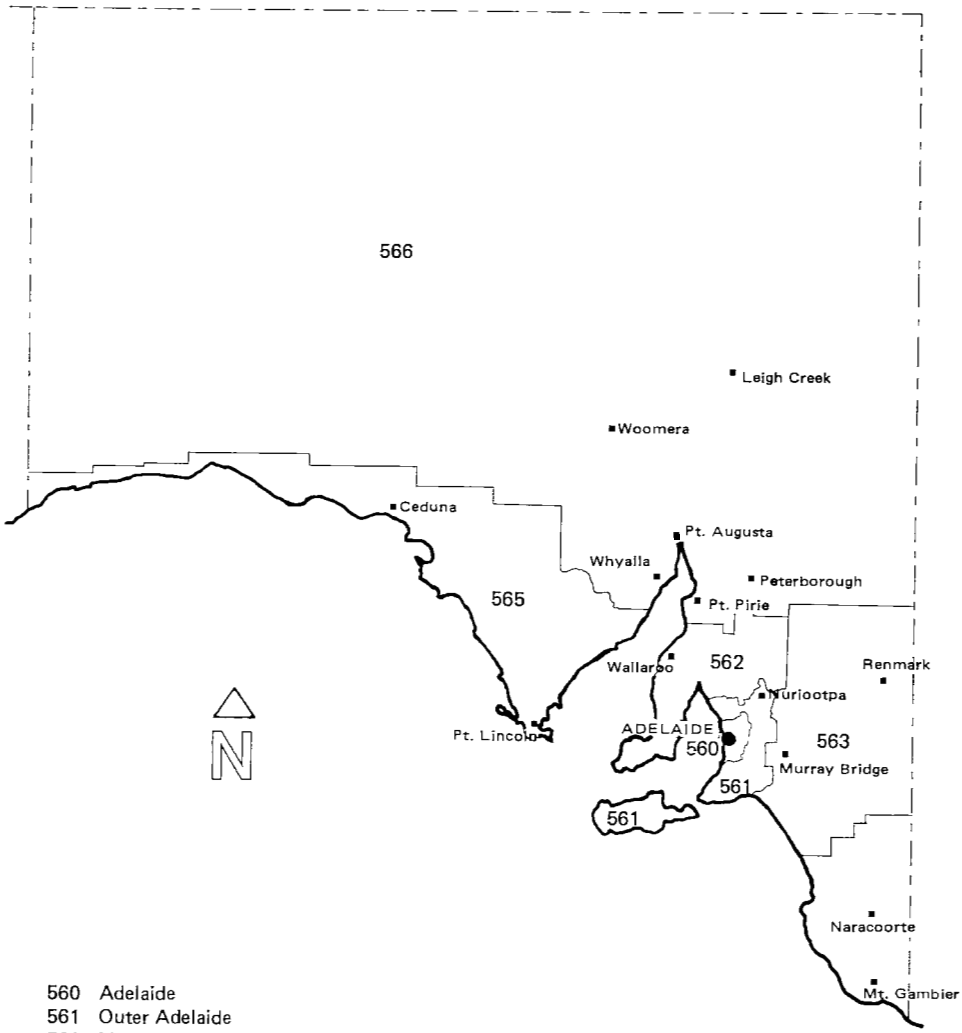
330 Melbourne
331 Barwon
332 South Western
333 Central Highlands
334 Wimmera
335 Northern Mallee
336 Loddon-Campaspe
337 Goulburn
338 North Eastern
339 East Gippsland
340 Central Gippsland
341 East Central

Figure III.2 Victorian regions



440 Brisbane
441 Moreton
442 Wide Bay-Burnett
443 Darling Downs
444 South West
445 Fitzroy
446 Central West
447 Mackay
448 Northern
449 Far North
451 North West

Figure III.3 Queensland regions



560 Adelaide
561 Outer Adelaide
562 Yorke and Lower North
563 Murray Lands
564 South East
565 Eyre
566 Northern

Figure III.4 South Australian regions

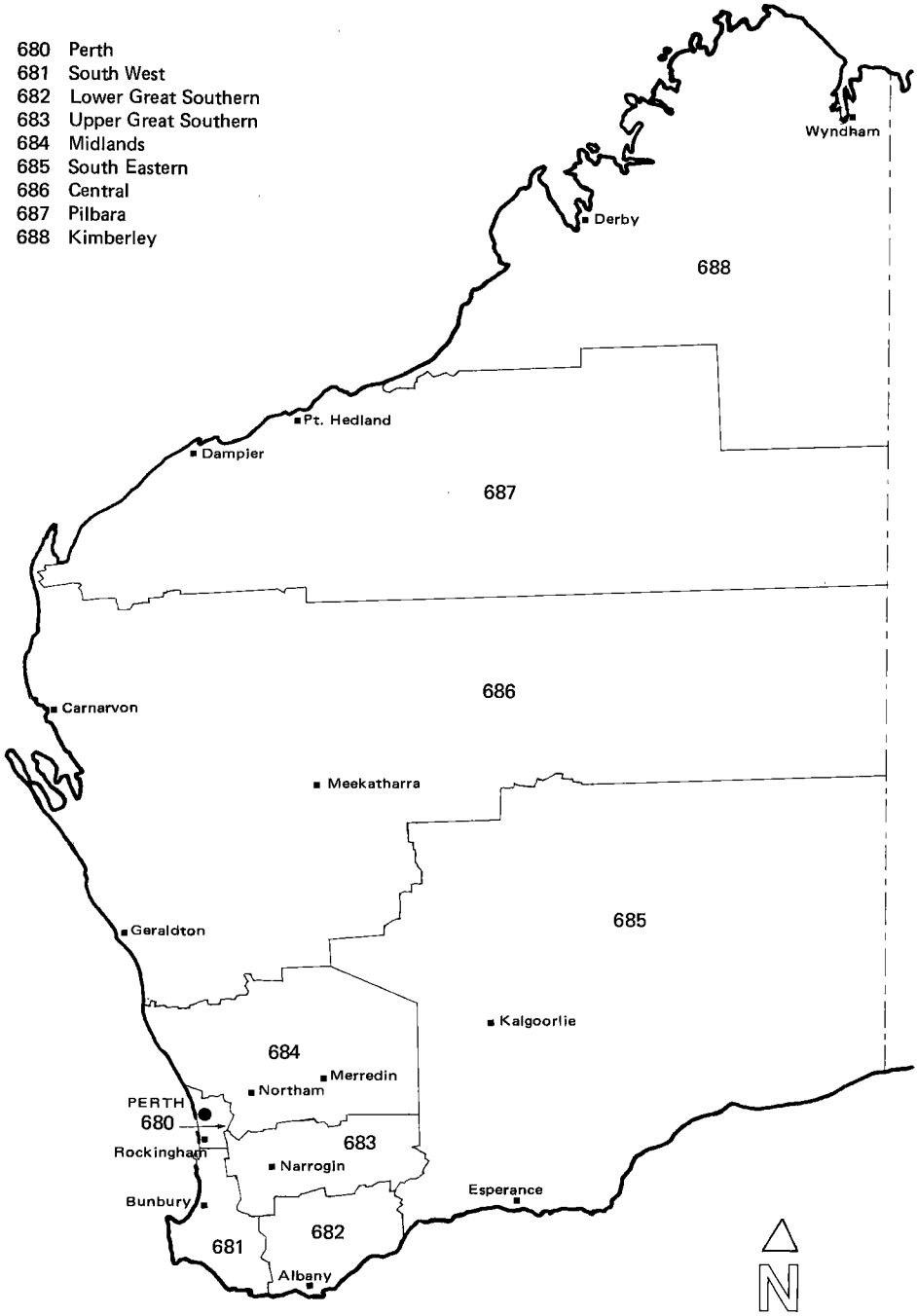
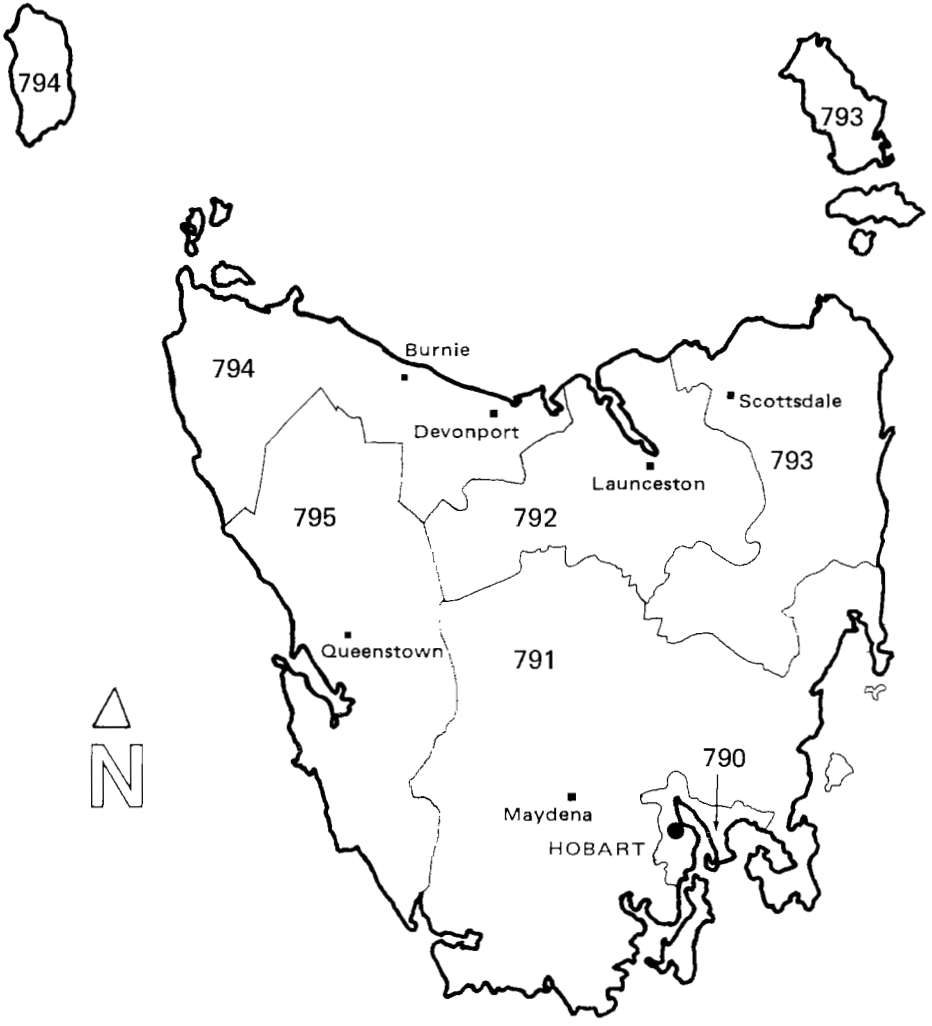


Figure III.5 Western Australian regions



790 Hobart
791 Southern
792 Tamar
793 North Eastern
794 North Western
795 Western

Figure III.6 Tasmanian regions

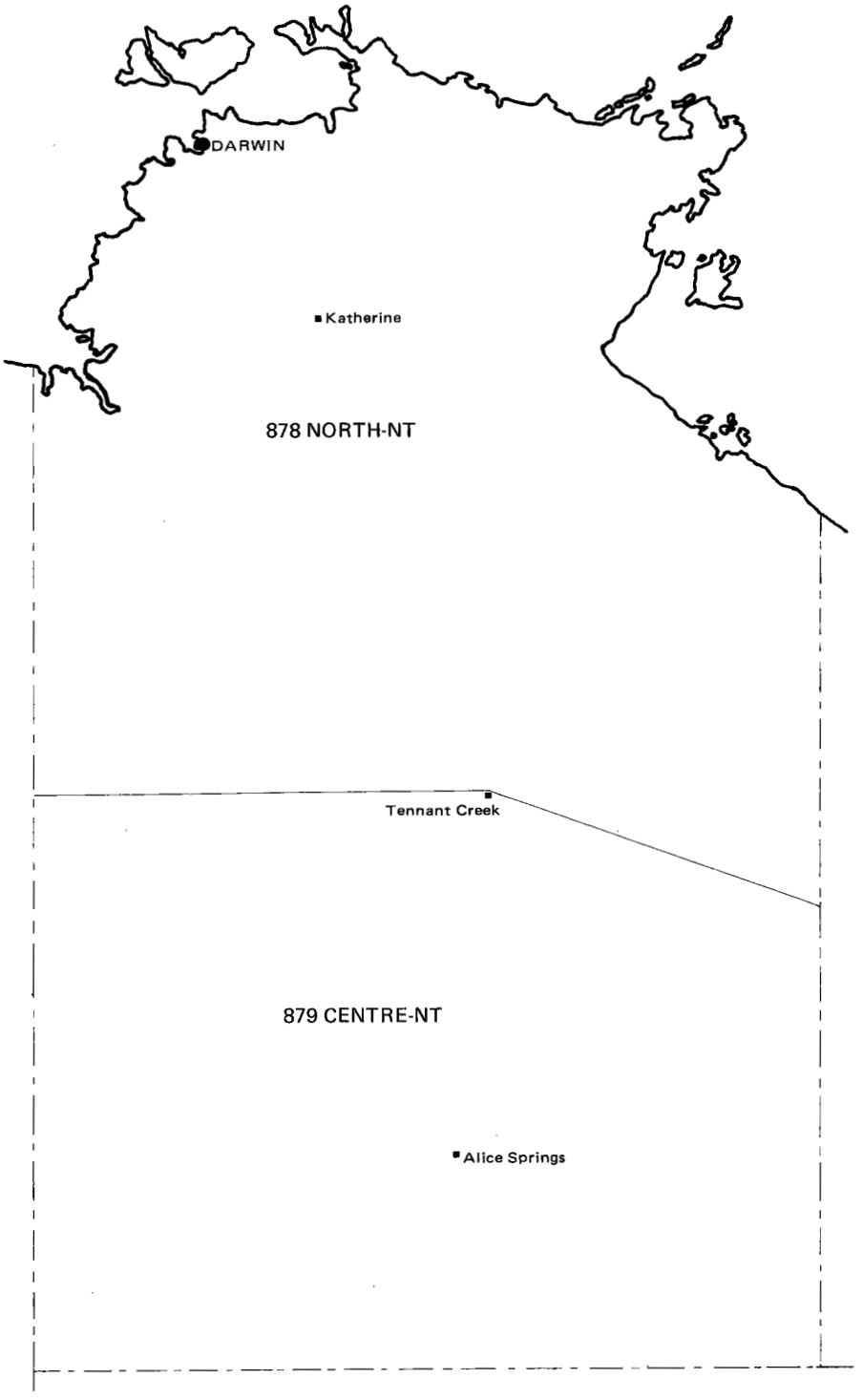


Figure III.7 Northern Territory regions

The survey of saleyards and stock and station agents' branch offices sought information to confirm and supplement that provided by the abattoirs. The local knowledge concerning movement patterns provided by the agents was invaluable in establishing beef cattle movements at a local and district level. The survey of trucking operators was concerned mainly with rates and cost data and provided only a minor cross-check of the sample pattern of road movements.

From these surveys road transport flow matrices for each State were calculated as a precursor to estimation of the transport task[1]. To incorporate distances travelled for each interregional movement, distances between regions were calculated as the distances between regional centres based on the regional nodal points used in the BTE study of rural products (BTE 1981). The transport task for the intraregional road movements was based on distance data derived from abattoirs and road transport firms.

TABLE III.2—CATTLE ARRIVALS AT ABATTOIRS—ESTIMATES OF MODAL AND ORIGIN SPLITS, 1977-78

(per cent)

State	Destination region[a] (ie location of abattoirs)	Modal split (per cent moved by road to abattoir)	Origin (per cent arriving at abattoir from:)	
			Farm	*Saleyard*
NSW	201	77	7	93
	202	97	—	100
	203	94	30	70
	204	99	10	90
	205	97	9	91
	206	97	5	95
	207	88	33	67
	208	93	50	50
	209	97	86	14
	210	84	35	65
	211	99	13	87
	212	96	1	99
	213	98	15	85
	214	93	4	96
	215	100	60	40
	216	97	36	64
	217	98	15	85
	218	100	39	61
	219	100	24	76
	220	97	1	99
	221	98	26	74
	222	96	21	79
	223	97	30	70
	224	100	100	—
	225	100	100	—
	226	100	40	60
Vic	330	91	12	88
	331	100	15	85
	332	100	39	61
	333	100	20	80
	334	100	29	71
	335	100	12	88
	336	100	12	88

1. The road matrices containing cattle movements, nodal distances and cattle-kilometres for each State and the NT are detailed in Appendix IV.

TABLE III.2—CATTLE ARRIVALS AT ABATTOIRS—ESTIMATES OF MODAL AND ORIGIN SPLITS, 1977-78 —*continued*

(per cent)

State	Destination region[a] (ie location of abattoirs)	Modal split (per cent moved by road to abattoir)	Origin (per cent arriving at abattoir from:)	
			Farm	Saleyard
	337	100	25	75
	338	100	14	86
	339	100	15	85
	340	100	23	77
	341	100	11	89
Qld	440	54	44	56
	441	52	43	57
	442	93	64	36
	443	42	45	55
	444	79	65	35
	445	99	63	37
	446	100	100	—
	447	64	78	22
	448	29	80	20
	449	39	59	41
	451	100	60	40
SA	560	44	26	74
	561	94	15	85
	562	100	—	100
	563	85	22	78
	564	91	9	91
	565	100	38	62
	566	97	17	83
WA	680	98	10	90
	681	98	33	67
	682	99	16	84
	683	100	100	—
	684	100	8	92
	685	100	10	90
	686	100	9	91
	687	—	—	—
	688	100	100	—
Tas	790	54	11	89
	791	100	100	—
	792	100	61	39
	793	100	100	—
	794	96	50	50
	795	—	—	—
NT	878	100	100	—
	879	100	100	—
ACT	128	100	—	100

a. Names of regions given in Figures III.1 to III.7.

Source: Survey undertaken by Hassall and Associates and BTE.

APPENDIX IV—THE PATTERN OF SLAUGHTER CATTLE MOVEMENTS IN AUSTRALIA 1977-78

This appendix presents summary tables of the movements of slaughter cattle by road and rail transport in 1977-78. This information is presented in both aggregate form and in regional matrices showing cattle movements and nodal distances for each State and the NT and for each mode. While the road data refer to slaughter cattle, it was not possible to exclude from the rail data movements of stores and breeding cattle. So far as these cattle are included in the rail data, the slaughter cattle rail transport task has been overstated.

AGGREGATE ROAD AND RAIL SLAUGHTER CATTLE MOVEMENTS AND TRANSPORT TASKS

This section presents the aggregate intrastate and interstate tasks by mode of transport.

Intrastate slaughter cattle movements by road transport

Table IV.1 outlines the aggregate intrastate road transport task for slaughter cattle for each State and the NT for each type of movement, that is saleyard to abattoir, farmgate to abattoir and farmgate to saleyard[1].

TABLE IV.1—INTRASTATE AND NORTHERN TERRITORY ROAD TRANSPORT TASK BY SLAUGHTER CATTLE MOVEMENT TYPE, 1977-78

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*Total*[a]
No. of cattle movements (millions)								
farm to saleyard	2.74	1.76	0.74	0.55	0.54	0.12	—	6.45
saleyard to abattoir	2.25	1.97	0.49	0.33	0.45	0.11	—	5.60
farm to abattoir	0.60	0.39	0.63	0.06	0.18	0.13	0.10	2.08
Total[a]	5.58	4.11	1.86	0.93	1.18	0.36	0.10	14.13
Cattle-kilometres (millions)								
farm to saleyard	552.4	200.9	291.8	92.9	152.8	4.1	—1	294.9
saleyard to abattoir	554.1	294.1	81.8	75.7	24.4	11.4	—1	041.6
farm to abattoir	125.0	53.5	241.3	10.7	88.1	11.8	28.7	559.1
Total[a]	1 231.4	548.6	614.9	179.3	265.4	27.3	28.72	895.6
Average distance per cattle movement (trip length in kilometres)								
farm to saleyard	202	114	392	168	282	34	—	201
saleyard to abattoir	246	150	166	232	54	100	—	186
farm to abattoir	209	138	384	192	480	90	300	269

a. Figures may not add to totals due to rounding.

Source: Derived from surveys undertaken by Hassall and Associates and BTE.

1. There were no slaughter cattle movements identified within the ACT. Only interstate flows were estimated from the road transport survey and obtained from the rail census data.

In 1977-78 the total intrastate road transport task for slaughter cattle in Australia involved moving approximately 14 million head of cattle and 2896 million cattle-kilometres. NSW, Vic and Qld accounted for over 80 per cent of slaughter cattle movements by road transport. Table IV.1 also shows that 46 per cent of cattle movements by road transport were from farmgate to saleyard, and 40 per cent were from saleyard to abattoir. These two types of movement involved shorter average hauls than the movement of cattle from farmgate to abattoir. The average length of journey between farm and saleyard by road transport was 201 kilometres while the journey from farm to abattoir averaged 269 kilometres. Movements from saleyard to abattoir by road transport averaged 186 kilometres.

Interstate road movements

Table IV.2 presents the interstate movements of cattle by road transport in 1977-78. Interstate movements by road transport amounted to 1.1 million head in 1977-78 which represented seven per cent of total movements on this mode of transport. However, the interstate task performed by road transport was approximately 18 per cent of the road transport task for Australia, due to the relatively longer average interstate hauls which ranged from 293 kilometres from SA to over 2000 kilometres from the NT. Almost 50 per cent of interstate road movements of slaughter cattle originated in NSW of which most terminated in Vic.

TABLE IV.2—INTERSTATE/TERRITORY SLAUGHTER CATTLE MOVEMENTS BY ROAD TRANSPORT, 1977-78

('000 head[a])

Origin	*Destination*							*Total[b]*
	NSW	*Vic*	*Qld*	*SA*	*WA*	*NT*	*ACT*	
NSW	—	375.0 (327)	130.2 (370)	12.7 (1 259)	—	—	33.8 (367)	551.8 (419)
Vic	70.6 (594)	—	30.0 (1 811)	22.1 (185)	—	—	—	122.7 (381)
Qld	184.4 (695)	—	—	2.3 (2 468)	—	—	—	186.7 (717)
SA	—	181.0 (240)	0.5 (2 066)	—	—	—	—	181.0 (293)
WA	—	—	—	—	—	—	—	—
NT	—	0.3 (2 977)	30.9 (3 132)	6.1 (1 701)	34.8 (1 581)	—	—	72.2 (2 263)
ACT	—	—	—	—	—	—	—	—
Total[b]	255.0 (667)	555.9 (300)	191.6 (1 045)	43.2 (837)	34.8 (1 581)	—	33.8 (367)	1 114.4 (564)

a. The figures in brackets represent the weighted average distance per cattle movement expressed in kilometres.
b. Figures may not add to totals due to rounding.

Source: Derived from survey undertaken by Hassall and Associates.

Intrastate rail movements of cattle

Table IV.3 details the intrastate rail movements of cattle in 1977-78. Total intrastate movements of cattle by rail transport amounted to 2.4 million head and the task comprised 1449 million cattle-kilometres. Qld rail movements approximated 1.8 million cattle or 73 per cent of the total. This was more than five times the second largest movement of 328 000 head which occurred in Vic. On average, cattle moved shorter distances in Vic than in the other mainland States—the weighted average haul was 251 kilometres in Vic compared with 400 kilometres or more in the other four States. The

largest average rail haul of 676 kilometres occurred in Qld and this is reflected in the comparatively large intrastate rail transport task for that State of 1204 million cattle-kilometres.

TABLE IV.3—INTRASTATE RAIL TRANSPORT TASK FOR CATTLE MOVEMENTS, 1977-78[a]

	NSW	Vic	Qld	SA	WA	Tas	Total[b]
No of cattle movements ('000)	144.7	327.9	1 780.8	164.7	17.7	3.0	2 438.9
Cattle-kilometres (millions)	87.6	82.2	1 203.8	65.3	9.7	0.7	1 449.3
Average distance per cattle movement (trip length in kilometres)	605	251	676	397	548	240	594

a. Rail movements from NT were interstate only.
b. Figures may not add to totals due to rounding.

Source: Derived from State Rail Authorities' cattle census data.

Interstate rail movements

Table IV.4 contains the estimated interstate rail movements of cattle in 1977-78. Some discrepancies occurred in the information supplied by the rail authorities concerning interstate flows. Where conflicting information was supplied by the States, the BTE has adopted the higher figure as some movements may either have originated at the border or have been unloaded at the border.

TABLE IV.4—INTERSTATE/TERRITORY CATTLE MOVEMENTS BY RAIL TRANSPORT, 1977-78

('000 head[a])

Origin	Destination							Total[b]
	NSW	Vic	Qld	SA	WA	NT	ACT	
NSW	—	18.8 (1 011)	1.9 (1 008)	9.8 (481)	—	—	—	30.4 (840)
Vic	24.8 (738)	—	8.4 (1 630)	3.4 (579)	—	—	—	36.5 (928)
Qld	45.0 (22)	—	—	—	—	—	—	45.0 (22)
SA	1.9 (1 082)	75.7 (582)	—	—	5.6 (2 133)	—	—	83.1 (697)
WA	—	—	—	4.7 (1 993)	—	—	—	4.7 (1 993)
NT	—	—	—	60.8 (1 483)	—	—	—	60.8 (1 483)
ACT	0.4 (381)	—	—	—	—	—	—	0.4 (381)
Total[b]	72.0 (297)	94.4 (667)	10.3 (1 515)	78.6 (1 350)	5.6 (2 133)	—	—	260.9 (836)

a. The figures in brackets represent the weighted average distance per cattle movement expressed in kilometres.
b. Figures may not add to totals due to rounding.

Source: Derived from State Rail Authorities' cattle census data.

Estimated interstate rail movements of cattle in 1977-78 amounted to 261 000 head or approximately 10 per cent of total cattle movements by rail transport. The associated interstate rail transport task was 218 million cattle-kilometres and the weighted average distance per interstate movement was 836 kilometres. The largest interstate rail flows were the movement of 75 700 head from SA to Vic, 60 800 head from NT to SA, and 45 000 head from Qld to NSW.

INTRA AND INTERREGIONAL MOVEMENTS OF CATTLE

In this section intra and interregional movements of cattle by State and the NT by mode of transport are presented. Movements of less than 50 head in 1977-78 have been excluded from the tables and all movement data have been rounded in order not to infer an inappropriate level of precision. Consequently, values appearing in the tables may not sum exactly to totals shown.

Road movements in New South Wales

Table IV.5 presents intra and interregional slaughter cattle movements in NSW by road transport in 1977-78. Table IV.6 is the corresponding nodal distance matrix. Table IV.5 reveals that in 1977-78 the north-central regions of the State were the most significant origins of cattle movements. Approximately 40 per cent or 2.2 million cattle movements originated in the Northern Tablelands, Northern Slopes, North Central Plain, Central Macquarie and Macquarie-Barwon Regions. The movements from these regions ranged over distances of 84 to 1019 kilometres. Both the coastal and inland regions received large numbers of cattle by road transport which reflects the location of saleyards and abattoirs in NSW. Intraregional movement of 2.6 million head of cattle comprised 47 per cent of the total intrastate movement of slaughter cattle by road transport but accounted for only 19 per cent of the road transport task as measured by cattle-kilometres. The average length of haul for cattle movements in the State was 221 kilometres.

Road movements in Victoria

The corresponding information for the movement of slaughter cattle by road transport in Vic is illustrated in Tables IV.7 and IV.8. Central Gippsland was the most important region by origin for the movement of cattle by road transport in 1977-78. Also approximately 1.1 million head or 27 per cent of total movements by road transport originated in the northern regions of Loddon-Campaspe, Goulburn and North Eastern.

The average road haul of 133 kilometres reflects the significant intraregional movements in Vic of 2.4 million head or 57 per cent of road movements. The largest transport task by destination involved 310 million cattle-kilometres (56 per cent of total intrastate task) for the movement of 1.9 million head into Melbourne from all regions.

Road movements in Queensland

Table IV.9 outlines the intra and interregional movements of slaughter cattle by road transport in Qld in 1977-78 and Table IV.10 shows the distances within and between regions over which these movements occurred. Of the 1.9 million cattle moved by road transport in Qld, 56 per cent of total slaughter cattle road movements were moved intraregionally. The largest flow was for the intraregional road transportation of 270 000 head in the Darling Downs.

The major interregional movements were from the Darling Downs, Central West, North West, South West and Fitzroy Regions of 576 000 head over distances ranging from 130 to 1783 kilometres. The transport task for the movement of slaughter cattle from these regions was 432 million cattle-kilometres or 70 per cent of the intrastate road transport task. The average length of haul per cattle movement in Qld was 330 kilometres.

TABLE IV.5—INTRA AND INTERREGIONAL ROAD MOVEMENTS OF SLAUGHTER CATTLE—NEW SOUTH WALES, 1977–78

('000 head)

Region of origin[a]		Region of destination[a]																								Total
		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	
201	Sydney	31.0	16 6	16.4	54.8	8.6	21.7	1.4	—	—	—	—	—	—	—	—	—	—	—	—	0 2	0.1	—	0.4	—	—	—	151.2
202	Outer Sydney	15.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15 2
203	Newcastle	0.1	—	36.4	7.8	—	0 9	0 7	—	0.3	—	—	0.9	—	—	—	—	—	—	—	—	—	—	0.2	—	—	—	47.3
204	Hunter (balance)	3.1	8.4	40.8	237.6	—	2.1	2.7	—	19.8	—	—	5.3	—	—	—	—	0 1	—	—	—	0.3	—	0.2	—	—	—	320.5
205	Wollongong	13.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13.5
206	Illawarra (balance)	18.9	—	—	—	21.7	50.8	0.1	—	—	—	—	—	—	—	—	—	0 2	—	0 2	14 6	0 1	—	—	—	—	—	106.6
207	Richmond-Tweed	1.0	—	—	—	—	—	111 8	10.8	—	—	—	—	0.9	—	—	0.9	—	—	—	—	0.1	—	—	—	—	—	125 5
208	Clarence	0.7	—	—	—	—	—	40 9	44 8	—	—	—	—	—	—	—	0.9	—	—	—	—	—	0.5	0 1	—	—	—	87 9
209	Hastings	0.4	—	0.1	—	—	0.1	8.6	27.1	21.6	—	—	—	—	—	—	0.9	0.5	—	—	0.1	1 7	0.1	1.1	—	—	—	62.2
210	Northern Tablelands	6 3	13 6	11 7	14.3	0.4	0 1	84.1	47 1	42.5	146.8	22.4	9.1	—	—	—	0.8	0.3	—	—	—	1 2	1 0	0.8	—	—	—	402.7
211	Northern Slopes	23.7	12.8	22.5	12.2	32.8	0.2	9.1	30.5	5.9	38.4	336.4	22 7	10.1	—	0.2	0.9	10.7	—	—	—	0 7	—	—	—	—	—	569 8
212	North Central Plain	7 8	0.5	0.2	0.2	0 8	0.1	23.6	39.6	—	64.0	51.0	152.5	16 9	—	—	0.8	—	—	—	—	0 9	—	—	—	—	—	359 1
213	Central Macquarie	16 5	0.1	4.0	27.4	8.3	4.6	42.8	1.9	7.5	12.6	37.9	19 6	264.3	6.9	4 8	61.7	8 0	—	—	2.2	4 4	—	—	—	—	—	535.5
214	Macquarie-Barwon	25.3	0.1	4.1	9.2	0 1	—	0.1	3.6	—	9 0	33.5	69 4	18 5	112.1	10.9	12.3	3.6	—	—	—	—	—	—	—	—	—	311.6
215	Upper Darling	0.6	—	—	—	—	—	0.1	—	—	5.6	—	—	26.6	0.8	36.7	1.3	0.1	—	—	—	—	—	—	—	—	—	71 8
216	Central Tablelands	39.4	71.0	0.1	27 4	10.3	—	13.9	—	1 0	—	38.7	—	32.3	0.5	0.1	168.0	35.9	—	—	—	—	—	—	—	—	—	438 5
217	Lachlan	45 7	0.1	—	—	0 3	5.0	7 8	—	—	—	—	—	62 1	—	—	62 5	230.9	—	—	—	5 4	—	—	—	—	—	419.7
218	Lower South Coast	17.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29.3	—	18.2	—	—	—	—	—	—	64 7
219	Snowy	14 6	0 1	—	—	—	7.3	—	—	—	—	0.2	—	—	—	—	—	—	—	21 7	22.2	17 3	—	—	—	—	—	83.4
220	Southern Tablelands	37.9	23.2	—	—	17.3	31.8	2.5	—	—	—	17.4	—	—	—	—	87.0	18.2	—	0.5	87.6	19.1	—	—	—	—	—	342.6
221	Central Murrumbidgee	31.4	16.6	5.9	7 3	34 1	9.0	—	—	—	6 9	1.6	—	0 9	—	—	9.5	23.0	—	—	73 5	200.5	0.2	—	—	—	3.3	423.7
222	Lower Murrumbidgee	27 7	0 1	5 9	—	18.9	—	—	—	—	—	1.6	1.4	0.9	—	—	—	1.3	—	—	1 0	40 6	98 0	10.9	—	—	—	208.3
223	Upper Murray	13 9	—	—	—	—	—	—		—	—	—	1.1	—	—	0.7	—	—	—	—	—	—	—	157 5	—	—	—	173.2
224	Central Murray	17.6	—	—	—	—	—	—	—	—	—	1.6	—	—	—	—	—	—	—	—	—	118.0		—	30.3	—	—	167.5
225	Murray-Darling	0.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29.4	—	—	—	—	0 9	—	30.4
226	Far West	—	—	—	—	—	—	—	—	—	—	—	—	—	7.7	—	—	16.2	—	—	—	—	—	25.0	—	—	2.2	51 1
	Total	409.9	163.1	148.1	398.2	153.3	133.7	350.4	205 4	98.6	283.2	542 4	282.0	433 4	128.0	53.4	407.6	349.0	29.3	22 4	249.0	410 5	99.8	196.2	30.3	0.9	5 5	5583.6

a. Statistical Subdivisions 1975-76 Census of Population and Housing.

b. Figures may not add to totals due to rounding.

Source: Derived from survey undertaken by Hassall and Associates.

TABLE IV.6—INTRA AND INTERREGIONAL ROAD DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—NEW SOUTH WALES, 1977-78

(kilometres)

Region of origin[a]		Region of destination[a]																								Weighted average distance from origin
		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	
201	Sydney	22	89	172	295	84	129	829	—	—	—	—	—	—	—	—	—	—	—	—	208	478	—	523	—	—	—	173
202	Outer Sydney	89	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	89
203	Newcastle	172	—	28	124	—	314	615	—	166	—	—	491	—	—	—	—	—	—	—	—	—	—	672	—	—	—	71
204	Hunter (balance)	295	206	124	66	—	424	655	—	262	—	—	378	—	—	—	—	398	—	—	—	739	—	740	—	—	—	105
205	Wollongong	84	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	84
206	Illawarra (balance)	129	—	—	—	63	46	890	—	—	—	—	—	—	—	—	—	468	—	275	81	366	—	—	—	—	—	71
207	Richmond-Tweed	829	—	—	—	—	—	82	131	—	—	—	—	788	—	—	848	—	—	—	—	1126	—	—	—	—	—	103
208	Clarence	662	—	—	—	—	—	131	89	—	—	—	—	—	—	—	713	—	—	—	—	—	1069	1174	—	—	—	126
209	Hastings	340	—	166	—	—	480	453	318	90	—	—	—	—	—	—	497	650	—	—	512	815	953	852	—	—	—	287
210	Northern Tablelands	564	475	381	269	603	691	336	201	286	163	111	288	—	—	—	522	572	—	—	—	813	922	1019	—	—	—	251
211	Northern Slopes	452	363	282	170	491	580	453	312	337	111	144	229	341	—	645	400	460	—	—	—	716	—	—	—	—	—	215
212	North Central Plain	728	593	491	378	722	643	455	367	—	288	229	84	378	—	—	531	—	—	—	—	664	—	—	—	—	—	230
213	Central Macquarie	415	498	457	263	508	520	788	598	599	452	341	378	87	165	368	205	120	—	—	473	354	—	—	—	—	—	243
214	Macquarie-Barwon	580	663	564	429	610	—	894	746	—	545	434	478	165	170	203	370	324	—	—	—	—	—	—	—	—	—	341
215	Upper Darling	783	—	—	—	—	—	901	—	—	700	—	—	368	203	210	573	434	—	—	—	—	—	—	—	—	—	319
216	Central Tablelands	211	254	329	375	249	—	848	—	497	—	400	—	205	370	573	74	153	—	—	—	—	—	—	—	—	—	209
217	Lachlan	363	450	—	—	393	468	942	—	—	—	—	—	120	—	—	153	85	—	—	—	266	—	—	—	—	—	154
218	Lower South Coast	436	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	62	—	289	—	—	—	—	—	—	225
219	Snowy	404	512	—	—	—	275	—	—	—	—	768	—	—	—	—	—	—	—	70	208	290	—	—	—	—	—	231
220	Southern Tableland	212	297	—	—	143	81	971	—	—	—	414	—	—	—	—	190	319	—	208	94	269	—	—	—	—	—	191
221	Central Murrumbidgee	478	567	645	1126	411	366	—	—	—	813	716	—	354	—	—	318	266	—	—	269	76	183	—	—	—	768	254
222	Lower Murrumbidgee	616	746	753	—	529	—	—	—	—	—	756	794	416	—	—	—	296	—	—	431	183	139	263	—	—	—	283
223	Upper Murray	523	—	—	—	—	—	—	—	—	—	—	761	—	—	764	—	—	—	—	—	—	—	96	—	—	—	137
224	Central Murray	743	—	—	—	—	—	—	—	—	—	901	—	—	—	—	—	—	—	—	—	—	222	—	84	—	—	258
225	Murray-Darling	874	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	674	—	—	—	—	60	—	658
226	Far West	—	—	—	—	—	—	—	—	—	—	—	—	—	588	—	—	763	—	—	—	—	—	977	—	—	100	813
Weighted average distance destination		363	302	218	172	341	144	344	250	267	236	215	233	141	195	232	153	165	62	75	243	161	152	228	84	60	501	221

a. Statistical Subdivisions 1975-76 Census of Population and Housing.

Source: Derived from survey undertaken by Hassall and Associates.

TABLE IV.7—INTRA AND INTERREGIONAL ROAD MOVEMENTS OF SLAUGHTER CATTLE—VICTORIA, 1977-78

('000 head)

Region of origin[a]		*Region of destination*[a]											*Total*[b]
		330	*331*	*332*	*333*	*334*	*335*	*336*	*337*	*338*	*339*	*340*	*341*	
330	Melbourne	582.4	43.2	0.2	10.8	—	—	0.3	2.9	6.3	2.3	11.3	26.4	686.1
331	Barwon	45.3	144.5	8.8	3.7	—	—	—	—	—	—	—	—	202.3
332	South Western	321.0	60.0	302.8	29.2	—	—	—	—	—	—	—	—	713.0
333	Central Highlands	24.6	15.1	—	100.5	—	—	3.6	3.0	—	—	—	—	146.8
334	Wimmera	0.2	—	0.3	5.0	50.7	—	—	—	—	—	—	—	56.3
335	Northern Mallee	8.4	—	—	—	24.3	54.0	4.3	—	—	—	—	—	91.0
336	Loddon-Campaspe	45.4	—	—	3.7	19.8	—	186.5	14.4	3.4	—	—	—	273.2
337	Goulburn	147.5	—	—	—	—	—	18.6	224.0	38.7	—	—	—	428.8
338	North Eastern	134.6	—	—	—	—	—	5.2	18.7	233.0	—	—	—	391.5
339	East Gippsland	37.6	—	—	—	—	—	1.2	—	—	127.3	5.7	0.3	172.0
340	Central Gippsland	444.9	—	—	—	—	—	5.4	—	0.9	5.2	309.1	26.1	791.6
341	East Central	98.6	—	—	—	—	—	—	2.9	—	—	13.0	43.4	157.9
	Total[b]	1 890.4	262.9	312.2	152.7	94.9	54.0	225.1	265.9	282.3	134.9	339.0	96.2	4 110.5

a. Statistical Divisions 1975-76 Census of Population and Housing.
b. Figures may not add to totals due to rounding.

Source: Derived from survey undertaken by Hassall and Associates.

TABLE IV.8—INTRA AND INTERREGIONAL ROAD DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—VICTORIA, 1977-78

(kilometres)

Region of origin[a]	*Region of destination*[a]												*Weighted average distance from origin*
	330	*331*	*332*	*333*	*334*	*335*	*336*	*337*	*338*	*339*	*340*	*341*	
330 Melbourne	75	75	360	113	—	—	150	181	235	288	138	58	79
331 Barwon	75	105	289	77	—	—	—	—	—	—	—	—	106
332 South Western	360	289	110	258	—	—	—	—	—	—	—	—	244
333 Central Highlands	113	77	—	50	—	—	119	253	—	—	—	—	69
334 Wimmera	301	—	205	185	90	—	—	—	—	—	—	—	100
335 Northern Mallee	150	—	—	—	205	100	286	—	—	—	—	—	141
336 Loddon-Campaspe	150	—	—	119	226	—	75	120	208	—	—	—	103
337 Goulburn	181	—	—	—	—	—	120	105	101	—	—	—	131
338 North-Eastern	235	—	—	—	—	—	208	101	110	—	—	—	154
339 East Gippsland	288	—	—	—	—	—	466	—	—	150	142	222	182
340 Central Gippsland	138	—	—	—	—	—	288	—	351	142	60	80	107
341 East Central	58	—	—	—	—	—	—	239	—	—	80	60	64
Weighted average distance to destination	164	140	115	101	148	100	94	110	113	152	65	65	133

a. Statistical Divisions 1975-76 Census of Population and Housing.

Source: Derived from survey undertaken by Hassall and Associates.

TABLE IV.9—INTRA AND INTERREGIONAL ROAD MOVEMENTS OF SLAUGHTER CATTLE—QUEENSLAND, 1977-78

('000 head)

Region of Origin[a]		*Region of Destination*[a]										*Total*[b]
		440	*441*	*442*	*443*	*444*	*445*	*446*	*447*	*448*	*449*	*451*	
440	Brisbane	129.8	22.7	—	—	—	—	—	—	—	—	—	152.6
441	Moreton	11.7	25.9	—	—	—	—	—	—	—	—	—	37.6
442	Wide Bay-Burnett	39.0	2.2	111.2	36.3	—	—	—	—	—	—	—	188.7
443	Darling Downs	115.9	24.3	38.3	269.6	12.5	4.8	—	—	—	—	—	465.4
444	South West	22.8	14.0	1.8	56.3	80.6	—	1.8	—	—	—	—	177.4
445	Fitzroy	31.0	0.8	2.2	49.4	8.8	205.9	—	4.0	—	—	—	302.2
446	Central West	16.8	5.0	—	23.5	11.0	18.6	26.4	2.0	2.1	—	6.8	112.2
447	Mackay	11.5	—	—	15.2	—	8.6	—	36.8	21.2	—	—	93.4
448	Northern	7.6	0.1	—	16.0	—	—	—	4.8	69.5	20.4	—	118.3
449	Far North	3.7	—	—	8.0	—	—	—	2.9	8.6	54.3	—	77.6
451	North West	—	1.1	—	24.9	—	—	—	—	52.3	22.8	38.5	139.7
	Total[b]	90.0	96.1	153.5	499.2	113.0	238.0	28.2	50.5	153.7	97.5	45.3	1 864.9

a. Statistical Divisions 1975-76 Census of Population and Housing.
b. Figures may not add to totals due to rounding.

Source: Survey undertaken by Hassall and Associates.

TABLE IV.10—INTRA AND INTERREGIONAL ROAD DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—QUEENSLAND, 1977-78

(kilometres)

Region of origin[a]	*Region of destination*[a]											*Weighted average distance from origin*
	440	*441*	*442*	*443*	*444*	*445*	*446*	*447*	*448*	*449*	*451*	
440 Brisbane	10	111	—	—	—	—	—	—	—	—	—	25
441 Moreton	111	60	—	—	—	—	—	—	—	—	—	76
442 Wide Bay-Burnett	393	261	59	421	—	—	—	—	—	—	—	200
443 Darling Downs	130	218	421	110	380	690	—	—	—	—	—	159
444 South West	493	576	829	380	125	—	720	—	—	—	—	302
445 Fitzroy	678	601	322	690	629	128	—	386	—	—	—	297
446 Central West	1 203	1 141	—	1 081	720	1 081	102	1 095	700	—	660	804
447 Mackay	1 074	—	—	1 211	—	386	—	76	393	—	—	485
448 Northern	1 179	1 400	—	1 604	—	—	—	393	100	353	—	429
449 Far North	1 856	—	—	1 993	—	—	—	746	353	263	—	546
451 North West	—	1 783	—	1 734	—	—	—	—	915	1 205	105	892
Weighted average distance to destination	292	274	162	458	251	223	141	210	440	502	188	330

a. Statistical Divisions 1975-76 Census of Population and Housing.

Source: Derived from survey undertaken by Hassall and Associates.

Road movements in South Australia

Movements of slaughter cattle by road transport within SA in 1977-78 are contained in Table IV.11. Table IV.12 contains the distance matrix. Of the 935 000 cattle moved by road transport, Adelaide received 316 000 head and the South East Region 360 000 head.

TABLE IV.11—INTRA AND INTERREGIONAL ROAD MOVEMENTS OF SLAUGHTER CATTLE—SOUTH AUSTRALIA, 1977-78

('000 head)

Region of origin[a]		Region of destination[a]							Total[b]
		560	561	562	563	564	565	566	
560	Adelaide	20.2	12.0	—	28.1	4.6	—	26.3	91.1
561	Outer Adelaide	61.5	34.7	—	—	16.1	—	—	112.3
562	Yorke and Lower North	45.6	—	11.8	—	—	—	—	57.4
563	Murray Lands	8.3	—	—	46.5	12.7	—	—	67.5
564	South East	77.5	8.7	—	28.8	326.1	—	—	441.1
565	Eyre	21.8	—	—	—	—	29.8	—	51.6
566	Northern	81.4	—	—	—	—	—	32.2	113.7
	Total[b]	316.3	55.3	11.8	103.4	359.5	29.8	58.5	934.6

a. Statistical Divisions 1975-76 Census of Population and Housing.
b. Figures may not add to totals due to rounding.

Source: Derived from survey undertaken by Hassall and Associates.

TABLE IV.12—INTRA AND INTERREGIONAL ROAD DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—SOUTH AUSTRALIA, 1977-78

(kilometres)

Region of origin[a]		Region of destination[a]							Weighted average distance from origin
		560	561	562	563	564	565	566	
560	Adelaide	20	81	—	253	467	—	225	182
561	Outer Adelaide	81	39	—	—	507	—	—	129
562	Yorke and Lower North	163	—	47	—	—	—	—	139
563	Murray Lands	253	—	—	130	485	—	—	211
564	South East	467	507	—	485	90	—	—	190
565	Eyre	816	—	—	—	—	96	—	400
566	Northern	225	—	—	—	—	—	100	190
Weighted average distance to destination		276	121	47	262	127	96	156	192

a. Statistical Divisions 1975-76 Census of Population and Housing.

Source: Derived from survey undertaken by Hassall and Associates.

The South East Region contained the most significant intraregional movement of cattle, with 326 000 or 74 per cent of the 441 000 movements originating in this region remaining within the region. Although there were road hauls of up to 816 kilometres in SA, the significant smaller intraregional movements resulted in an average road haul of 192 kilometres.

Road movements in Western Australia

Table IV.13 shows that in WA approximately one million head or 84 per cent of cattle movements by road transport in 1977-78 originated in the five south western regions. Perth received 477 000 head and together the regions of Perth, South West and Lower Great Southern received one million head.

The average road haul in WA was 225 kilometres (Table IV.14). The derivation of this figure was influenced significantly by intraregional road movements in the Perth, South West and Lower Great Southern Regions where movements ranged over distances from 16 to 53 kilometres.

The largest road transport task in 1977-78 involved the movement of approximately 58 000 head from the Kimberley Region in the north of WA. These cattle were transported between 360 and 2800 kilometres and involved a transport task of 64 million cattle-kilometres or 24 per cent of the total intrastate task.

Road movements in Tasmania

The pattern of slaughter cattle movements by road transport in Tas in 1977-78 is outlined in Table IV.15. The most significant movement of cattle occurred within the North Western Region of the State where 134 000 head were moved by road transport over an average distance of 39 kilometres (Table IV.16). The North Western and Tamar Regions received 300 000 head or 82 per cent of slaughter cattle movements in Tas. Hobart received 55 000 head by road transport and most of these cattle were transported from the adjoining Southern Region.

Over 220 000 cattle or 61 per cent of cattle movements by road transport occurred intraregionally in Tas with intraregional road hauls ranging from 15 to 39 kilometres.

Road movements in the Northern Territory

Table IV.17 outlines the flow of slaughter cattle by road transport in 1977-78 within the NT. Approximately 95 800 head were moved by road within the NT and the main movements were for intraregional flows to the Darwin and Alice Springs areas. The Darwin and Gulf district received nearly all of the cattle moved to that area from the three pastoral districts in the northern half of the Territory[1].

The average length of haul for cattle in the NT was 300 kilometres with longer hauls generally being undertaken in the North NT Region (Table IV.18).

Rail movements in New South Wales

Intra and interregional movements of cattle over the NSW railways are contained in Table IV.19. The table shows that the main rail destinations in NSW for cattle were coastal areas, with the Sydney, Newcastle and Richmond-Tweed Regions receiving 82 300 head or 57 per cent of the intrastate total of 144 700 head. Most of the rail movements (43 per cent) originated in the North Central Plain, Macquarie-Barwon, Snowy and Lower Murrumbidgee Regions and the length of haul from these regions ranged from 189 to 1398 kilometres (Table IV.20). The largest rail transport task involved moving 22 800 head from the North Central Plain Region an average 614 kilometres, constituting a task of 14 million cattle-kilometres. The average length of a rail journey in the State for the movement of cattle was 605 kilometres.

Rail movements in Victoria

Table IV.21 outlines the intra and interregional flows of cattle in 1977-78 over the Vic railway system. The Melbourne Region dominated the pattern of rail movements in that it received 236 800 head or 72 per cent of all intrastate cattle movements by rail transport. This region accounted for 17 per cent of all movements by origin, second only to the North Eastern Region from which 28 per cent originated. Significant

1. There are four pastoral districts in the NT: Darwin and Gulf district, Victoria River district and Barkly Tableland district in the North NT, and Alice Springs district in the Centre NT.

TABLE IV.13—INTRA AND INTERREGIONAL ROAD MOVEMENTS OF SLAUGHTER CATTLE—WESTERN AUSTRALIA, 1977-78

('000 head)

Region of origin[a]		*Region of destination*[a]								*Total*[b]
		680	*681*	*682*	*683*	*684*	*685*	*686*	*687*	*688*	
680	Perth	202.2	76.9	—	—	—	—	—	—	—	279.2
681	South West	61.1	237.0	10.3	—	—	—	—	—	—	308.4
682	Lower Great Southern	38.6	41.6	149.2	—	—	—	—	—	—	229.3
683	Upper Great Southern	34.7	18.4	—	3.2	—	—	—	—	—	56.3
684	Midlands	71.0	15.2	—	—	22.6	1.0	7.5	—	4.2	121.5
685	South Eastern	40.1	3.8	3.5	—	6.4	12.1	—	—	—	65.8
686	Central	14.7	—	—	—	—	—	26.6	—	7.5	48.8
687	Pilbara	6.6	—	—	—	—	—	—	—	5.2	11.7
688	Kimberley	8.3	8.9	—	—	—	—	1.1	—	40.2	58.4
	Total[b]	477.3	401.6	163.0	3.2	29.0	13.1	35.2	—	57.0	1 179.4

a. Statistical Divisions 1975-76 Census of Population and Housing.
b. Figures may not add to totals due to rounding.

Source: Derived from survey undertaken by Hassall and Associates.

TABLE IV.14—INTRA AND INTERREGIONAL ROAD DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—WESTERN AUSTRALIA, 1977-78

(kilometres)

Region of origin[a]	*Region of destination*[a]									*Weighted average distance from origin*
	680	*681*	*682*	*683*	*684*	*685*	*686*	*687*	*688*	
680 Perth	16	185	—	—	—	—	—	—	—	62
681 South West	188	50	372	—	—	—	—	—	—	88
682 Lower Great Southern	405	372	53	—	—	—	—	—	—	170
683 Upper Great Southern	188	217	—	96	—	—	—	—	—	192
684 Midlands	97	282	—	—	86	497	489	—	2 727	236
685 South Eastern	593	790	912	—	497	184	—	—	—	537
686 Central	494	—	—	—	—	—	114	—	2 205	549
687 Pilbara	1 905	—	—	—	—	—	—	—	776	1 408
688 Kimberley	2 629	2 814	—	—	—	—	2 205	—	360	1 089
Weighted average distance to destination	229	194	91	96	176	207	260	—	814	225

a. Statistical Divisions 1975-76 Census of Population and Housing.

Source: Derived from survey undertaken by Hassall and Associates.

TABLE IV.15—INTRA AND INTERREGIONAL ROAD MOVEMENTS OF SLAUGHTER CATTLE—TASMANIA, 1977-78

('000 head)

Region of origin[a]		Region of destination[a]						Total[b]
		790	791	792	793	794	795	
790	Hobart	8.6	—	4.3	—	4.1	—	17.0
791	Southern	34.7	1.6	1.7	—	—	—	38.0
792	Tamar	8.6	—	68.5	—	20.4	—	97.5
793	North Eastern	2.2	—	25.2	7.3	8.9[c]	—	43.6
794	North Western	1.1	—	32.3	—	134.2[d]	—	167.6
795	Western	—	—	—	—	—		
	Total[b]	52.4	1.6	132.0	7.3	167.6	—	363.7

a. Statistical Subdivisions 1975-76 Census of Population and Housing.
b. Figures may not add to totals due to rounding.
c. Includes 2700 cattle ex Flinders Island.
d. Includes 2700 cattle ex King Island.

Source: BTE.

TABLE IV.16—INTRA AND INTERREGIONAL ROAD DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—TASMANIA, 1977-78

(kilometres)

Region of origin[a]		Region of destination[a]						Weighted average distance from origin
		790	791	792	793	794	795	
790	Hobart	15	—	160	—	305	—	121
791	Southern	50	26	230	—	—	—	57
792	Tamar	193	—	30	—	137	—	67
793	North Eastern	189	—	124	31	186	—	124
794	North Western	415	—	166	—	39	—	61
795	Western	—	—	—	—	—	—	—
Weighted average distance to destination		80	26	88	31	65	—	75

a. Statistical Subdivisions 1975-76 Census of Population and Housing.

Source: BTE.

TABLE IV.17—ROAD MOVEMENTS OF SLAUGHTER CATTLE BY REGION—NORTHERN TERRITORY, 1977-78

('000 head)

Region of origin[a]		Region of destination[a]		Total[b]
		878	879	
878	North	43.8	1.4	45.2
879	Centre	1.3	49.3	50.6
	Total[b]	45.0	50.8	95.8

a. BTE Rural Products Study Regions (BTE 1981).
b. Figures may not add to totals due to rounding.

Source: Derived from data supplied by Northern Territory Department of Primary Production.

TABLE IV.18—ROAD DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT BY REGION—NORTHERN TERRITORY, 1977-78

(kilometres)

Region of origin	*Region of destination*[a]		*Weighted average distance from origin*
	878	*879*	
878 North	335	1 518	372
879 Centre	1 518	202	236
Weighted average distance to destination	369	239	300

a. BTE Rural Products Study Regions (BTE 1981).

Source: Derived from data supplied by Northern Territory Department of Primary Production.

movements occurred from the northern and eastern areas of the State and mainly to Melbourne. Northern Mallee, Loddon-Campaspe, Goulburn, North Eastern and East Gippsland accounted for over 62 per cent of cattle movements by origin in 1977-78. The largest component of the Vic rail transport task was for the movement of 79 200 cattle from North Eastern Region to Melbourne, over an average distance of 289 kilometres (Table IV.22) constituting a task of 22.9 million cattle-kilometres.

Rail movements in Queensland

The pattern of intra and interregional cattle movements over the Qld railways in 1977-78 is illustrated in Table IV.23. Of the 1.8 million head moved, most of these were transported from the central and western areas of the State to coastal destinations. Significant movements from the Fitzroy, Central West and South West Regions accounted for 893 000 head or 50 per cent of total movements and approximately half of these cattle were transported between 700 and 1200 kilometres (Table IV.24) to Brisbane. Nearly 330 000 head of cattle were moved by rail transport out of the North West Region of the State, most of which were moved to the coastal regions of Northern and Far North, over distances ranging from 650 to 1050 kilometres. The average length of a rail journey in Qld was 676 kilometres.

Rail movements in South Australia

Intra and interregional cattle movements by rail transport in SA in 1977-78 are presented in Table IV.25. Significant flows of cattle were moved by rail transport from the Northern Region to Adelaide, an average distance of 540 kilometres. The total number of cattle originating in the Northern Region was 88 000 head which represented 54 per cent of the intrastate rail movements for SA. Large numbers of cattle were also moved to Adelaide from the South East Region over an average distance of 400 kilometres (Table IV.26). The average length of rail haul in the State was 397 kilometres.

Rail movements in Western Australia

Table IV.27 illustrates that Perth was the main destination for cattle transported by rail in WA in 1977-78. Perth received approximately 13 800 cattle or 60 per cent of WA's intra and interregional rail movements of 23 300[1] head. The main flows were from the South Eastern and Central Regions of the State to Perth and the South West Regions. These cattle movements ranged over distances of 548 to 770 kilometres (Table IV.28). The average length of haul by rail transport in WA was 501 kilometres.

1. Includes the movement of 5500 head from SA into WA by rail. It was not possible to identify the destinations of these cattle and therefore exclude them from the intrastate matrix.

TABLE IV.19—INTRA AND INTERREGIONAL RAIL MOVEMENTS OF CATTLE—NEW SOUTH WALES, 1977-78

('000 head)

Region of origin[a]	Region of destination[a]																									Total[b]
	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	
201 Sydney	—	—	0.5	0.3	—	—	5.5	0.9	—	—	—	—	—	—	—	—	—	—	—	—	0.9	—	0.5	—	—	—	8.6
202 Outer Sydney	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
203 Newcastle	—	—	—	—	—	—	0.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.6
204 Hunter (balance)	0.8	—	—	—	—	0.7	—	0.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.3
205 Wollongong	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
206 Illawarra (balance)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.6	—	—	—	—	—	—	—	—	—	0.6
207 Richmond-Tweed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
208 Clarence	—	—	—	0.6	—	—	0.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.1
209 Hastings	0.3	—	—	—	—	—	4.7	0.4	—	—	—	—	—	—	—	—	—	—	—	—	0.4	0.5	—	2.8	—	—	9.1
210 Northern Tablelands	3.0	—	0.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3	—	0.3	—	—	—	4.3
211 Northern Slopes	4.6	—	—	—	0.9	—	—	—	1.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.1
212 North Central Plain	7.8	2.7	7.6	—	—	0.2	—	—	0.9	0.6	0.4	—	—	—	—	—	—	—	—	—	0.3	—	—	2.4	—	—	22.8
213 Central Macquarie	3.0	1.1	0.4	—	1.9	0.5	0.3	—	—	0.3	—	—	—	—	—	0.6	—	—	—	—	0.6	—	—	0.4	—	0.3	9.4
214 Macquarie-Barwon	2.3	0.8	0.6	—	—	—	0.6	—	—	2.9	0.5	—	—	—	—	1.8	0.9	—	—	—	—	—	2.5	—	—	—	12.8
215 Upper Darling	1.6	—	—	—	—	—	—	—	—	—	—	—	0.5	—	—	2.1	0.3	—	—	—	—	—	—	1.8	—	—	6.4
216 Central Tablelands	1.4	—	—	—	0.6	—	2.1	—	0.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.7
217 Lachlan	0.8	—	—	—	—	—	0.4	—	—	0.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.1	5.9
218 Lower South Coast	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
219 Snowy	11.2	0.4	—	—	—	0.4	—	—	—	—	—	—	—	0.7	—	—	—	—	—	1.0	—	—	—	—	—	—	13.7
220 Southern Tableland	5.7	0.3	—	0.7	—	—	1.1	—	—	—	—	—	—	—	—	—	—	—	—	0.9	—	—	—	—	—	—	8.8
221 Central Murrumbidgee	5.0	1.5	0.5	—	—	—	0.4	—	—	—	—	—	—	—	—	—	0.5	—	—	—	—	—	—	—	—	—	7.9
222 Lower Murrumbidgee	4.8	—	—	—	—	—	—	—	—	0.6	—	—	—	6.0	—	—	2.0	—	—	—	—	—	—	—	—	—	13.3
223 Upper Murray	—	—	—	—	—	—	—	—	—	—	—	1.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.2
224 Central Murray	3.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.2
225 Murray-Darling	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
226 Far West	—	—	—	—	—	—	—	—	—	—	—	—	1.0	—	—	—	—	—	—	—	—	—	—	—	—	—	1.1
Total[b]	55.6	6.0	10.3	1.6	3.4	1.3	16.4	2.2	3.0	4.9	0.9	1.2	1.5	6.6	—	4.5	4.3	—	—	2.0	2.5	0.5	3.3	7.3	—	4.4	144.7

a. Statistical Subdivisions 1975-76 Census of Publication and Housing.
b. Figures may not add to totals due to rounding.

Source: Derived from data supplied by Public Transport Commission, New South Wales.

TABLE IV.20—INTRA AND INTERREGIONAL RAIL DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—NEW SOUTH WALES, 1977-78

(kilometres)

Region of origin[a]	Region of destination[a]																								Weighted average distance from origin
	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	
201 Sydney	—	—	155	287	—	—	796	542	—	—	—	—	—	—	—	—	—	—	—	—	500	568	—	—	—	—	670
202 Outer Sydney	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
203 Newcastle	—	—	—	—	—	—	613	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	613
204 Hunter (balance)	300	—	—	—	—	354	—	411	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	355
205 Wollongong	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
206 Illawarra (balance)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	569	—	—	—	—	—	—	—	—	—	569
207 Richmond-Tweed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
208 Clarence	—	—	—	392	—	—	333	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	365
209 Hastings	395	—	—	—	—	—	406	191	—	—	—	—	—	—	—	—	—	—	—	—	1061	1231	—	1221	—	—	714
210 Northern Tablelands	552	—	438	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	973	—	981	—	—	—	587
211 Northern Slopes	456	—	—	—	595	—	—	—	472	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	477
212 North Central Plain	577	534	470	—	—	689	—	—	550	398	189	—	—	—	—	—	—	—	—	—	1117	—	—	1351	—	—	614
213 Central Macquarie	448	361	602	—	550	164	1242	—	—	644	—	—	—	—	—	174	—	—	—	—	469	—	—	662	—	512	472
214 Macquarie-Barwon	712	656	484	—	—	—	1398	—	—	520	278	—	—	—	—	304	402	—	—	—	—	—	644	—	—	—	571
215 Upper Darling	820	—	—	—	—	—	—	—	—	—	—	—	357	—	—	498	476	—	—	—	—	—	—	923	—	—	688
216 Central Tablelands	231	—	—	—	411	—	1074	—	630	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	683
217 Lachlan	584	—	—	—	—	—	1376	—	—	736	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	711	747
218 Lower South Coast	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
219 Snowy	461	348	—	—	—	—	1252	—	—	—	—	—	—	801	—	—	—	—	—	204	—	—	—	—	—	—	476
220 Southern Tablelands	368	302	—	496	—	—	1004	—	—	—	—	—	—	—	—	—	—	—	—	188	—	—	—	—	—	—	438
221 Central Murrumbidgee	495	598	659	—	—	—	1296	—	—	—	—	—	—	—	—	—	232	—	—	—	—	—	—	—	—	—	546
222 Lower Murrumbidgee	640	—	—	—	—	—	—	—	—	950	—	—	—	884	—	—	377	—	—	—	—	—	—	—	—	—	723
223 Upper Murray	—	—	—	—	—	—	—	—	—	—	—	1860	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1860
223 Central Murray	733	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	733
225 Murray-Darling	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
226 Far West	—	—	—	—	—	—	—	—	—	—	—	—	790	—	—	—	—	—	—	—	—	—	—	—	—	—	790
Weighted average distance to destination	520	513	468	418	538	345	775	422	526	587	240	1860	657	876	—	378	402	—	—	197	705	1231	659	1162	—	698	605

a. Statistical Subdivisions 1975-76 Census of Population and Housing.

Source: Derived from data supplied by Public Transport Commission, New South Wales.

TABLE IV.21—INTRA AND INTERREGIONAL RAIL MOVEMENTS OF CATTLE—VICTORIA, 1977-78

('000 head)

Region of origin[a]	*Region of destination*[a]												*Total*[b]
	330	*331*	*332*	*333*	*334*	*335*	*336*	*337*	*338*	*339*	*340*	*341*	
330 Melbourne	5.7	1.2	0.4	3.8	1.6	1.5	2.8	5.2	9.2	2.1	21.1	0.7	55.1
331 Barwon	1.0	—	—	—	—	—	—	—	—	—	—	—	1.1
332 South Western	18.0	0.3	—	0.1	0.4	—	—	0.5	0.4	0.1	1.8	0.1	21.7
333 Central Highlands	10.6	—	—	—	—	—	—	0.1	0.1	—	1.0	—	12.0
334 Wimmera	5.5	—	0.1	0.1	—	—	0.2	—	—	0.4	—	—	6.5
335 Northern Mallee	25.5	1.1	—	0.1	—	0.3	1.6	0.1	0.2	—	0.2	0.4	29.4
336 Loddon-Campaspe	26.7	0.1	0.1	0.2	—	0.5	0.4	0.1	0.1	—	0.8	—	28.9
337 Goulburn	27.5	—	0.2	—	—	—	0.1	0.1	0.1	0.1	1.1	—	29.2
338 North Eastern	79.2	1.8	1.2	0.2	—	—	0.9	1.3	0.6	0.5	3.8	0.8	90.5
339 East Gippsland	17.9	0.5	0.2	0.1	—	—	0.5	0.1	0.1	0.7	1.7	4.3	26.2
340 Central Gippsland	19.1	0.8	0.1	—	0.1	—	0.5	1.1	4.6	—	0.8	0.1	27.1
341 East Central	—	—	—	—	—	—	—	—	0.1	—	—	—	0.2
Total[b]	236.8	5.9	2.2	4.6	2.3	2.3	7.1	8.7	15.5	3.4	32.7	6.5	327.9

a. Statistical Divisions 1975-76 Census of Population and Housing.
b. Figures may not add to totals due to rounding.

Source: Derived from data supplied by Victorian Railways.

TABLE IV.22—INTRA AND INTERREGIONAL RAIL DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—VICTORIA, 1977-78

(kilometres)

Region of origin[a]	*Region of destination*[a]												*Weighted average distance from origin*
	330	*331*	*332*	*333*	*334*	*335*	*336*	*337*	*338*	*339*	*340*	*341*	
330 Melbourne	52	117	261	130	248	441	193	183	286	229	136	86	174
331 Barwon	141	83	—	—	—	—	326	—	384	268	253	—	149
332 South Western	296	130	—	212	230	—	438	481	387	531	468	394	314
333 Central Highlands	134	96	—	—	192	459	170	273	405	—	258	—	149
334 Wimmera	335	294	297	274	107	—	407	—	570	—	438	393	342
335 Northern Mallee	390	543	539	395	481	56	272	344	539	537	442	599	390
336 Loddon-Campaspe	179	222	435	291	219	187	93	105	333	367	346	239	184
337 Goulburn	198	—	480	270	—	—	98	48	152	415	286	253	202
338 North Eastern	289	367	558	396	543	—	449	182	106	534	410	465	301
339 East Gippsland	241	351	544	355	515	—	362	324	576	49	140	180	228
340 Central Gippsland	162	188	426	219	290	—	326	298	396	157	68	138	209
341 East Central	44	—	—	277	—	—	299	285	—	—	—	—	116
Weighted average distance to destination	251	306	473	163	253	336	265	218	317	246	204	235	251

a. Statistical Divisions 1975-76 Census of Population and Housing.

Source: Derived from data supplied by Victorian Railways.

TABLE IV.23—INTRA AND INTERREGIONAL RAIL MOVEMENTS OF CATTLE—QUEENSLAND, 1977-78

('000 head)

Region of origin[a]		*Region of destination*[a]											*Total*[b]
		440	*441*	*442*	*443*	*444*	*445*	*446*	*447*	*448*	*449*	*451*	
440	Brisbane	—	0.4	1.2	8.8	—	—	—	—	—	—	—	10.4
441	Moreton	0.4	—	—	8.2	—	—	—	—	—	—	—	8.6
442	Wide Bay-Burnett	50.0	21.6	8.8	—	—	—	—	—	—	—	—	80.4
443	Darling Downs	59.6	5.4	—	53.4	8.0	—	—	—	—	—	—	126.4
444	South West	91.4	35.4	—	86.6	23.2	—	—	—	—	—	—	236.6
445	Fitzroy	203.2	73.4	8.6	—	—	134.0	6.6	2.0	0.4	—	—	428.2
446	Central West	141.2	23.2	12.8	4.8	—	38.2	0.6	1.4	1.8	4.4	—	228.4
447	Mackay	80.6	9.2	0.8	—	—	38.6	—	2.2	1.4	3.4	—	136.2
448	Northern	10.2	2.2	0.6	—	—	0.8	—	4.2	74.0	25.0	4.6	121.6
449	Far North	—	—	—	—	—	—	—	—	11.0	63.0	0.6	74.6
451	North West	13.4	10.4	2.4	—	—	25.8	4.2	1.2	208.2	46.2	17.6	329.4
	Total[b]	650.0	181.2	35.2	161.8	31.2	237.4	11.4	11.0	296.8	142.0	22.8	1 780.8

a. Statistical Divisions 1975-76 Census of Population and Housing.
b. Figures may not add to totals due to rounding.

Source: Derived from data supplied by Queensland Railways.

TABLE IV.24—INTRA AND INTERREGIONAL RAIL DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—QUEENSLAND, 1977-78

(kilometres)

Region of origin[a]	*Region of destination*[a]											*Weighted average distance from origin*
	440	*441*	*442*	*443*	*444*	*445*	*446*	*447*	*448*	*449*	*451*	
440 Brisbane	—	116	76	309	—	—	—	—	—	—	—	275
441 Moreton	130	—	—	245	—	—	—	—	—	—	—	240
442 Wide Bay-Burnett	418	474	221	—	—	—	—	—	—	—	—	411
443 Darling Downs	383	480	—	301	190	—	—	—	—	—	—	340
444 South West	771	917	—	557	301	—	—	—	—	—	—	668
445 Fitzroy	857	817	436	—	—	192	658	167	698	—	—	627
446 Central West	1 214	720	1 100	1 845	—	727	156	959	639	1 057	—	1 077
447 Mackay	1 006	1 086	868	—	—	331	—	318	507	841	—	799
448 Northern	1 277	1 610	1 097	—	—	599	—	230	121	386	574	328
449 Far North	—	—	—	—	—	—	—	—	306	322	914	324
451 North West	1 812	2 102	1 664	—	—	1 417	151	1 256	654	1 051	201	841
Weighted average distance to destination	890	869	716	481	273	435	445	441	507	606	295	676

a. Statistical Divisions 1975-76 Census of Population and Housing.

Source: Derived from data supplied by Queensland Railways.

TABLE IV.25—INTRA AND INTERREGIONAL RAIL MOVEMENTS OF CATTLE—SOUTH AUSTRALIA, 1977-78

('000 head)

Region of origin[a]		*Region of destination*[a]							*Total*[b]
		560	*561*	*562*	*563*	*564*	*565*	*566*	
560	Adelaide	—	0.1	0.4	11.4	10.0	—	2.6	24.5
561	Outer Adelaide	0.1	—	—	—	0.7	—	—	0.8
562	Yorke and Lower North	0.5	—	—	—	0.2	—	—	0.1
563	Murray Land	0.8	—	—	0.3	1.4	—	—	2.6
564	South East	25.0	0.4	0.2	5.1	16.4	—	0.5	47.6
565	Eyre	—	—	—	—	—	0.2	—	0.2
566	Northern	69.4	—	0.3	12.3	0.5	—	5.8	88.4
	Total[b]	95.9	0.5	0.9	29.2	29.2	0.2	8.8	164.7

a. Statistical Divisions 1975-76 Census of Population and Housing.
b. Figures may not add to totals due to rounding.

Source: Derived from data supplied by Australian National Railways Commission.

TABLE IV.26—INTRA AND INTERREGIONAL RAIL DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—SOUTH AUSTRALIA, 1977-78

(kilometres)

Region of origin[a]		*Region of destination*[a]							*Weighted average distance from origin*
		560	*561*	*562*	*563*	*564*	*565*	*566*	
560	Adelaide	—	68	124	109	381	—	170	226
561	Outer Adelaide	51	—	—	—	316	—	—	281
562	Yorke and Lower North	111	—	—	—	584	—	—	217
563	Murray Land	100	—	—	171	244	—	—	189
564	South East	396	312	539	278	82	—	598	247
565	Eyre	—	—	—	—	—	237	—	237
566	Northern	540	—	171	646	594	—	220	533
Weighted average distance to destination		496	149	221	320	209	237	226	397

a. Statistical Divisions 1975-76 Census of Population and Housing.

Source: Derived from data supplied by Australian National Railways Commission.

TABLE IV.27—INTRA AND INTERREGIONAL RAIL MOVEMENTS OF CATTLE—WESTERN AUSTRALIA, 1977-78

('000 head)

Region of origin[a]		Region of destination[a]									Total[b]
		680	681	682	683	684	685	686	687	688	
680	Perth	3.6	1.3	0.2	0.1	0.7	0.1	1.5	—	—	7.4
681	South West	0.3	0.1	—	—	—	—	—	—	—	0.4
682	Lower Great Southern	0.1	—	—	—	—	—	—	—	—	0.1
683	Upper Great Southern	—	—	—	—	—	—	—	—	—	—
684	Midlands	0.6	0.1	—	—	—	—	—	—	—	0.7
685	South Eastern	4.4	2.7	—	0.1	0.1	0.5	—	—	—	7.8[c]
686	Central	4.7	0.1	0.1	—	—	—	1.9	—	—	6.8
687	Pilbara	—	—	—	—	—	—	—	—	—	—
688	Kimberley	—	—	—	—	—	—	—	—	—	—
	Total[b]	13.8	4.2	0.3	0.1	0.7	0.7	3.5	—	—	23.3[c]

a. Statistical Divisions 1975-76 Census of Population and Housing.
b. Figures may not add to totals due to rounding.
c. Includes an estimated movement of 5550 head from SA into WA.

Source: Derived from data supplied by Western Australian Railways.

TABLE IV.28—INTRA AND INTERREGIONAL RAIL DISTANCES AND WEIGHTED AVERAGE DISTANCES PER CATTLE MOVEMENT—WESTERN AUSTRALIA, 1977-78

(kilometres)

Region of origin[a]	*Region of destination*[a]									
	680	*681*	*682*	*683*	*684*	*685*	*686*	*687*	*688*	*Weighted average distance from origin*
680 Perth	93	237	586	173	259	654	444	—	—	225
681 South West	305	183	—	—	—	—	572	—	—	288
682 Lower Great Southern	477	610	—	165	—	—	1 126	—	—	567
683 Upper Great Southern	252	260	—	—	348	—	603	—	—	402
684 Midlands	313	433	—	—	—	—	94	—	—	332
685 South Eastern	701	770	—	938	740	373	—	—	—	706
686 Central	630	548	1 009	—	—	—	499	—	—	599
687 Pilbara	—	—	—	—	—	—	—	—	—	—
688 Kimberley	—	—	—	—	—	—	—	—	—	—
Weighted average distance to destination	481	586	760	594	314	435	479	—	—	501

a. Statistical Divisions 1975-76 Census of Population and Housing.

Source: Derived from data supplied by Western Australian Railways.

Rail movements in Tasmania

Cattle movements over the rail system in Tas in 1977-78 are shown in Table IV.29. Approximately 3000 cattle were moved by rail in Tas for which only loadings and unloadings data were available. However the table shows that the main origin region for rail movements was the North Eastern Region while the North Western Region received most cattle. The average distance for rail movements of cattle in Tas was 240 kilometres.

TABLE IV.29—INTRA AND INTERREGIONAL RAIL MOVEMENTS OF CATTLE AND WEIGHTED AVERAGE DISTANCES PER MOVEMENT—TASMANIA, 1977-78

Region[a]		*Inwards movements*		*Outwards movements*	
		No of head	*Weighted average distance per cattle movement (kilometres)*	*No of head*	*Weighted average distance per cattle movement (kilometres)*
790	Hobart	760	249	590	349
791	Southern	50	267	60	200
792	Tamar	330	138	830	172
793	North Eastern	490	162	1 200	216
794	North Western	1 380	286	330	311
795	Western	—	—	—	—
	Total	3 010	240	3 010	240

a. Statistical Subdivision 1975-76 Census of Population and Housing.

Source: Derived from data supplied by Australian National Railways Commission.

APPENDIX V—THE SURVEY OF HAULIERS AND ESTIMATION OF ROAD HAULAGE COSTS

A total of 76 hauliers was surveyed by Hassall and Associates and the BTE in 1980 to obtain information about the road haulage industry involved in the transportation of slaughter cattle. In the survey of hauliers, 19 were based in NSW, 21 in Vic, 17 in Qld, 3 in SA, 10 in WA and 6 in Tas. Hauliers from the NT were not included in the survey since almost all enterprises operating in the NT were based in either WA or Qld. The survey group was selected from a list of the operators engaged in road transport of beef and was designed to be broadly representative with respect to the regional dispersion of base operations and size of enterprise.

The information collected from the 76 hauliers formed the data base for the BTE analysis. The data included details of the number and type of vehicles involved in the transportation of cattle, the number of cattle moved, kilometres travelled, payload, the value of plant, rates charged and operating costs for the year 1977-78.

Many hauliers did not keep adequate records of either the physical or financial aspects of their enterprises. Nevertheless the cost details furnished by the hauliers allowed an estimate of the overall cost structure of the industry to be made.

FIXED COSTS

Fixed costs include registration, third party and insurance, depreciation and interest payments on vehicles, land, buildings and plant and sundry costs including administration. The capital charges for the use of road vehicles were difficult to ascertain. The method of financing varied considerably between hauliers, but in general it appeared equity was low. The rate of interest paid on debt also fluctuated between operators. The recent BTE investigation of financial aspects of the road transport business (Scott 1980) revealed that leasing and hire purchase rates were of the order of 17 to 25 per cent per annum in 1979-80. On the other hand, gilt edged securities (eg capital investment at banks) attracted a rate of return in the vicinity of 10 to 12 per cent. In calculating the equivalent annual costs[1] (EAC) applicable to the vehicle fleet, the weighted average interest rate applicable to hauliers in 1977-78 was taken to be 18 per cent, based on an assumption of 20 per cent equity in the asset[2].

For taxation purposes, operators are permitted to depreciate road vehicles at 22.5 per cent per annum on a declining balance basis[3] and this depreciation rate was used in the EAC formula for calculating the salvage value of the vehicle fleet. Road vehicle dealers have confirmed that this represents a reasonable depreciation for normal utilisation of both prime movers and trailers.

For the purpose of the study the EAC for the vehicle fleet was calculated on the basis of an average life of six years and an average age in 1977-78 of three years. Consequently, the capital costs for the vehicle fleet to be recovered in 1977-78 approximated one-third of the stated value of the asset in that year[4].

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1. The equivalent annual cost for an asset is derived using the following formula: $EAC = iP+i(P-S)/((1+i)^n-1)$, where P = capital outlay in period o, S = salvage value in period n, and i the interest rate.
2. The interest rate i, is based on the assumptions of 20 per cent equity (at 10 per cent internal rate) and 80 per cent debt (at 20 per cent rate). Then $i=(0.2x10\%)+(0.8x20\%)=18\%$.
3. An allowable alternative is 15 per cent straight line depreciation except where a higher rate can be justified.
4. The EAC = $0.18\ P_3 + 0.18\ (P_3-S)/(1.18^3-1)$, and therefore EAC = $0.3296\ P_3$.

Capital costs of land, other buildings and plant displayed the greatest variability. The extent to which these costs were inflated due to the inclusion of residential homes, land and other buildings was unclear. In the computation of annual costs for land, interest foregone on the current value at a rate of 10 per cent was applied. The EAC for buildings and plant was calculated on the basis of an asset life of 20 years, with zero salvage value, and with the average age of the asset set at 10 years. Hence, assuming 50 per cent equity in buildings and plant and a weighted average interest rate of 10 per cent, the capital cost to be recovered in 1977-78 approximated one-sixth of the stated value of the asset in that year[1].

Sundry costs comprise office charges, the cost of supervision and the costs of administration of the business. Self-owned enterprises had minimal outlays in this area, while some of the larger firms incurred substantial costs.

Variable costs

Variable costs are those which are directly related to the distance travelled and which cannot be avoided if the truck is operational. Items included in this cost category are wages, fuel, tyres, maintenance and repairs and, in the mainland States in 1977-78, road maintenance charges[2]. Some firms in the sample used subcontractors in 1977-78 and these costs were included as variable costs for those particular firms.

Variable costs are influenced by such factors as the type of transport unit, for example, diesel or petrol engines, the physical features of the travel environment and the varying price levels for labour and materials, as well as by management factors such as load factors and labour utilisation. There was considerable variation in the costs incurred by individual enterprises in the sample.

In 1977-78 the road maintenance charge was the same in all mainland States at 0.17 cents per tonne-kilometre, assessed on the basis of tare weight plus 40 per cent of the carrying capacity of the vehicle whether loaded or empty. The variation in this cost by type of enterprise is therefore due to the different types of vehicles operated by the hauliers. In NSW, Vic and Qld the charge applied to all vehicles with a carrying capacity greater than 4.1 tonnes. In SA and WA the limits were 8.15 tonnes and 8.13 tonnes respectively.

There was considerable variation between firms in the costs incurred in the payment of wages for drivers. This was not surprising, as some hauliers maintained their drivers throughout the year, while others employed them on a casual basis according to the demand for haulage work. For owner-drivers the imputed wage was based on the average wage derived from the survey data.

A breakdown of average costs per tonne-kilometre for the sampled hauliers is documented in Table 5.7.

1. The EAC = $0.1627.P_{10}$.
2. Road maintenance charges were abolished in 1979. Road maintenance charges did not apply in Tas.

APPENDIX VI—TYPES OF VEHICLES USED IN THE TRANSPORTATION OF CATTLE

ROAD TRANSPORT

A variety of road transport units is employed in the movement of cattle. The three main vehicle types used may be classified as follows.

- Tray top; a four wheel rigid vehicle with a tray body and stock crate attached having a capacity of between 12 and 16 head.
- Single deck; an articulated vehicle. comprising a prime mover generally of single axle drive and a semi-trailer on which is mounted a stock crate with an average capacity of 26 head.
- Double deck; similar to the single deck except that the stock crate is two tiered, enabling a capacity of 50 head of cattle.

In addition, hauliers may use road trains to transport cattle. These are articulated vehicles comprising a prime mover and two or more trailers, either single or double deck. The road trains in the survey generally had a capacity of up to two double deck trailers although hauliers are able to combine prime movers and trailers in numerous combinations. Road trains are operated most frequently in the NT and in outback Qld.

In general, the horsepower (hp) of the prime movers used to haul the double deck and single deck trailers ranged from 250 hp to 450 hp. The choice of prime mover depended to a considerable degree on the type of trailer used to transport cattle. In general, the more powerful prime movers were employed in the haulage of double deck trailers.

RAIL TRANSPORT

In NSW, Vic and WA, rail wagons in general use were the four wheel type (eg CW, M and BE Classes) which had a capacity of 5.5 to 6.0 tonnes and an internal length of between 5.3 and 5.8 metres. These wagons usually carried 10 to 12 beasts. In Qld the K Class wagons used were approximately nine metres in length with a capacity for 20 beasts on average. For the AN (Northern Region) system the bogie wagons formed the basis for BTE estimates. These vans were twice the length of the four wheel vans and had a capacity of 18 to 20 beasts. Four wheel type wagons of length 5.2 metres were employed on the AN (Central Region) system. These had a capacity of nine to 10 beasts.

APPENDIX VII—ROAD AND RAIL FREIGHT RATES

In this appendix, following the presentation of road and rail freight rates that applied to the movement of cattle in 1977-78, a comparative analysis of intermodal rates by State is made.

ROAD AND RAIL FREIGHT RATES

The road and rail freight rates for the movement of cattle in all mainland States[1] and rail freight rates for the Australian National Railways Commission (AN) are outlined in Tables VII.1 to VII.6.

TABLE VII.1—RAIL AND ROAD FREIGHT RATES FOR CATTLE—NEW SOUTH WALES, 1977-78

Rail			*Road*		
Distance (kilometres)	*Per van ($)*	*Per cattle—kilometre[a] (cents)*	*Distance (kilometres)*	*Per double deck kilometre ($)*	*Per cattle—kilometre[b] (cents)*
1-20	c		1-80	2.60	5.19
71-80	32.54	3.39	"	"	"
91-100	41.13	3.43	81-160	2.08	4.15
151-160	58.94	3.07	"	"	"
191-200	67.69	2.82	161-320	1.25	2.49
291-300	86.27	2.40	"	"	"
311-320	89.19	2.32	"	"	"
391-400	100.08	2.09	>320	1.04	2.08
491-500	113.42	1.89	"	"	"
591-600	126.17	1.75	"	"	"
691-700	138.62	1.65	"	"	"
791-800	151.34	1.58	"	"	"
891-900	158.86	1.47	"	"	"
991-1000	164.08	1.37	"	"	"

a. Assumes a rail van load of 12 beasts.
b. Obtained by dividing the road rate by 50, the capacity of a double deck trailer.
c. A minimum charge of $32.50 per van applied.

Source: Derived from data supplied by Public Transport Commission NSW and survey undertaken by Hassall and Associates.

1. Rail rates in Tas were not included in the analysis since cattle are no longer moved by rail in Tas.

TABLE VII.2—RAIL AND ROAD FREIGHT RATES FOR CATTLE—VICTORIA, 1977-78

Rail			Road		
Distance (kilometres)	Per van ($)	Per cattle—kilometre[a] (cents)	Distance (kilometres)	Per double deck kilometre ($)	Per cattle—kilometre[b] (cents)
1-30	8.00	2.22	1-80	2.40	5.99
71-80	15.75	1.64	"	"	"
91-100	17.35	1.45	81-160	1.92	4.79
151-160	24.55	1.28	"	"	"
191-200	29.50	1.23	161-320	1.15	2.87
291-300	39.15	1.09	"	"	"
311-320	42.45	1.11	"	"	"
391-400	49.45	1.03	>320	0.96	2.40
491-500	59.00	0.93	"	"	"
591-600	67.20	0.93	"	"	"
691-700	73.75	0.88	"	"	"
791-800	79.85	0.83	"	"	"
891-900	86.00	0.80	"	"	"
991-1000	92.00	0.77	"	"	"

a. Assumes a rail van capacity of 12 beasts.
b. Obtained by dividing the road rate by 40, the capacity of a double deck trailer in Vic.

Source: Derived from data supplied by VicRail and survey undertaken by Hassall and Associates.

TABLE VII.3—RAIL AND ROAD FREIGHT RATES FOR CATTLE—QUEENSLAND, 1977-78

Rail			Road		
Distance (kilometres)	Per[a] van ($)	Per cattle—kilometre (cents)	Distance (kilometres)	Per double deck kilometre[b] ($)	Per cattle—kilometre[c] (cents)
1-32	21.40	3.34	1-80	2.28	4.56
71-80	46.40	2.90	"	"	"
91-100	57.40	2.87	81-160	2.19	4.37
151-160	88.70	2.77	"	"	"
191-200	102.40	2.56	161-320	2.09	4.18
291-300	144.80	2.41	"	"	"
311-320	153.50	2.40	"	"	"
391-400	174.40	2.18	>320	1.90	3.80
491-500	204.40	2.04	"	"	"
591-600	221.30	1.84	"	"	"
691-700	250.30	1.79	"	"	"
791-800	276.60	1.73	"	"	"
891-900	296.50	1.65	"	"	"
991-1000	313.30	1.57	"	"	"

a. Assumes a K wagon with a capacity of 20 cattle.
b. Road charge computed for a K wagon equivalent transport unit.
c. Obtained by dividing the road rate by 50, the capacity of a double deck trailer in Qld.

Source: Derived from data supplied by Queensland Railways and survey undertaken by Hassall and Associates.

TABLE VII.4—RAIL FREIGHT RATES FOR AUSTRALIAN NATIONAL (CENTRAL REGION)[a] AND ROAD FREIGHT RATES FOR CATTLE—SOUTH AUSTRALIA, 1977-78

Rail			Road		
Distance (kilometres)	*Per van ($)*	*Per cattle—kilometre[c] (cents)*	*Distance (kilometres)*	*Per double deck kilometre ($)*	*Per cattle—kilometre[c] (cents)*
1-20	13.10	6.89	1-80	2.35	4.70
90-100	27.60	2.91	81-160	1.88	3.76
190-200	45.20	2.38	161-320	1.13	2.26
290-300	59.50	2.09	"	"	"
390-400	72.60	1.91	>320	0.94	1.88
490-500	84.10	1.77	"	"	"
590-600	95.20	1.67	"	"	"
690-700	105.10	1.58	"	"	"
790-800	116.00	1.53	"	"	"
890-900	125.00	1.46	"	"	"
990-1000	133.50	1.41	"	"	"

a. Australian National (Central Region) refers to the previous SAR system.
b. The number of cattle carried in a railway wagon is approximately 9 or 10. Assume a load capacity of 9.5.
c. Obtained by dividing the road rate by 50, the capacity of a double deck trailer in SA.

Source: Derived from data supplied by Australian National Railways Commission and survey undertaken by Hassall and Associates.

TABLE VII.5—RAIL AND ROAD FREIGHT RATES FOR CATTLE—WESTERN AUSTRALIA, 1977-78

Rail			Road		
Distance (kilometres)	*Per van ($)*	*Per cattle—kilometre[a] (cents)*	*Distance (kilometres)*	*Per double deck kilometre ($)*	*Per cattle—kilometre[b] (cents)*
1-30	14.50	4.39	1-80	2.20	4.40
71-80	24.40	2.77	"	"	"
90-100	28.80	2.62	81-160	1.76	3.52
151-160	44.00	2.50	"	"	"
191-200	50.80	2.31	161-320	1.06	2.11
291-300	67.60	2.05	"	"	"
311-320	70.40	2.00	"	"	"
391-400	82.00	1.86	>320	0.88	1.76
491-500	96.40	1.75	"	"	"
591-600	105.40	1.60	"	"	"
691-700	114.50	1.49	"	"	"
791-800	123.60	1.40	"	"	"
891-900	132.70	1.34	"	"	"
991-1000	141.80	1.29	"	"	"

a. Assumes a rail van capacity of 11 beasts.
b. Obtained by dividing the road rate by 50, the capacity of a double deck trailer in WA.

Source: Derived from data supplied by Westrail and survey undertaken by Hassall and Associates.

TABLE VII.6—RAIL FREIGHT RATES FOR CATTLE—AUSTRALIAN NATIONAL (NORTHERN REGION)[a], 1977-78

Distance (kilometres)	Per van ($)	Per cattle—kilometre[b] (cents)
41-50	18.60	1.96
91-100	34.40	1.81
191-200	66.25	1.74
291-300	97.85	1.72
391-400	126.10	1.66
491-500	146.10	1.54
591-600	168.10	1.47
691-700	191.80	1.44
791-800	213.70	1.41
891-900	235.20	1.38
991-1000	250.10	1.32
1091-1100	264.95	1.27
1191-1200	277.50	1.22
1291-1300	288.95	1.17
1311-1320	292.00	1.16

a. Australian National (Northern Region) refers to Australian National CAR and TAR systems.
b. The capacity of the rail van usually ranges between 18 and 20; assume 19.

Source: Derived from data supplied by Australian National Railways Commission.

The rail van statistic is based on rate book figures and varies among States and AN[1]. The capacity of a rail van in each State and the NT was assumed to be as follows:

- NSW 12 beasts
- Vic 12 beasts
- Qld 20 beasts
- AN (Central Region) 9.5 beasts
- AN (Northern Region) 19 beasts
- WA 11 beasts

The rail freight charge per cattle-kilometre was obtained by dividing the rate per van by the trip distance (the upper figure of the range specified in the tables) and by the number of cattle carried on the van.

Producers choosing to transport their cattle by rail must meet additional costs in the movement of the cattle to the railhead, either by hoof or by road. One study, undertaken by the BAE[2] suggested that these secondary movements of cattle were generally over relatively short distances in all States and that significant movements occurred only in Qld. However, the BTE was unable to obtain sufficient information to quantify the occurrence of these secondary movements or the associated average distances moved.

Road rates were obtained from the group of hauliers surveyed by Hassall and Associates. In general only the double deck road rate for journeys of greater than 320 kilometres could be ascertained. Nevertheless, from the survey data and additional

1. Australian National's rail system in 1977-78 consisted of the Central Region (previously the South Australian Railways, apart from the urban passenger operations) and the Northern Region (that is, the Trans Australian Railways and Central Australian Railways). Also, from March 1978 Australian National assumed responsibility for the day to day operations of the Tasmanian rail system.
2. BAE (1978).

information obtained by the BTE from firms engaged in the movement of livestock, the following raising factors were applied to the base rate for other trip distances for the mainland States except Qld:

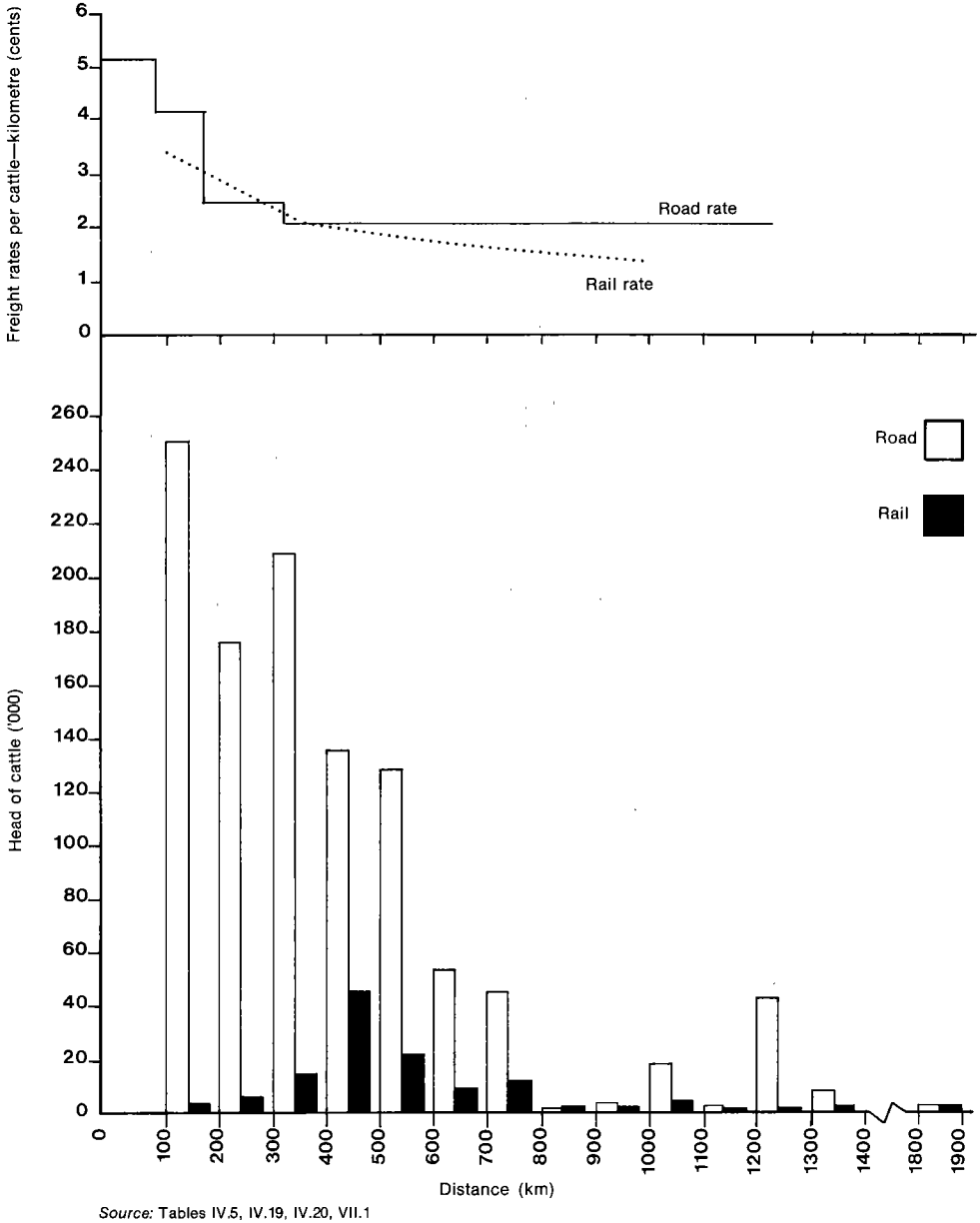
- up to 80 kilometres 2.5 times base rate
- 80 to 160 kilometres 2.0 times base rate
- 160 to 320 kilometres 1.2 times base rate
- above 320 kilometres base rate

In Qld, the survey data for rates were provided by most firms for each of the distance categories. The road rate per cattle-kilometre was obtained by dividing the road rate per double deck by 50[1], the capacity of a double deck trailer.

COMPARISON OF ROAD/RAIL FREIGHT RATES

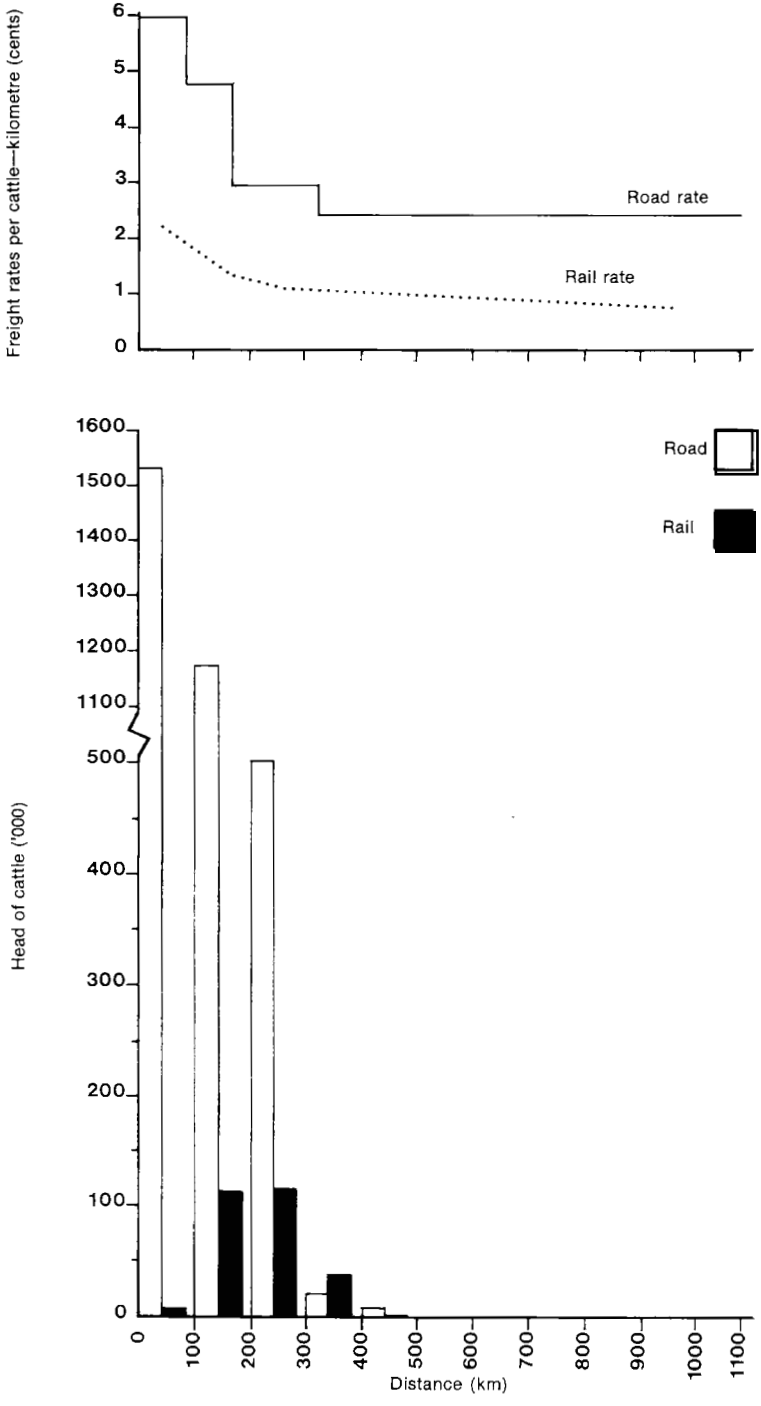
A series of histograms was developed to identify the areas of potential modal competition. This was done by comparing the number of slaughter cattle moved by road and rail for those journeys where both road and rail movements occurred. The histograms were obtained by overlaying the road and rail matrix tables of Appendix IV and excluding the 'captive' markets as represented by those journeys where only a single mode was involved in the movement of slaughter cattle. The results are illustrated in Figures VII.1 to VII.5. The graphs show that a greater number of cattle moved by road transport over most distances despite the fact that road freight rates in many instances were higher than for rail transport. Road transport displayed a price advantage in NSW, SA and WA only, and in these States only with respect to a limited number of short/medium haul distances. Road freight rates were below rail rates in these States generally over the distances 150 to 500 kilometres (Figures VII.1, VII.4, VII.5). In Vic and Qld (Figures VII.2, VII.3a, VII.3b), rail rates were significantly lower than road rates over all distances in 1977-78. However, where both road and rail transport were employed, road transport was the dominant mode in the movement of cattle over distances up to 500 kilometres in Vic and Qld, up to 600 kilometres in SA and WA and up to 1000 kilometres in NSW.

1. In Vic, the rate per cattle-kilometre was obtained by dividing the road rate by 40. Lower axle load limits meant the average load carried in a double deck trailer in Vic was less than in the other States.



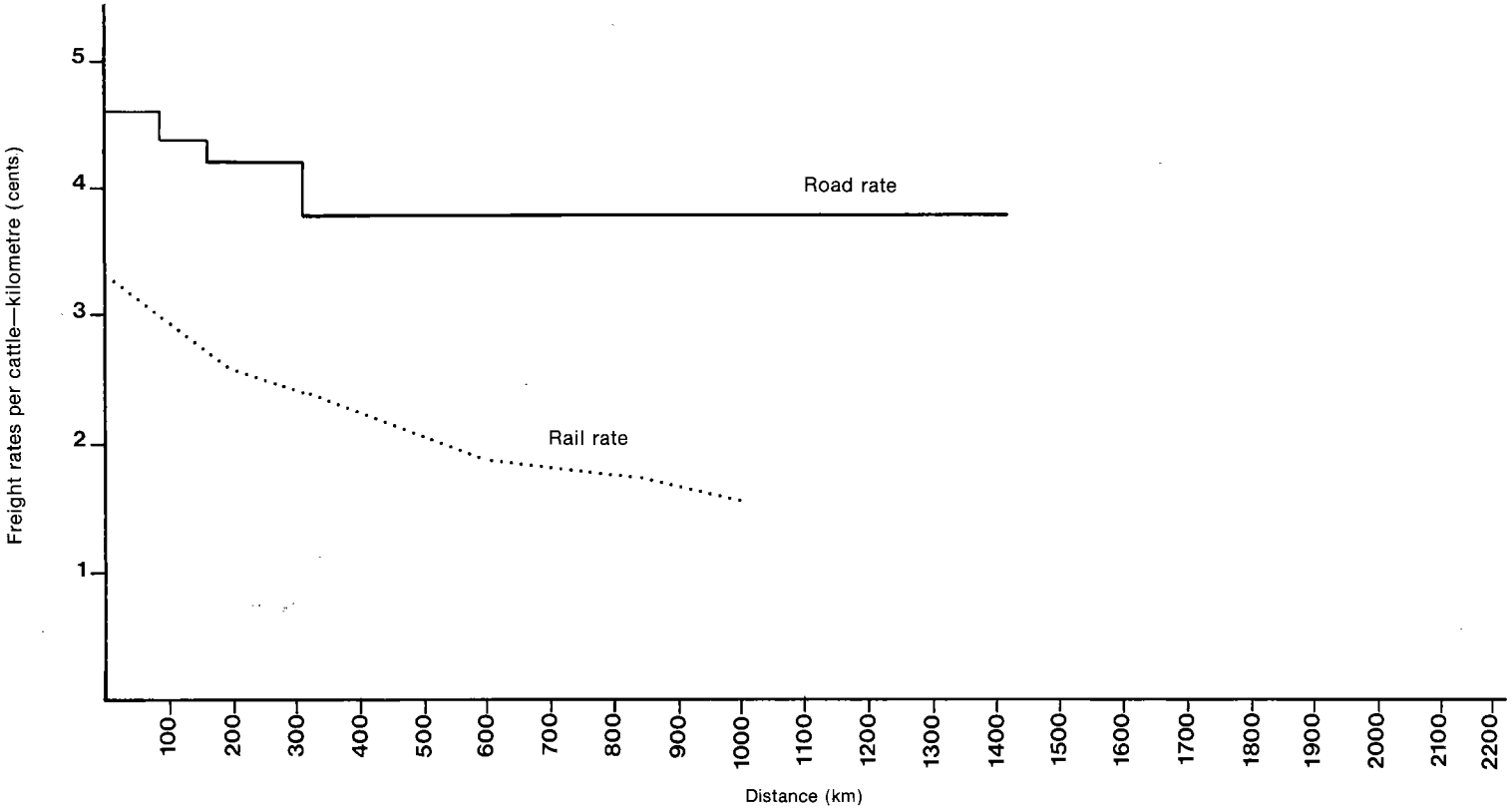
Source: Tables IV.5, IV.19, IV.20, VII.1

Figure VII.1 Road and rail freight rates and cattle movements —New South Wales, 1977-78



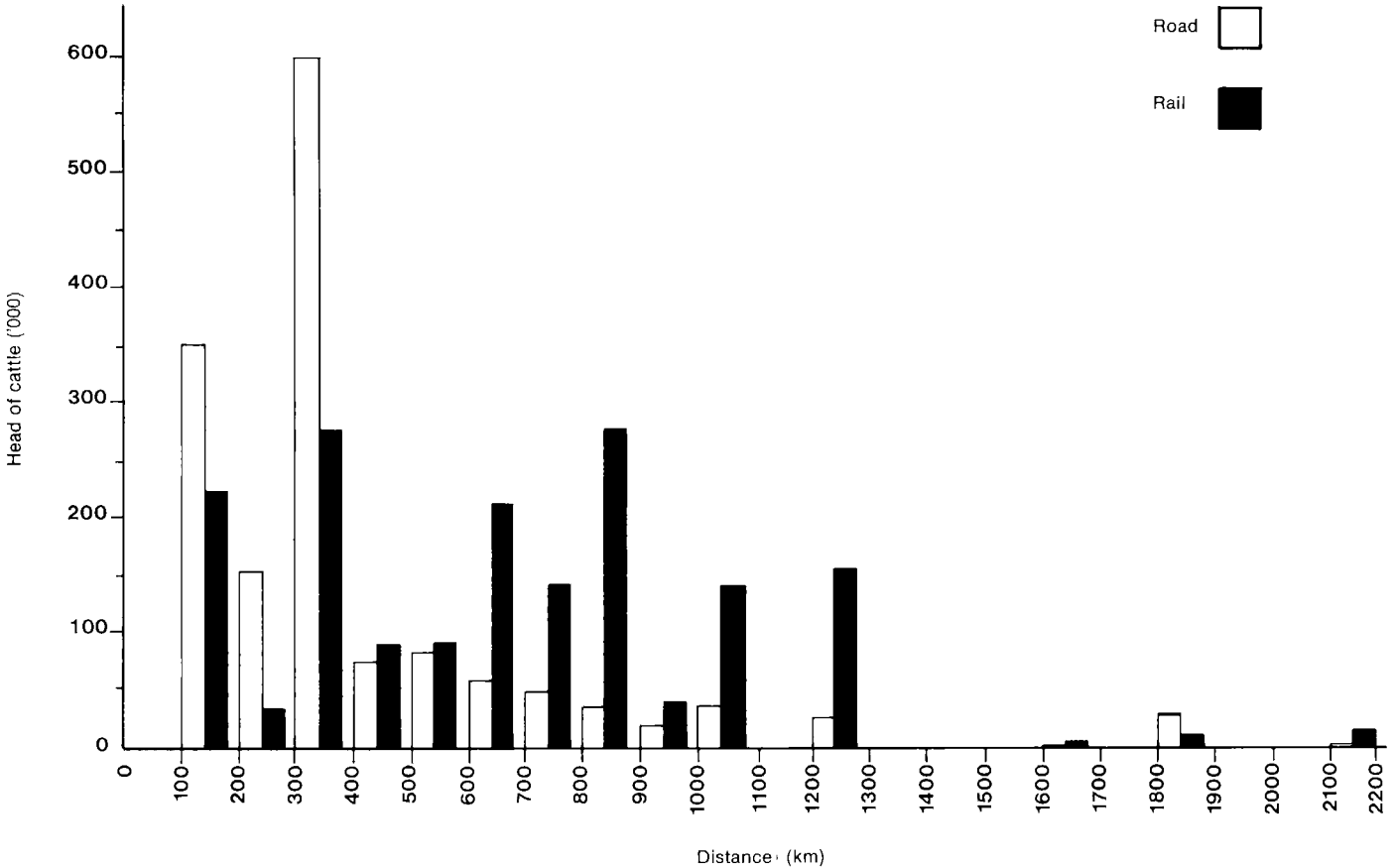
Source: Tables IV.7, IV.21, IV.22, VII.2

Figure VII.2 Road and rail freight rates and cattle movements —Victoria, 1977–78



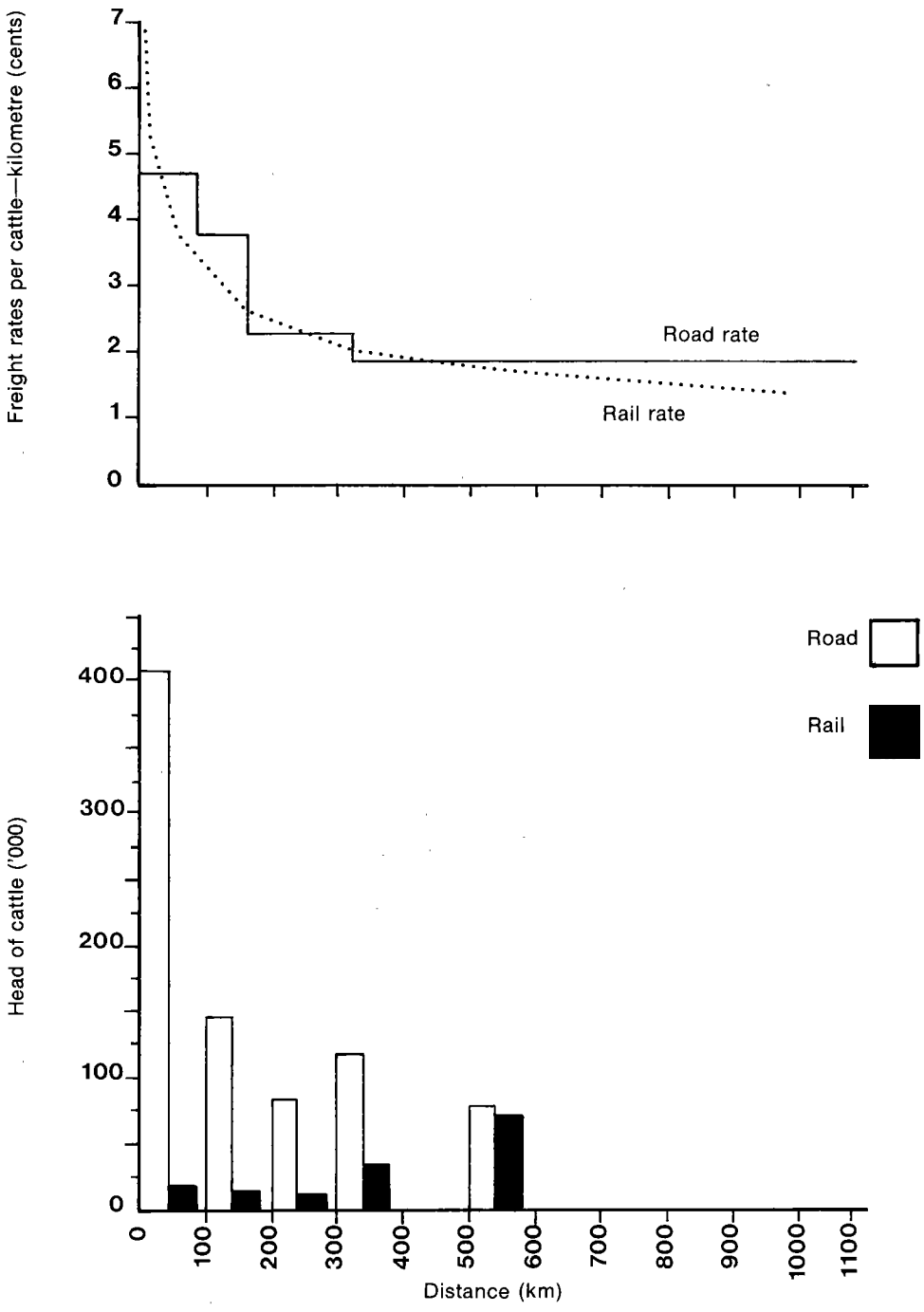
Source: Table VII.3

Figure VII.3A Road and rail freight rates—Queensland,1977-78



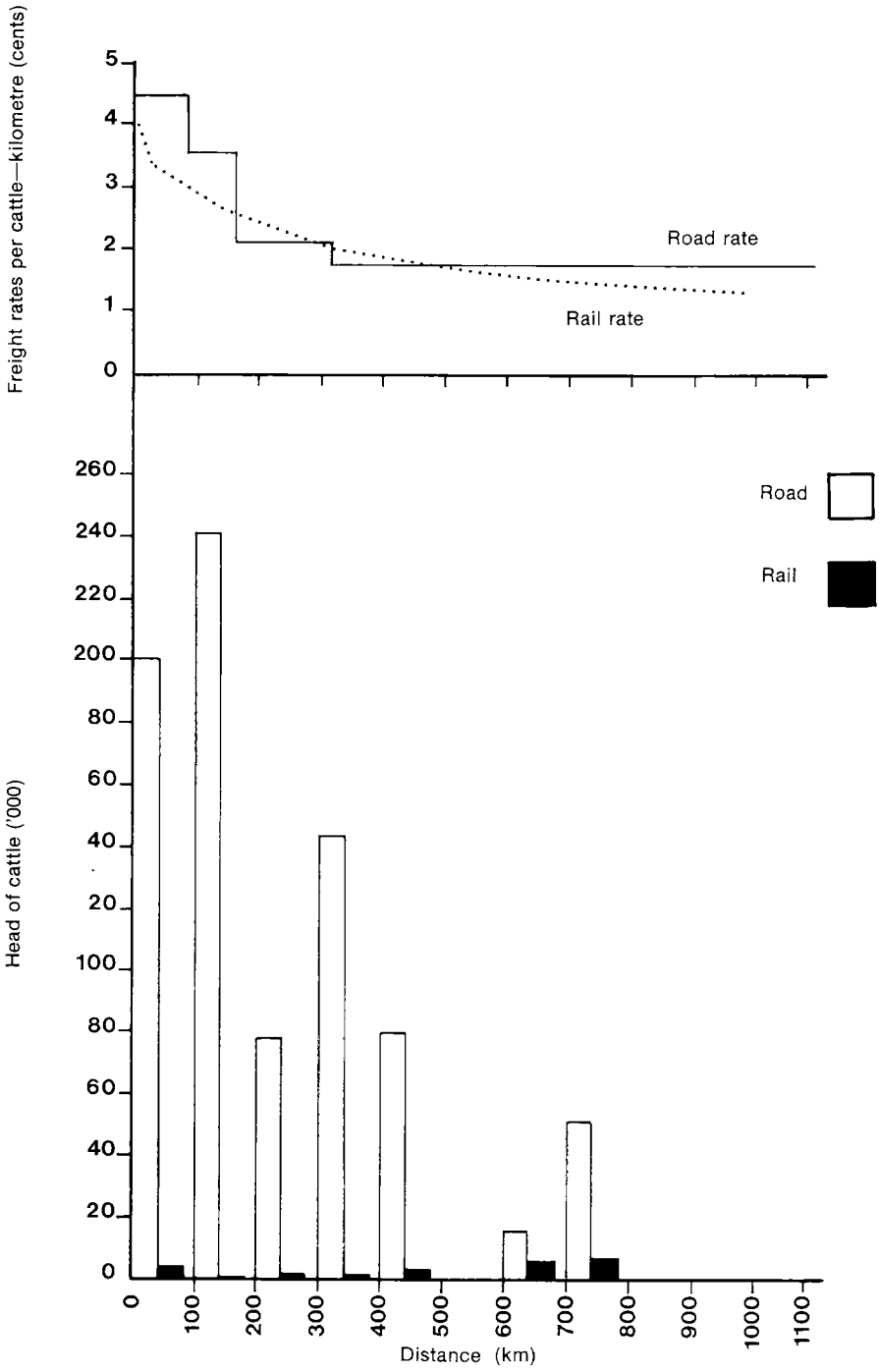
Source: Tables IV.9, IV.23, IV.24

Figure VII.3B Road and rail cattle movements—Queensland,1977-78



Source: Tables IV.11, IV.25, IV.26, VII.4

Figure VII.4 Road and rail freight rates and cattle movements —South Australia, 1977-78



Source: Tables IV.13, IV.27, IV.28, VII.5

Figure VII.5 Road and rail freight rates and cattle movements —Western Australia, 1977-78

APPENDIX VIII—INCIDENCE OF AN INCREASE IN TRANSPORT CHARGES

In this appendix the incidence of an increase in the cost of transporting slaughter cattle on both producers and consumers is illustrated diagramatically. An algebraic formulation of the incidence of the increase is also included.

ANALYSIS OF THE INCIDENCE OF A CHANGE IN TRANSPORT COSTS

Consider transport costs between farmgate and abattoir, and assume a small increase in these of T. Under competitive market conditions and assuming transport charges are a cost of production, the initial increase in transport costs will be borne by the producer. Other things being equal, the producer will supply less at the existing market price for cattle.

Subsequently however, the producer will attempt to pass the increased freight costs to the consumer of beef products. Assuming that middlemen, such as agents and abattoir operators, do not bear any of the transport cost increase, the success achieved by the producer in avoiding the increased costs will depend on the values of the price elasticities of demand and supply.

The initial increase in the retail price of beef products (which occurs as a result of producers' attempts to pass on the entire transport cost increase) will, in time, cause a contraction in consumer demand. This will lead to a reduced price to the consumer although this final price will be higher than that operating before the increase in transport charges. In the long run, therefore, T will be converted partly into increased costs to producers and partly into increased prices to consumers.

The above situation is illustrated in Figure VIII.1. In the diagram, the curves SS_1 and DS represent the supply and demand for slaughter cattle at the producer level. The initial equilibrium point is A, where the price of slaughter cattle is PS_1 and the quantity demanded Q_1. DR is the demand curve facing consumers of beef cattle products at the retail outlet. Consumers pay PR_1 for beef products.

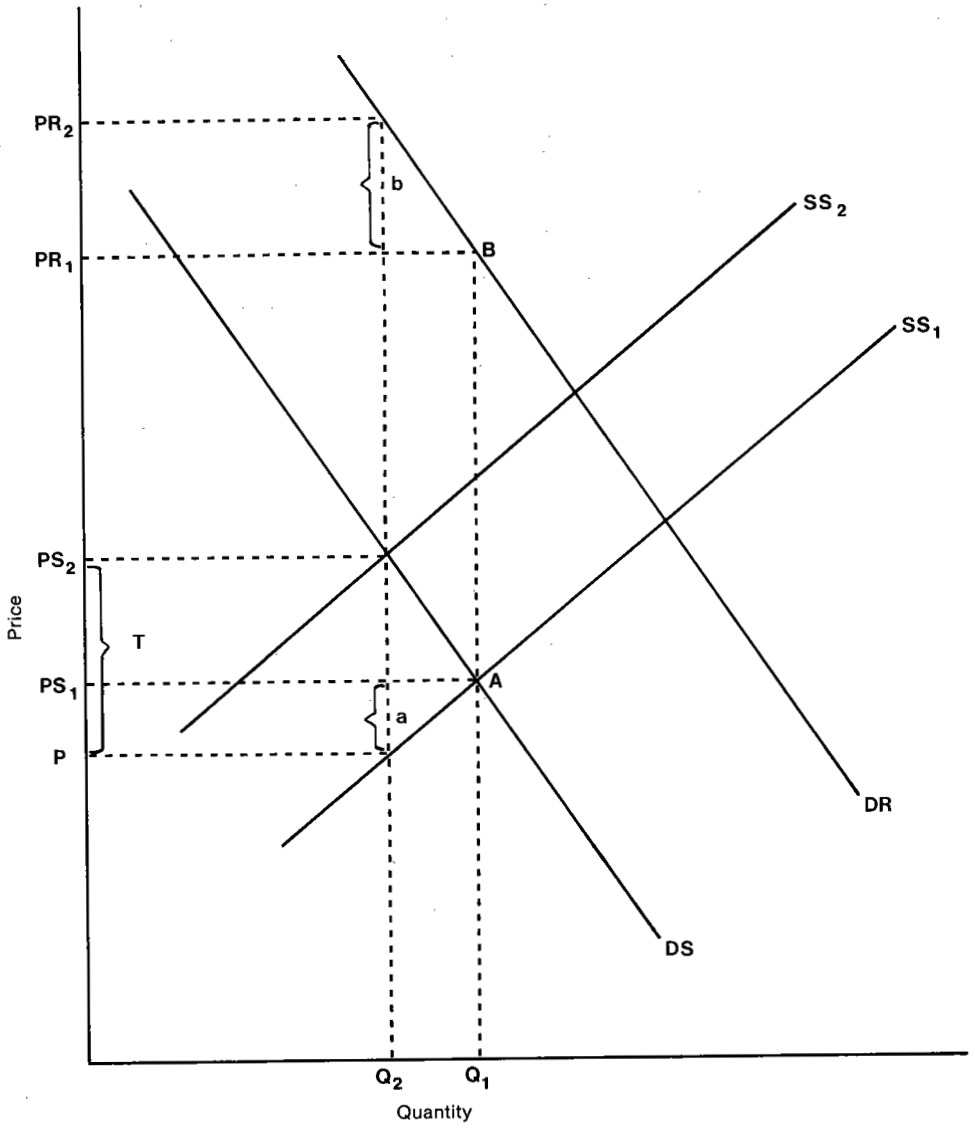


Figure VIII.1 Effect of an increase in transport costs on consumers and producers

In the long run, the producer's supply curve will shift to the left as a result of the increase in his schedule of costs, that is the supply curve becomes SS_2. Costs of production will have risen by the amount PPS_2, that is equal to T, as a result of the rise in freight charges. However the producer will now be receiving PS_2 for his product, an increase of PS_1PS_2. Therefore, the proportion of the original rise in transport costs which will be borne by the producers is PPS_1, that is equal to 'a'.

The price paid by consumers for beef products in the long term will rise from PR_1 to PR_2 as a result of the increase in transport costs. This is the proportion of the original increase T which is borne by the consumers; it is equal to the amount 'b'.

ALGEBRAIC FORMULATION

In Figure VIII.1, it was demonstrated that an increase in freight charges could be decomposed into an effect on producers, 'a', and a concomitant effect on consumers, 'b', with the total cost increase due to the rise in freight charges being 'a + b'. The incidence of an increase in transport costs is shown algebraically below.

The producers' share, P, of the cost increase will be a/a+b. It can be shown that P is approximated by the relationship,

$$\frac{1}{\epsilon_s} \Big/ \left(\frac{1}{\epsilon_s} + \frac{1}{|\epsilon_d|} \cdot \frac{PR_1}{PS_1} \right)$$

where ϵ_s is the price elasticity of supply at A and ϵ_d the price elasticity of retail demand at B. The formulation of the relationship is as follows:

$$a = \frac{\partial PS_1}{\partial Q_1} \cdot \Delta Q \tag{1}$$

$$b = \left| \frac{\partial PR_1}{\partial Q_1} \cdot \Delta Q \right| \tag{2}$$

$$\therefore \frac{a}{a+b} = \frac{\partial PS_1 / \partial Q_1}{\frac{\partial PS_1}{\partial Q_1} + \left| \frac{\partial PR_1}{\partial Q_1} \right|} \tag{3}$$

But,

$$\left|\epsilon_d\right| \text{ at } B = \left| \frac{\partial Q_1}{\partial PR_1} \cdot \frac{PR}{Q_1} \right|$$

$$\therefore \frac{1}{\epsilon_d} \text{ at } B = \left| \frac{\partial PR_1}{\partial Q_1} \right| \cdot \frac{Q_1}{PR_1} \tag{4}$$

Similarly,

$$\frac{1}{\epsilon_s} \text{at } A = \frac{\partial PS_1}{\partial Q_1} \cdot \frac{Q_1}{PS_1} \tag{5}$$

From (3), the relationship which approximates P (the producers' share) can be developed.

Hence,

$$P = \frac{1}{\epsilon_s} \Big/ \left(\frac{1}{\epsilon_s} + \frac{1}{|\epsilon_d|} \cdot \frac{PR_1}{PS_1} \right)$$

The share of the increase borne by consumers will then be 1 - P.

It can be seen from the derivation of the incidence of an increase in transport charges that the elasticity of demand at the retail outlet has been adjusted by the relative prices at the retail and producer levels. To this extent, the formulation differs from that presented in the PJT report. The difference between the two approaches is that consumers will bear a greater proportion of a price increase than suggested by the PJT.

EFFECT OF AN INCREASE IN TRANSPORT COSTS

Assuming all other marketing costs remain constant, the long term effect of an increase in transport charges will be a change in demand for beef products. The change in demand can be computed from the formula,

$$\frac{\Delta Q}{Q} = \frac{\epsilon_d \cdot \Delta b}{b}$$

where 'Δb' is the increase in transport costs passed on to consumers in the form of higher retail prices. This incidence 'Δb', has been discussed in the preceding section and the likely changes in consumer demand which would occur as a result of a 10 per cent rise in transport costs have been outlined in Chapter 7.

REFERENCES

Australian Bureau of Statistics (ABS) (1980a and earlier issues), *Livestock Statistics,* ABS, Canberra.

Australian Bureau of Statistics (ABS) (1980b and earlier issues), *Year Book,* ABS, Canberra.

Bureau of Agricultural Economics (BAE) (1971), *Regional Movements of Cattle in Queensland 1967,* AGPS, Canberra.

Bureau of Agricultural Economics (BAE) (1974), *The Regional Pattern of Spatial Marketing-Flow Characteristics of Beef Cattle in 1970-71,* Beef Research Report No. 16, AGPS, Canberra.

Bureau of Agricultural Economics (BAE) (1976), *Production Systems in the Australian Beef Cattle Industry,* Beef Research Report No. 18, AGPS, Canberra.

Bureau of Agricultural Economics (BAE) (1978), *Australian Grazing Industry Survey (AGIS) 1977-78,* unpublished data.

Bureau of Agricultural Economics (BAE) (1980 and earlier issues), *Situation and Outlook 1981—Meat,* AGPS, Canberra.

Bureau of Transport Economics (BTE) (1976), *Estimates of Australian Interregional Freight Movements, 1971-72,* AGPS, Canberra.

Bureau of Transport Economics (BTE) (1978), *Estimates of Australian Interregional Freight Movements, 1975-76,* AGPS, Canberra.

Bureau of Transport Economics (BTE) (1979), *Australian Rail Freight Movements 1975-76,* AGPS, Canberra.

Bureau of Transport Economics (BTE) (1981), *Estimates of the Task of Transporting Principal Rural Products Within Australia, 1975-76,* AGPS, Canberra.

Freebairn, J.W. (1973), 'Some Estimates of Supply and Inventory Response Functions for the Cattle and Sheep Sector of New South Wales', *Review of Marketing and Agricultural Economics,* Vol. 41, Nos. 2 & 3, pp53-90.

Girdlestone, J.N. and Parsons, S.A. (1973), 'The Regional Supply Pattern of Beef Cattle for Slaughter in Queensland', *Quarterly Review of Agricultural Economics,* Vol. 26, No. 1, pp44-59.

Greenfield, J.N. (1974), 'Effect of Price Changes on the Demand for Meat', *Monthly Bulletin of Agricultural Economics and Statistics,* Food and Agricultural Organisation (FAO), Vol. 23, No. 12, pp1-8.

Gruen, F.H. *et al* (1967), *Long Term Projections of Agricultural Supply and Demand, Australia, 1965 to 1980,* Department of Economics, Monash University, Melbourne.

Hassall and Associates (1980), *Transportation of Fat Cattle in Australia 1977-78,* unpublished Report to the Bureau of Transport Economics (BTE), May.

Main, G.W., *et al* (1976), 'Quantity-Price Relationships in the Australian Retail Meat Market', *Quarterly Review of Agricultural Economics,* Vol. 29, No. 3, pp193-211.

Marceau, I.W. (1967), 'Quarterly Estimates of the Demand and Price Structure for Meat in New South Wales', *Australian Journal of Agricultural Economics,* Vol. 11, No. 1, pp49-62.

Powell, A.A. and Gruen, F.H. (1967), 'The Estimation of Production Frontiers -The Australian Livestock/Cereals Complex', *Australian Journal of Agricultural Economics,* Vol. 11, No. 1, pp63-81.

Prices Justification Tribunal (PJT) (1978), *Beef Marketing and Processing—An Examination of the Charges and Margins Applying at all Stages of Beef Marketing and Processing in Australia,* unpublished Report, December.

Reeves, G.W. and Hayman, A.H. (1975), 'Demand and Supply Forces in the World Beef Market', *Quarterly Review of Agricultural Economics,* Vol. 28, No. 3, pp121-151.

Reynolds, R.G. (1977), 'Composition of Slaughterings: A Note on Changes in Cattle Numbers and Beef Production in Australia', in BAE, *Meat Situation and Outlook 1977,* AGPS, Canberra.

Scott, A.R. (1980), *BTE Occasional Paper 36, The Road Transport Business: A Guide to Some Financial Aspects,* AGPS, Canberra.

Smith, A.W. and Smith, R.L. (1979), 'The Australian Cattle Industry: Prospects and Consequences', *The Australian Economic Review,* 3rd Quarter, pp57-68.

Vincent, D.P., Dixon, P.B. and Powell, A.A. (1977), *Estimates of the Constant Ratios of Elasticities of Transformation, Homothetic (CRETH) Supply System in Australian Agriculture,* Preliminary Working Paper No. OP-17, Industries Assistance Commission, Melbourne, October.