The Social Impacts of Rail Systems Rationalisation

Report

This report assesses the social impacts of a range of scenarios developed for non-urban rail by the Railway Industry Council to set out reform options for railway systems in Australia. Use is made of Australian Bureau of Statistics census data for 1981 and 1986, data from railway systems in Australia and results from a survey of redundant and redeployed railway workers.

Report 72

The social impacts of rail systems rationalisation

Bureau of Transport and Communications Economics

Australian Government Publishing Service, Canberra

ISSN 1034–4152
ISBN 0 644 13909 9

Printed for AGPS by Better Printing Service, 1 Foster Street, Queanbeyan NSW 2620

FOREWORD

In September 1988 the Bureau of Transport and Communications Economics was requested to assess the social impacts of a range of non-urban rail reform scenarios developed by the Railway Industry Council. The study has been undertaken under the direction of a steering committee comprising the Federal Department of Transport and Communications, the management of five government owned-railway systems and railway unions.

This report has been prepared by Dr Godfrey Lubulwa (Research Leader) and Mr Ted Mikosza (Principal Research Officer) assisted at various stages by Ms Susan Grant, Mr Tony Carmody, Mr Kelvin Jones, Mr Greg Pickup, Mr Martin Kunz and Ms Erica Sharp at the Bureau. Mr Graham Caldwell (Department of Transport and Communications) assisted with computing in the final stages of the study.

Mr John Zerby (University of New South Wales) applied the Wroclaw taxonomic technique to aggregate the results for each local labour market. Dr Michael Taylor supervised the study in its early stages.

The nature of the study required a significant input of data and information from the railway management of Australian National, State Rail Authority of New South Wales, V/Line, Westrail and Queensland Railways and from the railway unions, particularly the Australian Railways Union. The Bureau would like to express its appreciation for the assistance provided by the staff and executives of railway systems and railway unions.

A. P. OCKWELL
Research Manager

Bureau of Transport and Communications Economics
Canberra
March 1991

CONTENTS

FIGURES

TABLES

ABSTRACT

This report assesses the social impacts of a range of scenarios developed for non-urban rail by the Railway Industry Council to set out reform options for railway systems in Australia. Use is made of Australian Bureau of Statistics census data for 1981 and 1986, data from railway systems in Australia and results from a survey of redundant and redeployed railway workers.

The study isolates those variables which are likely to influence the opportunities for re-employment of former railway workers. The Wroclaw taxonomic technique is then used to construct an index of the capacity to reabsorb labour for each of ninety-four local labour markets. This index is used to estimate the extent to which the Railway Industry Council scenarios result in a pool of ex-railway workers who fail to find alternative forms of gainful employment. These estimates are developed for the ninety-four local labour markets.

SUMMARY

In 1988 the Bureau of Transport and Communications Economics (BTCE) was requested to assess the social impacts of a range of scenarios developed by the Railway Industry Council for reform of the railway systems in Australia.

In this assessment the BTCE estimates the extent to which Railway Industry Council scenarios developed for non-urban rail operations result in a pool of ex-railway workers who fail to find alternative forms of gainful non-railway employment. The size of the estimated pool of unabsorbed displaced railway workers is used as a proxy for the social impacts of the Railway Industry Council scenarios.

THE SCENARIOS

The scenarios analysed were as follows.

Scenario 1. This is a base case which describes the expected development of non-urban rail for the period 1986–87 to 2001–02. This scenario is not a static forward projection of the 1986–87 situation but rather reflects known and likely changes to the non-urban rail market and is based on the appropriate rail systems' strategic plans.

Scenario 2A. This is an unconstrained railway scenario which assesses the likely performance of a commercially oriented railway in a deregulated environment with full cost recovery for all modes, assumed to result in an increase of 1 cent per net tonne-kilometre in road operator costs.

Scenario 2B. This is an unconstrained railway scenario which assesses the likely performance of a commercially oriented railway in a deregulated environment with full cost recovery for all modes, assumed to result in an increase of 2 cents per net tonne-kilometre in road operator costs.

Scenario 3. This is an unconstrained railway scenario with deregulation, similar to scenario 2, except that cost recovery for road transport would remain at current levels.

Scenario 4. This is a bulk haul railway scenario which examines the effect of concentrating on bulk haul traffic only, in an unconstrained and deregulated environment.

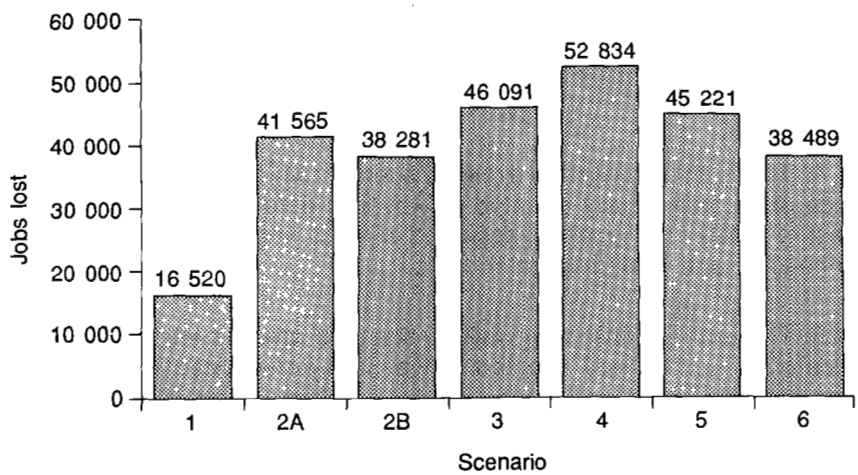
Scenario 5. This is a commercial railway scenario which examines the effect of concentrating on commercial traffic only in the current regulatory environment and assumes no change in road cost recovery. Interstate links are maintained irrespective of whether they cover their long-run avoidable costs.

Scenario 6. This is a commercial railway scenario which assumes that systems will carry, in addition to traffic identified under scenario 5, certain traffics considered by governments as community service obligations and separately funded.

INPUTS FROM THE FINANCIAL ANALYSIS

The major inputs in this analysis are the results from the financial assessment, which indicate that the Railway Industry Council scenarios are associated with reductions in the labour forces of the various railway systems. The required down-sizing varies by State and by scenario. Figure A shows the total non-urban railway jobs likely to be lost by the year 2001–02 aggregated over all railway systems under the various scenarios.

The national cumulative annual rates of job losses from 1986–87 to 2001–02 vary according to the scenario, ranging from the lowest rate of 1.76 per cent under the



Source Simulations of RAILCOST (Travers Morgan).

Figure A Non-urban railway jobs lost by 2001-02, Australia

base case to the highest rate of 8.80 per cent under the bulk traffics only railway (scenario 4).

Despite considerable variation in the distribution of employment by occupational group within the national system, the average annual rates of job losses by job classification display only slightly more variation than the equivalent rates of job losses by system.

ASSESSMENT

The assessment was carried out in two major stages.

The *first stage* of the analysis determined the buoyancy of ninety-four local labour markets in Australia by examining the interaction of the demand and the supply of labour between the 1981 census and 1986 census in each of the local labour markets.

The age, skill and occupational structures of these labour markets were determined and compared with the age, skill and occupational profiles of workers likely to be shed by the railway systems under the different Railway Industry Council scenarios.

In order to determine the buoyancy of these local labour markets the BTCE developed a model to assess the ninety-four local labour markets. The parameters of this model were estimated using:

- the 1981 and 1986 local government area census data from the Australian Bureau of Statistics (ABS);
- the 1988 ABS Integrated Register of Industry Statistics (IRIS);
- railway systems information on system employment cross-tabulated by age, sex, skill and major railway station or division; and
- results from the BTCE survey of railway workers.

The ability of workers (referred to hereafter as displaced railway workers) to gain employment therefore depends on the buoyancy of local labour markets within which these workers are likely to search for non-rail jobs.

A labour market was assigned to one of the following four groups.

Group 1: less than 40 per cent of workers reabsorbed. A very poor local labour market is one where demand and supply characteristics are such that less than 40 per cent of workers looking for work in those markets are likely to find employment.

Group 2: 40 to 54.9 per cent of workers reabsorbed. These are markets which, while better than the group 1 markets, are still worse than the Australian average in terms of labour reabsorption capacity. Between 40 and 54.9 per cent of workers looking for jobs in these markets are likely to find alternative non-railway employment.

Group 3: 55 to 69.9 per cent of workers reabsorbed. These are markets where reabsorptive capacity is equal to or slightly better than the Australian average. They can reabsorb between 55 per cent and 69.9 per cent of the workers (including former railway workers) seeking work in these markets.

Group 4: 70 per cent or more of workers reabsorbed. These are markets with a capacity to reabsorb 70 per cent or more of the workers looking for work in those markets. This reabsorption capacity is higher than the national average.

Table A summarises the buoyancy of the local labour markets. It shows that:

- there are 9 labour markets classified as group 1 labour markets;
- there are 26 labour markets classified as group 2 markets;
- 51 of the labour markets are in group 3 ; and
- there are 8 labour markets in group 4. The majority of job seekers in these markets are not likely to find problems in obtaining work.

The social impacts will be most serious in those local labour markets in groups 1 and 2. The number of these labour markets in each State and their shares in the States' pools of displaced railway workers are typified by the scenario 5 results as follows:

New South Wales	13 (64.3 per cent)
Victoria	7 (34.0 per cent)
Queensland	1 (11.5 per cent)
South Australia and Tasmania	9 (66.6 per cent)
Western Australia	5 (5.4 per cent)

The study assumed that potential displaced railway workers were distributed amongst the local labour markets in proportion to the local labour market's share of the 1986-87 railway system employment. In table A the ranking of some of the metropolitan regions as group 1 markets may be explained by some special ethnic, economic or transport characteristics affecting labour mobility. It is arguable, however, whether the boundaries used for those metropolitan regions are the appropriate boundaries for the relevant labour markets, particularly in the context of labour mobility.

Railway unemployment

There are three categories of workers:

- displaced railway workers, identical to the job losses;
- job seeking displaced railway workers given by the number of displaced workers *less* retirements or other exits; and
- unemployed displaced railway workers, given by the job seeking displaced railway workers *less* local labour market absorption.

The *second stage* of the analysis involved a conversion of the job loss estimates into estimated numbers of unemployed displaced railway workers which could be

TABLE A CLASSIFICATION OF LOCAL LABOUR MARKETS BY THEIR CAPACITY TO REABSORB WORKERS

Labour market group	*New South Wales*	*Victoria*	*South Australia and Tasmania*	*Western Australia*	*Queensland*
Group 1: less than 40 per cent re-employed	Wollongong Broken Hill Central and Inner Western Sydney Griffith	Inner Melbourne	Whyalla	Narrogin Northam Albany	
Group 2: 40–54.9 per cent re-employed	Southern Sydney Northern Sydney Armidale Orange Dubbo Newcastle Lismore Lithgow Wagga Wagga	Colac Horsham Southern Melbourne Morwell Warrnambool Mildura	Port Pirie Hobart Renmark Eastern Adelaide Port Lincoln Burnie Mount Gambier Western Para and North Eastern Adelaide	Central Perth Port Hedland	Townsville
Group 3: 55–69.9 per cent re-employed	Western Sydney Port Macquarie Tamworth Moree Gosford/Wyong Taree Coffs Harbour Goulburn Nowra South Western Sydney Bathurst Grafton Albury-Wodonga Canberra	Sale Shepparton Ballarat Wangaratta Bendigo Traralgon Geelong Western Melbourne Moe Outer-Eastern Melbourne Mornington Peninsula Inner-East Melbourne	Launceston Southern Adelaide Murray Bridge Northern Territory Darwin	Kalgoorlie South West Perth South East Perth North Perth East Perth Bunbury Geraldton Mandurah	Bundaberg Maroochydore Mount Isa Gladstone Inner Brisbane Outer Brisbane Balance Brisbane Maryborough Gympie Mackay Cairns Hervey Bay
Group 4: 70 per cent or more re-employed		Hamilton North East Melbourne	Port Augusta Alice Springs		Toowoomba Rockhampton Caloundra Gold Coast

Note The classification of labour markets is based on 1981 and 1986 regionally aggregated data. The methodologies used and the classification do not accommodate region-specific events which occurred after 1986.

attributed to the various scenarios. Displaced railway workers are designated unemployed if they are likely to seek re-employment but fail to do so as a result of the lack of buoyancy of the local labour market.

As mentioned before, in order to determine the social impacts in the ninety-four local labour markets the total numbers of displaced workers were allocated to local labour markets in proportion to their 1986–87 railway employment. The labour market absorptive capacities were then used to convert those displacements into an estimate of the number of rail employees who are not likely to be absorbed by local labour markets within a period of twelve months from the time of displacement.

Data limitations have prevented extension of the analysis beyond the initial twelve-month period following displacement but it is reasonable to assume that some of those remaining unemployed at the end of the first twelve months would subsequently find employment. Table B presents the national results on the numbers of job seeking displaced and unemployed displaced railway workers over the period 1986–87 to 2001–02 assuming adjusted 1 per cent, 3 per cent and 5 per cent natural rates of attrition of the railway work force. The three adjusted natural rates of attrition were used to obtain a range of displaced railway workers who are not expected to seek re-employment.

In conclusion, the study shows that there are likely to be some negative social impacts arising from each of the Railway Industry Council scenarios. There are likely to be some unemployed displaced railway workers who are unable to be absorbed by local labour markets.

These Railway Industry Council scenario induced unemployed displaced railway workers are not evenly distributed amongst the ninety-four local labour markets. In some railway systems a large proportion of the job seeking displaced workers

TABLE B NON-URBAN JOB SEEKING AND UNEMPLOYED DISPLACED RAILWAY WORKERS, 1986–87 TO 2001–02

	Job seekers at adjusted natural attrition rates of			*Unemployed at adjusted natural attrition rates of*		
Scenario	*1%*	*3%*	*5%*	*1%*	*3%*	*5%*
1	16 432	2 113	0	6 990	784	0
2A	41 345	30 434	15 391	17 972	13 103	6 527
2B	38 073	26 479	11 012	16 329	11 103	4 305
3	45 851	35 888	21 249	20 134	15 714	9 329
4	52 555	44 000	30 302	23 184	19 384	13 403
5	44 986	34 842	20 082	19 798	15 312	8 882
6	38 287	26 775	11 105	16 760	11 674	4 858

Note The unemployed are those workers remaining unabsorbed at the end of the first twelve months from the time of displacement. Some of these would subsequently find employment.

would be looking for work in labour markets where opportunities for re-employment are slim.

The results are prefaced on the assumption that re-employment opportunities in the local labour markets to the year 2001–02 will be the same as in the recent past. This will not necessarily be the case. Accordingly, the study's estimates would understate the re-employment capacity if local labour markets grow and develop more in the future than they have done in the recent past, and vice versa.

CHAPTER 1 INTRODUCTION

There is considerable goodwill within most of the community to support rail, but a commitment to major reform by all key players — governments, rail systems management, unions, users, shippers and the general community — is needed to maximise the long-term potential of rail. Change is inevitable. The transition will be easiest if it can be anticipated, planned and managed, rather than as a reaction to external driving forces.

A continuation of past trends into the future results in an annual national rail financial deficit estimated to be $1.3 billion in 1986–87 dollars by the turn of the century. It is difficult at this point in time to judge whether the Australian community will consider this financial cost acceptable for the services being provided and whether the State and Commonwealth governments will consider it within their financial means.

It is clear from work that the Railway Industry Council has undertaken that there are alternatives which would significantly reduce this financial cost. Some of the key elements for future improvement are productivity improvements, rationalisation of services, and expansion into complementary activities. They are not mutually exclusive. However, it needs to be recognised that economic and social benefits and costs are also relevant to decisions about the direction of rail in the future.

OBJECTIVES OF THE STUDY

This paper has two major objectives:

- to outline a methodology that has proved useful in a study of the social impacts of railway industry reorganisation and rationalisation; and
- to present the results from an application of this methodology in studying the likely social impacts of railway rationalisation in Australia.

The methodology can easily be applied to other national industries undergoing processes of restructuring and reorganisation that lead to substantial labour reductions. The results presented here, though specific to the railway industry, are interesting in a general sense because they highlight the importance of the structure, composition and performance of the overall regional economy in

determining whether the social impacts of restructuring are bearable by the local community or not.

POTENTIAL IMPACTS

In the last century, railways were regarded as catalysts for the growth and development of Australia's hinterland. Coupled with this was a political ideology which generated a railway network in each State which, while arguably inefficient, is still regarded by the inhabitants of small country towns as the lifeblood of their communities. This view is based on the perception that railways provide access to other regional and metropolitan centres and provide employment and income for outback locations. Three outcomes can result from removing railway services:

- the community shrinks as unemployed railway workers go elsewhere to seek employment, or are relocated;
- local businesses suffer, as the number of customers is reduced; and
- the burden on welfare increases, as often unemployable ex-railway workers enter the local unemployment pool.

This paper looks at what may happen to displaced rail workers as a result of railway restructuring under Railway Industry Council scenarios described in chapter 5. In particular it examines their re-employment prospects in their local areas.

LABOUR MARKET IMPACTS

In the case of the restructuring of railway systems, displaced labour would be introduced in differing amounts into a range of local labour markets. Some of those labour markets would be diverse, others highly specialised; some would be highly dependent on railways, others only marginally so. Varying capacity among local labour markets to absorb the labour shed by railway restructuring could also be expected. In fact, this capacity depends upon the resilience of the local economy — its potential to generate new jobs, and upon the rate at which displaced railway labour is introduced into it.

Theoretically, local labour market conditions would be expected to interact with the skill, age and family structure profiles of those people who are displaced by the rail systems. A range of responses can be expected. Some local labour markets will have no difficulty absorbing labour released by the railways, others will be able to offer only downgraded employment opportunities, and still others will be able to offer no alternative employment whatsoever.

Hence, a major requirement of the social analysis was to produce estimates of the present and future job generation potential of local labour markets.

REVERSE MULTIPLIER EFFECTS

There can be significant indirect impacts in local communities associated with labour shedding by the railway systems. In economic terms, these stem from the reverse multipliers created by reduced local spending (Atkins 1972). It is particularly important to estimate these reverse multipliers in communities where large numbers of rail system employees are involved. There may also be significant impacts in local housing markets. However, it is much harder to gauge these social and family dislocation effects that may arise from the future restructuring of rail systems. These reverse multiplier effects and other second round effects of railway system rationalisation are not included in this study.

OUTLINE OF THE PAPER

Chapter 2 discusses 94 local labour markets which are relevant to rail reform in Australia and the geographical distribution of those markets.

Chapter 3 deals with the small area analysis of labour markets. It discusses the variables that typify various local labour markets. The interactions between the supply and demand sides of these markets are explored.

Chapter 4 presents the results on the absorptive capacity of local labour markets. The *z*-scores technique and the Wroclaw taxonomic method are used to produce a ranking of the local labour markets in terms of their labour absorptive capacity.

Chapter 5 deals with the restructuring of the railway industry and the associated displacement of labour. In particular this chapter:

- outlines the Railway Industry Council scenarios that provided motivation for the study;
- discusses the methodology used in estimating the number of displaced workers;
- discusses the construction of the occupation and skills profiles of displaced workers; and
- estimates the number of railway workers likely to remain unemployed by 2001–02 under various assumptions about the rate of natural attrition and the way in which the displacements occur.

These results are indicative only. Certainly the actual numbers of unabsorbed workers are likely to differ from the ones reported here because railway systems and State governments might choose patterns of job displacements that differ from those used in this report.

Conclusions are presented in chapter 6.

CHAPTER 2 GEOGRAPHICAL DISTRIBUTION OF LOCAL LABOUR MARKETS

LOCAL LABOUR MARKET AREAS

An analysis at the national level of the impacts of economic change will generally fail to capture the heterogeneity of impacts at the State level. Similarly, an analysis at the State level will not portray the variations in the incidence of the costs and benefits of economic change at the regional level. This is particularly true when it comes to the railway industry.

A meaningful analysis of railway restructuring is ideally based on a labour market area consisting of a major regional centre which is affected by railway restructuring and its socially and economically interactive surrounds, such that labour mobility can be assumed to take place throughout the area. A regionalisation of Australia into such areas developed by the Office of Local Government (1988) was chosen as the basis of this analysis.

REGIONAL BASIS OF LOCAL LABOUR MARKETS

These regions were used by the Office of Local Government for comparative analysis of regional economies. The regions were constructed as 'nodal regions' based on urban centres with population greater than 10 000 in 1981. To describe each region a hinterland polygon was established around each node from a set of surrounding Australian Bureau of Statistics local government areas (LGAs) to describe each region. The regions are mutually exclusive comprehensive sets and were not organised hierarchically. The regional boundaries were determined by assigning each LGA to its nearest urban centre: distances were calculated by regarding each LGA (polygon) as a point located at its own geographic centroid and measuring the proximity of this point to the surrounding urban centres (nodes). Following this mechanical allocation, regional boundaries were then reviewed in relation to natural barriers such as mountain ranges, rivers and straits, road and rail links and recognised regional affiliations, to arrive at best possible regional connectivity.

As mentioned before, the regional system treats each urban centre with a population greater than 10 000 as a node. It was decided to consider Queanbeyan (NSW) as part of the Canberra (ACT) node and Devonport

(Tasmania) as part of the Burnie node. The set of urban centres as defined above was supplemented by the addition of a further six centres with populations of less than 10 000 in 1981. These centres were Katherine in the Northern Territory, Renmark and Murray Bridge in South Australia, Hamilton in Victoria and Narrogin and Northam in Western Australia. Given the rural and 'country centres' orientation of the research exercise, these further six centres were selected to avoid the creation of several unacceptably large metropolis-centred regions.

Notwithstanding the attempts that were made to create as realistic a regionalisation as possible, the creation of a number of extremely large regions in central, north and north-western Australia remained unavoidable (appendix figure I.1)

In addition, several of the regions created by the Office of Local Government cross State borders, in order to avoid the effects of creating artificial or illogical functional regions such as may have resulted on either side of the Murray River. Cross-border regions are not seen as constituting a problem, as could have arisen from a mix of comparably sized railway employments from two systems in a region. In fact, for all cross-border regions, railway employments of one railway system dominated.

A total of 75 towns, cities and metropolitan areas were selected as nodes upon which to base regions, shown in appendix figure I.1. The major metropolitan areas of Sydney, Melbourne, Brisbane, Adelaide and Perth were further subdivided into smaller regions, six in Sydney, seven in Melbourne, three each in Brisbane and Adelaide, and five in Perth. The total number of regions considered was thus 94. A complete list of the LGAs, and in a few cases, statistical local areas (SLAs), that make up each region is given in appendix I.

SOURCES OF LABOUR MARKET DATA

The study relied on four main sources of data on labour markets. These sources are described below.

Railway systems

Four railway systems, namely the State Rail Authority of New South Wales (SRA), Queensland Railways, Westrail (Western Australia) and Australian National provided the BTCE with detailed data as of June 1988 on:

- the labour force of the respective railway system;
- the distribution of that labour force by sex and in some cases by age;
- the location of the employees by branch/directorate and in the case of SRA by major railway station; and
- the occupation and skill distribution of workers at each identified location.

This information was used to establish the share of railway employment in the various local labour markets described by the regional boundaries.

The information was mapped into the LGAs which were then aggregated into the local labour markets.

Integrated register of industry statistics

To assist in the process of matching railway systems data with a small area (LGA and SLA) database, use was made of the Integrated Register of Industry Statistics (IRIS), a database from the Australian Bureau of Statistics. The IRIS data were for February 1988. The BTCE extracted data for the Australian Standard Industry Classification (ASIC) number 5200, which refers to railway establishments. For each statistical local area (a sub-unit of an LGA) where there was a railway establishment, IRIS:

- gave the Australian Standard Geographical Classification nine-digit code for the SLA;
- indicated the type of ownership of the railway establishment:
  - private (excluded from this analysis);
  - Federal; or
  - State; and
- reported an estimate of employment in each SLA.

These employment estimates were available only in the following groups:

unknown employment level
zero employees
1–4 employees
5–9 employees
10–19 employees
20–49 employees
50–99 employees
100–199 employees
200–499 employees
500–999 employees
1000–over employees

Because the IRIS data were grouped data their accuracy could not measure up to railway systems data. The data were used to confirm or otherwise assist the BTCE's integration of railway system information into the Census Applications Small Area System (CASAS 1988), a software package designed especially for the analysis of ABS census data.

Australian Bureau of Statistics census data

The most detailed information on the labour markets was obtained from the Australian Bureau of Statistics 1981 and 1986 census data via CASAS. These data were used to assess the changes in the labour market in the inter-censal period in terms of a number of key variables outlined in chapter 3.

STEREOTYPES OF LOCAL LABOUR MARKETS

To determine the labour market impacts of railway reform in the 94 regions in Australia, skill and occupational profiles of railway workers were required for each of the 94 regions.

The BTCE required for each market a distribution of the railway employees by the eight major Australian Standard Classification of Occupations (ASCO) groups, namely:

managers and administrators (ASCO1)
professionals (ASCO2)
para-professionals (ASCO3)
tradespersons (ASCO4)
clerks (ASCO5)
salespersons and personal service workers (ASCO6)
plant and machine operators, and drivers (ASCO7)
labourers and related workers (ASCO8)

For each of the 94 regions employees had to be further cross-classified by major railway functional employment groups, namely:

infrastructure
mechanical/workshops
train operations – crew
train operations – other
administration

Ideally one would need 94 matrices each of dimension 8×5. Unfortunately these data were not available in the required format for the majority of regions. To overcome this problem, the BTCE constructed stereotypes of local labour markets. Data were collected on 27 local labour markets. For each of these 27 markets, matrices of dimension 8×5 giving cross-tabulations of employees' occupations (eight groups) by major railway functional employment groups (five groups) were constructed. The 27 regions act as stereotypes for the remaining regions for which skill profiles have not been estimated. These stereotype regions are shown in table 2.1.

The matching of stereotype regions to the remaining regions was conducted on the basis of similar railway employment size and any known common characteristics, such as presence of workshops. This means that the skill profiles of the railway employees in the regions listed on the right-hand side of table 2.1 were approximated by the skill profiles of the corresponding stereotype region. These regions are classified into four types:

- small rural regions, with 1986–87 railway employments of 250 or less;
- medium rural regions, with corresponding employments of 251 to 1000;
- large rural regions of over 1000 employees; and
- metropolitan regions.

TABLE 2.1 SKILL PROFILE STEREOTYPE REGIONS AND REGIONS TO WHICH PROFILES HAVE BEEN APPLIED

Region type (1986–87 rail employment)	*Stereotype region*		*Region to which skill profile applied*	
	Number and name	*System*	*Number and name*	*System*
Small rural (≤ 250)	Combination of:			
	54 Griffith	SRA	3 Nowra	SRA
	41 Broken Hill	SRA	30 Lithgow	SRA
			36 Armidale	SRA
			48 Coffs Harbour	SRA
			49 Port Macquarie	SRA
			23 Warrnambool	V/Line
			32 Traralgon	V/Line
			38 Sale	V/Line
			44 Morwell	V/Line
			57 Colac	V/Line
			50 Coloundra	QR
			52 Maroochydore	QR
			68 Gold Coast	QR
			69 Hervey Bay	QR
	54 Griffith	SRA	54 Griffith	SRA
	75 Murray Bridge	AN	73 Mount Gambier	AN
			74 Renmark	AN
			40 Alice Springs	AN
	65 Port Lincoln	AN	35 Whyalla	AN
	26 Burnie	AN	26 Burnie	AN
	71 Narrogin	Westrail	46 Kalgoorlie	Westrail
			66 Albany	Westrail
			53 Mandurah	Westrail
Medium rural (251–1000)	12 Bathurst	SRA	10 Canberra	SRA
			11 Albury-Wodonga	SRA
			15 Grafton	SRA
			16 Lismore	SRA
			17 Orange	SRA
			29 Wollongong	SRA
			56 Taree	SRA
			19 Ballarat	V/Line
			20 Bendigo	V/Line
			21 Shepparton	V/Line
			22 Wangaratta	V/Line
			37 Hamilton	V/Line
			43 Moe	V/Line
			58 Horsham	V/Line
			59 Mildura	V/Line
			45 Mount Isa	QR
			60 Bundaberg	QR
			62 Gympie	QR

TABLE 2.1 (Cont.) SKILL PROFILE STEREOTYPE REGIONS AND REGIONS TO WHICH PROFILES HAVE BEEN APPLIED

Region type (1986–87 rail employment)	*Stereotype region*		*Region to which skill profile applied*	
	Number and name	*System*	*Number and name*	*System*
	41 Broken Hill	SRA	41 Broken Hill	SRA
	34 Port Pirie	AN	34 Port Pirie	AN
	27 Launceston	AN	27 Launceston	AN
	72 Northam	Westrail	67 Geraldton	Westrail
			70 Bunbury	Westrail
Large rural (>1000)	04 Wagga Wagga	SRA	04 Wagga Wagga	SRA
	Combination of:			
	04 Wagga Wagga	SRA	18 Tamworth	SRA
	13 Dubbo	SRA	28 Newcastle	SRA
	14 Goulburn	SRA	55 Moree	SRA
			31 Geelong	SRA
	13 Dubbo	SRA	13 Dubbo	SRA
	14 Goulburn	SRA	14 Goulburn	SRA
	33 Port Augusta	AN	33 Port Augusta	AN
	06 Townsville	QR	24 Maryborough	QR
			25 Rockhampton	QR
			51 Gladstone	QR
			61 Cairns	QR
			63 Mackay	QR
			64 Toowoomba	QR
Metropolitan	01.1 Central and Inner Western Sydney	SRA	01.1 Central and Inner Western Sydney	SRA
	01.2 Gosford/Wyong	SRA	01.6 Western Sydney	SRA
			02.1 Inner Melbourne	V/Line
			02.2 Inner-East Melbourne	V/Line
			02.3 Mornington Peninsula	V/Line
			02.4 North East Melbourne	V/Line
			02.5 Outer-Eastern Melbourne	V/Line
			02.6 Southern Melbourne	V/Line
			02.7 Western Melbourne	V/Line
	01.5 Southern Sydney		01.5 Southern Sydney	SRA

TABLE 2.1 (Cont.) SKILL PROFILE STEREOTYPE REGIONS AND REGIONS TO WHICH PROFILES HAVE BEEN APPLIED

Region type (1986–87 rail employment)	*Stereotype region*		*Region to which skill profile applied*	
	Number and name	*System*	*Number and name*	*System*
	Brisbane Statistical District		05.1 Balance Brisbane	QR
			05.2 Inner Brisbane	QR
			05.3 Outer Brisbane	QR
	07.1 Eastern Adelaide	AN	07.3 Western Para and North East Adelaide	AN
	08.1 Central Perth	Westrail	08.1 Central Perth	Westrail
	08.2 East Perth	Westrail	08.2 East Perth	Westrail
	08.3 North Perth	Westrail	08.3 North Perth	Westrail
	08.4 South East Perth	Westrail	08.4 East Perth	Westrail
	08.5 South West Perth	Westrail	08.5 South West Perth	Westrail
	09 Hobart	AN	09 Hobart	AN

Note The following regions have very small government railway employments or no government railway employment: 01.3 Northern Sydney SRA; 01.4 South Western Sydney SRA; 07.2 Southern Adelaide AN; 39 Northern Territory AN; 42 Darwin; 47 Port Hedland

CHAPTER 3 SMALL AREA DATA ANALYSIS OF LOCAL LABOUR MARKETS

INTRODUCTION

In order to assess the impact on local labour markets of industrial restructuring one needs to determine what other structural changes might influence the impacts of the planned industrial restructure. In this chapter the methodology for identifying the influences on the supply and demand sides of the local labour markets is briefly described. The methodology, termed shift-share, is fully documented by Steve Garlick of the Bureau of Labour Market Research in a study of labour market adjustment in the Hunter region of New South Wales (BLMR 1985a, 1985b). The methodology uses the demographic group as the unit of analysis.

Demographic groups

For each local labour market and for Australia as a whole the analysis uses Australian Bureau of Statistics census data for 1981 and 1986 to identify the influences on:

- males and females in the age groups:
  - 15–19
  - 20–34
  - 35–54
  - 55–64
- persons (total of males and females) in the age groups listed above.

These demographic groups describe the labour force in a given local labour market. The labour force is defined as the number of employed plus the number of unemployed who are seeking employment. Individuals younger than 15 and those older than 64 are traditionally assumed to be outside the labour market.

In the ensuing analysis the term labour market *supply* means the region's labour force. The term labour market *demand* means the total employment in the region.

SUPPLY SIDE OF LOCAL LABOUR MARKETS

Labour supply in a local labour market occurs through population growth, the movement of persons in and out of the labour force and by migration.

Change in the labour force

For a given demographic group the percentage change in the labour force in a local labour market is computed by:

- finding the average number of individuals in the demographic group over the two census years (1981 and 1986); and
- computing the difference in the 1981 and 1986 totals in the demographic group as a percentage of the average number in the group.

The methodology here involves the decomposition of the change in labour supply of each of the above-listed demographic groups into three components:

- an age cohort effect;
- a net migration effect; and
- the labour force participation rate.

Age cohort effect

If net migration and the death rate were zero for a given local labour market, then the labour supply would still change due to the upward shift in the age distribution. Some individuals who were too young in the 1981 census to form part of the 1981 labour supply would by 1986 be part of the local labour market's labour supply. Similarly individuals who in the 1981 census were in the 60–64 age group and so still part of the labour supply would have exited from the labour market by the 1986 census. The age cohort effect, then, is the change in the labour supply due solely to the ageing of the local population. In order to compute the age cohort of a demographic group the analysis:

- takes the 1986 census population in the group;
- subtracts from that the 1981 census population for the group and the computed net migration (see below);
- the remainder, expressed as a percentage of the average population for the demographic group, gives the age cohort effect for the group.

An age cohort effect of zero for a group indicates that the change in the age structure has left the population in the group unchanged. A negative age cohort effect indicates that the change in the age structure has, over time, shifted more people out of the group than it has shifted in. The reverse would be true for a positive age cohort effect.

Net migration effect

The labour supply in a given region's demographic group may change as a result of net migration. To compute the net migration effect of a given demographic group, the analysis:

- takes the average population in the group for each of the two census years (1981 and 1986);
- computes the net migration as the difference in the total population in the demographic group in the census year 1986 and the corresponding demographic group in 1981, the latter figures being adjusted for the number of deaths in the intervening period; the number of deaths was computed using age-specific death rates in Australian Bureau of Statistics (1988);
- the net migration effect of the demographic group is the group's net migration as a percentage of the average population in the group.

A negative net migration effect means that between the two censuses, out-migration in the demographic group in question exceeded in-migration for the group in the local labour market.

Similarly, if the net migration effect is zero then the labour supply component in the demographic group remained stable. A positive net migration effect means that in-migration in the group exceeded out-migration indicating that more individuals have moved into the local labour market than have moved out, thus positively impacting on the labour absorption capacity of the market.

Labour force participation rate effect

The labour force participation rate for a demographic group is a measure of the extent to which a given age group is involved in the local labour market. Typically the participation rate is the sum of those who are employed and those who are currently seeking employment divided by the population. Thus, in a labour market, if p is the total population in the 35–54 age group and q is the number of individuals in the labour force in the 35–54 age group, then the participation rate for this age group is q/p.

The social impacts that this report deals with will partly depend on the changes in the participation rates of different demographic groups, that is, on the groups' labour force participation rate effects. These are computed for a group by:

- finding the difference in the participation rate for the group between the two censuses; and
- dividing this difference by the corresponding average participation rate.

A positive participation rate effect for a group indicates that between the two censuses there has been an increase in the proportion of the group that are either employed or seeking work. A negative labour force participation rate effect for a group means that there has been a decrease in the proportion of the group who are either employed or seeking work.

TABLE 3.1 IMPACTS OF STRUCTURAL CHANGES ON LABOUR SUPPLY

Net migration effect	*Age cohort effect*	*Labour force participation rate effect*	*Impact on labour supply*
–	–	–	Decrease
–	–	+	?
–	+	+	?
+	+	+	Increase
+	+	–	?
+	–	–	?
+	–	+	?
–	–	0	Decrease
+	0	0	Increase
0	0	0	No change

Note + and – stand for positive and negative effects respectively; ? indicates that the overall impact will depend on the relative sizes of sector changes.

For example, increasing school retention rates would lead to a negative participation rate effect for the 15–19 years age group. Similarly, increasing the number of workers taking retirement would have a negative participation rate effect on the 55–64 years age group.

Table 3.1 indicates how some possible combinations of structural changes in a local labour market could impact on labour supply.

From the point of view of the workers who may be displaced as a result of industrial restructuring, other things being equal:

- The social impacts would be most severe for a displaced worker belonging to a demographic group whose labour supply component is expanding. That is so because an expanding labour supply within the worker's demographic group increases the number of potential competitors for the positions available.
- The social impacts would be least for a displaced worker belonging to a demographic group whose labour supply component is decreasing, because decreasing supply of labour for the worker's demographic groups means a reduction in the competition for the available jobs.

However, there are exceptions. For example, in the case of expanding labour supply caused by net in-migration, job opportunities might be improving as a result of a buoyant economy.

Of course, this is only one part of the story. The changes in the supply of labour for a demographic group would be advantageous or otherwise to a potential

displaced worker depending on what happens on the demand side of the given local labour market.

DEMAND SIDE OF LOCAL LABOUR MARKETS

The focus in this part of the analysis was on the demand for labour by a given industry in a selected local labour market. This demand was then compared to the national demand for labour by the given industry.

The core data inputs from the Australian Bureau of Statistics census files were as follows:

$E_{ij\,81}$	Number of persons employed in 1981 in industry i (say the agriculture and forestry industry when $i = 1$) in local labour market j
$E_{ij\,86}$	Number of persons employed in 1986 in industry i in local labour market j
$\sum_{i=1}^{13} E_{ij\,81}$	Total number of persons employed in $i = 1$ in all the 13 industries in the region in local labour market j. The corresponding term for 1986 has a similar meaning
$\sum_{j=1}^{94} E_{ij\,81}$	Total number of persons employed in industry i, over all the local labour markets

The above summations apply to 13 industries ($i = 1, ..., 13$) and 94 regions ($j = 1, ..., 94$). The 13 industries were based on the Australian Bureau of Statistics Australian Standard Industrial Classification (ASIC) divisions:

1	Agriculture and forestry
2	Mining
3	Manufacturing
4	Electricity, gas and water
5	Construction
6	Wholesale and retail trade
7	Transport and storage
8	Communication
9	Finance, property and business services
10	Public administration and defence
11	Community services
12	Recreation, personal and other services
13	Not classified

The growth in employment in a given local labour market indicates the change in the aggregate demand for labour in the market. The influences on the direction and form of the change in labour markets fall into three major groups:

- the proportionality shift effects;
- the differential shift effects; and
- the regional share effects.

Proportionality shift effects

The proportionality shift effects (*P*) are sometimes referred to as the industrial mix effects. They refer to the change in employment in a region as a result of the region changing its industrial mix or structure. This may happen if the region is characterised by naturally growing or declining industries in which cases employment would increase or decrease, respectively. As the industrial mix changes so does the occupational mix for the region. Employment for certain skills or occupations may increase or decrease depending on the skills demanded under the changing regional industrial mix.

The proportionality shift in local labour market j for any industry i, P_{ij}, can be estimated by the following equation:

$$P_{ij} = E_{ij\,81}\left[\left(\sum_{j=1}^{94} E_{ij\,86} \Big/ \sum_{j=1}^{94} E_{ij\,81}\right) - \left(\sum_{i=1}^{13}\sum_{j=1}^{94} E_{ij\,86} \Big/ \sum_{i=1}^{13}\sum_{j=1}^{94} E_{ij\,81}\right)\right] \qquad (3a)$$

In equation 3a the first ratio of summations inside the square brackets is specific to industry *i*. It indicates the ratio of Australia-wide demand for labour in industry *i* in 1986 to that in 1981. The Australia-wide demand for workers in industry *i* will have increased, decreased or remained constant depending on whether that ratio is greater than 1, less than 1 or equal to 1, respectively.

In equation 3a the second ratio of summations in the square brackets refers to all industries, and all local labour markets. It indicates the ratio of the Australia-wide aggregate demand for labour over all industries and all local labour markets in Australia for the two census years. Again, depending on whether this ratio was greater than 1, less than 1 or equal to 1, the aggregate Australia-wide demand for labour over all industries would have increased, decreased or remained static in the inter-censal period.

It is then clear that in equation 3a if the two ratios inside the square brackets were both equal to 1 then the demand for labour in industry *i* and the Australia-wide aggregate demand for labour would not have changed in the inter-censal years. The difference between the ratios in the square brackets would be zero and so would be the proportionality shift for industry *i* in the local labour market.

If the ratio specific to industry *i* was larger than the Australia-wide aggregate demand ratio then the Australia-wide demand for labour in industry *i* would have grown faster compared to the aggregate Australia-wide demand for labour. This would have implications for the demand for labour in those local labour markets where industry *i* is the dominant industry.

Similarly if the ratio specific to industry *i* was less than the Australia-wide aggregate demand ratio, then employment opportunities in industry *i* would have not grown at the same rate as the opportunities in other industries. This would have undesirable labour market effects for those regions where industry *i* is the dominant industry.

Differential shift effects

Differential shift effects are sometimes referred to in the literature as local effects. They refer to the additional changes in the regional employment levels resulting from employment in the region growing or declining at rates different from the national rates as a result of socioeconomic factors peculiar to the region.

The differential shift (D) for industry i and local labour market j is estimated by the following equation:

$$D = E_{ij\,86} - E_{ij\,81}\left(\sum_{j=1}^{94} E_{ij\,86} \Big/ \sum_{j=1}^{94} E_{ji\,81}\right) \qquad (3b)$$

In equation 3b the term in brackets could again be less than 1, equal to 1 or greater than 1 depending on whether the nationwide demand for labour in industry i has decreased or increased or remained constant in the inter-censal period.

Thus the portion of equation 3b in brackets indicates what the demand for labour in industry i and local labour market j would have been if the local employment opportunities changed in unison with the national trends. The extent to which the second term differs from the first term in equation 3b indicates the role of local factors in the growth or decline of employment opportunities in the region.

The total shift in the demand for labour is given by $P + D$ where:

$$P + D = E_{ij\,86} - E_{ij\,81}\left(\sum_{i}\sum_{j} E_{ij\,86} \Big/ \sum_{i}\sum_{j} E_{ij\,81}\right) \qquad (3c)$$

and P and D are as defined earlier.

Regional share effects

In the analysis each labour market is compared to the aggregated Australia-wide labour market. In order to compute the regional share effects on the demand for labour one determines the amount by which total employment in a given local labour market would have grown during the inter-censal period 1981 to 1986 if employment in the region grew at the same rate as the employment in the whole of Australia.

The total growth in employment opportunities in a region j is given by G where:

$$G = \sum_{j=1}^{13} E_{ij\,86} - \sum_{j=1}^{13} E_{ij\,81}$$

$$= R + P + D$$

R is the regional share effect.

DEMAND AND SUPPLY INTERACTIONS ON LOCAL LABOUR MARKETS

For each of the local labour markets, demand and supply interact to generate an equilibrium solution. The analysis of these labour markets has been done using a methodology akin to the comparative statics analysis in economics. Two 'snapshots' of each labour market are taken, one in 1981 and another in 1986. Changes on both the demand and supply side of these markets in the inter-censal years are observed.

CONCLUSION

Labour demand and supply concepts are used to characterise local labour markets in Australia. These characteristics of labour markets determine the re-employment opportunities of displaced workers who have to look for work in these labour markets. The re-employment opportunities were estimated on the basis of recently past labour market conditions (from 1981 to 1986). These conditions, particularly the rates of change in local labour markets, will not necessarily apply at the same rate from now until 2001. Accordingly, the estimates will understate the re-employment capacity for regions which grow and develop more in the future than they have in the recent past, and will overstate the re-employment capacity for regions which grow less. The results should be interpreted as an indication of the re-employment capacity of a region if rate of growth or decline does not change. Nevertheless since the analysis uses demographic variables characterised by slow rate of change the results are reasonably robust.

CHAPTER 4 LOCAL LABOUR MARKET BUOYANCY

This chapter presents the results on local labour market buoyancy in Australia, and explains how those results were obtained.

The buoyancy of the local labour markets was assessed with special reference to the railway industry in Australia. Particular emphasis was placed on the likelihood of re-employment for members of those groups in the railway sector who are most vulnerable to displacement in the event of railway rationalisation. These age and skill groups were identified in BTCE (1990a). The percentages of workers falling in these groups were used to estimate the likelihood of displacement for workers in the groups.

Table 4.1 summarises the proportional shares of the different age and skill groups in the pool of displaced railway workers and how they differed depending on whether the region in question was metropolitan or rural. In the following discussion these shares are referred to as the displaced railway workers' age and skill profiles.

The key step in the analysis was the identification of the variables that are likely to influence the buoyancy of a local labour market. These were grouped into supply side variables and demand side variables.

SUPPLY SIDE VARIABLES

Fifteen variables on the supply side were identified to measure labour market buoyancy. These are described below.

Employment rate variables

For each local labour market three employment rate related variables are important. V_1, V_2 and V_3 refer to change in the participation rate in the 20–34, 35–54 and 55–64 age groups, respectively. The participation rate for any group is defined as the labour force expressed as a percentage of the civilian population in the same group.

These variables describe the change between the 1981 and 1986 censuses in the employment rates of the 20–34, 35–54 and 55–64 age groups in the region

TABLE 4.1 AGE AND SKILL PROFILES OF DISPLACED RAILWAY WORKERS
(in proportions)

ASCO[a]	*Metropolitan age group*[b,c]				*Rural age group*[b,c]			
	20–34	35–54	55–64	Total	20–34	35–54	53–64	Total
1 Managers	0.003	0.019	0.012	0.034	0.022	0.039	0.006	0.067
4 Trades	0.102	0.161	0.073	0.336	0.067	0.119	0.018	0.204
7 Plant and machine operators	0.023	0.043	0.017	0.083	0.073	0.129	0.019	0.221
8 Labourers	0.058	0.124	0.088	0.270	0.106	0.187	0.028	0.321
Others[d]	0.097	0.139	0.041	0.277	0.062	0.109	0.016	0.187
Total	0.283	0.486	0.231	1.000	0.330	0.583	0.087	1.000

a. ASCO stands for the Australian Standard Classification of Occupations.
b. The metropolitan and rural split of the data was determined from postcodes of the survey returns, question 2 (place of domicile).
c. There were no displaced railway workers encountered in the survey in the 15–19 age group.
d. Including professionals (ASCO2), para-professionals (ASCO3), clerks (ASCO5) and salespersons/personal services (ASCO6).

Source Computed from the returns of the survey of redeployed and redundant railway workers (BTCE 1990a).

in question and the estimated shares of the relevant age groups in the pool of displaced railway workers derived from BTCE (1990a).

Generally, if the employment rate increased in the period between the two censuses this would signal greater job availability in the region. The reverse would be true if the employment rate declined.

These three employment rate variables contribute positively to local labour absorption capacity. A separate variable is introduced later to describe unemployment in the local labour market.

Age cohort size variables

For each local labour market three age cohort size related variables were important. V_4, V_5 and V_6 denote the age cohort size variables corresponding to the 20–34, 35–54 and 55–64 age cohorts, respectively. These variables are constructed for each region as the change in the sizes of each of the three age groups, respectively, scaled by the estimated shares in BTCE (1990a) of the age groups in the pool of displaced railway workers.

Increasing cohort size in the period between the two censuses equates with increased competition for available jobs for workers of the age group. On the other hand reductions in cohort size arising from, say, early retirement will increase the ability to absorb additional workers in the region.

Net migration variables

Net migration for an age group in a particular region measures the extent to which in-migration exceeds out-migration for the region with respect to the age group. V_7, V_8 and V_9 denote the net migration variables corresponding to individuals in the 20–34, 35–54, 55–64 age groups, respectively. These variables describe the change between the two censuses in net migration for an age group in the region and on the estimated shares of the age group in the pool of displaced railway workers.

Out-migration means that the regional competition for existing jobs is reduced. It must be noted, however, that out-migration is a lagged indicator of the scarcity of jobs. Out-migration is greatest in those regions where jobs are scarcest.

In-migration means that workers from other regions are moving into the region thus increasing the competition for locally available jobs. The larger the excess of inwards over outwards migration for the region, with other things remaining the same, the larger the capacity for the local market to absorb displaced railway workers. Often in-migration is a lagged indicator of buoyant labour markets. In-migration tends to be high the higher is the probability for a job seeker to find work.

Each one of these variables is a positive influence on the local labour market's absorptive capacity.

Cumulative rate of growth in the labour force

The cumulative rate of growth of a region's labour force for the period 1981 to 1986 (V_{10}) is calculated as:

$$V_{10} = [\sqrt[5]{(\text{labour force in 1986}/\text{labour force in 1981})} - 1] \times 100$$

A growing labour force often reflects local labour market buoyancy and improving opportunities for re-employment. Regions such as Traralgon (32) show this characteristic between census years 1981 and 1986.

Regions whose labour forces are growing are also the regions which are growing in other ways conducive to greater re-employment opportunities.

Occupation and skills related variables

The Railway Industry Council survey of redeployed and displaced railway workers indicated that there were four occupational groups that are vulnerable both with

respect to displacement and with respect to their capacity to transfer from railways to non-railway employment in other industry sectors.

Five occupation and skills related variables were introduced to the local labour market model developed by BTCE. These were V_{11}, V_{12}, V_{13}, V_{14} and V_{15}, the employment losses by occupational groups related to a region's 1986 labour force.

The variables V_{11} to V_{14} represented the four vulnerable occupational groups listed below, as identified in BTCE (1990a), and V_{15} the remaining occupational groups. Each of these variables is a ratio of the estimated number of displaced railway workers in the vulnerable occupational group to the 1986 labour force in the particular group in the local labour market:

- V_{11} refers to labourers and related workers (ASCO8);
- V_{12} refers to plant and machine operators and drivers (ASCO7);
- V_{13} refers to tradespersons (ASCO4);
- V_{14} refers to managers and administrators (ASCO1); and
- V_{15} refers to other ASCO categories (ASCO2, ASCO3, ASC05, ASC06).

High values of V_{11}, ..., V_{15} mean higher competition for jobs and hence less absorption. Thus these five ratios have a negative influence on the local labour markets absorptive capacity.

DEMAND SIDE VARIABLES

The first variable on the demand side of each of the local labour markets is the percentage change in unemployment between 1981 and 1986, V_{16}.

It is reasonable to suppose that high unemployment rates are associated with poor market absorption rates. Unemployment is an indicator of poor demand for labour relative to the regional supply of labour. Thus V_{16} is an indicator of local labour market absorptive capacity.

The proportionality shifts (industry mix) indices associated with the dominant regional industry for each of the five vulnerable occupational groups identified above. are denoted by variables V_{17}, V_{18}, V_{19}, V_{20} and V_{21}.

The differential shifts (local effects) indices associated with the dominant regional industry for each vulnerable occupational group identified earlier are denoted by variables V_{22}, V_{23}, V_{24}, V_{25} and V_{26}.

The total industry employment growth for the local labour market is represented by V_{27}.

The total growth less the displacements, for each occupation group related to a region's 1986 employment, is represented by V_{28}, V_{29}, V_{30}, V_{31} and V_{32}, respectively.

The variables V_1, ..., V_{32} were constructed from Australian Bureau of Statistics census data using customised spreadsheets developed by Census Applications.

AGGREGATING THE VARIABLES

These variables are not additive and they are not equally important in determining local labour market buoyancy. Nevertheless, no a priori judgement can be made as to the relative weighting which should be applied.

The raw scores for the thirty-two variables are in different units.

In order to develop scores that are independent of the units of measure, two methods of aggregating the variables into an index were sequentially used. The first obtains a composite for each region, based on the *z*-scores technique. The second is referred to as the Wroclaw taxonomic method.

The *z*-scores technique

The *z*-scores were computed for each of the thirty-two variables. For each of the variables:

$$Z_j = \frac{V_j - \mu_j}{\sigma_j}$$

where μ_j is the national arithmetic mean of the raw scores of the jth variable and σ_j is the standard deviation for the jth variable.

A composite score, based on the thirty-two variables, can be developed for each region by converting the variables to *z*-scores and summing the scores for each region (Croucher & Oliver 1986; Freund 1984).

z-scores essentially express the normalised distance of a given score from the mean in a distribution of scores. Each regions composite score, derived from the summation of the thirty-two *z*-scores, expresses the region's capacity to absorb displaced workers relative to other regions and to the national average.

In the case of the small area data analysis, the closer the composite *z*-score for each local labour market is to zero, the more closely it represents the national average capacity of industry to absorb displaced railway workers. Negative scores represent below average capacity of local labour markers to absorb displaced railway workers. Positive scores represent above average capacity. While attractive because of its simplicity, the major shortcoming of this method of aggregating the *z*-scores is that a simple summation across all indicators will result in a partial cancellation of the positive and negative influences.

Wroclaw taxonomic method

Origin of the method

The Wroclaw method was developed by a group of Polish mathematicians and applied to the aggregation of indicators of economic development by Harbison, Maruhnic and Resnick (1970). Similar applications are provided by Khan and Zerby (1984) and comparisons with other methods are found in Zerby and Khan (1984).

Reclassification of variables

The variables V_1, ..., V_{32} are initially judged to be 'stimulants' or 'retardants' according to whether they are expected to contribute directly (positively) or inversely (negatively) to the desired measure. Among the thirty-two variables used to calculate a composite score for each region, nine are treated as 'retardants': V_4, V_5, V_6, V_{11}, ..., V_{15} and V_{16}. All other variables are treated as 'stimulants' to labour market absorption and are given positive signs.

This process of reclassification of variables involves giving a plus or minus sign to each variable according to whether the variable makes a positive contribution to the ability of the region to absorb additional workers into the labour market, or a negative contribution.

Euclidean distances

The procedure searches for the largest value of each 'stimulant' and the smallest value of each 'retardant'. The collection of such values comprises an optimum score in the sense that it represents the most desirable set of values within the sample. The Euclidean distance from each region to the optimum is then calculated. The resulting score can be rescaled to form a more convenient measure.

To illustrate in two dimensions, the highest standardised score for variable V_1 (percentage change in participation rate by the lowest age cohort) is 0.752 and for variable V_2 (percentage change in participation rate by the next lowest age cohort) is 2.558. These values are plotted as the optimum vector in figure 4.1. The vector associated with the recorded values (in z-scores) for a particular region (Gosford/Wyong) is also plotted on the diagram. The distance between the vectors is shown by the broken line and is equal to the Wroclaw measure for those two dimensions. Similar distances are obtained from other dimensions and summed for the entire set.

Regions which are close to the optimum score are ranked highly compared with those at the other ends of the scale.

Implicit weighting procedure

The Wroclaw technique carries an implicit weighting procedure that is related to the scatter of values for each indicator. If all regions display the same value for a specific variable, then a constant distance score would be added to each and the ranking for the ninety-four regions will be unchanged. If, on the other hand, the values differ considerably, then the regions which are close to the optimum

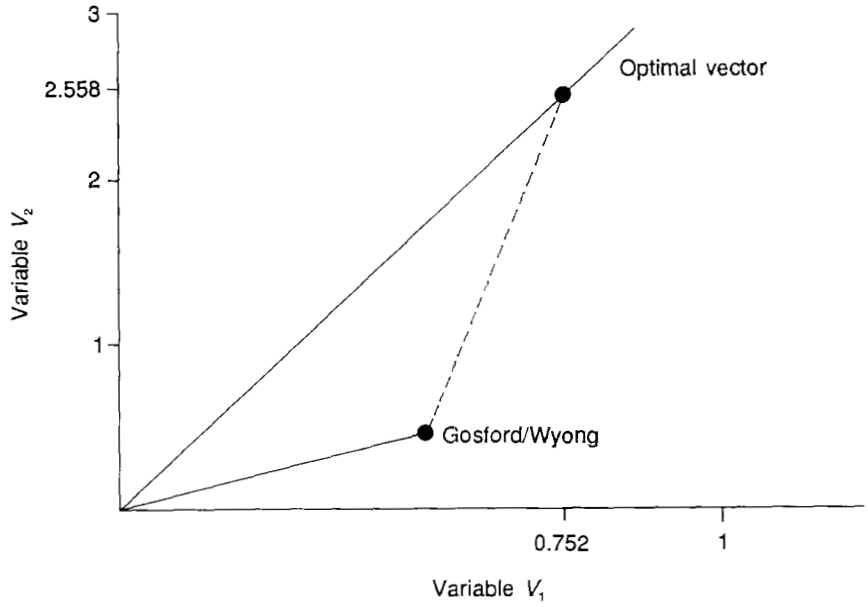


Figure 4.1 Wroclaw taxonomic method: an illustration

score will improve substantially in ranking compared with those at the other end of the scale.

Similarly, correlations among several of the indicators will reinforce the high ranking for those regions which are near the optimum. The correlation matrix for the demand side variables used in the analysis is given in table 4.2. Correlations for the supply side variables are substantially weaker and are not shown.

Local labour markets which are structurally similar would tend to have similar ranking. A taxonomy of local labour markets would then group together those markets which are similar in structure.

The Wroclaw procedure allows taxonomic distances to be calculated from each region to all other regions for the purpose of determining the nearest neighbours. Although nearest neighbours are expected to have similar ranking in terms of the composite index, the 'nearness' may not be in the same direction as the optimum score so the ranking will not necessarily be identical.

The correlations among the demand side variables $V_{22}, ..., V_{32}$ tend to dominate the correlation structure. A similar but less pronounced correlation pattern exists for the variables indicating employment losses, $V_{11}, ..., V_{15}$. Regions which attain low scores with these variables will almost certainly have a high ranking in terms of labour absorption capacity.

TABLE 4.2 CORRELATIONS AMONG THE DEMAND SIDE VARIABLES

	V_{16}	V_{17}	V_{18}	V_{19}	V_{20}	V_{21}	V_{22}	V_{23}	V_{24}	V_{25}	V_{26}	V_{27}	V_{28}	V_{29}	V_{30}	V_{31}
V_{17}	0.021															
V_{18}	–0.180	–0.521														
V_{19}	–0.257	–0.254	0.711													
V_{20}	–0.125	0.333	0.148	0.261												
V_{21}	0.326	0.158	–0.743	–0.757	–0.647											
V_{22}	0.546	0.509	–0.147	–0.020	0.229	–0.118										
V_{23}	0.371	0.334	–0.014	0.202	0.376	–0.276	0.563									
V_{24}	–0.163	0.148	0.116	0.182	0.292	–0.294	0.296	0.691								
V_{25}	0.418	0.330	0.128	0.318	0.374	–0.388	0.704	0.767	0.594							
V_{26}	–0.470	0.439	–0.200	–0.146	0.105	0.066	0.620	0.271	0.131	0.355						
V_{27}	–0.513	0.552	–0.089	0.077	0.357	–0.178	0.809	0.726	0.553	0.773	0.809					
V_{28}	–0.366	0.790	–0.334	–0.123	0.265	0.008	0.921	0.522	0.262	0.627	0.613	0.793				
V_{29}	–0.423	–0.011	0.521	0.538	0.369	–0.611	0.410	0.841	0.644	0.727	0.135	0.575	0.267			
V_{30}	–0.241	0.037	0.379	0.547	0.335	–0.535	0.268	0.657	0.905	0.649	0.098	0.530	0.200	0.763		
V_{31}	–0.321	0.387	0.136	0.301	0.766	–0.560	0.573	0.649	0.515	0.842	0.319	0.695	0.551	0.628	0.599	
V_{32}	–0.297	–0.464	–0.432	–0.388	–0.119	0.411	0.514	0.145	0.012	0.191	0.929	0.675	0.555	–0.089	–0.094	0.104

Source J. Zerby.

The labour absorption index

The absorptive capacities of the various local labour markets are determined as follows. In the Wroclaw taxonomic technique region 40, Alice Springs, had a score closest to the optimum. In the absence of meaningful employment data for Alice Springs, this region is assigned a value of 1.0. This score indicates that a displaced worker in this region would almost certainly be re-employed.

The region most distant from the optimum score was Whyalla, region 35. A displaced worker in this labour market had the lowest chance of re-employment. A Commonwealth Employment Service data source in 1990 indicated that the re-employment changes in Whyalla were 0.1, that is, a job seeker in Whyalla had only one chance in ten of being re-employed. Having determined the end points in the re-employment spectrum or distribution, the re-employment or re-absorption coefficients of the remaining ninety-two local labour markets can be estimated once the mean of the distribution is determined.

The distribution mean was set at the average national absorption rate for displaced railway workers estimated in BTCE (1990a). The choice of this average absorption rate reflects the most recent experience of displaced rail workers looking for work in the local labour markets under consideration.

Accordingly, since the survey indicated that nationwide the probability of being re-employed in the local labour markets was 57 per cent, it was ensured that the distribution of estimated absorption coefficients had an average absorption rate which matched this probability. Some regions will reflect probabilities which are higher than the average and some will have lower values. For each region, the position relative to the mean is given by the value of the re-scaled index.

This distribution of absorption indices has to be interpreted with caution because:

- it has no measured counterpart and therefore cannot be verified directly;
- its computation involves a method of weighting which has no properties to be optimised; and
- the indices themselves are composite units which are re-scaled on the basis one data end point (Whyalla).

It is nevertheless expected to preserve the rank order of regions according to the capacity of each region to absorb displaced rail workers. It also contains a set of values which is consistent, on the average, with independently obtained estimates in BTCE (1990a).

RESULTS: LABOUR MARKET GROUPINGS

Number of local labour markets

There are ninety-four local labour markets altogether. The region number is given in column 1 of table 4.3. Each local labour market is classified by its size and location, according to whether it is metropolitan, small rural, medium rural or large rural. These classifications are explained in chapter 2.

TABLE 4.3 CLASSIFICATION OF LOCAL LABOUR MARKETS

(1) *Region no.*	*(2)* *Region name and type*	*(3)* *Railway employment 1986–87*	*(4)* *Reabsorption coefficient scenario 5*	*(5)* *Bouyancy rank*	*(6)* *Labour market group*
State Rail Authority of New South Wales (SRA)					
41	Broken Hill (mr)	266	0.298	3	1
29	Wollongong (mr)	797	0.329	4	1
01.1	Central and Inner Western Sydney (m)	6 457	0.332	5	1
54	Griffith (sr)	222	0.378	9	1
01.5	Southern Sydney(m)	1 595	0.410	10	2
01.3	Northern Sydney (m)	0	0.458	77	2
36	Armidale (sr)	159	0.471	19	2
17	Orange (mr)	460	0.473	20	2
13	Dubbo (lr)	1 215	0.486	22	2
28	Newcastle (lr)	1 679	0.494	26	2
16	Lismore (mr)	365	0.507	30	2
30	Lithgow (sr)	238	0.511	31	2
04	Wagga Wagga (lr)	1 414	0.543	34	2
49	Port Macquarie (sr)	101	0.559	40	3
01.6	Western Sydney (m)	1 130	0.570	45	3
18	Tamworth (lr)	1 110	0.577	49	3
55	Moree (lr)	1 484	0.579	50	3
01.2	Gosford/Wyong (m)	118	0.593	57	3
56	Taree (mr)	514	0.606	62	3
48	Coffs Harbour (sr)	75	0.611	64	3
03	Nowra (sr)	207	0.619	67	3
01.4	South Western Sydney (m)	0	0.642	69	3
12	Bathurst (mr)	646	0.646	70	3
11	Albury-Wodonga (mr)	781	0.649	72	3
14	Goulburn (mr)	1 009	0.654	76	3
10	Canberra (mr)	341	0.659	77	3
15	Grafton (mr)	731	0.691	84	3
Total SRA		23 114			

TABLE 4.3 (Cont.) CLASSIFICATION OF LOCAL LABOUR MARKETS

(1) Region no.	(2) Region name and type	(3) Railway employment 1986–87	(4) Reabsorption coefficient scenario 5	(5) Bouyancy rank	(6) Labour market group
V/Line					
02.1	Inner Melbourne (m)	1 909	0.347	7	1
7	Colac (sr)	90	0.411	11	2
58	Horsham (mr)	838	0.452	14	2
02.6	Southern Melbourne (m)	465	0.454	15	2
44	Morwell (sr)	53	0.487	23	2
23	Warrnambool (sr)	50	0.495	27	2
59	Mildura (mr)	435	0.506	29	2
21	Shepparton (mr)	837	0.554	38	3
38	Sale (sr)	203	0.569	44	3
19	Ballarat (mr)	764	0.583	53	3
22	Wangaratta (mr)	386	0.589	55	3
32	Traralgon (sr)	225	0.599	59	3
20	Bendigo (mr)	749	0.601	60	3
31	Geelong (lr)	1 361	0.606	63	3
02.7	Western Melbourne (m)	1 118	0.619	66	3
43	Moe (mr)	366	0.642	68	3
02.5	Outer-Eastern Melbourne (m)	145	0.651	73	3
02.3	Mornington Peninsula (m)	240	0.669	79	3
02.2	Inner East Melbourne (m)	156	0.693	86	3
37	Hamilton (mr)	755	0.720	88	4
02.4	North East Melbourne (m)	150	0.726	89	4
Total V/Line		11 295			

TABLE 4.3 (Cont.) CLASSIFICATION OF LOCAL LABOUR MARKETS

(1) Region no.	(2) Region name and type	(3) Railway employment 1986–87	(4) Reabsorption coefficient scenario 5	(5) Buoyancy rank	(6) Labour market group
Queensland Railways					
06	Townsville (lr)	2 627	0.537	33	2
52	Maroochydore (sr)	860	0.551	37	3
45	Mount Isa (mr)	990	0.561	41	3
51	Gladstone (lr)	2 627	0.573	46	3
60	Bundaberg (mr)	1 337	0.576	48	3
05.1	Balance Brisbane (m)	66	0.579	51	3
05.3	Outer Brisbane (m)	1 388	0.590	56	3
05.2	Inner Brisbane (m)	2 250	0.598	58	3
61	Cairns (lr)	701	0.653	74	3
62	Gympie (mr)	2 289	0.660	78	3
24	Maryborough (lr)	1 284	0.670	80	3
63	Mackay (lr)	641	0.681	81	3
69	Hervey Bay (sr)	36	0.685	82	3
64	Toowoomba (lr)	1 337	0.700	87	4
50	Caloundra (sr)	106	0.733	90	4
68	Gold Coast (sr)	76	0.748	91	4
25	Rockhampton (lr)	3 812	0.755	92	4
Total Queensland Railways		22 877			
Australian National[a]					
35	Whyalla (sr)	30	0.100	1	1
34	Port Pirie (mr)	578	0.414	12	2
09	Hobart (m)	260	0.438	13	2
74	Renmark (sr)	12	0.462	18	2
07.1	Eastern Adelaide (m)	941	0.477	21	2
74	Port Lincoln (sr)	210	0.487	24	2
26	Burnie (sr)	129	0.492	25	2
73	Mount Gambier (sr)	129	0.495	28	2
07.3	Western Para North Eastern Adelaide (m)	2 933	0.543	35	2
07.2	Southern Adelaide (m)	0	0.550	36	3
27	Launceston (mr)	529	0.555	39	3
75	Murray Bridge (mr)	224	0.648	71	3
39	Northern Territory (sr)	0	0.685	83	3
33	Port Augusta (lr)	1 704	0.841	93	4
40	Alice Springs (sr)	159	1.000	94	4
Total Australian National		7 838			

TABLE 4.3 (Cont.) CLASSIFICATION OF LOCAL LABOUR MARKETS

(1) *Region no.*	*(2)* *Region name and type*	*(3)* *Railway employment 1986–87*	*(4)* *Reabsorption coefficient scenario 5*	*(5)* *Buoyancy rank*	*(6)* *Labour market group*
Westrail					
71	Narrogin (sr)	190	0.150	2	1
66	Albany (sr)	102	0.342	6	1
72	Northam (mr)	570	0.358	8	1
08.1	Central Perth (m)	1 109	0.458	16	2
46	Kalgoorlie (sr)	208	0.568	43	3
08.5	South West Perth (m)	185	0.575	47	
08.4	South East Perth (m)	28	0.581	52	3
70	Bunbury (mr)	313	0.583	54	3
67	Geraldton (mr)	294	0.605	61	3
08.3	North Perth (m)	97	0.616	65	3
53	Mandurah (sr)	13	0.653	75	3
08.2	East Perth (m)	2 235	0.693	85	3
Total Westrail		5 444			
47	Port Hedland (sr)	0	0.525	32	2
42	Darwin (sr)	0	0.568	42	3
Total Australia		70 568			

a. Tasmanian regions are grouped with mainland regions covering AN's operations.

na Not assigned to a railway system
m Metropolitian
sr Small rural
mr Medium rural
lr Large rural

Note The classification of labour markets is based on 1981 and 1986 regionally aggregated data. The methodologies used and the classification do not accommodate region specific events which occurred after 1986.

Ranking of local labour markets

Column 6 of table 4.3 gives the classifications assigned to the various local labour markets based on their reabsorption capacities in column 4:

- group 1 denotes regions with estimated re-employment rates of less than 40 per cent;
- group 2 denotes regions with re-employment rates of 40 to 54.9 per cent;
- group 3 denotes regions whose re-employment rates are equal to or slightly better than the national average: the reabsorption rates range from 55 to 69.9 per cent; and
- group 4 denotes the regions with estimated re-employment rates of 70 per cent or better.

In the table the different local labour markets are arranged by railway system and by level of sensitivity of the local labour market.

Column 5 in table 4.3 gives the Australia-wide buoyancy ranking of local labour markets under the commercial railway scenario 5 (see chapter 5). The local labour market with the worst capacity to reabsorb labour is ranked 1, and the best is ranked 94.

This ranking is based on a measure of the labour absorptive capacity of the given labour market given in column 4. This column gives the fraction of the displaced railway workers who are likely to be absorbed in the local labour market.

This fraction depends on:

- the attributes of the local labour market and the skills demanded by the market;
- the age structure of the labour force in the market; and
- the attributes of the displaced worker in terms of age, skill and occupation.

The worst region nationally is the region of Whyalla, ranked 1. It has a re-employment coefficient of 0.1 meaning that a displaced railway worker in Whyalla would have one chance in ten of being re-employed.

The best labour market nationally is Alice Springs which is ranked 94. It has a re-employment coefficient of 1.0 meaning that a displaced railway worker in that labour market is almost certain to find alternative employment. Thus the higher the rank for a local labour market the better that labour market is in terms of re-employment opportunities for the displaced worker.

The nine very sensitive labour markets in group 1 show the following characteristics for the period 1981–86.

Central and Inner Western Sydney (SRA). The regions dominant employment base is the manufacturing industry, which Australia-wide has a slowly declining employment base. In addition, the regions manufacturing industries declined at a significantly faster rate than the Australian average, particularly affecting the

re-employment prospects for tradespersons and plant and machine operators. Community services, the largest employers of labourers in the region, also declined.

There was significant out-migration from the region of the 55–64 age group.

Inner Melbourne (V/Line). The characteristics of Inner Melbourne are similar to those of Central and Inner Western Sydney, except that the manufacturing industries make up a greater proportion of the employment base in Melbourne than in Sydney and are also the largest employers of labourers.

Inner Melbourne shows relatively fast-declining participation rates for the age groups spanning 20 to 64 years — that is, declining labour forces expressed as a percentage of the civilian population in the same age groups. Out-migration is at a lower rate than in Central and Inner Western Sydney.

Wollongong (SRA). In relative terms, Wollongong relies on manufacturing (its steel industry) as an employment base more than do the other metropolitan regions. Furthermore, Wollongong's steel industry employment declined over 1981 to 1986 at a faster rate than the centrally located Sydney and Melbourne manufactures.

There were significant cohort size and participation rate reductions in Wollongong for the 55–64 age group.

Whyalla (AN). Iron and steel (Whyalla's manufacturing base) fared worse Australia-wide than other manufactures during 1981–86. This was exacerbated by a more severe rate of employment decline in Whyalla's iron and steel industry than was experienced by that industry at the national level.

Whyalla experienced net migration losses for the ages 20 to 64 and a significant cohort size reduction in the 20–34 age bracket.

This is a small rural labour market with a labour reabsorption rate of 0.1. Whyalla is the least buoyant of the ninety-four local labour markets.

Broken Hill (SRA). In Broken Hill, the largest employer of tradespersons in 1986 was the wholesale retail trade and services sector, while mining employed most plant and machine operators, and manufacturing most labourers. Mining experienced severe contraction between 1981 and 1986. This appears to be the principal cause of erosion of the employment base and net migration losses from the region.

Griffith (SRA). The region's agricultural industry contracted more than the Australian average, affecting prospects for the self-employed and for labourers. The region's wholesale and retail industry declined in unison with agriculture, affecting re-employment prospects for tradespersons. The leading employer of plant and machine operators was the transport and storage industry, which remained static.

Albany (Westrail). Albany's employment base is similar to that of Griffith. However, Albany's agriculture declined at a faster rate than Griffiths, affecting the self-employed and labourers. There was some compensation in the wholesale and retail industry which performed marginally better than the Australia-wide average.

Narrogin and Northam (Westrail). These adjoining regions had similar employment characteristics. Agriculture employed most managers (self-employed) and labourers. The wholesale and retail trade employed most of the tradespersons and the transport sector employed most of the plant and machine operators.

Agriculture declined more severely in the Narrogin region than in Northam, and Narrogin experienced significant out-migration between 1981 and 1986. Participation rates fell in both regions, particularly in Northam whose net migration loss was smaller. Wholesale/retail and transport industries in both regions fared a little better than the Australia-wide average.

MAPS OF LABOUR MARKET REABSORPTION CAPACITIES

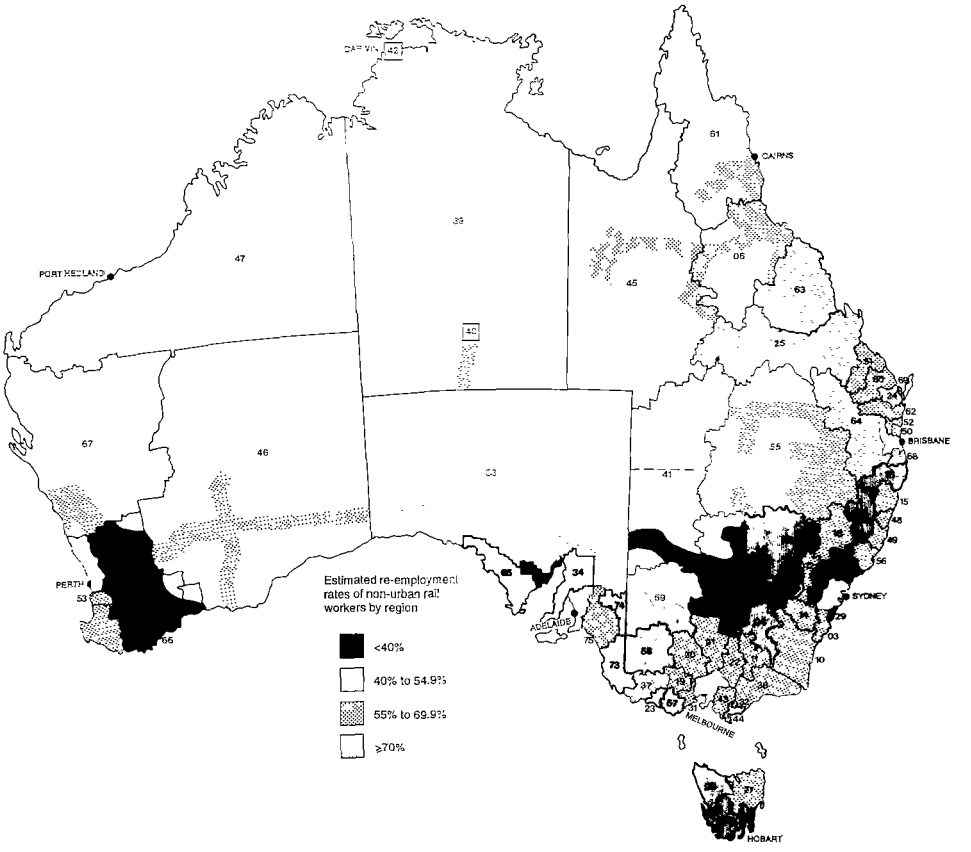
This section presents in map form the results of labour market reabsorption capacities according to scenarios described in chapter 5.

The overriding feature of the maps is that the results do not change appreciably for the various scenarios. This is an expected result, in that the estimated railway work force does not dominate in most of the regional labour markets and is part of a host of other labour force adjustments.

Different Railway Industry Council scenarios imply different railway skill mixes. The changes in these skill mixes are indicated by the changes in the labour force shares of the following five major railway functional groups:

- infrastructure;
- mechanical/workshops;
- train operations – crew;
- train operations – other; and
- administration.

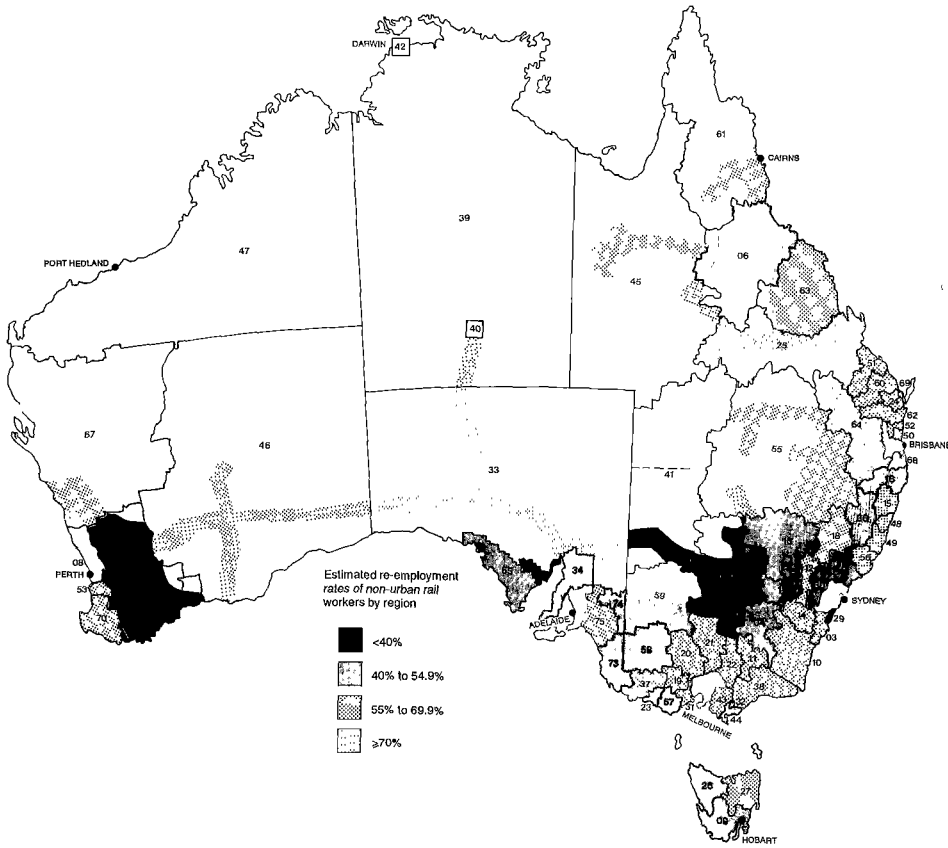
The changes in the functional groups affected across scenarios have implications for the sorts of workers and skills that are shed by the railway systems because each one of the functional groups has a different skill distribution. The differences in the skill profile of groups of workers released by the railway system under the different scenarios mean that the reabsorption capacities of the various local labour markets vary from scenario to scenario. Those scenarios where the skill profiles of the workers released by the railway system are similar to the skill profiles of workers demanded in the given local labour markets will be associated with higher reabsorption capacities compared to those scenarios where the mismatch between these skill profiles is greatest.



01	Sydney	20	Bendigo	39	Northern Territory	58	Horsham
02	Melbourne	21	Shepparton	40	Alice Springs	59	Mildura
03	Nowra	22	Wangaratta	41	Broken Hill	60	Bundaberg
04	Wagga Wagga	23	Warrnambool	42	Darwin	61	Cairns
05	Brisbane	24	Maryborough	43	Moe	62	Gympie
06	Townsville	25	Rockhampton	44	Morwell	63	Mackay
07	Adelaide	26	Burnie	45	Mount Isa	64	Toowoomba
08	Perth	27	Launceston	46	Kalgoorlie	65	Port Lincoln
09	Hobart	28	Newcastle	47	Port Hedland	66	Albany
10	Canberra	29	Wollongong	48	Coffs Harbour	67	Geraldton
11	Albury-Wodonga	30	Lithgow	49	Port Macquarie	68	Gold Coast
12	Bathurst	31	Geelong	50	Caloundra	69	Hervey Bay
13	Dubbo	32	Traralgon	51	Gladstone	70	Bunbury
14	Goulburn	33	Port Augusta	52	Maroochydore	71	Narrogin
15	Grafton	34	Port Pirie	53	Mandurah	72	Northam
16	Lismore	35	Whyalla	54	Griffith	73	Mount Gambier
17	Orange	36	Armidale	55	Moree	74	Renmark
18	Tamworth	37	Hamilton	56	Taree	75	Murray Bridge
19	Ballarat	38	Sale	57	Colac		

Notes 1. Shading in regions is confined to populated areas and to railway corridors.
2. For metropolitan re-employment rates, refer to numerical results in table 4.4.

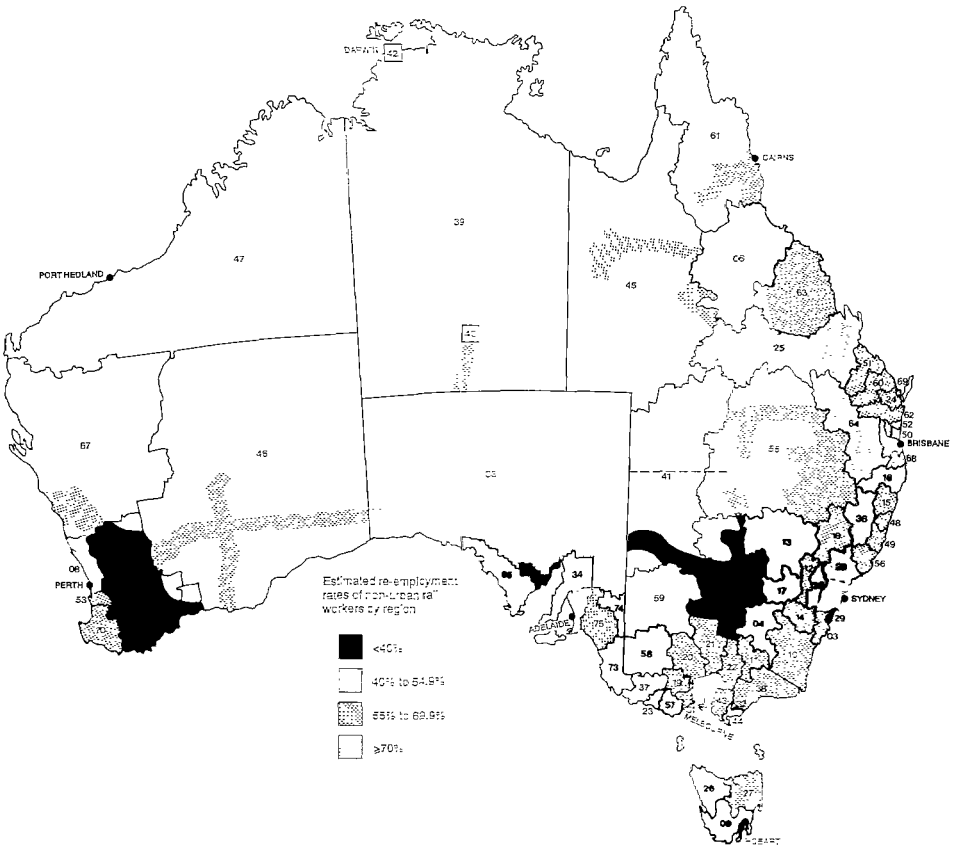
Figure 4.2 Scenario 1: regional rail worker reabsorption capacity



01	Sydney	20	Bendigo	39	Northern Territory	58	Horsham
02	Melbourne	21	Shepparton	40	Alice Springs	59	Mildura
03	Nowra	22	Wangaratta	41	Broken Hill	60	Bundaberg
04	Wagga Wagga	23	Warrnambool	42	Darwin	61	Cairns
05	Brisbane	24	Maryborough	43	Moe	62	Gympie
06	Townsville	25	Rockhampton	44	Morwell	63	Mackay
07	Adelaide	26	Burnie	45	Mount Isa	64	Toowoomba
08	Perth	27	Launceston	46	Kalgoorlie	65	Port Lincoln
09	Hobart	28	Newcastle	47	Port Hedland	66	Albany
10	Canberra	29	Wollongong	48	Coffs Harbour	67	Geraldton
11	Albury-Wodonga	30	Lithgow	49	Port Macquarie	68	Gold Coast
12	Bathurst	31	Geelong	50	Caloundra	69	Hervey Bay
13	Dubbo	32	Traralgon	51	Gladstone	70	Bunbury
14	Goulburn	33	Port Augusta	52	Maroochydore	71	Narrogin
15	Grafton	34	Port Pirie	53	Mandurah	72	Northam
16	Lismore	35	Whyalla	54	Griffith	73	Mount Gambier
17	Orange	36	Armidale	55	Moree	74	Renmark
18	Tamworth	37	Hamilton	56	Taree	75	Murray Bridge
19	Ballarat	38	Sale	57	Colac		

Notes 1. Shading in regions is confined to populated areas and to railway corridors.
2. For metropolitan re-employment rates, refer to numerical results in table 4.4.

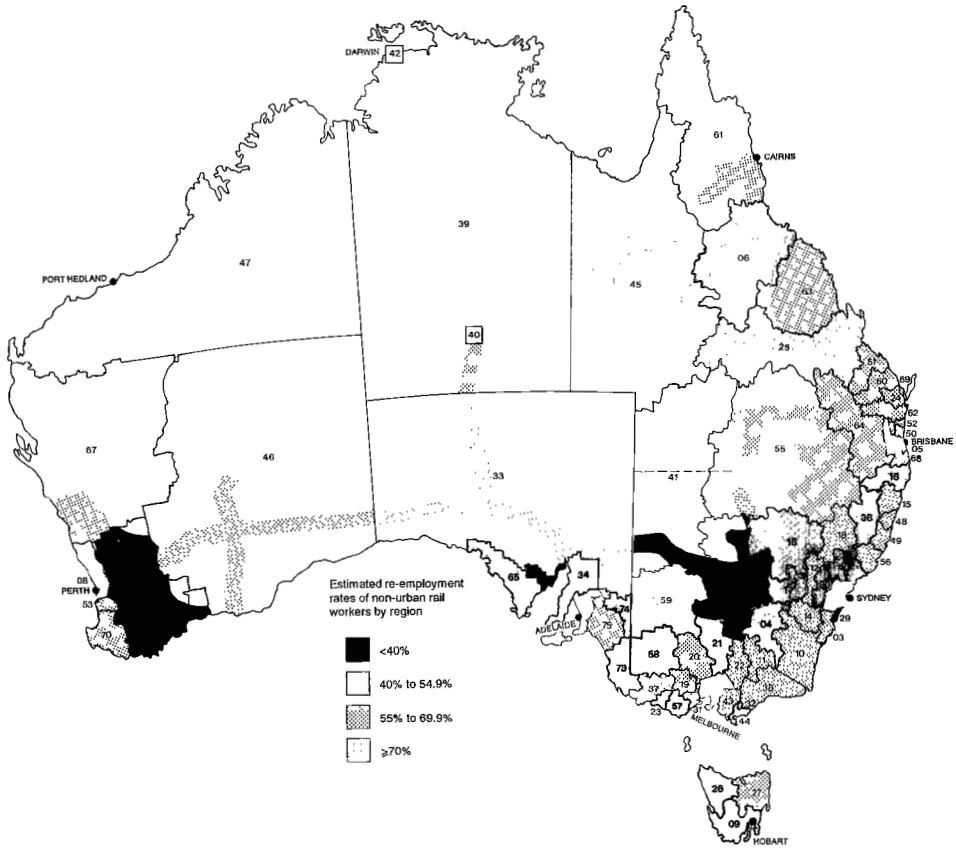
Figure 4.3 Scenarios 2A, 2B and 5: regional rail worker reabsorption capacity



01	Sydney	20	Bendigo	39	Northern Territory	58	Horsham
02	Melbourne	21	Shepparton	40	Alice Springs	59	Mildura
03	Nowra	22	Wangaratta	41	Broken Hill	60	Bundaberg
04	Wagga Wagga	23	Warrnambool	42	Darwin	61	Cairns
05	Brisbane	24	Maryborough	43	Moe	62	Gympie
06	Townsville	25	Rockhampton	44	Morwell	63	Mackay
07	Adelaide	26	Burnie	45	Mount Isa	64	Toowoomba
08	Perth	27	Launceston	46	Kalgoorlie	65	Port Lincoln
09	Hobart	28	Newcastle	47	Port Hedland	66	Albany
10	Canberra	29	Wollongong	48	Coffs Harbour	67	Geraldton
11	Albury-Wodonga	30	Lithgow	49	Port Macquarie	68	Gold Coast
12	Bathurst	31	Geelong	50	Caloundra	69	Hervey Bay
13	Dubbo	32	Traralgon	51	Gladstone	70	Bunbury
14	Goulburn	33	Port Augusta	52	Maroochydore	71	Narrogin
15	Grafton	34	Port Pirie	53	Mandurah	72	Northam
16	Lismore	35	Whyalla	54	Griffith	73	Mount Gambier
17	Orange	36	Armidale	55	Moree	74	Renmark
18	Tamworth	37	Hamilton	56	Taree	75	Murray Bridge
19	Ballarat	38	Sale	57	Colac		

Notes 1. Shading in regions is confined to populated areas and to railway corridors.
2. For metropolitan re-employment rates, refer to numerical results in table 4.4.

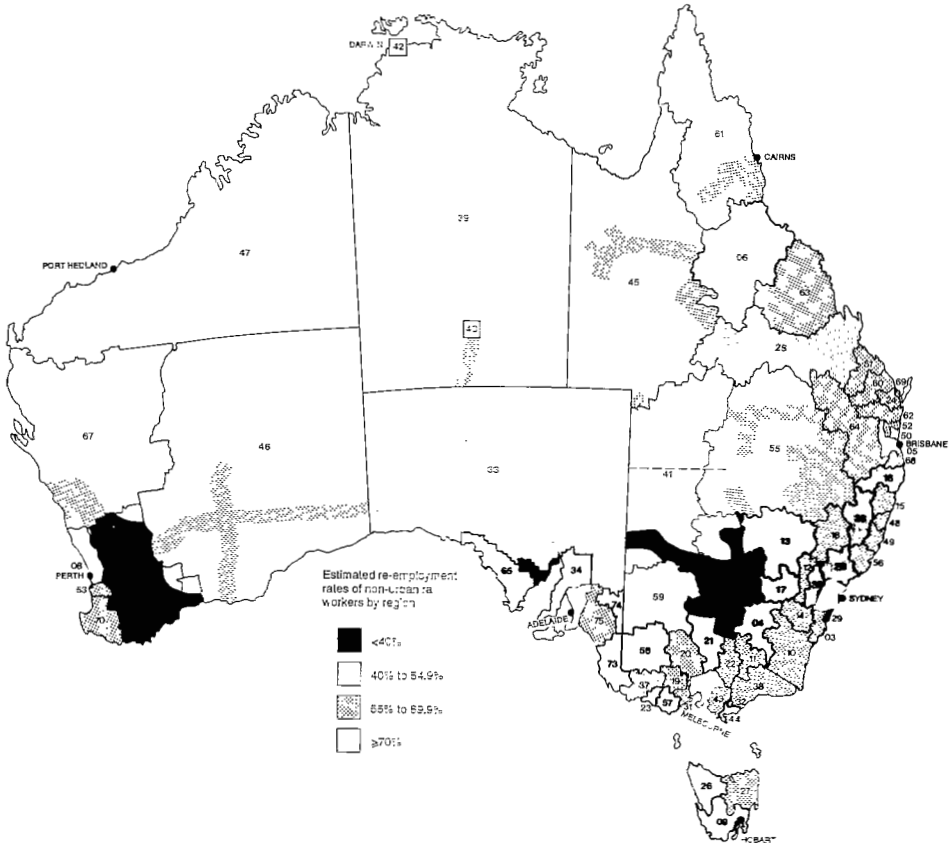
Figure 4.4 Scenario 3: regional rail worker reabsorption capacity



01	Sydney	20	Bendigo	39	Northern Territory	58	Horsham
02	Melbourne	21	Shepparton	40	Alice Springs	59	Mildura
03	Nowra	22	Wangaratta	41	Broken Hill	60	Bundaberg
04	Wagga Wagga	23	Warrnambool	42	Darwin	61	Cairns
05	Brisbane	24	Maryborough	43	Moe	62	Gympie
06	Townsville	25	Rockhampton	44	Morwell	63	Mackay
07	Adelaide	26	Burnie	45	Mount Isa	64	Toowoomba
08	Perth	27	Launceston	46	Kalgoorlie	65	Port Lincoln
09	Hobart	28	Newcastle	47	Port Hedland	66	Albany
10	Canberra	29	Wollongong	48	Coffs Harbour	67	Geraldton
11	Albury-Wodonga	30	Lithgow	49	Port Macquarie	68	Gold Coast
12	Bathurst	31	Geelong	50	Caloundra	69	Hervey Bay
13	Dubbo	32	Traralgon	51	Gladstone	70	Bunbury
14	Goulburn	33	Port Augusta	52	Maroochydore	71	Narrogin
15	Grafton	34	Port Pirie	53	Mandurah	72	Northam
16	Lismore	35	Whyalla	54	Griffith	73	Mount Gambier
17	Orange	36	Armidale	55	Moree	74	Renmark
18	Tamworth	37	Hamilton	56	Taree	75	Murray Bridge
19	Ballarat	38	Sale	57	Colac		

Notes 1. Shading in regions is confined to populated areas and to railway corridors.
2. For metropolitan re-employment rates, refer to numerical results in table 4.4.

Figure 4.5 Scenario 4: regional rail worker reabsorption capacity



01	Sydney	20	Bendigo	39	Northern Territory	58	Horsham
02	Melbourne	21	Shepparton	40	Alice Springs	59	Mildura
03	Nowra	22	Wangaratta	41	Broken Hill	60	Bundaberg
04	Wagga Wagga	23	Warrnambool	42	Darwin	61	Cairns
05	Brisbane	24	Maryborough	43	Moe	62	Gympie
06	Townsville	25	Rockhampton	44	Morwell	63	Mackay
07	Adelaide	26	Burnie	45	Mount Isa	64	Toowoomba
08	Perth	27	Launceston	46	Kalgoorlie	65	Port Lincoln
09	Hobart	28	Newcastle	47	Port Hedland	66	Albany
10	Canberra	29	Wollongong	48	Coffs Harbour	67	Geraldton
11	Albury-Wodonga	30	Lithgow	49	Port Macquarie	68	Gold Coast
12	Bathurst	31	Geelong	50	Caloundra	69	Hervey Bay
13	Dubbo	32	Traralgon	51	Gladstone	70	Bunbury
14	Goulburn	33	Port Augusta	52	Maroochydore	71	Narrogin
15	Grafton	34	Port Pirie	53	Mandurah	72	Northam
16	Lismore	35	Whyalla	54	Griffith	73	Mount Gambier
17	Orange	36	Armidale	55	Moree	74	Renmark
18	Tamworth	37	Hamilton	56	Taree	75	Murray Bridge
19	Ballarat	38	Sale	57	Colac		

Notes 1. Shading in regions is confined to populated areas and to railway corridors.
2. For metropolitan re-employment rates, refer to numerical results in table 4.4.

Figure 4.6 Scenario 6: regional rail worker reabsorption capacity

TABLE 4.4 ESTIMATED RE-EMPLOYMENT RATES OF NON-URBAN RAILWAY WORKERS IN METROPOLITAN REGIONS

Metropolitan region and no.	*Scenario* 1	2A, 2B and 5	3	4	6
01.1 Central and Inner Western Sydney	0.328	0.332	0.330	0.325	0.335
01.2 Gosford/Wyong	0.598	0.593	0.593	0.591	0.594
01.3 Northern Sydney	0.464	0.458	0.458	0.458	0.459
01.4 South Western Sydney	0.651	0.642	0.642	0.641	0.643
01.5 Southern Sydney	0.412	0.410	0.410	0.408	0.411
01.6 Western Sydney	0.574	0.570	0.570	0.569	0.571
02.1 Inner Melbourne	0.350	0.347	0.346	0.339	0.340
02.2 Inner-East Melbourne	0.700	0.693	0.693	0.692	0.694
02.3 Mornington Peninsula	0.675	0.669	0.669	0.667	0.669
02.4 North East Melbourne	0.732	0.726	0.726	0.724	0.726
02.5 Outer-Eastern Melbourne	0.657	0.651	0.651	0.649	0.652
02.6 Southern Melbourne	0.458	0.454	0.454	0.451	0.452
02.7 Western Melbourne	0.624	0.619	0.619	0.615	0.617
05.1 Inner Brisbane	0.604	0.598	0.598	0.596	0.599
05.2 Outer Brisbane	0.597	0.590	0.591	0.589	0.591
05.3 Balance Brisbane	0.585	0.579	0.579	0.579	0.580
07.1 Eastern Adelaide	0.480	0.477	0.476	0.487	0.478
07.2 Southern Adelaide	0.557	0.550	0.550	0.550	0.551
07.3 Western Para and North Eastern Adelaide	0.548	0.543	0.542	0.554	0.543
08.1 Central Perth	0.454	0.458	0.457	0.468	0.458
08.2 East Perth	0.702	0.693	0.693	0.706	0.697
08.3 North Perth	0.627	0.616	0.616	0.615	0.617
08.4 South East Perth	0.588	0.581	0.581	0.581	0.582
08.5 South West Perth	0.579	0.575	0.575	0.575	0.576

Note The classification of labour markets is based on 1981 and 1986 regionally aggregated data. The methodologies used and the classification do not accommodate region specific events which occurred after 1986.

A pattern of labour markets with below-average reabsorption capacity has emerged. Irrespective of scenario the nine 'very sensitive' group 1 regions are:

- the adjoining Westrail regions of Northam (72), Narrogin (71) and Albany (66);
- the AN region of Whyalla (35);
- the adjoining SRA regions of Broken Hill (41) and Griffith (54);
- Central and Inner Western Sydney (01.1) and Wollongong (29); and
- Inner Melbourne (02.1).

The outcome for Queensland's regions has been more favourable than for the other systems (figures 4.2 to 4.6).

The results for the metropolitan regions are not presented on the maps because they would have overcrowded the maps. Instead they are presented separately in table 4.4.

CAVEAT ON THE INTERPRETATION OF RESULTS

The regional re-employment rates for displaced rail workers hinge on the assumed displacement levels and skill and age profiles. These displacements have been treated too uniformly across regions to accurately reflect local effects. The regional results are not translatable to towns and localities within the regions.

A redeeming feature of the analysis is that the job losses in the railways are usually not prominent at the regional labour market level. Therefore, adjustment of the magnitudes of displaced railway workers does not appreciably change the re-employment rates. This is demonstrated by the relative uniformity of results for individual regions with redundancy level and skill and age profile changes as exist between scenarios.

Finally, the prospect of a turnaround in some regional economies in the Railway Industry Council time frame should not be overlooked.

CHAPTER 5 RAILWAY WORKERS DISPLACEMENT AND LOCAL LABOUR MARKETS

INTRODUCTION

This chapter describes the methodology used to estimate the numbers of:

- displaced railway workers (job losses),
- railway redundancies,
- displaced job seeking and
- unemployed displaced workers

associated with the Railway Industry Council (RIC) scenarios, to construct profiles of displaced railway workers, and to map these displaced workers into the ninety-four local labour markets.

The major input in this process consisted of estimates by the RIC non-urban evaluation working group of the number of employees required by each of the five railway systems by the year 2001–02, under various scenarios.

Scenario 1. This is a base case which describes the expected development of non-urban rail for the period 1986–87 to 2001–02. This scenario is not a static forward projection of the 1986–87 situation but rather reflects known and likely changes to the non-urban rail market and is based on the appropriate rail systems' strategic plans.

Scenario 2A. This is an unconstrained railway scenario which assesses the likely performance of a commercially oriented railway in a deregulated environment with full cost recovery for all modes, assumed to result in an increase of 1 cent per net tonne-kilometre in road operator costs.

Scenario 2B. This is an unconstrained railway scenario which assesses the likely performance of a commercially oriented railway in a deregulated environment with full cost recovery for all modes, assumed to result in an increased of 2 cents per net tonne-kilometre in road operator costs.

Scenario 3. This is an unconstrained railway scenario with deregulation, similar to scenario 2, except that cost recovery for road transport would remain at current levels.

Scenario 4. This is a bulk haul railway scenario which examines the effect of concentrating on bulk haul traffic only, in an unconstrained and deregulated environment.

Scenario 5. This is a commercial railway scenario which examines the effect of concentrating on commercial traffic only in the current regulatory environment and assumes no change in road cost recovery. Interstate links are maintained irrespective of whether they cover their long-run avoidable costs.

Scenario 6. This is a commercial railway scenario which assumes that systems will carry, in addition to traffic identified under scenario 5, certain traffics considered by governments as community service obligations and separately funded.

Analysis of the scenarios

The analysis of these scenarios was undertaken in two major stages. First, the RIC non-urban evaluation working group carried out the financial assessment of the scenarios from the viewpoint of the railway systems. The second stage involved the Bureau of Transport and Communications Economics assessing the economic and social implications of these scenarios. This study looks at the social implications of these scenarios.

ESTIMATES OF RAILWAY SYSTEMS' JOB LOSSES

The starting point in the process of estimating the number of potential displaced and unemployed workers under the RIC scenarios was the estimation by the RIC non-urban working group of the labour forces of the railway systems in Australia by the year 2001–02.

The estimates reflect the demand patterns for railway labour and skills across the scenarios. Table 5.1 presents the 1986–87 and the 2001–02 national, aggregated, railway labour forces for each scenario, decomposed by major railway functional groups. The job losses can be derived by taking the differences between the labour force in 1986–87 and 2001–02.

Nationally, all railway functional groups would have job losses under all the RIC scenarios. Under the commercial scenarios the job losses would be as shown in table 5.2.

In proportionate terms, at the national level the three functional groups with the largest job losses, train operations – other, mechanical/workshops and infrastructure, are similar under both scenarios (table 5.2). Under scenario 5 the least affected group is administration whereas under scenario 6 it is the train operators – crew group which is the least affected.

Figure 5.1 summarises the job losses over all the scenarios, at the national level.

TABLE 5.1 NATIONAL RESULTS: CHANGES IN THE RAILWAY WORK FORCE BY MAJOR FUNCTIONAL GROUP UNDER EACH SCENARIO

	Major railway functional group					
Scenario	*Infrastructure*	*Mechanical/ workshop*	*Train operations– crew*	*Train operations– other*	*Adminis-tration*	*Total*
1986-87	16 700	16 085	10 115	18 758	8 910	70 568
2001-02:						
Base case	15 310	14 246	7 396	11 537	5 558	54 047
2A	9 601	7 980	3 490	4 955	2 977	29 003
2B	10 733	8 751	3 841	5 719	3 272	32 289
3	9 055	6 552	2 891	3 596	2 384	24 478
4	7 394	4 464	2 177	2 006	1 692	17 753
5A	9 327	6 702	3 044	3 841	2 435	25 349
6	10 092	8 986	4 276	6 002	2 725	32 081

Source Railway Industry Council non-urban evaluation working group.

TABLE 5.2 NATIONAL RESULTS: JOB LOSSES UNDER COMMERCIAL SCENARIOS, 1986–87 TO 2001–02

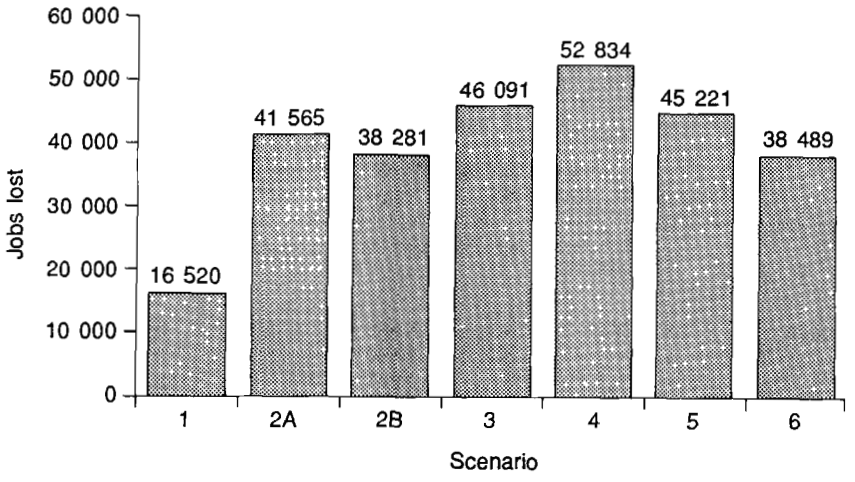
Functional employment group	*Commercial traffics only scenario 5*	*Commercial traffics and CSOs scenario 6*
Infrastructure	7 373 (0.16)	6 608 (0.17)
Mechanical/workshops	9 383 (0.21)	7 099 (0.19)
Train operations – crews	7 072 (0.16)	5 839 (0.15)
Train operations – other	14 917 (0.33)	12 756 (0.33)
Administration	6 474 (0.14)	6 185 (0.16)
Total	45 219 (1.00)	38 487 (1.00)

Notes 1. Commercial traffics are those which cover their long-run avoidable costs.

2. Community service obligations (CSOs) are traffics which do not cover long-run avoidable costs but which are supplied by railway systems because they are required to do so by government.

3. Figures in parentheses are proportions of total.

Source Derived from table 5.1.



Source Simulations of RAILCOST (Travers Morgan).

Figure 5.1 National results: total Australian non-urban railway jobs lost by 2001-02

The distribution of job losses across systems varies according to the scenario. Table 5.3 shows the percentage shares of national rail employment by systems, arranged in order of the 1986–87 shares. The relative shares of New South Wales and Queensland change according to scenario, but both of those systems remain in either the first or the second position for all scenarios. The remaining systems alter positions with scenarios 2A to 6, but none of the changes in relative positions is substantial.

Average annual rates of job losses from 1986–87 to 2001–02 are shown in table 5.4. At the national level, the lowest rate of change occurs with scenario 1, which is the base case (1.55 per cent), and the highest is associated with scenario 4, a

TABLE 5.3 CHANGES IN RAILWAY WORK FORCES UNDER EACH SCENARIO
(as a per cent of national rail employment)

	Base case		*Scenarios 2001–02*					
System	*1986–87*	*2001–02*	*2A*	*2B*	*3*	*4*	*5*	*6*
SRA	32.8	33.3	34.2	38.6	30.7	29.9	29.6	29.6
QR	32.4	31.2	29.2	27.1	32.2	40.5	33.5	31.0
V/Line	16.0	14.9	11.1	11.0	9.3	9.7	9.7	14.8
AN	11.1	12.0	13.8	12.7	15.1	7.5	14.7	13.9
Westrail	7.7	8.6	11.7	10.6	12.7	12.4	12.5	10.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source Calculated from Railcost model data.

TABLE 5.4 AVERAGE ANNUAL RATES OF JOB LOSSES
(as a percentage of 1986–87 rail employment)

System	Scenario 1	2A	2B	3	4	5B	6
V/Line	1.93	4.77	4.57	5.32	5.65	5.22	3.87
QR	1.75	4.20	4.12	4.37	4.57	4.20	3.76
SRA	1.47	3.80	3.07	4.50	5.14	4.50	3.93
AN	1.15	3.25	3.17	3.52	5.54	3.49	2.89
Westrail	0.97	2.50	2.47	2.85	3.98	2.78	2.44
National	1.55	3.93	3.62	4.35	4.99	4.27	3.64

Source Calculated from Railcost model data.

TABLE 5.5 DISTRIBUTION OF RAILWAY EMPLOYMENT BY OCCUPATIONAL GROUP
(per cent of employment)

Group	1986–87	Scenarios 2001–02 1	2A	2B	3	4	5	6
Infrastructure	23.8	28.3	33.1	33.2	37.0	41.7	36.8	31.5
Mechanical/workshop	22.9	26.4	27.5	27.1	26.8	25.2	26.4	28.0
Train operations – crew	14.6	13.7	12.0	11.8	11.8	12.3	12.0	13.3
Train operations – other	25.9	21.3	17.1	17.7	14.7	11.3	15.2	18.7
Administration	12.8	10.3	10.3	10.2	9.7	9.5	9.6	8.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source Calculated from Travers Morgan Railcost model data.

TABLE 5.6 AVERAGE ANNUAL RATE OF JOB LOSSES BY OCCUPATION: NATIONAL
(average annual percentage loss from 1986–87)

Group	Scenario *1*	*2A*	*2B*	*3*	*4*	*5*	*6*
Infrastructure	0.55	2.83	2.38	3.06	3.71	2.94	2.64
Mechanical/workshop	0.76	3.36	3.04	3.95	4.82	3.89	2.94
Train operations – crew	1.79	4.37	4.15	4.76	5.23	4.66	3.86
Train operations – other	2.57	4.91	4.63	5.39	5.95	5.30	4.53
Administration	2.51	4.44	4.22	4.88	5.40	4.84	4.63

Source Calculated from Travers Morgan Railcost model data.

TABLE 5.7 AVERAGE ANNUAL RATE OF JOB LOSSES BY OCCUPATION AND BY SYSTEM
(average annual percentage loss from 1986–87)

	Scenario						
Group	*1*	*2A*	*2B*	*3*	*4*	*5*	*6*
SRA							
Infrastructure	0.45	2.96	1.93	3.14	3.88	3.13	2.85
Mechanical/workshop	0.48	3.27	2.40	4.32	5.08	4.32	3.36
Train operations – crew	1.00	3.70	3.16	4.44	5.04	4.44	3.47
Train operations – other	2.78	4.62	4.07	5.45	5.98	5.45	4.95
Administration	2.49	4.50	3.92	5.17	5.66	5.17	4.99
V/Line							
Infrastructure	0.57	3.52	2.80	3.78	4.08	3.58	2.85
Mechanical/workshop	0.50	4.09	4.03	5.03	5.52	4.94	2.86
Train operations – crew	1.68	5.36	5.30	5.84	6.10	5.74	4.14
Train operations other	3.31	5.59	5.42	5.93	6.15	5.86	4.39
Administration	2.60	4.83	4.79	5.58	5.97	5.51	5.04
Australian National							
Infrastructure	0.34	2.29	2.14	2.55	4.75	2.50	2.18
Mechanical/workshop	0.03	2.48	2.39	2.75	5.88	2.72	1.83
Train operations – crew	1.50	4.11	4.05	4.28	5.74	4.25	3.10
Train operations – other	2.45	4.17	4.07	4.54	5.81	4.49	4.09
Administration	2.45	4.09	4.05	4.24	6.10	4.22	4.05
Westrail							
Infrastructure	0.35	1.87	1.72	2.06	3.02	1.97	1.80
Mechanical/workshop	0.10	1.86	1.86	2.32	3.70	2.23	1.71
Train operations – crew	0.99	2.93	2.93	3.43	3.90	3.35	2.74
Train operations – other	1.97	3.05	3.05	3.46	4.71	3.37	3.14
Administration	2.41	3.85	3.85	4.01	5.21	3.96	3.89
Queensland Railways							
Infrastructure	0.72	2.87	2.81	3.11	3.33	2.91	2.74
Mechanical/workshop	1.80	4.00	3.94	4.11	4.18	3.98	3.45
Train operations – crew	2.67	4.82	4.71	4.97	5.12	4.77	4.47
Train operations – other	2.00	5.55	5.42	5.74	6.15	5.52	4.61
Administration	2.49	4.29	4.25	4.35	4.41	4.28	4.19

Source Calculated from Railcost model data.

bulk haul only railway (4.99 per cent). Westrail shows the smallest average annual rates of job losses for all scenarios (ranging from 0.97 per cent to 3.98 per cent) while V/Line is expected to experience the largest average annual rates, except for scenario 6 (ranging from 1.93 per cent to 5.65 per cent). Although a small number of changes in rankings occur with scenarios 2B through 6, especially with scenario 4, the average annual rate of job losses is reasonably consistent across systems for the various scenarios.

Table 5.5 shows the variation in the distribution of employment by occupational group within the national totals. Despite this variation, table 5.6 shows that the average annual rates of job losses by job classification display only slightly more variation than the equivalent rates of job losses by system.

Nevertheless, the combined effect of uneven rates of job losses across systems as well as across occupational groups (see table 5.7) meant that system-specific rates had to be applied in the analysis for each scenario.

FLOW OF DISPLACED RAILWAY WORKERS

The objective is to obtain an estimate of the number of rail system employees in 1986–87 who are likely to be displaced sometime within the period to 2001–02 who are likely to fail to get alternative jobs, as a result of each of the scenario changes. In making the estimates, several factors were taken into account.

First, not all of the job losses are attributable to Railway Industry Council scenarios. Natural attrition is likely to absorb part of those losses and the rate of natural attrition from the railway system's work force will depend upon:

- old age retirements;
- retirements as a result of ill health;
- resignations; and
- deaths.

Second, within any given year the number of job losses associated with a scenario may exceed the number of natural exits from a railway system's work force for specific occupational groups and for specific regional areas. This excess of expected job losses over natural exits is likely to arise from the desire of rail systems to close down particular activities within a relatively short period of time. For example, if an entire workshop is closed down, the number of job losses among those previously employed in that workshop is certain to exceed the number of those employees who otherwise would have left their jobs 'naturally'.

Third, the number of natural exits from the work force may exceed the number of job losses required for specific occupations and for specific regional employment centres. It is therefore expected that within the fifteen-year period from 1986–87 to 2001–02 each rail system will have vacant positions to fill.

Fourth, while some of those workers who may be counted as net job losses can be transferred to other positions within the railway work force, and therefore to fill some of the vacant positions, it is unlikely that most of them can do so.

Labour force adjustment paths

The net effect of these four factors is relevant to the estimated number of rail worker displacements. A year-to-year analysis is necessary, especially in view of the second factor. A critical element, therefore, is the work force time path for adjustment which railway management chooses to adopt.

There are many such paths. Examples include:

- shed all the surplus workers in the first three years of the fifteen-year planning horizon;
- shed a constant number of employees every year (say 2000) until the desired labour force is achieve;
- shed a constant percentage of the labour force for each of the fifteen years;
- shed as many surplus workers as possible when the economy is in a boom and very few or none when the economy is in a recession.

Since the ability of a local labour market to absorb displaced rail workers will depend, in part, upon the length of time during which the absorption can occur, each of these time paths implies a slightly different number of rail workers left unabsorbed even though they may each be consistent with the gross number of job losses reported in the previous sub-section for the fifteen-year period.

While this report presents, for each RIC scenario, an estimate of the number of workers likely to be unabsorbed by the year 2001–02, the above discussion shows that it is impossible to generate a unique set of such numbers. The BTCE estimated the likely social impacts for each scenario based upon the straight-line dynamic time path, which assumes that each railway system reduces its labour force by the same number of workers each year. It must be emphasised that this time path:

- is not meant to approximate the adjustment path that would be followed in actuality by any railway system or government
- is used here because:
  - it is the most transparent in terms of the associated social impacts,
  - it is easy for both railway unions and management to monitor over time since it requires a constant number of rail workers to be displaced each year,
  - it is computationally resource-efficient, and
  - it is adequate given the aims of the study.

The aim of the analyses was to indicate that:

- there are some undesirable social impacts in some local labour markets;
- these impacts are not uniformly distributed amongst all local labour markets;
- the magnitudes of these impacts cannot be inferred simply by looking at aggregate job losses; and
- the number of railway workers who are likely to remain unabsorbed in 2001–02 is likely to be less than the number of railway jobs lost by 2001–02.

Natural attrition

Age profiles provided by the rail systems suggest that annual attrition over the fifteen-year period would average about 1.4 per cent across rail systems from age retirement alone. The contribution of resignations and retirements due to ill

health to the natural rate of attrition cannot be accurately determined. Moreover, the rate at which special skills are needed and the ability of the rail systems to retrain and relocate workers who would otherwise be released from the rail work force cannot be estimated. Hence, rather than attempting to estimate separate rates of natural attrition, net requirements for essential skills, and retraining and relocation, a range of voluntary exit rates from the work force was assumed, to convey a reasonable expectation of the net effect of the three influences. These rates were set at:

- 1 per cent of the beginning of year work force;
- 3 per cent at the beginning of year work force;
- 5 per cent of the beginning of year work force.

The lowest level of the range is less than the average annual rate of job losses associated with the base case, while the highest level of the range is approximately equal to the highest average annual rate of job losses, associated with scenario 4. The likelihood that the net rate of voluntary exits would exceed that percentage appears to be relatively low.

It should be emphasised that the assumed rates are natural rates of attrition (and are referred to as natural attrition in the discussion which follows), but nevertheless take into account the assumption that some of the gross turnover of the work force has to be replaced to maintain essential skills in job classifications which have higher than average turnover, as well as the assumption that some degree of retraining is possible.

RESULTS: REDUNDANCY ESTIMATES

The term redundancy is used here to mean exits from railway labour force which are associated with some form of financial inducement. Redundancies are of course part of displaced railway labour. They are different from other forms of displacements, though, because they require some financial outlay on the part of the railway system in order to effect them. This expenditure is in the form of what are called redundancy packages. Some systems already have these packages in place in order to accelerate the process of labour force downsizing. In this analysis redundancies occurred under a given scenario in a railway system if the exits as a result of natural attrition were not enough to achieve job losses designed by the railway system.

Estimates of redundant railway workers

An estimate of the gross railway redundant workers in year t of the fifteen-year period under scenario S depends on

- the rate of natural attrition in the railway work force; and
- the specific labour force required under scenario S in year t.

The number of workers who, in a given year, are likely to exit from the employment of the railway system as a result of natural attrition is given by the product of the

assumed natural rate of attrition and the labour force in the previous year. The analysis then compares the estimated natural attrition exits with the job losses needed in order to achieve by 2001-02 the gross job losses portrayed in figure 5.1. Whether redundancies occur or not depends on the type of outcome:

- let $J(t,S)$ be the actual job losses for scenario S and year t, and
- let $J^*(t,S)$ be the system-specific desired level of job losses under scenario S which is assumed equal to $J(t,S)$ in year $t = 15$, but need not be equal for other years.

There are three possible outcomes. The first possible outcome is when:

$$J^*(t,S) = J(t,S)$$

This equality between the natural attrition exits and the railway system desired exits does not mean that there is a balance between the skills of workers departing and the skills the railway system no longer needs. Neither do these exits reflect the regions from which the railway systems might be withdrawing services. Thus even in this case there would be a requirement for some retraining and relocation, but these are assumed to be conveyed in $J^*(t,S)$. The job displacements in this case would be zero in the sense that no special inducements need be introduced to downsize the labour force to the required level.

The second possible outcome is one where:

$$J^*(t,S) < J(t,S)$$

In this case more workers are leaving the railway system under natural attrition than the desired level of job losses under the scenario. Again no displacements are required to achieve the scenario-specific labour force. Some additional recruitment may be necessary.

The third possible outcome is one where:

$$J^*(t, S) > J(t,S)$$

In this case the number of exits required in order to achieve the desired level of job losses exceeds the number of exits possible under natural attrition. Displacements are required to make up the difference.

One can then assume that for an average year t:

$$J^*(t,S) = J(t,S)$$

where $J^*(t,S)$ is altered to include additional recruitment or additional job losses of previous periods.

Under the linear adjustment path the labour force is reduced annually by a constant, k, where:

$$k = (\text{1986–87 labour force} - \text{2001–02 labour force})/15$$

The simple procedure is followed where at the beginning of each year the desired job losses, $J^*(t,S)$, are set to k. If by the end of the year actual job losses $J(t,S)$ are less than k then redundancies equal to $k - J(t,S)$ are created to bring the total job losses to k.

For those years where the natural attrition exits exceed the desired constant annual exits of k, enough additional recruitments are made so that the net change in the labour force is k for the given year. The lower the rate of natural attrition, the higher the implied redundancies.

Table 5.8 summarises the scenario results corresponding to the linear adjustment time path. The results are national aggregates. The corresponding results based on the State railway systems appear in appendix II.

Adjusted natural attrition rates

The BTCE survey of displaced and redeployed rail workers revealed that a number of railway workers in the 50 years and over age group retired as a result of disaffection with railway management relocation policies and, upon leaving rail employment looked for a job in the local labour market.

Thus the rates of natural attrition described above will exaggerate the number of workers leaving their railway jobs on a strictly voluntary basis. The survey indicated that of the retired railway workers sampled 83 per cent were below the retirement age.

This result was used to adjust downwards each of the rates of natural attrition mentioned above in order to account for the disaffection-induced exits. For example the rate of natural attrition of 1 per cent is adjusted downwards to one of about 0.2 per cent.

This downward adjustment of natural attrition rates was applied as follows.

Data provided by railway systems on the age distribution of railway system employees in 1986–87 was used to estimate the number of workers likely to exit from railway employment by 2001–02 due to no other factor than age. This was done on the assumption that:

- the age distributions remain stable for the next fifteen years; and
- that workers retire at 65 years of age.

The age distributions used in the analysis are presented in figures 5.2 to 5.6. If the distribution of skills amongst retirees was not consistent with the skills distribution within the rail activities being closed, there may be some requirement for employee retraining or relocation.

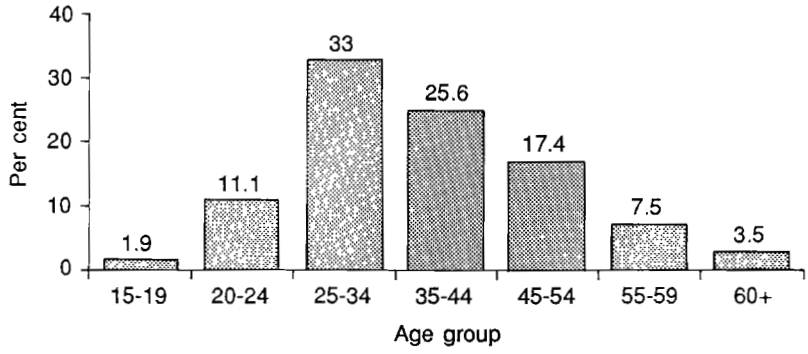
Results from BTCE (1990a) were used to estimate the 'rattling out' effect, which is a term used to refer to a labour force downsizing strategy by downgrading working conditions and/or redeploying workers to unacceptable positions or

TABLE 5.8 NATIONAL RESULTS: THE LINEAR PATH AND ASSOCIATED RETIREMENTS, NATURAL ATTRITION EXITS, REDUNDANCIES AND ADDITIONAL RECRUITMENT

	(1)	(2)	(3)	(4)	(5)	(6)
Scenario	*Natural attrition rate*[a] *(per cent)*	*Retirement totals*[b]	*Total natural attrition exits*[c]	*Redundancy totals*[d]	*Additional recruitment*	*2001–02* labour *force*
1	1	12 530	9 373	7 148	0	54 047
	3	12 530	28 285	0	11 764	54 047
	5	12 530	47 144	0	30 623	54 047
2A	1	12 530	7 678	33 887	0	29 003
	3	12 530	23 029	18 640	104	29 003
	5	12 530	38 380	6 789	3 604	29 003
2B	1	12 530	7 908	30 372	0	32 288
	3	12 530	23 717	14 681	118	32 288
	5	12 530	39 527	4 647	5 894	32 288
3	1	12 530	7 359	38 730	0	24 479
	3	12 530	22 076	24 024	11	24 479
	5	12 530	36 796	11 241	1 948	24 479
4	1	12 530	6 887	45 948	0	17 733
	3	12 530	20 660	32 175	0	17 733
	5	12 530	34 433	18 714	312	17 733
5	1	12 530	7 420	37 799	0	25 349
	3	12 530	22 259	22 982	22	25 349
	5	12 530	37 099	10 348	2 228	25 349
6	1	12 530	7 877	30 801	0	31 890
	3	12 530	23 633	15 187	142	31 890
	5	12 530	39 389	4 189	4 900	31 890

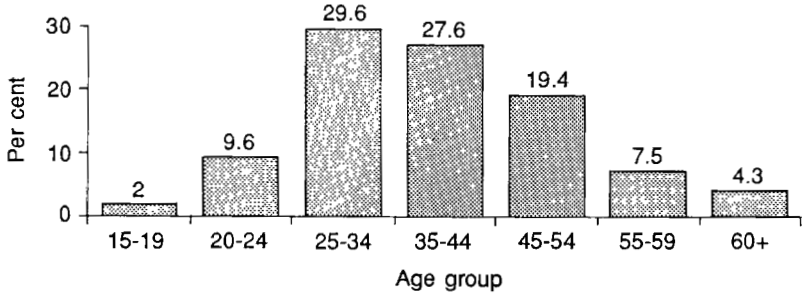
a. These unadjusted natural attrition rates are used to estimate redundancies only.
b. Only 17 per cent of these retirees are treated as genuine old-age retirees who retire at 65 years; 83 per cent are assumed to leave the railway systems before age 65 and to look for work in the local labour market.
c. These totals include the old-age retirements.
d. These are not the total displacements. The redundancies are a part of total displacements.

Note The 1986–87 national railway labour force was estimated to be 70 568.
C6 = 70 568 – C3 – C4 + C5. The net change in the labour force between 1986–87 and 2001–02 for a scenario is given by –C3 – C4 + C5.



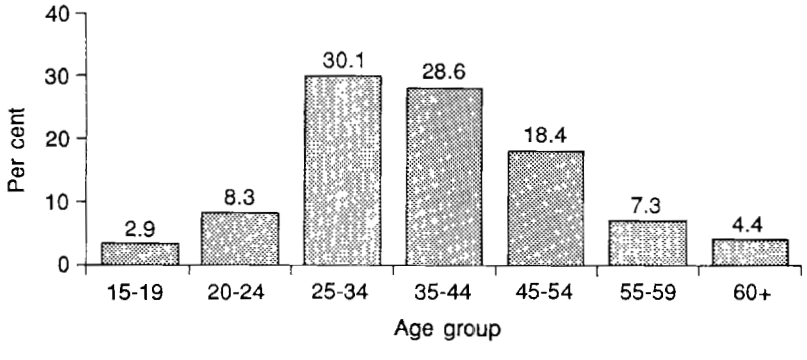
Source State Rail Authority of New South Wales.

Figure 5.2 State Rail Authority of New South Wales: age distribution of its work force, 1986-87



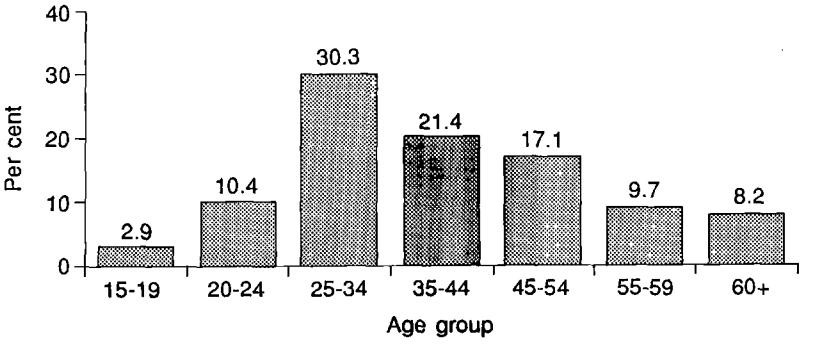
Source V/Line.

Figure 5.3 V/Line Victoria: age distribution of its work force (as at 30 June 1988)



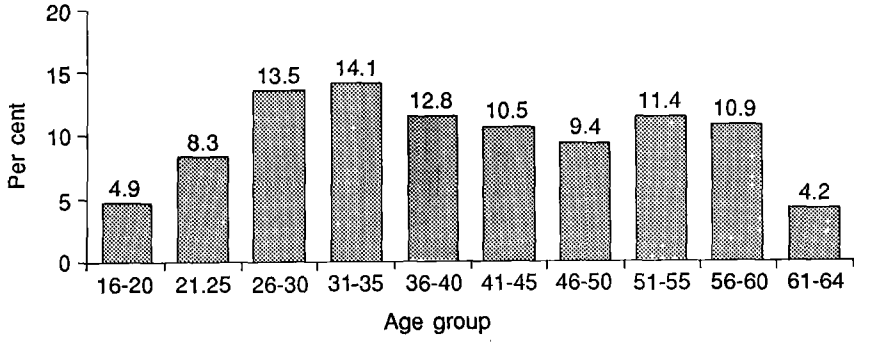
Source Australian National railways.

Figure 5.4 Australian National: age distribution of its work force, 1986-87



Source Queensland Railways.

Figure 5.6 Queensland Railways: age distribution of its work force, 1986-87



Source Westrail.

Figure 5.5 Westrail: age distribution of its work force (as at 30 June 1988)

locations. The rattling out effect was estimated to be 83 per cent of the railway workers who were 50 years and over in 1986–87, that is, who will have reached age retirement by 2001–02. This effectively meant that only 17 per cent of the workers who were 50 and over in 1986–87 would leave the employment of railways naturally.

In the absence of other data, the age profiles for the estimated displacements by system and scenario have been approximated by the profile of the workers covered under the BTCE survey (BTCE 1990a).

The analysis has concentrated on the most vulnerable occupations revealed in the survey:

- labourers and related workers;

- plant and machine operators, and drivers; and
- tradespersons.

The analysis also emphasised the managers and administrators category which provided displaced workers with the highest re-employment opportunities. Displaced workers in this category comprised mainly those workers who became self-employed.

The remaining categories, namely, professionals, para-professionals, clerks, salespersons and personal service workers, have been grouped together for the analysis. The analysis has taken into account the regional industries (classified by ASIC) which employed most of the workers under these occupations.

The age cohorts analysed were 20–34 years, 35–54 years and 55–64 years.

Voluntary separations were set equal to the difference between the natural attrition exits less 83 per cent of the railway employees who were 50 and over in 1986–87. The displaced railway workers were then estimated to be the difference between the gross job losses and the voluntary exits.

JOB SEEKERS BY LOCAL LABOUR MARKETS

In the absence of information on the regional variability of scenario impacts for each employment group, total displacements in each region were determined on a pro rata basis using the share of the local labour market in the 1986–87 railway system's labour force as a whole.

For each scenario the analysis allocates the estimate for displaced workers corresponding to the each of the five railway systems to the ninety-four local labour markets as follows:

- First, for each local labour market in a given State, the share in the State's railway employment is determined. That is, for each market the ratio of rail jobs in the local labour market divided by the total number of jobs in the State's railway system is calculated.
- Second, the local labour market's share of displaced railway displaced workers is assumed to be equal to the local labour market's share in railway employment.
- Third, the retirement rates in each of the ninety-four local labour markets over the fifteen-year period from 1986–87 are estimated and differences between those rates and the rail system rates are computed. This difference is used to correct for discrepancies between the age profile of the railway labour force and that of the community at large.

This process produces an estimate for each local labour market of the number of displaced railway workers who are likely to seek employment in that local labour market during the fifteen-year period. The number of such job seekers is estimated by the following equation:

Job seekers = (job losses − natural attrition exits) + 0.83 × number 50 years and over × [1 − (railway system retirement rate − local community's retirement rate)]

This number is then fed into the model to determine the number of displaced railway workers who are likely to remain unemployed by the year 2001–02. The results from these simulations are discussed below.

Different RIC scenarios assume different railway skill mixes. Changes in these skill mixes between 1986–87 and 2001–02 are reflected in the changes in the work force shares of the following five major railway functional groups:

- infrastructure;
- mechanical/workshops;
- train operations – crew;
- train operations – other; and
- administration.

The changes in the functional groups according to scenario have implications for the skills and occupations that are shed by the railway systems because each one of the functional groups has a different worker distribution. These differences in the skill profile being released by the railway system under the different scenarios mean that the reabsorption capacities of the various local labour markets do vary from scenario to scenario. Those scenarios where the skill profiles of the workers released are similar to the skill profiles of workers demanded in the local labour markets will be associated with higher reabsorption capacities compared to those scenarios where these skill profiles are mismatched.

NUMBER OF UNEMPLOYED DISPLACED RAILWAY WORKERS

The social impacts of RIC scenarios are proxied by the number of displaced railway workers likely to remain unemployed under each of the RIC scenarios. In order to estimate these, the results from the analysis of the buoyancy of local labour markets and the results from the estimates of displaced workers are combined. Each one of the ninety-four local labour markets has associated with it a labour reabsorption coefficient ranging from 0.1 in Whyalla to 1.0 in Alice Springs. This coefficient is used to determine the number of railway workers who are likely to be unemployed at the end of the first twelve months following their job displacement. Given that some of the unemployed respondents in the survey of redeployed and redundant railway workers (BTCE 1990a) were likely to have been employed after displacement then become unemployed at the time of the survey, the coefficient presents the worst possible scenario for reabsorption. Data limitations have prevented extensions of the analysis beyond the initial twelve-month period following displacement, but it is reasonable to suppose that a number of those remaining unemployed at the end of the first twelve months would ultimately find employment.

At this point it is worth recalling that the reabsorption coefficients of the ninety-four local labour markets under the various scenarios:

- are only partly determined by the scenarios which provide estimates of the types of worker likely to be looking for work in the given local labour market;
- they are in part determined by supply factors in the market, that is, the skill, age and other attributes of other workers looking for work in the same market; and
- they are also dependent on the local labour market demand factors, that is, those skills and occupational attributes that are in demand in the given region.

These reabsorption coefficients were computed in the first part of the study and led to the ranking of local labour markets reported in chapter 4 of this report. These coefficients determine the extent to which displaced railway workers are likely to be re-employed in local labour markets.

For a given local labour market let e be the corresponding reabsorption coefficient, where $0.1 < e < 1.0$. Then $(1 - e)$ is the proportion of the displaced railway workers who are likely to be unabsorbed in the local labour market in any given year. An estimate of the number of unabsorbed displaced workers, $u(t,S)$ for time t and scenario S is then given by the following equation:

$$u(t,S) = \text{job seekers} \times (1 - e)$$

where $(1 - e)$ is the proportion of displaced railway workers likely to remain unabsorbed in the local labour market. Table 5.9 presents estimates of the unemployed railway workers by scenario.

TABLE 5.9 NATIONAL RESULTS: JOB SEEKING AND UNEMPLOYED DISPLACED RAILWAY WORKERS, 1986–87 TO 2001–02

	Job seekers at adjusted natural attrition rates of			*Unemployed at adjusted at natural attrition rates of*		
Scenario	*1%*	*3%*	*5%*	*1%*	*3%*	*5%*
1	16 432	2 113	0	6 990	784	0
2A	41 345	30 434	15 391	17 972	13 103	6 527
2B	38 073	26 479	11 012	16 329	11 103	4 305
3	45 851	35 888	21 249	20 134	15 714	9 329
4	52 555	44 000	30 302	23 184	19 384	13 403
5	44 986	34 842	20 082	19 798	15 312	8 882
6	38 287	26 775	11 105	16 760	11 674	4 858

Note The unemployed are those workers remaining unabsorbed at the end of the first twelve months from the time of displacement. Some of these would subsequently find employment

TABLE 5.10 DISAGGREGATED RESULTS: LINEAR PATH AND AVERAGE ANNUAL UNEMPLOYED DISPLACED REDUNDANT RAILWAY WORKERS, COMMERCIAL SCENARIOS

	Scenario 5			*Scenario 6*		
Local labour market	*1%*	*3%*	*5%*	*1%*	*3%*	*5%*
NSW						
Broken Hill	8	6	4	7	5	2
Wollongong	24	18	11	21	15	7
Central and Inner Western Sydney	193	148	89	168	118	56
Griffith	6	5	3	5	4	2
Southern Sydney	42	32	19	37	26	12
Northern Sydney	0	0	0	0	0	0
Armidale	4	3	2	3	2	1
Orange	11	8	5	9	7	3
Dubbo	28	21	13	24	17	8
Newcastle	38	29	18	33	23	11
Lismore	8	6	4	7	5	2
Lithgow	5	4	2	5	3	2
Wagga Wagga	29	22	13	25	18	8
Port Macquarie	2	2	1	2	1	1
Western Sydney	22	17	10	19	13	6
Tamworth	21	16	10	18	13	6
Moree	28	21	13	24	17	8
Gosford/Wyong	2	2	1	2	1	1
Taree	9	7	4	8	6	3
Coffs Harbour	1	1	1	1	1	0
Nowra	4	3	2	3	2	1
South Western Sydney	0	0	0	0	0	0
Bathurst	10	8	5	9	6	3
Albury-Wodonga	12	9	6	11	7	4
Goulburn	16	12	7	14	9	4
Canberra	5	4	2	5	3	2
Grafton	10	8	5	9	6	3
Subtotal	538	412	250	469	328	156
Victoria						
Inner Melbourne	65	55	39	49	35	16
Colac	3	2	2	2	1	1
Horsham	24	20	14	18	13	6
Southern Melbourne	13	11	8	10	7	3
Morwell	1	1	1	1	1	0
Warrnambool	1	1	1	1	1	0
Mildura	11	9	7	8	6	3
Shepparton	19	16	12	15	10	5
Sale	5	4	3	3	2	1
Ballarat	17	14	10	13	9	4
Wangaratta	8	7	5	6	4	2
Traralgon	5	4	3	4	3	1
Bendigo	16	13	9	12	8	4

TABLE 5.10 (Cont.) DISAGGREGATED RESULTS: LINEAR PATH AND AVERAGE ANNUAL UNEMPLOYED DISPLACED REDUNDANT RAILWAY WORKERS, COMMERCIAL SCENARIOS

	Scenario 5			*Scenario 6*		
Local labour market	*1%*	*3%*	*5%*	*1%*	*3%*	*5%*
Geelong	28	23	17	21	15	7
Western Melbourne	22	19	13	17	12	6
Moe	7	6	4	5	4	2
Outer-Eastern Melbourne	3	2	2	2	1	1
Mornington Peninsula	4	3	2	3	2	1
Inner-East Melbourne	2	2	1	2	1	1
Hamilton	11	9	7	9	6	3
North East Melbourne	2	2	1	2	1	1
Subtotal	268	223	161	203	143	68
Queensland						
Townsville	51	41	24	45	34	17
Maroochydore	16	13	8	14	11	5
Mount Isa	18	15	8	16	12	6
Gladstone	1	1	1	1	1	0
Bundaberg	24	19	11	21	16	8
Balance Brisbane	1	1	1	1	1	0
Outer Brisbane	24	19	11	21	16	8
Inner Brisbane	38	30	10	34	26	13
Cairns	10	8	5	9	7	3
Gympie	32	26	15	29	22	11
Maryborough	18	14	8	15	12	6
Mackay	48	39	23	43	32	16
Hervey Bay	0	0	0	0	0	0
Toowoomba	1	1	0	1	1	0
Caloundra	15	12	7	13	10	5
Gold Coast	1	1	1	1	1	0
Rockhampton	39	31	18	34	26	12
Subtotal	337	271	151	298	228	111
Australian National						
Whyalla	1	1	0	1	0	0
Port Pirie	12	8	3	10	5	0
Renmark	5	3	1	4	2	0
Eastern Adelaide	0	0	0	0	0	0
Port Lincoln	17	11	4	14	8	0
Burnie	4	2	1	3	2	0
Mount Gambier	2	1	0	2	1	0
Western Para and North Eastern	2	1	0	2	1	0
Adelaide	46	30	10	38	21	0
Southern Adelaide	0	0	0	0	0	0

TABLE 5.10 (Cont.) DISAGGREGATED RESULTS: LINEAR PATH AND AVERAGE ANNUAL UNEMPLOYED DISPLACED REDUNDANT RAILWAY WORKERS, COMMERCIAL SCENARIOS

	Scenario 5			*Scenario 6*		
Local labour market	*1%*	*3%*	*5%*	*1%*	*3%*	*5%*
Launceston	8	5	2	7	4	0
Darwin	0	0	0	0	0	0
Murray Bridge	3	2	1	2	1	0
Northern Territory	0	0	0	0	0	0
Port Augusta	9	6	2	7	4	0
Alice Springs	0	0	0	0	0	0
Subtotal	109	70	24	90	49	0
Westrail						
Narrogin	4	3	0	4	2	0
Albany	2	1	0	2	1	0
Northam	10	6	0	9	5	0
Central Perth	17	10	1	15	8	0
Port Hedland	0	0	0	0	0	0
Kalgoorlie	2	2	0	2	1	0
South West Perth	2	1	0	2	1	0
South East Perth	1	1	0	1	1	0
Bunbury	4	2	0	3	2	0
Geraldton	3	2	0	3	1	0
North Perth	1	1	0	1	0	0
Mandurah	0	0	0	0	0	0
East Perth	19	12	1	16	9	0
Subtotal	65	41	2	58	31	0
Total Australia	1 317	1 017	588	1 118	779	334

Time *t* is interpreted to be the end of the first twelve months following the workers being displaced. Data limitations have prevented extension of the analysis beyond the twelve-month period.

What happens to a displaced worker after the twelve-month period is subject to a number of influences. The question of 'scarring', or influence of previous employment or unemployment experiences on future durations of unemployment, has been the subject of a number of investigations. Trivedi and Alexander (1986) show that the duration of an unemployment spell is influenced by the duration of previous employment. The duration of unemployment differs according to whether it is a first, second or subsequent unemployment spell. They also show that longer previous unemployment spells indicate longer current unemployment spells.

Regardless of circumstance it is reasonable to expect that a number of those unemployed at the end of the first twelve months would subsequently find re-employment.

Table 5.10 disaggregates the results to the local labour market level for the commercial rail scenarios 5 and 6.

The numbers in the table are for the linear work force adjustment path. It is clear that there are several local labour markets where unemployment may be concentrated. In all cases these areas are major metropolitan labour markets, namely, Sydney, Melbourne, Brisbane, Adelaide and Perth. Though these areas have a concentration of the unemployed on the first round results in table 5.10, the negative social impacts of unemployment are likely to be abated by the increased employment opportunities in these large and diverse markets.

The negative social impacts of unemployment vary with the rate of natural attrition. The lower the rate of natural attrition, the larger the associated negative social impacts. Overall, for the majority of local labour markets, there seem to be some negative social impacts associated with the scenarios. To the extent that these negative social impacts can be approximated by the number of displaced workers who fail to gain alternative non-railway employment, the results seem to suggest that at the level of local labour market these impacts would be minimal.

CHAPTER 6 CONCLUSIONS

This report has assessed the extent to which Railway Industry Council scenarios developed for non-urban rail would result in a pool of displaced railway workers who fail to find alternative forms of gainful non-railway employment. The size of this estimated pool of unabsorbed former railway workers is used as a proxy for the social impacts of the RIC scenarios. Seven scenarios were analysed, covering the fifteen-year period from 1986–87 to 2001–02.

ASSESSMENT OF SOCIAL IMPACTS

Assessment by the BTCE of social impacts commenced with the development of a model to determine the buoyancy of ninety-four local labour markets by examining the interaction of supply and demand characteristics of the markets during the inter-censal period 1981 to 1986. These local labour markets consisted of major regional centres affected by railway restructuring and their socially and economically interactive surrounds. Analysis involved shift-share, an established methodology of appraising labour market dynamics. The Wroclaw taxonomic method was used to aggregate a number of supply-side and demand-side variables to an index describing the local labour markets' relative capacities to reabsorb displaced railway workers.

These absorption capacities for the local labour markets were re-scaled to satisfy re-employment data points in order to produce estimates of the numbers of displaced railway workers reabsorbed twelve months after being displaced. The analysis took into account the age, skill and occupational profiles of workers likely to be shed by the railway systems under the different scenarios and compared these with the age, skill and occupational structures of the individual local labour markets. Account was taken of vulnerable railway occupational groups and the labour markets' potential to re-employ displaced rail workers from those groups.

As a starting point to this work each of the scenarios was described in terms of estimates of the total numbers of non-urban railway jobs lost by the railway systems by the year 2001–02. These raw estimates of rail work force reductions between 1986–87 and 2001–02 were not at all indicative of the actual scenario-induced displacement of railway workers. This was because the estimates did not consider the natural rates of attrition, such as old-age retirements, ill health or resignations. Thus former rail workers who were not

expected to seek re-employment were excluded from the raw displacement totals. Total retirements were in turn scaled down by the subtraction of disaffection-induced exits. Disaffection-induced exits arose from rail workers leaving rather than, for example, accepting a management's decision to deploy them to a location they did not want to go to.

The results of the analysis were predicated on railway managements shedding a constant number of employees every year until 2001–02 until a desired labour force was achieved for a railway system under a specific scenario. This linear adjustment time path of course is not unique in the sense that lumpiness of job shedding would inevitably arise. Nevertheless it was deemed to be the simplest and best approach to the exercise.

THE RESULTS

In terms of the capacity of local labour markets to reabsorb rail workers in non-railway employment at the end of the first twelve months of their displacement, nine labour markets consistently fared worst regardless of scenario. They were Central and Inner Western Sydney, Wollongong, Broken Hill and Griffith (NSW), Inner Melbourne (Vic), Whyalla (SA) and Narrogin, Albany and Northam (WA). These labour markets were estimated to provide less than a 40 per cent chance for the displaced rail workers to be reabsorbed in the first twelve months. Reasons for these markets' relatively unfavourable result are outlined in chapter 4. A further twenty-six local labour markets were grouped in the 40 to 55 per cent reabsoption category of less than the national absorption rate of some 56 per cent. Fifty-nine local labour markets had a reabsorption capacity of greater than 55 per cent.

With the effects of natural attrition included, and a linear work force adjustment time path assumed to be applied by railway managements, the net social impacts were conspicuously small. Based on the railway systems' worker age profiles, total retirements, natural attrition exits and redundancy totals were estimated for each scenario for the State railway systems and in terms of national aggregates. Alternatively, the additional recruitment required to the year 2001–02 was estimated when natural attrition exits exceeded the desired job losses. Based on the local labour markets' estimated reabsorption capacities the net numbers of scenario-induced job seeking unemployed railway workers were calculated. For the commercial scenarios 5 and 6 the annual average numbers of scenario-induced displaced railway workers who were unable to find gainful non-railway employment twelve months following their displacement were very small, amounting to only 4 to 14 unemployed. Unemployed displaced rail workers were found in larger numbers in the metropolitan regions, particularly in Inner and Central Western Sydney, in these first round results. In general, the negative social impacts were more likely to be abated in the longer term in these large and diverse markets than in the rural labour markets, where the estimated numbers of unemployed were small.

Nevertheless, the majority of the local labour markets seemed to incur some negative social impacts based on the proxy of unemployment. The lower the rate of natural attrition, the larger the associated negative impacts were.

Reabsorption coefficients for the local labour markets did not vary significantly from one scenario to another irrespective of the number of railway workers displaced. This was because the railway labour forces comprised a very small part of the regional markets' labour forces, so that changes in the job losses and the age, skills and occupational structures of the displaced railway workers according to scenario made little impression on the result.

The results apply only at the level of aggregation of the local labour market as defined in the report. They are not translatable from the local labour market level to specific towns or localities within those markets.

The results are based on the assumption that re-employment opportunities in the local labour markets to the year 2001–02 will be the same as in the recent past. This will not necessarily be the case. Accordingly, the study's estimates may understate the reabsorption capacities for local labour markets which will grow faster in the future than they did in the recent past. Conversely, the estimates may overstate reabsorption capacities for those local labour markets whose future rates are lower compared with their recent past.

APPENDIX I REGIONS USED IN THE ANALYSIS

The construction of local labour market areas is described in Chapter 2. The following list shows the names of the local labour market are as (in italics), with their numeric identifiers, and their component local government or ABS statistical local areas. Figure I.1 shows their location.

Abbreviations

B	Borough
C	City, City Council, Corporation of City of
DC	District Council
M	Municipality, Municipal Council
S	Shire, Shire Council
T	Town, Town Council

01 SYDNEY

01.1 *Central and Inner Western Sydney*
- Ashfield (M)
- Burwood (M)
- Concord (M)
- Drummoyne (M)
- Leichhardt (M)
- Marrickville (M)
- Randwick (M)
- Strathfield (M)
- Sydney (C)
- Waverley (M)
- Woollahra (M)

01.2 *Gosford/Wyong*
- Gosford (C)
- Wyong (S)

01.3 *Northern Sydney*
- Hornsby (S)
- Hunters Hill (M)
- Ku-ring-gai (M)
- Lane Cove (M)
- Manly (M)
- Mosman (M)
- North Sydney (M)
- Ryde (M)
- Warringah (S)
- Willoughby (M)

01.4 *South Western Sydney*
- Camden (M)
- Campbelltown (C)
- Liverpool (C)
- Wollondilly (S)

01	Sydney	20	Bendigo	39	Northern Territory	58	Horsham
02	Melbourne	21	Shepparton	40	Alice Springs	59	Mildura
03	Nowra	22	Wangaratta	41	Broken Hill	60	Bundaberg
04	Wagga Wagga	23	Warrnambool	42	Darwin	61	Cairns
05	Brisbane	24	Maryborough	43	Moe	62	Gympie
06	Townsville	25	Rockhampton	44	Morwell	63	Mackay
07	Adelaide	26	Burnie	45	Mount Isa	64	Toowoomba
08	Perth	27	Launceston	46	Kalgoorlie	65	Port Lincoln
09	Hobart	28	Newcastle	47	Port Hedland	66	Albany
10	Canberra	29	Wollongong	48	Coffs Harbour	67	Geraldton
11	Albury-Wodonga	30	Lithgow	49	Port Macquarie	68	Gold Coast
12	Bathurst	31	Geelong	50	Caloundra	69	Hervey Bay
13	Dubbo	32	Traralgon	51	Gladstone	70	Bunbury
14	Goulburn	33	Port Augusta	52	Maroochydore	71	Narrogin
15	Grafton	34	Port Pirie	53	Mandurah	72	Northam
16	Lismore	35	Whyalla	54	Griffith	73	Mount Gambier
17	Orange	36	Armidale	55	Moree	74	Renmark
18	Tamworth	37	Hamilton	56	Taree	75	Murray Bridge
19	Ballarat	38	Sale	57	Colac		

Source Office of Local Government (1988).

Figure I.1 Office of Local Government regions used for social evaluation

01.5 *Southern Sydney*
Bankstown (C)
Botany (M)
Canterbury (M)
Hurstville (M)
Kogarah (M)
Rockdale (M)
Sutherland (S)

01.6 *Western Sydney*
Auburn (M)
Baulkham Hills (S)
Blacktown (C)
Blue Mountains (C)
Fairfield (C)
Hawkesbury (S)
Holroyd (M)
Parramatta (C)
Penrith (C)

02 MELBOURNE

02.1 *Inner Melbourne*
Brunswick (C)
Coburg (C)
Collingwood (C)
Fitzroy (C)
Melbourne (C)
Port Melbourne (C)
Prahran (C)
Richmond (C)
South Melbourne (C)
St Kilda (C)

02.2 *Inner-East Melbourne*
Box Hill (C)
Camberwell (C)
Doncaster & Templestowe (C)
Hawthorn (C)
Kew (C)
Nunawading (C)
Waverley (C)

02.3 *Mornington Peninsula*
Berwick (C)
Chelsea (C)
Cranbourne (S)
Dandenong (C)
Flinders (S)
Frankston (C)
French Island
Hastings (S)
Mornington (S)
Phillip Island
Springvale (C)

02.4 *North East Melbourne*
Broadford (S)
Diamond Valley (S)
Eltham (S)
Heidelberg (C)
Northcote (C)
Preston (C)
Whittlesea (S)
Yea (S)

02.5 *Outer-Eastern Melbourne*
Alexandra (S)
Croydon (C)
Healesville (S)
Knox (C)
Lilydale (S)
Ringwood (C)
Sherbrooke (S)

02.6 *Southern Melbourne*
Brighton (C)
Caulfield (C)
Malvern (C)
Moorabbin (C)
Mordialloc (C)
Oakleigh (C)
Sandringham (C)

02.7 *Western Melbourne*
Altona (C)
Broadmeadows (C)
Bulla (S)
Essendon (C)
Footscray (C)
Gisborne
Keilor (C)
Kilmore
Melton (S)
Newham & Woodend (S)
Sunshine (C)
Romsey
Werribee (S)
Williamstown (C)

03 *NOWRA*
Shoalhaven (C)
Jervis Bay

Wingecarribee (S)

04 *WAGGA WAGGA*
Coolamon (S)
Cootamundra (S)
Gundagai (S)
Holbrook (S)
Junee (S)
Lockhart (S)
Temora (S)
Tumbarumba (S)
Wagga Wagga (C)
Young (S)

05 BRISBANE

05.1 *Balance Brisbane*
Caboolture (S)
Logan (C)
Moreton (S)
Pine Rivers (S)
Redcliffe (C)
Redland (S)

05.2 *Inner Brisbane*
Albion
Alderley
Annerley
Ascot
Ashgrove
Balmoral
Bardon
Bowen Hills
Bulimba
Camp Hill
Cannon Hill
Carina
Carina Heights
Carindale
Chelmer
City
Clayfield
Coorparoo
Corinda
Dutton Park
East Brisbane
Enoggera
Fairfield
Fortitude Valley
Graceville
Grange
Greenslopes
Hamilton and Eagle Farm
Hawthorne
Hendra
Herston
Highgate Hill
Holland Park
Holland Park West
Indooroopilly
Kangaroo Point
Kedron
Kelvin Grove
Lutwyche
Milton
Moorooka
Morningside
New Farm
Newmarket
Newstead
Norman Park
Nundah
Paddington
Red Hill
Sherwood
South Brisbane
Spring Hill
St Lucia
Stafford
Stafford Heights
Taringa
Tarragindi
Toowong
West End
Wilston
Windsor
Woolloongabba
Wooloowin
Yeerongpilly
Yeronga

05.3 *Outer Brisbane*
Acacia Ridge
Algester
Anstead
Archerfield
Aspley
Bald Hills
Banyo

Bellbowrie
Belmont
Berrinba and Drewvale
Boondall
Bracken Ridge and Fitzgibbon
Bridgeman Downs
Brighton
Brookfield
Burbank
Calamvale
Capalaba West
Carseldine
Chandler
Chapel Hill
Chermside
Chermside West
Coopers Plains
Darra
Deagon
Doolandella
Durack
Eight Mile Plains
Ellen Grove
Everton Park
Ferny Grove
Fig Tree Pocket
Geebung
Gumdale
Hemmant and Lytton
Inala
Jamboree Heights
Jindalee
Kenmore
Kenmore Hills
Keperra
Kuraby
Lota
McDowall
Macgregor
Mackenzie
Manly
Manly West
Mansfield
Middle Park
Mitchelton
Moreton Island
Mount Gravatt
Mount Gravatt East
Mount Ommaney
Murarrie
Nathan
Northgate
Nudgee
Nudgee Beach
Oxley
Pallara and Heathwood
Parkinson and Larapinta
Pinjarra Hills
Pinkenba
Pullenvale
Ransome
Richlands
Riverhills and Sumner
Robertson
Rochedale
Rocklea
Runcorn
Salisbury
Sandgate
Seventeen Mile Rocks
Stretton
Sunnybank
Sunnybank Hills
Taigum
The Gap
Tingalpa
Underwood
Upper Brookfield
Upper Kedron
Upper Mount Gravatt
Virginia
Wacol
Wakerley
Wavell Heights
Westlake
Willawong
Wishart
Wynnum
Wynnum West
Zillmere

06 *TOWNSVILLE*

Aramac (S)
Ayr (S)
Charters Towers (C)

Dalrymple (S)
Flinders (S)
Hinchinbrook (S)
Thuringowa (S)
Townsville (S)

07 ADELAIDE

07.1 *Eastern Adelaide*
Adelaide (C)
Burnside (C)
Campbelltown (C)
East Torrens (DC)
Kensington & Norwood (C)
Onkaparinga (DC)
Payneham (C)
Prospect (C)
St Peters (M)
Stirling (DC)
Unley (C)
Walkerville (M)

07.2 *Southern Adelaide*
Brighton (C)
Dudley (DC)
Glenelg (C)
Happy Valley
(formerly Meadows A)
Mallala (DC)
Marion (C)
Mitcham (C)
Noarlunga (C)
Victor Harbor (DC)
Willunga (DC)
Yankalilla (DC)

07.3 *Western Para and North Eastern Adelaide*
Angaston (DC)
Barossa (DC)
Elizabeth (C)
Enfield (C)
Gawler (M)
Gumeracha (DC)
Henley & Grange (C)
Hindmarsh (M)
Light
Munno Para (DC)
Port Adelaide (C)
Riverton (DC)
Saddleworth & Auburn (DC)
Salisbury (C)
Tea Tree Gully (C)
Thebarton (M)
Wakefield Plains
West Torrens (C)
Woodville (C)

08 PERTH

08.1 *Central Perth*
Claremont (T)
Cottesloe (T)
Nedlands (C)
Peppermint Grove (S)
Perth (C)
Subiaco (C)

08.2 *East Perth*
Bassendean (T)
Bayswater (C)
Chittering (S)
Kalamunda (S)
Mundaring (S)
Swan (S)

08.3 *North Perth*
Dandaragan (S)
Gingin (S)
Stirling (C)
Wanneroo (S)

08.4 *South East Perth*
Armadale (T)
Belmont (C)
Canning (C)
Gosnells (C)
Serpentine-Jarrahdale (S)
South Perth (C)

08.5 *South West Perth*
Cockburn (C)
East Fremantle (T)
Fremantle (C)
Kwinana (T)
Melville (C)
Rockingham (S)

09 *HOBART*
Brighton (M)
Bruny (M)
Clarence (M)
Esperance (M)
Glenorchy (C)

Green Ponds (M)
Hamilton (M)
Hobart (C)
Huon (M)
Kingborough (M)
New Norfolk (M)
Oatlands (M)
Port Cygnet (M)
Richmond (M)
Sorell (M)
Spring Bay (M)
Strahan (M)
Tasman (M)

10 *CANBERRA*
ACT (excludes Jervis Bay)
Bega Valley (S)
Bombala (S)
Cooma-Monaro (S)
Eurobodalla (S)
Harden (S)
Queanbeyan (C)
Snowy River (S)
Tallanganda (S)
Tumut (S)
Yarrowlumla (S)
Yass (S)

11 *ALBURY-WODONGA*
Albury (C)
Bright (S)
Chiltern (S)
Culcairn (S)
Hume (S)
Tallangatta (S)
Upper Murray (S)
Wodonga Rural (C)
Yackandandah (S)

12 *BATHURST*
Bathurst (C)
Evans (S)
Mudgee (S)

13 *DUBBO*
Bogan (S)
Coolah (S)
Coonabarabran (S)
Coonamble (S)
Dubbo (C)
Gilgandra (S)
Narromine (S)
Parkes (S)
Warren (S)
Wellington (S)

14 *GOULBURN*
Boorowa (S)
Crookwell (S)
Goulburn (C)
Gunning (S)
Mulwaree (S)

15 *GRAFTON*
Copmanhurst (S)
Grafton (C)
Maclean (S)
Nymboida (S)
Ulmarra (S)

16 *LISMORE*
Ballina (S)
Byron (S)
Casino (M)
Kyogle (S)
Lismore (C)
Richmond River (S)
Tenterfield (S)
Tweed (S)

17 *ORANGE*
Blayney (S)
Cabonne (S)
Cowra (S)
Forbes (S)
Orange (C)
Weddin (S)

18 *TAMWORTH*
Barraba (S)
Gunnedah (S)
Manilla (S)
Merriwa (S)
Murrurundi (S)
Nundle (S)
Parry (S)
Quirindi (S)
Tamworth (C)

19 *BALLARAT*
Avoca (S)
Ballan (S)
Ballarat (C)

Ballarat (S)
Bungaree (S)
Buninyong (S)
Creswick (S)
Daylesford & Glenlyon (S)
Grenville (S)
Lexton (S)
Maryborough
Ripen (S)
Sebastopol (B)
Talbot & Clunes (S)
Tullaroop (S)

20 *BENDIGO*
Bendigo (C)
Bet Bet (S)
Castlemaine (C)
Charlton (S)
Cohuna (S)
Eaglehawk (B)
East Loddon (S)
Gordon (S)
Huntly (S)
Kerang (B)
Kerang (S)
Korong (S)
Kyneton (S)
McIvor (S)
Maldon (S)
Marong (S)
Metcalfe (S)
Newstead (S)
Pyalong (S)
Rochester (S)
Strathfieldsaye (S)
Waranga (S)

21 *SHEPPARTON*
Berrigan (S)
Cobram (S)
Conargo (S)
Deakin (S)
Deniliquin (M)
Echuca (C)
Euroa (S)
Goulburn (S)
Kyabram (T)
Nathalia (S)
Numurkah (S)
Rodney (S)
Seymour (S)
Shepparton (C)
Shepparton (S)
Tungamah (S)
Violet Town (S)
Windouran (S)

22 *WANGARATTA*
Beechworth (S)
Benalla (C)
Benalla (S)
Corowa (S)
Mansfield (S)
Myrtleford (S)
Oxley (S)
Rutherglen (S)
Wangaratta (C)
Wangaratta (S)
Yarrawonga (S)

23 *WARRNAMBOOL*
Belfast (S)
Koroit (B)
Mortlake (S)
Port Fairy (B)
Warrnambool (C)
Warrnambool (S)

24 *MARYBOROUGH*
Biggenden (S)
Maryborough (C)
Tiaro (S)
Woocoo (S)

25 *ROCKHAMPTON*
Banana (S)
Barcaldine (S)
Bauhinia (S)
Blackall (S)
Duaringa (S)
Emerald (S)
Fitzroy (S)
Ilfracombe (S)
Isisford (S)
Jericho (S)
Livingstone (S)
Mount Morgan (S)
Rockhampton (C)
Tambo (S)

26 *BURNIE*
Burnie (M)
Circular Head (M)
Deloraine (M)
Devonport (M)
Gormanston (M)
Kentish (C)
King Island (M)
Penguin (M)
Queenstown (M)
Ulverstone (M)
Waratah (M)
Wynyard (M)
Zeehan (M)

27 *LAUNCESTON*
Beaconsfield (M)
Bothwell (M)
Campbell Town (M)
Evandale (M)
Fingal (M)
Flinders (M)
George Town (M)
Glamorgan (M)
Latrobe (M)
Launceston (C)
Lilydale (M)
Longford (M)
Portland (M)
Ringarooma (M)
Ross (M)
Scottsdale (M)
St Leonards (M)
Westbury (M)

28 *NEWCASTLE*
Dungog (S)
Greater Cessnock (C)
Lake Macquarie (M)
Maitland (C)
Muswellbrook (S)
Newcastle (C)
Port Stephens (S)
Scone (S)
Singleton (S)

29 *WOLLONGONG*
Kiama (M)
Shellharbour (M)
Wollongong (C)

30 *LITHGOW*
Greater Lithgow (C)
Oberon (S)
Rylstone (S)

31 *GEELONG*
Bacchus Marsh (S)
Bannockburn (S)
Barrabool (S)
Bellarine (S)
Corio (S)
Geelong (C)
Geelong West (C)
Leigh (S)
Queenscliff (B)
Newtown (C)
South Barwon (C)

32 *TRARALGON*
Alberton (S)
Traralgon (C)
Traralgon (S)

33 *PORT AUGUSTA*
Carrieton (DC)
Hawker (DC)
Kanyaka-Quorn (DC)
Port Augusta (C)
South Australia Unincorp.

34 *PORT PIRIE*
Blyth (DC)
Burra-Burra (DC)
Bute (DC)
Central Yorke Peninsula (DC)
Clare (DC)
Clinton (DC)
Crystal Brook (DC)
Georgetown (DC)
Gladstone (DC)
Hallett (DC)
Jamestown (DC)
Jamestown (M)
Kadina (DC)
Kingscote (DC)
Laura (DC)
Minlaton (DC)
Moonta (M)
Mount Remarkable (DC)
Orroroo (DC)
Peterborough (M)

Peterborough (DC)
Pirie (DC)
Port Broughton (DC)
Port Pirie Corp of City
Redhill (DC)
Snowtown (DC)
Spalding (DC)
Wallaroo (M)
Warooka (DC)
Yorketown (DC)

35 *WHYALLA*
Franklin Harbour (DC)
Kimba (DC)
Whyalla (C)

36 *ARMIDALE*
Armidale (C)
Dumaresq (S)
Glen Innes (M)
Guyra (S)
Severn (S)
Uralla (S)
Walcha (S)

37 *HAMILTON*
Ararat (S)
Ararat (C)
Dundas (S)
Hamilton (C)
Minhamite (S)
Mount Rouse (S)
Portland (S)
Portland (T)
Wannon (S)

38 *SALE*
Avon (S)
Bairnsdale (S)
Bairnsdale (T)
Maffra (S)
Omeo (S)
Orbost (S)
Rosedale (S)
Sale (C)
Tambo (S)

39 *NORTHERN TERRITORY*
Katherine (T)
Northern Territory Undefined
Tennant Creek (T)

40 *ALICE SPRINGS*
Alice Springs (T)

41 *BROKEN HILL*
Broken Hill (C)
Bulloo (S)
Central Darling (S)
Quilpie (S)
Western Lands Unincorp.

42 *DARWIN*
Darwin (C)

43 *MOE*
Bass (S)
Buln Buln (S)
Cranbourne (S)
Korumburra (S)
Mirboo (S)
Moe (C)
Narracan (S)
Pakenham (S)
Upper Yarra (S)
Warragul (S)
Wonthaggi (B)
Woorayl (S)
Yallourn Works Area

44 *MORWELL*
Morwell (S)
South Gippsland (S)

45 *MOUNT ISA*
Barcoo (S)
Boulia (S)
Burke (S)
Carpentaria (S)
Cloncurry (S)
Croydon (S)
Diamantina (S)
Longreach (S)
McKinlay (S)
Mornington (S)
Mount Isa (C)
Richmond (S)
Winton (S)

46 *KALGOORLIE*
Boulder (S)
Coolgardie (S)
Dundas (S)
Esperance (S)

Kalgoorlie (T)
Laverton (S)
Leonora (S)
Menzies (S)
Wiluna (S)
Yilgarn (S)

47 *PORT HEDLAND*
Broome (S)
East Pilbara (S)
Exmouth (S)
Halls Creek (S)
Port Hedland (S)
Roebourne (S)
West Kimberley (S)
West Pilbara (S)
Wyndham-East Kimberley (S)

48 *COFFS HARBOUR*
Bellingen (S)
Coffs Harbour (S)
Nambucca (S)

49 *PORT MACQUARIE*
Hastings (M)
Kempsey (S)

50 *CALOUNDRA*
Caboolture (S)
Landsborough (S)

51 *GLADSTONE*
Calliope (S)
Eidsvold (S)
Gladstone (C)
Miriam Vale (S)
Monto (S)

52 *MAROOCHYDORE*
Kilcoy (S)
Maroochy (S)

53 *MANDURAH*
Boddington (S)
Mandurah (S)
Murray (S)
Waroona (S)

54 *GRIFFITH*
Bland (S)
Carrathool (S)
Cobar (S)
Hay (S)
Jerilderie (S)
Lachlan (S)
Leeton (S)
Murrumbidgee (S)
Narrandera (S)
Urana (S)
Wade (S)

55 *MOREE*
Balonne (S)
Bendemere (S)
Bingara (S)
Booringa (S)
Bourke (S)
Brewarrina (S)
Bungil (S)
Goondiwindi (T)
Inverell (S)
Moree Plains (S)
Murweh (S)
Narrabri (S)
Paroo (S)
Roma (T)
Tara (S)
Waggamba (S)
Walgett (S)
Warroo (S)
Yallaroi (S)

56 *TAREE*
Gloucester (S)
Great Lakes (S)
Greater Taree (C)

57 *COLAC*
Camperdown (T)
Colac (C)
Colac (S)
Hampden (S)
Heytesbury (S)
Otway (S)
Winchelsea (S)

58 *HORSHAM*
Arapiles (S)
Birchip (S)
Dimboola (S)
Donald (S)
Dunmunkle (S)
Horsham (C)
Kaniva (S)
Kara Kara (S)

Karkarooc (S)
Kowree (S)
Lowan (S)
St Arnaud (T)
Stawell (S)
Stawell (T)
Warracknabeal (S)
Wimmera (S)
Wycheproof (S)

59 *MILDURA*
Balranald (S)
Mildura (C)
Mildura (S)
Swan Hill (C)
Swan Hill (S)
Wakool (S)
Walpeup (S)
Wentworth (S)

60 *BUNDABERG*
Bundaberg (C)
Gayndah (S)
Gooburrum (S)
Isis (S)
Kolan (S)
Mundubberra (S)
Perry (S)
Woongarra (S)

61 *CAIRNS*
Atherton (S)
Aurukun (S)
Cairns (C)
Cardwell (S)
Cook (S)
Douglas (S)
Eacham (S)
Etheridge (S)
Herberton (S)
Johnstone (S)
Mareeba (S)
Mulgrave (S)
Torres (S)
Weipa (T)

62 *GYMPIE*
Gympie (C)
Kilkivan (S)
Murgon (S)
Noosa (S)
Widgee (S)

63 *MACKAY*
Belyando (S)
Bowen (S)
Broadsound (S)
Mackay (C)
Mirani (S)
Nebo (S)
Peak Downs (S)
Pioneer (S)
Proserpine (S)
Sarina (S)

64 *TOOWOOMBA*
Allora (S)
Boonah (S)
Cambooya (S)
Chinchilla (S)
Clifton (S)
Crows Nest (S)
Dalby (T)
Gatton (S)
Glengallan (S)
Inglewood (S)
Jondaryan (S)
Kingaroy (S)
Laidley (S)
Millmerran (S)
Murilla (S)
Nanango (S)
Pittsworth (S)
Rosalie (S)
Rosenthal (S)
Stanthorpe (S)
Taroom (S)
Toowoomba (C)
Wambo (S)
Warwick (C)

65 *PORT LINCOLN*
Cleve (DC)
Elliston (DC)
Le Hunte (DC)
Lincoln (DC)
Murat Bay (DC)
Port Lincoln (C)
Streaky Bay (DC)
Tumby Bay (DC)

66 *ALBANY*
Albany (S)
Albany (T)
Cranbrook (S)
Denmark (S)
Gnowangerup (S)
Plantagenet (S)
Ravensthorpe (S)
Tambellup (S)

67 *GERALDTON*
Carnamah (S)
Carnarvon (S)
Chapman Valley (S)
Coorow (S)
Cue (S)
Geraldton (T)
Greenough (S)
Irwin (S)
Meekatharra (S)
Mingenew (S)
Morawa (S)
Mount Magnet (S)
Mullewa (S)
Murchison (S)
Northhampton (S)
Perenjori (S)
Sandstone (S)
Shark Bay (S)
Three Springs (S)
Upper Gascoyne (S)
Yalgoo (S)

68 *GOLD COAST*
Albert (S)
Beaudesert (S)
Gold Coast (C)

69 *HERVEY BAY*
Hervey Bay (T)

70 *BUNBURY*
Augusta-Margaret River (S)
Boyup Brook (S)
Bridgetown-Greenbushes (S)
Bunbury (C)
Busselton (S)
Capel (S)
Collie (S)
Dardanup (S)
Donnybrook-Balingup (S)
Harvey (S)
Manjimup (S)
Nannup (S)

71 *NARROGIN*
Brookton (S)
Broomehill (S)
Bruce Rock (S)
Corrigin (S)
Cuballing (S)
Dumbleyung (S)
Katanning (S)
Kent (S)
Kojonup (S)
Kondinin (S)
Kulin (S)
Lake Grace (S)
Narembeen (S)
Narrogin (S)
Narrogin (T)
Pingelly (S)
Wagin (S)
Wandering (S)
West Arthur (S)
Wickepin (S)
Williams (S)
Woodanilling (S)

72 *NORTHAM*
Beverley (S)
Cunderdin (S)
Dalwallinu (S)
Dowerin (S)
Goomalling (S)
Kellerberrin (S)
Koorda (S)
Merredin (S)
Moora (S)
Mount Marshall (S)
Mukinbudin (S)
Northam (S)
Northam (T)
Nungarin
Quairading (S)
Tammin (S)
Toodyay (S)
Trayning (S)
Victoria Plains (S)
Westonia (S)

Wongan Ballidu (S)
Wyalkatchem (S)
York (S)

73 *MOUNT GAMBIER*
Beachport (DC)
Glenelg (S)
Lacepede (DC)
Lucindale (DC)
Millicent (DC)
Mount Gambier (C)
Mount Gambier (DC)
Naracoorte (DC)
Naracoorte (M)
Penola (DC)
Port Macdonnell (DC)
Robe (DC)
Tatiara (DC)

74 *RENMARK*
Barmera (DC)
Berri (DC)
Brown's Well (DC)
Loxton (DC)
Paringa (DC)
Pinnaroo (DC)
Renmark (M)
Waikerie (DC)

75 *MURRAY BRIDGE*
Coonalpyn Downs (DC)
Eudunda (DC)
Karoonda East Murray (DC)
Lameroo (DC)
Mannum (DC)
Meningie (DC)
Monarto (M)
Morgan (DC)
Mount Barker (DC)
Mount Pleasant (DC)
Murray Bridge (DC)
Peake (DC)
Port Elliott & Goolwa (DC)
Ridley (DC)
Strathalbyn (DC
Truro (DC)

APPENDIX II STATE-SPECIFIC RESULTS ON RETIREMENTS, ATTRITION EXITS, REDUNDANCIES AND ADDITIONAL RECRUITMENT

TABLE II.1 STRAIGHT-LINE PATH: SCENARIO 1[a]

	1986–87 employment	*Retirements*	*Exit totals due to natural attrition*	*Redundancy totals*	*Additional recruitment*	*2001–02 employment*
1 per cent natural attrition						
NSW	23 114	4 161	3 095	2 001	0	18 018
Vic.	11 295	2 201	1 452	1 813	0	8 030
Qld	22 877	5 358	2 988	3 028	0	16 861
SA and Tas.	7 838	488	1 078	274	0	6 486
WA	5 444	322	760	32	0	4 652
Total	70 568	12 530	9 373	7 148	0	54 047
3 per cent natural attrition						
NSW	23 114	4 161	9 331	0	4 235	18 018
Vic.	11 295	2 201	4 397	0	1 132	8 030
Qld	22 877	5 358	9 031	0	3 015	16 861
SA and Tas.	7 838	488	3 244	0	1 891	6 486
WA	5 444	322	2 283	0	1 491	4 652
Total	70 568	12 530	28 285	0	11 764	54 047
5 per cent natural attrition						
NSW	23 114	4 161	15 552	0	10 456	18 018
Vic.	11 295	2 201	7 329	0	4 064	8 030
Qld	22 877	5 358	15 052	0	9 036	16 861
SA and Tas.	7 838	488	5 405	0	4 053	6 486
WA	5 444	322	3 806	0	3 014	4 652
Total	70 568	12 530	47 144	0	30 623	54 047

a. For an explanation of labour force adjustment path, and of these results, refer to chapter 5 (particularly pp. 51–52 and 56, table 5.8).

TABLE II.2 STRAIGHT-LINE PATH: SCENARIO 2A[a]

	1986–87 employment	*Retirements*	*Exit totals due to natural attrition*	*Redundancy totals*	*Additional recruitment*	*2001–02 employment*
1 per cent natural attrition						
NSW	23 114	4 161	2 544	10 638	0	9 932
Vic.	11 295	2 201	1 129	6 953	0	3 213
Qld	22 877	5 358	2 422	12 001	0	8 454
SA and Tas.	7 838	488	909	2 925	0	4 004
WA	5 444	322	674	1 370	0	3 400
Total	70 568	12 530	7 678	33 887	0	29 003
3 per cent natural attrition						
NSW	23 114	4 161	7 633	5 549	0	9 932
Vic.	11 295	2 201	3 386	4 696	0	3 213
Qld	22 877	5 358	7 266	7 157	0	8 454
SA and Tas.	7 838	488	2 723	1 111	0	4 004
WA	5 444	322	2 021	127	104	3 400
Total	70 568	12 530	23 029	18 640	104	29 003
5 per cent natural attrition						
NSW	23 114	4 161	12 722	1 476	1 016	9 932
Vic.	11 295	2 201	5 643	2 465	26	3 213
Qld	22 877	5 258	12 110	2 754	441	8 454
SA and Tas.	7 838	488	4 537	94	797	4 004
WA	5 444	322	3 368	0	1 324	3 400
Total	70 568	12 530	38 380	6 789	3 604	29 003

a. For an explanation of labour force adjustment path, and of these results, refer to chapter 5 (particularly pp. 51–52 and 56, table 5.8).

TABLE II.3 STRAIGHT-LINE PATH: SCENARIO 2B[a]

	1986–87 employment	*Retirements*	*Exit totals due to natural attrition*	*Redundancy totals*	*Additional recruitment*	*2001–02 employment*
1 per cent natural attrition						
NSW	23 114	4 161	2 722	7 927	0	12 465
Vic.	11 295	2 201	1 152	6 597	0	3 546
Qld	22 877	5 358	2 442	11 699	0	8 736
SA and Tas.	7 838	488	917	2 807	0	4 114
WA	5 444	322	675	1 342	0	3 427
Total	70 568	12 530	7 908	30 372	0	32 288
3 per cent natural attrition						
NSW	23 114	4 161	8 165	2 484	0	12 465
Vic.	11 295	2 201	3 455	4 294	0	3 546
Qld	22 877	5 358	7 325	6 816	0	8 736
SA and Tas.	7 838	488	2 746	978	0	4 114
WA	5 444	322	2 026	109	118	3 427
Total	70 568	12 530	23 717	14 681	118	32 288
5 per cent natural attrition						
NSW	23 114	4 161	13 608	67	3 026	12 465
Vic.	11 295	2 201	5 759	2 060	70	3 546
Qld	22 877	5 358	12 208	2 467	534	8 736
SA and Tas.	7 838	488	4 575	53	904	4 114
WA	5 444	322	3 377	0	1 360	3 427
Total	70 568	12 530	39 527	4 647	5 894	32 288

a. For an explanation of labour force adjustment path, and of these results, refer to chapter 5 (particularly pp. 51–52 and 56, table 5.8).

TABLE II.4 STRAIGHT-LINE PATH: SCENARIO 3[a]

	1986–87 employment	*Retirements*	*Exit totals due to natural attrition*	*Redundancy totals*	*Additonal recruitment*	*2001–02 employment*
1 per cent natural attrition						
NSW	23 114	4 161	2 375	13 225	0	7 514
Vic.	11 295	2 201	1 063	7 953	0	2 279
Qld	22 877	5 358	2 382	12 612	0	7 883
SA and Tas.	7 838	488	886	3 250	0	3 694
WA	5 444	322	653	1 682	0	3 109
Total	70 568	12 530	7 359	38 730	0	24 479
3 per cent natural attrition						
NSW	23 114	4 161	7 125	8 475	0	7 514
Vic.	11 295	2 201	3 189	5 827	0	2 279
Qld	22 877	5 358	7 146	7 848	0	7 883
SA and Tas.	7 838	488	2 657	1 487	0	3 694
WA	5 444	322	1 959	387	11	3 109
Total	70 568	12 530	22 076	24 024	11	24 479
5 per cent natural attrition						
NSW	23 114	4 161	11 876	3 915	191	7 514
Vic.	11 295	2 201	5 316	3 700	0	2 279
Qld	22 877	5 358	11 910	3 367	283	7 883
SA and Tas.	7 838	488	4 428	259	543	3 694
WA	5 444	322	3 266	0	931	3 109
Total	70 568	12 530	36 796	11 241	1 948	24 479

a. For an explanation of labour force adjustment path, and of these results, refer to chapter 5 (particulary pp. 51–52 and 56, table 5.8).

TABLE II.5 STRAIGHT-LINE PATH: SCENARIO 4[a]

	1986–87 employ-ment	*Retirements*	*Exit totals due to natural attrition*	*Redund-ancy totals*	*Additonal recruit-ment*	*2001–02 employ-ment*
1 per cent natural attrition						
NSW	23 114	4 161	2 221	15 585	0	5 308
Vic.	11 295	2 201	1 024	8 546	0	1 725
Qld	22 877	5 358	2 333	13 357	0	7 187
SA and Tas.	7 838	488	720	5 795	0	1 323
WA	5 444	322	589	2 665	0	2 190
Total	70 568	12 530	6 887	45 948	0	17 733
3 per cent natural attrition						
NSW	23 114	4 161	6 662	11 144	0	5 308
Vic.	11 295	2 201	3 073	6 497	0	1 725
Qld	22 877	5 358	7 000	8 690	0	7 187
SA and Tas.	7 838	488	2 159	4 356	0	1 323
WA	5 444	322	1 766	1 488	0	2 190
Total	70 568	12 530	20 660	32 175	0	17 733
5 per cent natural attrition						
NSW	23 114	4 161	11 103	6 703	0	5 308
Vic.	11 295	2 201	5 122	4 448	0	1 725
Qld	22 877	5 358	11 666	4 167	143	7 187
SA and Tas.	7 838	488	3 598	2 917	0	1 323
WA	5 444	322	2 944	479	169	2 190
Total	70 568	12 530	34 433	18 714	312	17 733

a. For an explanation of labour force adjustment path, and of these results, refer to chapter 5 (particularly pp. 51–52 and 56, table 5.8).

TABLE II.6 STRAIGHT-LINE PATH: SCENARIO 5[a]

	1986–87 employment	*Retirements*	*Exit totals due to natural attrition*	*Redundancy totals*	*Additional recruitment*	*2001–02 employment*
1 per cent natural attrition						
NSW	23 114	4 161	2 375	13 225	0	7 514
Vic.	11 295	2 201	1 075	7 772	0	2 448
Qld	22 877	5 358	2 424	11 973	0	8 480
SA and Tas.	7 838	488	888	3 216	0	3 734
WA	5 444	322	658	1 613	0	3 173
Total	70 568	12 530	7 420	37 799	0	25 349
3 per cent natural attrition						
NSW	23 114	4 161	7 125	8 475	0	7 514
Vic.	11 295	2 201	3 225	5 622	0	2 448
Qld	22 877	5 358	7 271	7 126	0	8 480
SA and Tas.	7 838	488	2 665	1 439	0	3 734
WA	5 444	322	1 973	320	22	3 173
Total	70 568	12 530	22 260	22 982	22	25 349
5 per cent natural attrition						
NSW	23 114	4 161	11 875	3 916	191	7 514
Vic.	11 295	2 201	5 375	3 472	0	2 448
Qld	22 877	5 358	12 119	2 726	448	8 480
SA and Tas.	7 838	488	4 442	234	572	3 734
WA	5 444	322	3 288	0	1 017	3 173
Total	70 568	12 530	37 099	10 348	2 228	25 349

a. For an explanation of labour force adjustment path, and of these results, refer to chapter 5 (particularly pp. 51–52 and 56, table 5.8).

TABLE II.7 STRAIGHT-LINE PATH: SCENARIO 6[a]

	1986–87 employ-ment	*Retirements*	*Exit totals due to natural attrition*	*Redund-ancy totals*	*Additional recruit-ment*	*2001–02 employ-ment*
1 per cent natural attrition						
NSW	23 114	4 161	2 513	11 110	0	9 491
Vic.	11 295	2 201	1 235	5 326	0	4 734
Qld	22 877	5 358	2 514	10 591	0	9 772
SA and Tas.	7 838	488	938	2 456	0	4 444
WA	5 444	322	677	1 318	0	3 449
Total	70 568	12 530	7 877	30 801	0	31 890
3 per cent natural attrition						
NSW	23 114	4 161	7 540	6 083	0	9 491
Vic.	11 295	2 201	3 705	2 856	0	4 734
Qld	22 877	5 358	7 543	5 562	0	9 772
SA and Tas.	7 838	488	2 814	591	11	4 444
WA	5 444	322	2 031	95	131	3 449
Total	70 568	12 530	23 633	15 187	142	31 890
5 per cent natural attrition						
NSW	23 114	4 161	12 567	1 859	803	9 491
Vic.	11 295	2 201	6 175	822	436	4 734
Qld	22 877	5 358	12 571	1 508	974	9 772
SA and Tas.	7 838	488	4 691	0	1 297	4 444
WA	5 444	322	3 385	0	1 390	3 449
Total	70 568	12 530	39 389	4 189	4 900	31 890

a. For an explanation of labour force adjustment path, and of these results, refer to chapter 5 (particularly pp. 51–52 and 56, table 5.8).

REFERENCES

Abbreviations

BLMR Bureau of Labour Market Research
BTCE Bureau of Transport and Communications Economics
ANU Australian National University

Australian Bureau of Statistics 1988, *Deaths, Australia*, Annual, Australian Bureau of Statistics, Cat. no. 3302.0, Canberra.

Atkins, A. S. 1972, An input-output model of the Newcastle region, MEc thesis, Macquarie University, Sydney, 1972.

BLMR 1985a, Changes in the pattern of labour supply and demand: A regional/national labour market comparison, Paper presented by Steve Garlick at the Regional Science Association of Australia and New Zealand 10th Annual Conference, December 1985.

BLMR 1985b, *A Case Study of Regional Labour Market Adjustment: The Hunter Region,* by Steve Garlick, BLMR Working Paper no. 56, BLMR, Canberra.

BTCE 1990a, *Redeployment and Redundancy in Australian Railways,* BTCE Report no. 65, AGPS, Canberra.

CASAS 1988, *Census Applications Small Area System - Version 3.0*, Census Applications, Cabramatta, New South Wales.

Croucher, J. S. & Oliver, E. 1986, *Statistics,* McGraw-Hill, Sydney.

Freund, J. E. 1984, *Modern Elementary Statistics,* Prentice-Hall, Arizona.

Harbison, F. H., Maruhnic, J. & Resnick, J. R. 1970, *Quantitative Analysis of Modernisation and Development,* Princeton University.

Khan, M. H. & Zerby, J. A. 1984, 'A comparative study of socioeconomic development: 108 developing countries', *Scandinavian Journal of Development Alternatives,* March 1984, pp. 62–79.

Office of Local Government 1988, *Australian Regional Developments: 4.6: A Regionalisation of Australia for Comparative Economic Analysis,* AGPS, Canberra.

Trivedi, P. K. & Alexander, J. N. 1986, *Re-employment probability and multiple unemployment spells: a semi-parametric approach,* ANU Working Paper in Economics and Econometrics no. 139, Australian National University, Canberra.

Zerby, J. A. & Khan, M. H. 1984, 'A comparison of multivariate methods for indexing socioeconomic development', *Singapore Economic Review,* April 1984, pp. 47–66.

ABBREVIATIONS

ACT	Australian Capital Territory
ASCO	Australian Standard Classification of Occupations
ASIC	Australian Standard Industry Classification
BLMR	Bureau of Labour Market Research
BTCE	Bureau of Transport and Communications Economics
CSO	Community service obligations
IRIS	Integrated Register of Industry Statistics
LGA	Local government area
NSW	New South Wales
OLG	Office of Local Government
Qld	Queensland
RIC	Railway Industry Council
SA	South Australia
SLA	Statistical local area
SRA	State Rail Authority of New South Wales
Tas.	Tasmania
Vic.	Victoria
WA	Western Australia