LABOUR MARKET ADJUSTMENT IN REGIONAL AUSTRALIA

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Abstract

Over the past two decades, there has been a marked divergence in regional labour market outcomes within Australia. In this paper, we examine two aspects of this divergence. First, we analyse the wide variation in employment growth rates, finding that stronger rates of employment growth were associated with industry structure, proximity to factor and product markets, and the level of regional amenity. Second, we investigate how regional labour markets adjusted to different employment conditions. While regional migration is found to be the dominant adjustment channel, the relative strength of the migration adjustment differs across regions. Out-migration, accompanying employment declines, was stronger amongst regions with initially high unemployment rates and low regional amenity. Similarly, regions with initially low rates of unemployment and high regional amenity experienced stronger rates of in-migration in response to rising employment.

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1. Introduction

Over the past two decades in Australia, marked differences in the economic conditions of regions have emerged. This so-called 'regional divide' has occupied a prominent place in public discussion, and motivated a number of reports on the economic circumstances of regional Australia (ABARE 2001; Salt 2001; Productivity Commission 1999).[1] While a good deal is now known about the spatial dimensions of economic performance – particularly labour market outcomes – less is known about the reasons for such variation. And yet, in addition to their distributional effects, regional variations in economic outcomes can have efficiency implications. In an efficient national labour market, for example, a persistent change in local conditions will be reflected in patterns of inter-regional migration.[2] If this does not occur, or occurs only slowly, negative shocks may have prolonged effects, and the economy's growth potential might be impeded.

Given that significant disparities in regional labour market outcomes exist, why do they occur? This question is difficult to answer because a myriad of factors can influence a local labour market, including region-specific shocks as well as different regional responses to broader shocks. Consequently, researchers have tended to advance possible reasons for regional variations in labour market outcomes, with relatively few studies formally testing the role of specific factors. In an attempt to better understand the reasons for regional disparities in labour market outcomes, the strategy adopted in this paper is to identify the characteristics

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1 Furthermore, there has been privately commissioned research that is available to subscribers to the National Institute of Economic and Industry Research (NIEIR 1999, 2001).

2 Or relative wage adjustment. However, in practice, the scope for relative wage adjustment is often constrained by wage-setting institutions.

of regions, and then observe those characteristics that tend to be associated with particular outcomes. This permits us to assign a probability to a characteristic being present for regions that experience employment expansion or contraction, and for regions that experience inflows or outflows of migrants. In this way, we seek to identify the key conditions that are associated with regional disparities in labour market performance.

The paper is organised as follows. First, we present a brief review of the recent literature on regional economic conditions in Australia and define what we mean by a 'region'. Second, we illustrate some of the stylised facts about regional labour markets between the census years of 1986 and 1996. We show that employment growth was highly dispersed during this period. We also show that regional employment growth was often *not* inversely related to changes in unemployment rates, as tends to be the case in national and state economies, because of significant variations in the strength of regional migration. Third, using a new and comprehensive regional database that draws on data from both the census and government departments, we identify the economic characteristics of regions. We then use logit models to establish the significant characteristics of those regions that have experienced large changes in employment and large migration flows. Finally, the key drivers of regional disparities in performance are assessed.

2. Existing Australian Studies

In recent years, there have been several prominent studies that document regional economic conditions. These studies identify wide differences in regional population and employment growth, and show that Australia's fastest growing regions between 1986 and 1996 tended to be located on the coast, while those with the slowest growth tended to be inland, agricultural communities (ABARE 2001; Salt 2001; Productivity Commission 1999).[3]

[3] In fact, Salt (2001) uses demographic data published since the 1996 census to demonstrate that these trends have continued into 2000.

Most Australian studies of regional employment growth have, however, emphasised the extent of regional disparities in performance and tended to offer only a qualitative assessment of why it occurs.[4] Of the few studies to model the explanators of regional variations in employment growth, Bradley and Gans (1998) found that faster employment growth in the 1980s was positively related to a town's initial size, its previous growth rate, industrial diversification, and its level of human capital. As the authors were interested in the determinants of city growth, their sample did not include towns with populations below ten thousand people, and so excluded those regions that tended to have the weakest employment growth over the period examined. Consequently, wider inferences about the causes of regional variations in performance cannot be drawn.

Attempts to formally model regional variations in Australian labour market outcomes have tended to focus on unemployment differentials, rather than employment growth. (See Borland (2000) for a review of this literature.) This work has emphasised the interaction between individual skills, the business cycle, and structural changes in the demand for labour, in the determination of unemployment rates. It identifies the geographic concentration of the low-skilled as the principal reason for the emergence of large regional unemployment differentials. (Key examples include Karmel, McHugh and Pawsey (1993), Hunter (1994) and Gregory and Hunter (1995).) Again, though, the studies have tended to examine unemployment variations in metropolitan areas and so preclude wider inferences about drivers of regional variations in unemployment. Furthermore, they do not incorporate an explicit role for geographic labour mobility in explanations of regional unemployment.[5]

Inter-regional migration is, however, a feature of regional labour markets and may have an important bearing on unemployment rates. Despite the relevance of this adjustment mechanism in the explanation of labour market outcomes, the issue has been addressed in only a limited way, with most analysis focusing on the migration

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4 Although, in contrast, the Productivity Commission (1999) employed modelling techniques to assess the implications of competition policy on employment in regions.

5 Hunter (1994) proposes that significant barriers to mobility may exist between suburbs within cities, but does not have mobility as a variable in his empirical analysis.

response at the state level where migration data are more readily available than for smaller areas. The Industry Commission (1993) argued that most of the adjustment of state labour markets to shocks occurred through changes in labour force participation rates, with migration playing only a small role. In contrast, Borland and Suen (1990) found that inter-state labour mobility acts to significantly reduce interstate differences in unemployment rates in the long run. Similarly, Debelle and Vickery (1998) demonstrated that migration was the most important channel of adjustment to shocks to unemployment in the Australian states, in line with the role for migration that is highlighted in the US literature.[6]

More recently, ABARE (2001) has undertaken a detailed descriptive analysis of net-migration rates across Australian regions and identifies it as a significant phenomenon. It nominates a range of factors that are conducive to migration flows, but does not assess their impact on labour market outcomes. McGuire (2001) goes further and explores the role of migration in labour market outcomes within Queensland, but does not find the expected equilibrating role.[7] His claims that regional migration has increased unemployment rate differentials are, however, based on some assumed labour market characteristics of migrants.[8] And despite examining regional labour markets in some detail, a role for factors (other than employment growth) in regional migration was not quantified.

Thus there have been some substantive investigations of the nature of disparities in regional labour market performance in Australia, and some studies that model aspects of specific regional labour markets. However, there are few studies from which generalisations can be made about the principal causes of differences in labour market outcomes across regions, and the role that migration plays, at least at the sub-state level.

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6 See, in particular, Blanchard and Katz (1992).

7 He observes that, in Queensland, people have migrated from regions with both low employment opportunity and low unemployment rates to regions with both high employment opportunity but higher unemployment rates.

8 Moreover, McGuire (2001) does not consider whether migration flows are disproportionate to the change in employment. Only disproportionate migration flows would generate widening unemployment rate differentials.

3. Regional Labour Markets in Australia

3.1 What is a Region?

Before investigating regional labour markets in Australia, how should we define our basic unit of analysis? The regional science literature has settled on the following three methods for delimiting the boundaries of a region (Richardson 1973).

Homogeneity: Areas form an economic region if they are homogenous with respect to a key economic element, such as their industry structure. This key element should vary significantly more between regions than it does within regions.

Nodality: Areas form a region if they comprise a single labour market. The boundary of the region is the outer limits over which people can commute to the central location of economic activity.

Programming: Regions comprise administrative and political areas (such as municipalities, electorates or statistical areas) for which data are collected.

Given the practical nature of our investigation into regional labour markets, we must first consider regions for which data are collected. In Australia, economic data for sub-state areas are generally available over three different levels of disaggregation: Statistical Local Areas (SLAs) which are the finest level of disaggregation, Statistical Sub-Divisions (SSDs), and the more aggregated Statistical Divisions (SDs).[9]

In our analysis, we choose the SLA as the basic unit, because its finer level of disaggregation permits consideration of both homogeneity and nodality when choosing the boundaries of a region. At this level, it is easier to ensure that the region has a common set of economic characteristics and forms a single labour market than is the case for the much larger statistical sub-divisions and statistical

[9] In Australia, there are 1 337 SLAs, 181 SSDs, and 68 SDs.

divisions.[10] Furthermore, where SLAs are suburbs of larger cities, they can be aggregated to form a region. We classify all cities with multiple SLAs as single regions, a process that leaves us with a sample of 637 regions.

3.2 Regional Economic Performance between 1986 and 1996

Between 1986 and 1996 the number of people employed in Australia grew by about 17 per cent, or at an average annual rate of about 1.6 per cent. However, as shown in Figure 1, the rate of employment growth was not evenly distributed throughout Australia's regions. Median growth over the ten years was about 5 per cent (or ½ per cent per annum) and, in about 40 per cent of regions, the level of employment actually fell.[11]

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[10] SDs and SSDs are usually too large geographically for regular commuting and so cannot be characterised as having a single labour market. Furthermore, they are usually sufficiently large to contain multiple nodes of economic activity.

[11] In our sample of 637 regions, just over 200 had populations in 1986 of below 5 000. Because of the low average employment growth rates of these smaller regions, the unweighted median employment growth rate is less than the population-weighted median employment growth rate. That the superior performance of Australia's larger regions is able to mask the poorer performance of smaller regions (which also presumably have different economic characteristics than the larger regions) reinforces the desirability of giving equal weight to each region in our examination of relative regional economic performance.

Figure 1: Distribution of Employment Growth

Percentage change between 1986 and 1996

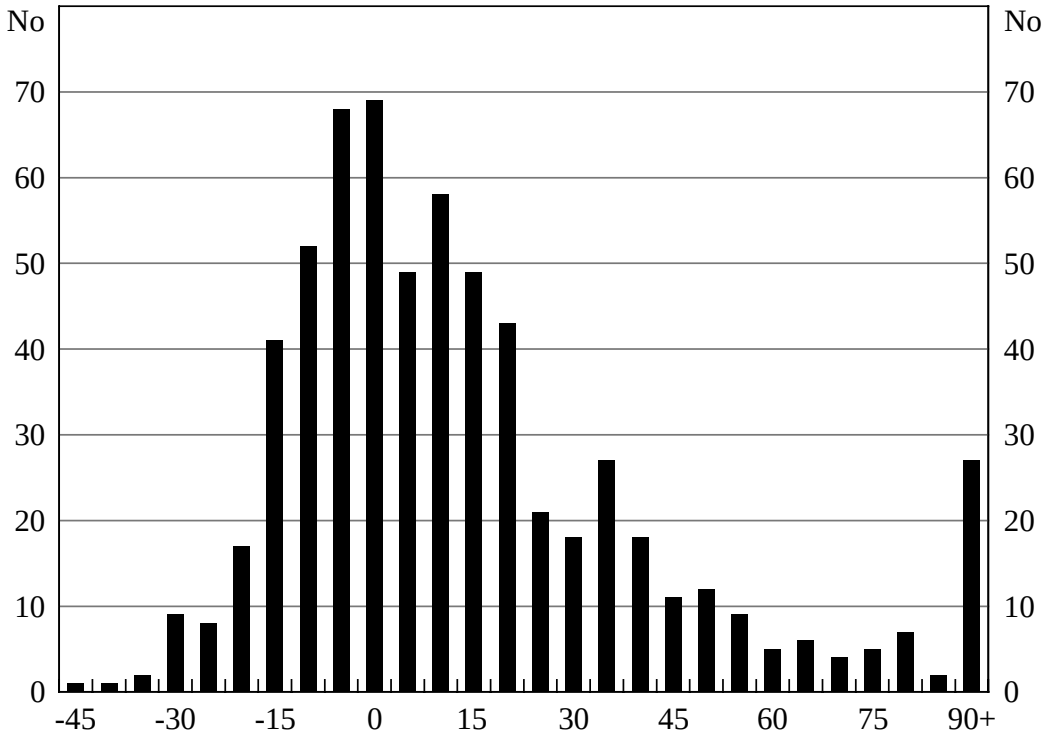
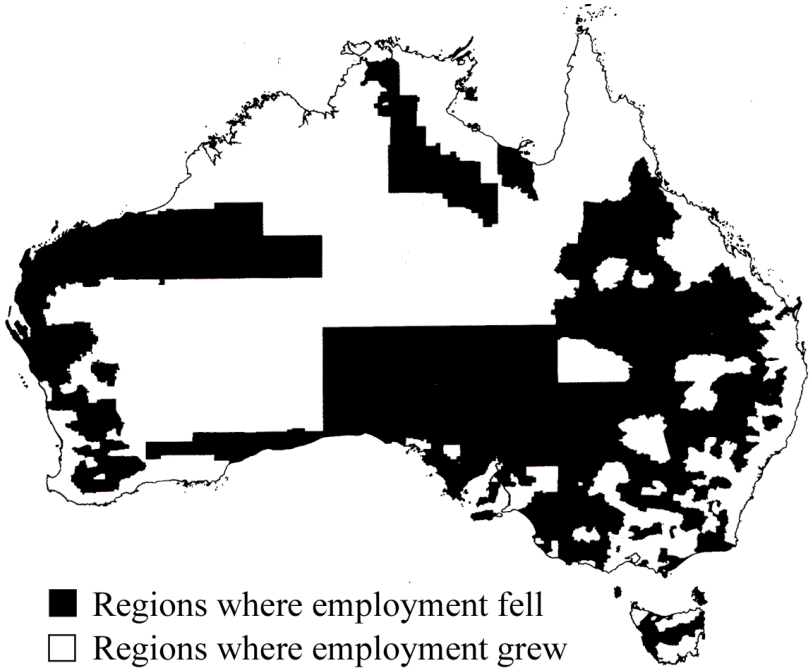


Figure 2 demonstrates that employment growth was also geographically concentrated. The white areas represent regions that experienced employment growth between 1986 and 1996 and the shaded areas represent regions that experienced employment contractions. Regions experiencing employment growth tended to be located along Australia's eastern seaboard, tended to be close to capital cities, or were in remote mining locations. On the other hand, regions experiencing falling employment were mainly rural regions in Australia's interior.

Figure 2: Regional Employment Growth

Areas of positive and negative growth between 1986 and 1996

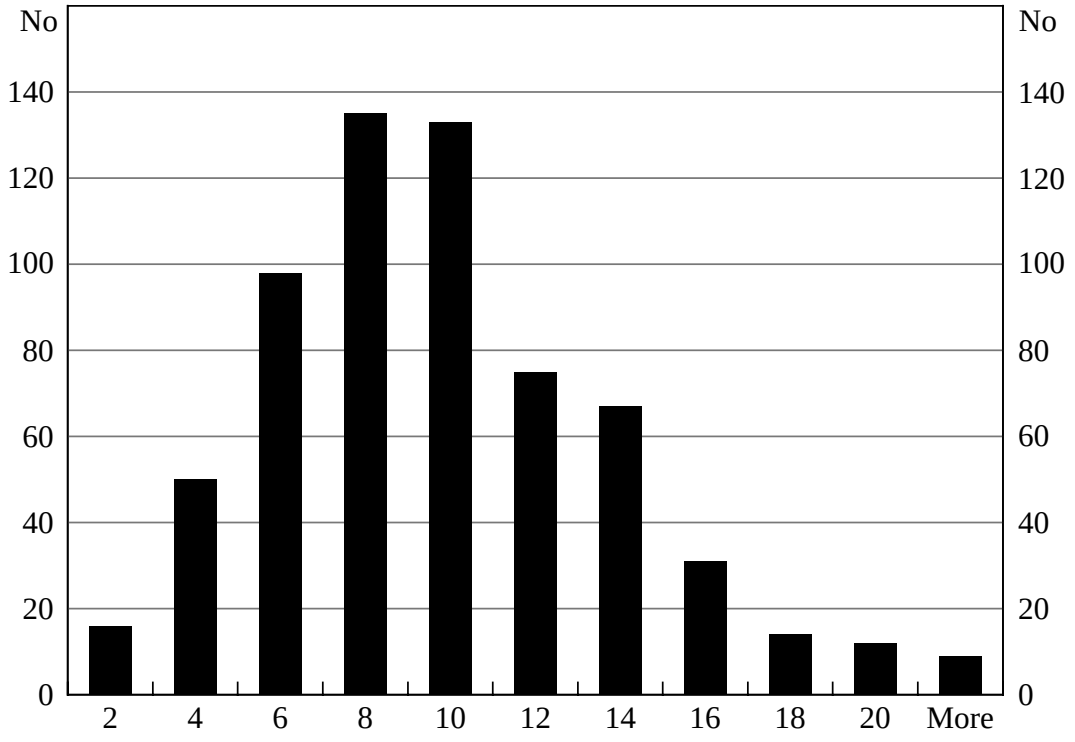


An alternative indicator of regional economic performance is the unemployment rate. Figure 3 shows that, like employment growth, unemployment rates were highly dispersed around the national average in 1996.[12] However, the geographic distribution of regional unemployment rates looks very different.

[12] Note that the dispersion of unemployment rates fell between 1986 and 1996. However, the reduction was small, so that there was only a slight narrowing of unemployment differentials during this period.

Figure 3: Distribution of Unemployment Rates

1996



The white areas of Figure 4 indicate regions that recorded 'low' unemployment in 1996, while the shaded areas recorded 'high' unemployment.[13] In fact, the shading of the eastern states in Figure 4 is almost the negative image of Figure 2, suggesting that regions that recorded employment growth between 1986 and 1996, tended to have relatively high unemployment rates at the end of the period.[14] Similarly, regions that experienced falling employment tended to have low unemployment rates at the end of the period. This raises questions about how Australia's regional labour markets adjust to changing economic conditions.

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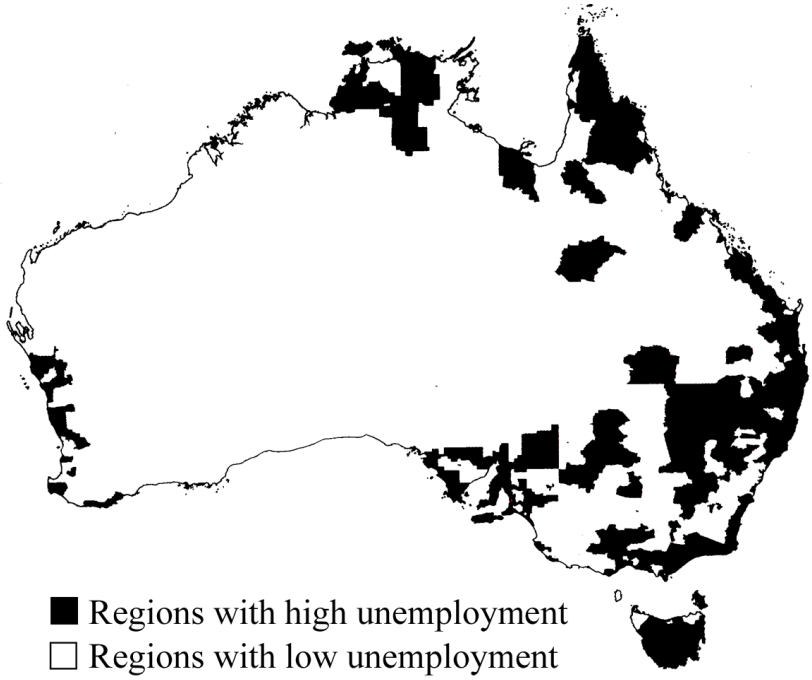
[13] A high (low) unemployment rate is defined here as that greater (less) than 8.3 per cent, which was the median unemployment rate for the regions in the sample in 1996.

[14] This supports the work of McGuire (2001), who found, for Queensland Statistical Divisions, that regions with high average unemployment rates between 1991 and 2001 tended to have the highest employment growth rates during this period.

Figure 4: Regional Unemployment Rates
Areas of high and low unemployment in 1996



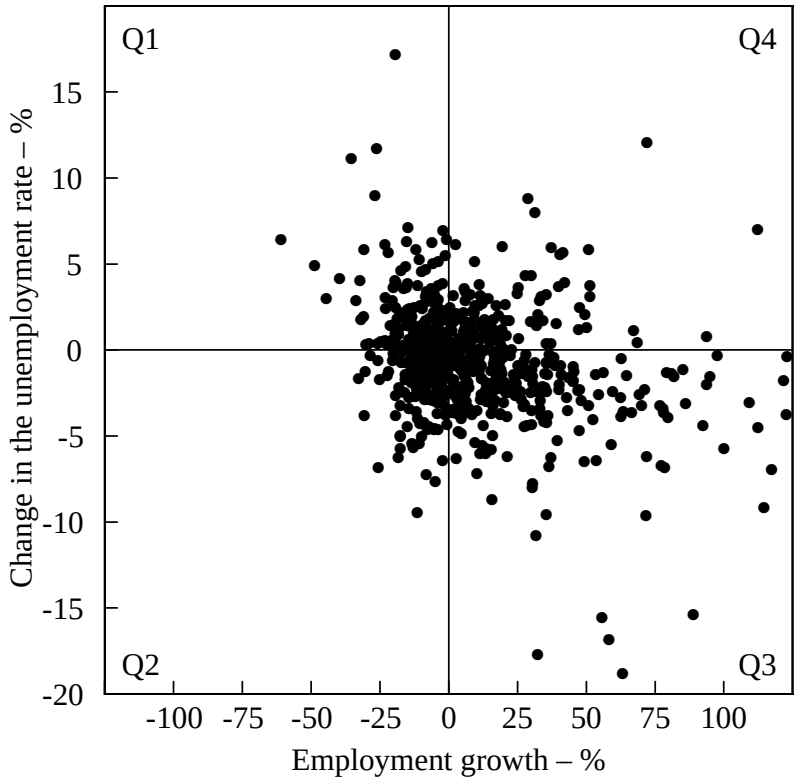
3.3 Labour Market Adjustment in Australia's Regions

Typically, we expect nations or states with rapidly expanding employment to experience larger falls in the unemployment rate than those with weak employment growth. This, however, was often not the case in regional Australia between 1986 and 1996. Figure 5 shows the pairwise combination of employment growth and the change in the unemployment rate for each region. The observations form a large cluster rather than a line, confirming that there is only a weak correlation between employment growth and the change in the unemployment rate at the regional level.[15] This suggests that regions may have adjusted to shocks in different ways.

[15] In a simple bivariate regression, employment growth explained only 17 per cent of the variation in changes in unemployment rates between 1986 and 1996.

Figure 5: Change in Unemployment Rate and Employment Growth

1986 to 1996



To understand why this may have been the case, we can see from Figure 5 that the observations fall into four quadrants:

Quadrant 1: *falling employment and rising unemployment*
Quadrant 2: *falling employment and falling unemployment*
Quadrant 3: *rising employment and falling unemployment*
Quadrant 4: *rising employment and rising unemployment*

While regions in Quadrants 1 and 3 display the expected inverse relationship between employment growth and unemployment rates, this is not so in the other quadrants. Unexpectedly, we observe a large number of regions where unemployment rates *fell*, even though employment *fell* over the full ten-year period (Quadrant 2). The labour market in these regions must have adjusted more through a combination of falling participation rates and out-migration. Similarly, a large number of regions unexpectedly fell into Quadrant 4, where *rising* employment over the ten-year period was associated with *rising* unemployment rates. The

labour market in these regions must have adjusted more through a combination of rising participation rates and in-migration.

But which adjustment mechanism was more important? Even though regional migration data are not published in the census (on a consistent basis through time), we make inferences about inter-regional migration based on changes in the regional population and labour force.[16] If we look to Table 1, it seems clear that differences in the strength of the migration response to shocks determined the path of unemployment. In the regions where both the unemployment rate and employment fell (Quadrant 2), there tended to be a proportionately larger fall in the population, implying an important role for out-migration. Similarly, in regions where the unemployment rate increased while employment was growing (Quadrant 4), there tended to be a proportionately larger increase in the population, implying an important role for in-migration.[17] Differences in the average response of participation rates were, by comparison, much smaller than the changes in population.[18]

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16 ABARE (2001) did, however, obtain unpublished regional migration data from the census. Our interest was not, however, in the precise number of domestic migrants, but rather the strength of regional migration relative to regional employment growth. This can be inferred from the published population and labour force data.

17 Note that ascribing all population growth to inter-regional migration in Quadrant 3 and 4 regions is not strictly correct, since both natural population growth and international migration also made contributions. The role of international migration can be safely ignored because the overwhelming majority of migrants settle in Australia's capital cities, which receive a small weighting in the overall trends discussed here. The role of natural increase may be more important, but due to data constraints cannot be identified.

18 Our inference that regional migration has influenced unemployment outcomes is not based solely on the *median* change in labour market variables in each quadrant, but on the *prevalence* of these changes. For example, in the regions that experienced rising unemployment together with employment growth, 61 per cent had more rapid population growth than employment growth. This contrasts with regions experiencing unemployment falls, where only 12 per cent had more rapid population growth than employment growth. More importantly, after examining the contributions that changes in population and changes in participation made to changes in the size of the labour force, we found that in 80 per cent of cases, changes in the size of the population made a larger contribution.

Table 1: Change in Median Labour Market Characteristics of Regions
1986–1996

	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Employment (per cent)	–11.6	–8.3	21.3	13.1
Unemployment rate (percentage points)	2.1	–2.1	–2.8	1.8
Participation rate (per cent)	–3.3	–2.2	0.4	–0.7
Population (per cent)	–7.1	–9.6	15.8	16.0

Such divergent regional labour market performance presents some interesting questions. Why, over a ten-year period, has employment grown so markedly in some regions and contracted in others? And how can we explain the regional migration response to such regional variations in conditions? We tackle these questions in turn.

4. Explaining Employment Growth in Regional Australia

In an effort to explain why employment has expanded in some regions and contracted in others, we consider some economic characteristics of regions. We then nominate summary measures of these characteristics and attempt to assign a probability to them being present in regions where employment is growing and where it is contracting.

4.1 Factors Influencing Regional Employment

A region's *industry composition* relative to that of the national economy is one of the principal factors cited in explanations of regional disparities in employment growth (Malizia and Ke 1993; Bradley and Gans 1998; Garcia-Mila and McGuire 1998). If a region's industry composition is skewed toward industries that have recorded a change in employment nationally, regional employment is likely to be disproportionately affected.[19] A region's industry composition may also be

[19] Reflecting this, shift-share analysis has been a standard form of assessing regional employment outcomes. (See Hunter (1994) for an Australian example.)

subject to *structural change* that is more pronounced than in the national economy and may accentuate regional variations in employment growth. Both ABARE (2001) and the Productivity Commission (1999) present evidence that industry composition and structural change are important contributors to regional variations in Australian employment growth.[20]

Industry composition also has a bearing on the way in which a region responds to shocks. Regions with a *diversified* industry structure may be less exposed to industry-specific shocks and so, on average, may experience more rapid employment growth than regions with narrow industrial structures (Duranton and Puga 1999). Diversified regions may also benefit from agglomeration economies that permit them to take advantage of intra and inter-industry linkages that stem from many industries being present in a locality.[21] Bradley and Gans (1998) identify a role for diversity in the relative economic performance of Australian cities.

Furthermore, aspects of geography can be important for employment growth. Prominent among these is the *proximity* of a region to product and factor markets, since an important factor in a firm's location decision is its access to customers and potential workers (Duffy 1994; Ellison and Glaeser 1999). The *size* of a region's population may also affect employment growth if there is a critical size below which particular services cannot be maintained (Glaeser and Shapiro 2001). When the population falls below this critical level, some firms may be forced to exit and subtract from employment in the affected region (Productivity Commission 1999).

Related to a region's size and proximity to key markets is the issue of *amenity*. Amenity – such as attractive physical and cultural characteristics – may influence the location decision of households and businesses. To the extent that amenity

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[20] In particular, they show that regions that specialised in agricultural production tended to record slow employment growth, while regions with a large services sector tended to record rapid employment growth.

[21] A tenet of economic geography is that economic benefits (such as knowledge spill overs) occur when firms within a region specialise in the production of a narrow range of goods or services. However, there is increasing evidence that regions benefit most from agglomeration economies when multiple specialisations are present (Duranton and Puga 1999).

attracts people to a region and generates demand, it may also be associated with higher employment growth (Salt 2001). In fact, Salt argues that this has been a significant factor in explaining 'coastal drift' in the growth of Australia's population and employment.

Another standard proposition in the regional science literature is that regions with higher levels of *human capital* experience more rapid growth over the long run (Glaeser and Shapiro 2001). Regions with skilled labour forces may have more success attracting firms to their regions, may be more likely to take advantage of economic opportunities, and may be favoured by skill biased technical change (Bradley and Gans 1998; NIEIR 2001).

Finally, government *policies* can directly influence regional employment growth, particularly if there is an explicit policy of regional development, as has occurred at various times in Australia.[22] Government decisions about where to locate public services and utilities also have the potential to influence the growth path of particular regions. Reflecting this, the Productivity Commission (1999) has explored the significance of such government decisions, and broader government policies on the regulation of markets, on regional employment outcomes in Australia.

4.2 The Data

To determine which initial characteristics of a region influenced whether it experienced expanding or contracting employment, we use small area data from the ABS Integrated Regional Database (IRDB). The IRDB combines small area data from the Census of Population and Housing and a range of government

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[22] For example, in the early 1970s, the Department of Urban and Regional Development and the Cities Commission investigated potential growth centres and introduced a range of public works programs designed to stimulate regional growth. Prominent among their initiatives were the financing of the regional growth centres of Albury-Wodonga and Bathurst-Orange, the national estate program and finance for urban renewal. For an historical perspective on regional policy in Australia see Harris and Dixon (1978). For a recent discussion of the potential and pitfalls of regional development policy in industrialised economies see Braunerhjelm *et al* (2000).

agencies. (See Appendix A for details.) Its distinctive feature is that it permits a region to be defined at a given level of aggregation (for our purposes an SLA), and the retrieval of all available data at that level of aggregation. The data available for SLAs are primarily from the census, although we also draw on some data from government agencies to compile a demographic and economic profile of each region at the beginning of our sample period in 1986. From this information, we derive a list of variables capturing the characteristics of regions that may have influenced employment growth.

Industry employment share: The share of regional employment in 1986 in each of the following industries taken separately: agriculture, mining, manufacturing, utilities, retail trade, accommodation, and property and business services.[23]

Industrial diversity: A modified Herfindahl index that increases as a region's industrial diversity increases to match the diversity of the Australian economy.

Structural change: An index showing the extent to which the industrial composition of employment changed between 1986 and 1996.

Remoteness: The Commonwealth Department of Health and Aging's Accessibility and Remoteness Index of Australia. The Department has allocated a score between 0 and 12, where 0 is the least remote SLA (SLAs in capital cities) and 12 is the most remote SLA, with the degree of remoteness based on the SLA's proximity to service centres of different size.

Human capital: The proportion of a region's population aged 15 and over with a skilled vocational qualification, TAFE qualification, or an undergraduate degree.

[23] See Appendix A for detailed information about the definition and construction of all the explanatory variables used in this paper.

Coastal dummy: A region is allocated a value of 1 if it borders the Australian coastline, and is not remote. A region is allocated a value of 0 otherwise.[24]

Size dummy: A region is allocated a value of 1 if it has a population below 5 000 in 1986 and 0 otherwise.

State dummies: We also include a dummy variable for each state, besides New South Wales, to control for any state-specific effects over our sample period.

While each of these variables (besides the state dummies) follows directly from our review of the factors that influence growth, we do not, however, include a variable for the influence of government policy because we do not have data to identify it, or the set of regions directly affected by the actions of government.[25]

4.3 A Modelling Strategy

In our attempt to explain the role played by the characteristics of regions in their employment growth, we first distinguish between regions in which employment has expanded and those in which it has contracted. Because employment growth and contraction are mutually exclusive events, we choose an estimation technique that imposes this as a restriction.[26] Labelling employment growth as 1 and

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[24] In most overseas studies, amenity is proxied by variables relating to weather. Given that data on weather are not available for small areas in Australia, we have chosen a region's coastal location because it encompasses cultural *and* physical advantages.

[25] Data on state government expenditure on regional development are available. However, these data do not provide information about the amount of expenditure per SLA.

[26] We are primarily interested in the question of what initial characteristics influenced the probability of a region growing or contracting between 1986 and 1996. However, explanations of the rate of employment growth in a region may also be of interest. Consequently, in Appendix B, we report the results of an OLS regression with a region's rate of employment growth as the dependent variable, and the same set of regressors. The results of the OLS regression are broadly consistent with the results of the binomial logit model.

employment contraction as 0, the binomial logit specification defines the probability of a region experiencing employment growth as: [27]

$$\text{Prob(y=1)} = \frac{e^{B'X}}{1+e^{B'X}} \tag{1}$$

$$= \Lambda(B'X) \tag{2}$$

where X is a vector of regional characteristics.

Because a binomial choice model is a non-linear function of its coefficients, the estimated coefficients provide information about the direction of the effect, but not readily interpretable information about its size. In order to better gauge the relative importance of variables, we present results in terms of an odds ratio associated with a particular variable. This shows the factor by which the odds favouring y=1 change with each 1 unit increase in variable i, holding all other variables constant:

$$\text{Odds ratio} = e^{B_i} \tag{3}$$

For regional characteristics that are continuous variables, the odds ratio for each X variable is interpreted as the amount by which the odds favouring y=1 change with each 1 percentage point increase in that variable at its mean. For characteristics captured by dummy variables, the odds ratio is interpreted as the amount by which the odds favouring y=1 change when the dummy variable changes from zero to unity.

4.4 Results

The results from the estimation of the binomial logit model are presented in Table 2. The odds ratios for each variable are listed. An odds ratio greater than

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[27] We could also have used a binomial probit model, which has a normal, continuous probability distribution. However, for practical purposes it usually does not matter because the two distributions tend to generate similar probabilities. (See Greene (1993) for a detailed discussion of the circumstances under which the functional form does matter.)

unity indicates that increases in that variable increased the probability that a region's employment grew between 1986 and 1996. Simple *z* tests are used to determine whether the odds ratio is statistically different from unity, and a likelihood ratio test of the null hypothesis that all the odds ratios are equal to unity is rejected at all conventional levels of significance. Further, almost 80 per cent of observations were predicted correctly using this model.

Estimation suggests that a number of initial regional characteristics increased the probability that a region experienced an employment expansion rather than an employment contraction. Larger initial shares of employment in the growing service industries of accommodation, cafes and restaurants, and property and business services, increased the probability that a region experienced employment growth. By contrast, larger employment shares in utilities reduced the probability that a region experienced an employment expansion.[28]

[28] The insignificance of a region's share of employment in agriculture is unexpected, and contradicts earlier research suggesting that falling employment levels in the agricultural sector have detracted from regional employment growth in recent decades. It turns out that this anomaly can be resolved only if we identify specialisation in agriculture and specialisation in other industries separately. We discuss this adjustment to the model a little later on.

Table 2: Results from the Binomial Logit Model

Variable	Odds ratio	Significance	Mean of the variable
Coastal	1.78	*	
Size	0.67		
Remoteness	0.82	***	3.51
Structural change	1.08	***	14.32
Diversity	2.14	***	1.99
Human capital	1.06		30.82
Agriculture	0.99		29.57
Manufacturing	1.04		7.30
Retail	0.93		10.37
Accommodation	1.20	***	3.64
Property	1.16	*	2.67
Utilities	0.91	**	2.40
Mining	0.99		0.08
Victoria	0.58		
Queensland	4.71	***	
South Australia	0.62		
Western Australia	2.51	***	
Northern Territory	1.89		
Tasmania	0.51		

Number of observations = 637

LR Chi2(19) = 274.91

Probability that the LR > χ^2 = 0.00

Pseudo R^2 = 0.32

Number of cases correctly predicted = 79 per cent

Note: ***, ** and * represent significance at 1, 5 and 10 per cent levels.

Regions that experienced relatively large structural changes in their industrial composition of employment also experienced, on average, more rapid employment growth than others. This is, in fact, contrary to popular claims about the effects of

structural change.[29] It suggests that between 1986 and 1996 many regions (at least at the level of aggregation we are examining) were successful in changing their industrial structure to include a greater role for industries that are either labour intensive or have recorded above-average rates of employment growth.

Consistent with the observation that structural change has been associated with employment growth, we also find that diversified regions tend to grow more quickly than highly specialised regions. Our diversity index is, however, highly correlated with a region's share of employment in agriculture, raising the possibility that it is specialisation in agriculture that has inhibited employment growth rather than specialisation *per se*, and that the high correlation between the two variables may also account for the insignificance of the agriculture variable.[30] In an attempt to account for this, we recalculated the diversity index to exclude agricultural employment. Not only did we find that the diversity index remained significant when agriculture was excluded, but that a region's share of employment in agriculture *became* significant. Furthermore, the odds ratio indicated that as the share of agricultural employment in total employment increased, so did the probability that a region experienced an employment contraction between 1986 and 1996.

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[29] This is not to say that for some regions structural change did not have a pronounced negative impact. In recent work, the Productivity Commission (1999) argued that structural change (as defined by a broad structural change index) had an ambiguous impact on regional employment growth between 1986 and 1996 because it depended on the *nature* of the change, and how it *interacted* with other regional characteristics such as human capital and natural endowments. Nevertheless, our results suggest that for many regions structural change presented an opportunity for growth.

[30] This is part of a broader problem with the variables we have constructed. A number of the variables in the model are highly correlated, raising the possibility that multicollinearity contributes to their statistical insignificance. For example, population size is negatively correlated with both the diversity index and the share of employment in manufacturing. To check the robustness of the results, variables were excluded from the model one at a time to determine whether the significance of the variables with which they were correlated was altered. We found that of the insignificant variables, only the manufacturing variable was sensitive to the exclusion of correlated variables. From this we infer that regions with higher shares of employment in manufacturing may have been more likely to experience employment growth between 1986 and 1996 than the results in Table 2 imply, which is consistent with evidence presented by ABARE (2001) that manufacturing was a regional growth industry during this period.

Coastal regions and less remote regions were also more likely to experience employment growth than others, suggesting that both firms and households have been attracted to locate in regions with greater amenity, thereby generating higher growth in local employment.

Point estimates suggest that regions in Queensland, Western Australia, and the Northern Territory were more likely to grow than regions in New South Wales, while regions in Tasmania, Victoria and South Australia were less likely to grow. However, only the odds ratios for Queensland and Western Australia were statistically significant. Because a myriad of factors could be behind these state-specific effects, we merely suggest Queensland and Western Australian regions were more likely to grow than regions in other states for reasons that could not otherwise be accounted for in our model.

Each of these findings accords with the arguments for growth posited in the regional science literature. There are, however, some exceptions. We could not find an independent influence on employment growth for either regional population size or regional human capital.[31] It may be that many small regions recorded contractions in employment not because of their size but because of other characteristics that they shared. The lack of significance of the human capital variable may be because our measure is a poor proxy for it, or because the influence of human capital may not be detectable over the time horizon of our sample.

5. Explaining Regional Migration in Australia

While employment has grown in some regions and contracted in others, the final unemployment outcome was previously shown to be dependent on inter-regional migration. In this section, we discuss some economic characteristics of regions that

[31] As it turns out, regional human capital is one of the few variables for which significance is altered when an OLS regression for employment growth rates was estimated. The OLS results suggest that higher proportions of skilled people in the local population were associated with higher employment growth rates.

may influence regional migration. We then attempt to assign a probability to these characteristics being present in Australian regional labour markets.

5.1 Factors Influencing Regional Migration

While many non-economic factors will influence inter-regional migration, the decision to relocate is not taken independently of economic factors. Consequently, in the standard model of regional migration, an individual will choose to relocate if there is 'net economic advantage' in doing so.[32] One of the most influential studies is by Harris and Todaro (1970), who emphasise that migration is dependent on relative wages, relative employment prospects, and housing and relocation costs, so that these factors are typically considered in addition to non-economic factors. Based on the small area data available to us, we nominate a set of factors that may be expected to influence regional migration.[33] In fact, many of the factors considered in our explanation of regional employment growth also have bearing on regional migration, primarily through their effect on relative employment prospects.

Unemployment rates are a key indicator of employment prospects, so we might expect out-migration to be more evident from regions with initially high unemployment rates, and in-migration to occur to those regions with initially low unemployment rates (Greenwood 1975; Debelle and Vickery 1998).

Similarly, the extent to which the industry composition of employment in a region is changing may influence employment prospects. Diversity may also have bearing on migration decisions, with diverse regional economies, which are less vulnerable to industry-specific shocks, being more able to attract or retain people than specialised regions.

The age and skill level of a region may influence migration, with some researchers claiming that younger, more educated people will have a greater tendency to

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[32] As argued by Hicks (1932) in his assessment of migration patterns.

[33] We do not discuss a role for the relative cost of housing or relative wages, both of which may influence regional location decisions, because the appropriate data are unavailable for SLAs.

migrate when subjected to negative shocks (Greenwood 1975). This is because the gains from relocations are likely to be greater for those with higher levels of skill or a longer expected working life over which gains can be realised.

Finally, regional amenity and access may also affect the incentives to migrate by raising the level of utility derived from a location (Glaeser, Scheinkman and Schleifer 1995). For example, if the probability of finding work in two regions is identical, an individual may prefer to relocate to the region with high amenity or access to markets.[34]

5.2 A Modelling Strategy

Regional labour market outcomes were characterised as falling into four quadrants: two that displayed the expected inverse relationship between employment growth and unemployment, and two that did not (as outlined in Figure 5) due to inter-regional migration. These quadrants are mutually exclusive states, and we are interested in the characteristics that influence the probability of a region being in a given quadrant. A multinomial logit specification defines these probabilities as:

$$P(Y = j) = \frac{e^{B_j'X}}{\sum_{k=1}^{4} e^{B_k'X}}, \; j = 1,2..,4. \qquad (4)$$

where one of the alternatives, the base category, has $B_j = 0$ as a normalisation restriction. The estimated equations then provide a set of probabilities for the j choices for a region with characteristics X.

In order to directly compare regions in which the migration response differed, we estimate the multinomial logit model using two separate base categories. In the first case, we choose Quadrant 1 as the base category and ask, 'which regional

[34] In the regional science literature, differences in regional amenity drive a wedge between regional unemployment rates. For example, in regions with high unemployment, attractive physical and cultural characteristics may compensate for reduced employment opportunities, reducing the incentives for out-migration.

economic characteristics influenced the relative strength of out-migration?'[35] From Equation 4 we can derive the following odds ratio for Case 1:

$$\text{Odds ratio} = e^{B_{2,i}} \tag{5}$$

In the second case, we choose Quadrant 3 as the base category and ask, 'which regional characteristics influenced the relative strength of in-migration?' The odds ratio for Case 2 is:

$$\text{Odds ratio} = e^{B_{4,i}} \tag{6}$$

5.3 Results

Table 3 presents the results from the estimation of the multinomial logit model for Cases 1 and 2. In Section 3.3, we showed that for most regions, differences in the strength of the migration response to shocks determined the path of unemployment. Consequently, in Case 1, we interpret an odds ratio greater than unity as indicating that a 1 percentage point increase in that variable increased the odds that a region had a larger adjustment through *out-migration*. In Case 2, we interpret an odds ratio greater than unity as indicating that a 1 percentage point increase in that variable increased the odds that a region had a larger adjustment through *in-migration*.

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[35] This inference follows naturally from our analysis in Section 3.3, where we demonstrated that it was differences in the strength of the migration response that most often determined the path of unemployment following a shock. However, it should be remembered that the statistical question that our model is addressing is, 'which regional characteristics influenced whether a region's unemployment rate increased or fell when the level of unemployment fell?'

Table 3: Results from the Multinomial Logit Models

Variable	Case 1: Out-migration Quadrants 1 and 2		Case 2: In-migration Quadrants 3 and 4	
	Odds ratio	Significance	Odds ratio	Significance
Coastal	0.40	**	3.10	***
Size	0.89		1.04	
Remoteness	1.24	***	0.80	***
Unemployment	1.34	***	0.69	***
Aged	0.83	***	1.16	***
Structural change	0.91	***	1.04	**
Diversity	1.14		1.06	
Human capital	0.80	***	0.96	

Number of observations = 637

LR Chi2 (24) = 405.1

Probability that the LR > χ^2= 0.00

Pseudo R^2 = 0.24

Note: ***, ** and * represent significance at 1, 5 and 10 per cent levels.

The results for Case 1, which seeks to explain influences on out-migration, illustrate some strong implications of the model. They suggest that high initial unemployment rates are an important factor increasing the probability that a region experienced out-migration. This is an important result. It indicates that after we *control* for the dominant effect of the direction of employment growth, inter-regional migration does play a role in narrowing unemployment differentials.

Low access to markets and low regional amenity also emerged as significant factors increasing the likelihood of leaving a region. And regions with younger populations were also more likely to adjust through out-migration than those with older populations. Each of these results accords with the reasons for inter-regional migration advanced in the literature.

However, regions with fewer skilled workers, which we interpret as relatively low human capital, had stronger rates of out-migration than others. At first glance, this appears inconsistent with the expectation that educated people are the most mobile. One interpretation follows Glaeser and Shapiro (2001), who argue that skilled workers are more likely to leave regions with low levels of human capital than

other regions, because of diminished expectations of future growth and employment opportunities.

Regions with lower rates of structural change also had stronger rates of out-migration. This result is consistent with our earlier findings that regions with low rates of structural change also tended to experience contractions in employment because new growth industries did not emerge, and suggests that people are more likely to leave regions where this type of structural change has not occurred.

The results for Case 2, which seeks to explain influences on in-migration, are, broadly speaking, the flip side of those for Case 1. Just as people were likely to leave regions with high initial unemployment, they are likely to move to regions of low unemployment. Similarly, they are more likely to move to accessible, high amenity regions. Regions with an older population in 1986 subsequently had higher rates of in-migration, possibly reflecting a role for retirement related migration.

Again, in the obverse of Case 1, higher rates of structural change were associated with stronger in-migration, perhaps suggesting that rapid structural change was associated with more employment opportunities in the future. However, unlike Case 1, we could not find a statistically significant role for regional human capital influencing relative rates of in-migration.

Finally, it is worth remembering that our focus in this section has been on assigning probabilities to the influence of *initial* characteristics on migration patterns between 1986 and 1996, rather than on events that occurred *during* this period. Both of course will have had a bearing on migration patterns. For example, we know that employment declines will have been driven by long-run structural factors in some regions (such as rising labour productivity in broad-acre farming), and by cyclical factors (such as the early 1990s recession) in others. However, such differences in the *reason for* and *timing of* employment declines may have different implications for the strength of the migration response. This should be borne in mind when interpreting the results.

6. Conclusion

Employment growth varied considerably across Australia's regions between the census periods of 1986 and 1996. In fact, in many regions the level of employment actually fell while in others rates of employment growth significantly exceeded the national average. But, contrary to the usual experience of national or state economies, stronger employment growth did not always translate into lower unemployment. Similarly, regional job losses did not always translate into higher unemployment rates. The final unemployment rate was greatly influenced by the strength of regional migration.

Inter-regional migration has emerged as an important channel through which regions adjust to shocks. The relative strength of migration flows does, however, vary considerably across regions, such that regional labour market outcomes can be disparate. This has both distributional and efficiency implications. Consequently, understanding the reasons for divergent regional labour market outcomes is an important public policy issue. As a first step, we have attempted to identify the characteristics of regions that are prone to particular labour market outcomes.

A number of characteristics were found to be associated with aspects of labour market performance. However, a recurring theme is that proximity to markets, amenity, and diversity of industrial structure (especially the presence of service industries) are central to a region's ability to generate jobs and to attract migrants. Significantly, our results also suggest that once the dominant effect of employment growth is controlled for, inter-regional migration does act to reduce unemployment differentials. However, because unemployment rate differentials are just one of the factors that prospective migrants respond to, they may persist, and even widen in some circumstances.

These ideas are far from new, and have been advanced as reasons for divergent regional economic performance in Australia in recent decades. But given the limited quantitative evidence of their role, the debate on regional economic performance is hopefully advanced by establishing the probability that distinguishing characteristics of a region can be associated with given labour market outcomes.

Finally, although the focus of this paper has been on the relationship between *initial* characteristics and subsequent labour market adjustment, it would also be of interest to determine how shocks hitting regions *during* our sample period affected regional labour markets. In particular, an attempt to disentangle long-run trends from cyclical trends would be of value. Of course, such a task is difficult when the census only presents us with snapshots in time every five years. However, data from the 2001 census will allow researchers to examine a period that encompasses the early 1990s recession and a decade-long expansion. Of interest will be whether the characteristics identified in this paper have continued to influence regional labour markets over the past five years.

Appendix A: Data

The data used in this paper are from the Australian Bureau of Statistics' Integrated Regions Database. Of the range of variables available at the level of SLA in this database, most that were used in estimation were sourced to the Census of Population and Housing, although some administrative data were also used. We use data for the census years of 1986, 1991 and 1996. Although census data go further back, 1986 is the earliest period for which data have been reconciled with the most recent SLA boundaries.

Census data

Population growth

Definition: The percentage change in the number of persons residing in a region between 1986 and 1996.

Employment growth

Definition: The percentage change in the number of persons that had a job in the week before the census between 1986 and 1996.

Unemployment rate

Definition: The proportion of the population aged 15 and over that did not have a job in the week prior to the census but was both looking for and able to start work.

Participation rate

Definition: The proportion of the population aged 15 and over that was either employed or actively looking for work in the week prior to the census.

Industry share

Definition: The share of regional employment in 1986 in the agriculture, mining, manufacturing, retail, utilities, accommodation, cafes and restaurants, and property and business services industries.

Industrial diversity

Definition: A modified Herfindahl index that increases as a region's industrial diversity increases to match the diversity of the Australian economy.

Formula: $$RDI_i = \frac{1}{\sum_j \left| s_{ij} - s_j \right|}$$

Where RDI is the relative diversity in region *i*, which is the inverse of the share of regional employment in industry *j* minus national share of employment in industry *j* summed over all industries present in a region in 1986. The industries are 1-digit ANZSIC industries. The formula is taken from Duranton and Puga (1999).

Structural change

Definition: An index showing the extent to which the industrial composition of employment changed between 1986 and 1996.

Formula: $$SCI_i = \frac{1}{2} \sum_j \left| s_{jt} - s_{jt-1} \right|$$

Where structural change is measured as the absolute value of the share of regional employment in industry *j* in region *i* in 1996 minus the share of regional employment in industry *j* in region *i* in 1986, summed over all 1-digit industries.

Aged

Definition: The proportion of a region's population in 1986 aged 65 and over.

Human capital

Definition: The proportion of a region's population aged 15 and over with a skilled vocational qualification, a TAFE qualification or an undergraduate degree.

Other data

Remoteness

Definition: The Department of Health's Accessibility and Remoteness Index of Australia (ARIA). The Department has allocated a score between 0 (capital cities) and 12 (for Australia's most remote locations) to each SLA on the basis of the SLA's proximity to service centres of five different sizes.

Source: Commonwealth Department of Health and Aging.

Coastal dummy

Definition: A region is allocated a value of 1 if one of its borders is on the Australian coastline, and, according to the ARIA index it is not remote. A region is allocated a value of 0 otherwise.

Source: Commonwealth Department of Health and Aging.

Appendix B: OLS Results for Regional Employment Growth

Results from an OLS Regression for Regional Employment Growth[(a)]

Variable	Coefficient	Significance
Coastal	4.58	**
Size	–2.67	
Remoteness	–1.11	***
Structural change	0.93	***
Diversity	1.38	*
Human capital	0.90	*
Agriculture	–0.24	***
Manufacturing	0.14	
Mining	–0.28	**
Retail	–0.91	***
Accommodation	1.70	***
Property	3.21	***
Utilities	–1.17	***
Victoria	–0.47	
Queensland	11.84	***
South Australia	–1.46	
Western Australia	11.29	***
Northern Territory	–1.24	
Tasmania	–3.97	

Number of observations = 573

F (19 553) = 24.62

Probability > F = 0.00

Adjusted R^2 = 0.439

Note: ***, **, and * represent significance at 1, 5 and 10 per cent levels.

(a) Note that the sample size in the OLS regression (573) differs from the sample size in the binomial logit model (637). We trimmed 5 per cent of observations from each tail of the distribution for the model estimated using OLS because we were concerned that outlying growth rates would unduly influence the regression results. This is not an issue in the binomial logit model because each region receives an equal weight.

References

ABARE (2001), *Country Australia: Influences on Employment and Population Growth*, AGPS, Canberra.

Blanchard O and L Katz (1992), 'Regional Evolutions', *Brookings Papers on Economic Activity*, 1, pp 1–61.

Borland J (2000), 'Disaggregated Models of Unemployment in Australia', Melbourne Institute Working Paper No 16/2000.

Borland J and A Suen (1990), 'Unemployment and Inter-state Mobility in Australia', University of Melbourne Department of Economics Research Paper No 256.

Bradley R and J Gans (1998), 'Growth in Australian Cities', *The Economic Record*, 74(226), pp 266–278.

Braunerhjelm P, R Faini, V Norman, F Ruane and P Seabright (2000), 'Integration and the Regions of Europe: How the Right Policies can Prevent Polarization', Centre for Economic Policy Research *Monitoring European Integration*, 10, London.

Debelle G and J Vickery (1998), 'Labour Market Adjustment: Evidence on Interstate Labour Mobility', Reserve Bank of Australia Research Discussion Paper 9801.

Duffy N (1994), 'The Determinants of State Manufacturing Growth Rates: A Two-Digit-Level Analysis', *Journal of Regional Science*, 34(2), pp 137–162.

Duranton G and D Puga (1999), 'Diversity and Specialisation in Cities: Why, where and when does it matter?', Centre for Economic Performance Discussion Paper No 433.

Ellison G and E Glaeser (1999), 'The Geographic Concentration of Industry: Does Natural Advantage Explain Agglomeration?', *American Economic Review*, 89(2), pp 311–316.

Garcia-Mila T and McGuire T (1998), 'A Note on the Shift to a Service-Based Economy and the Consequences for Regional Growth', *Journal of Regional Science*, 38(2), pp 353–363.

Glaeser E, J Scheinkman and A Schleifer (1995), 'Economic Growth in a Cross-section of Cities', *Journal of Monetary Economics*, 36(1), pp 117–143.

Glaeser E and J Shapiro (2001), 'Is There a New Urbanism? The Growth of U.S. Cities in the 1990s', NBER Working Paper No 8357.

Greene W (1993), *Econometric Analysis*, 2nd edition, Macmillan, New York.

Greenwood M (1975), 'Research on Internal Migration in the United States: A Survey', *Journal of Economic Literature*, 13(2), pp 397–433.

Gregory R and B Hunter (1995), 'The Macro Economy and the Growth of Ghettos and Urban Poverty in Australia', Australian National University, Centre for Economic Policy Research Discussion Paper No 325.

Harris CP and KE Dixon (1978), *Regional Planning in New South Wales and Victoria since 1944*, Centre for Research on Federal Financial Relations, Canberra.

Harris J and M Todaro (1970), 'Migration, Unemployment and Development: A Two-sector Analysis', *American Economic Review*, 60(1), pp 126–142.

Hicks J (1932), *The Theory of Wages*, Macmillan, London.

Hunter B (1994), 'The Spatial Structure of the Australian Labour Market', Australian National University, Centre for Economic Policy Research Discussion Paper No 306.

Industry Commission (1993), 'An Empirical Assessment of Interstate Mobility and Wage Flexibility', *Impediments to Regional Industry Adjustment; Volume 2 – Appendices (draft report)*, Industry Commission, Canberra, pp D1–D26.

Karmel T, B McHugh and A Pawsey (1993), 'People or Places?', in T Karmel, B McHugh, A Pawsey and C Evans (eds), *Regional Labour Market Disadvantage*, AGPS, Canberra, pp 11–43.

Malizia E and S Ke (1993), 'The Influence of Economic Diversity on Unemployment and Stability', *Journal of Regional Science*, 33(2), pp 221–235.

McGuire P (2001), 'Regional Unemployment in Queensland: Dimensions and Policy Issues', *Australian Bulletin of Labour*, 27(4), pp 296–313.

National Institute of Economic and Industry Research (NIEIR) (1999), 'State of the Regions', report prepared for the Australian Local Government Association.

NIEIR (2001), 'State of the Regions', report prepared for the Australian Local Government Association.

Productivity Commission (1999), 'Impact of Competition Policy Reforms on Rural and Regional Australia', AGPS, Canberra.

Richardson H (1973), *Regional Growth Theory*, Macmillan, London.

Salt B (2001), *The Big Shift*, Hardie Grant Books, South Yarra.