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Description and Spatial Analysis of Employment Change in New Zealand Regions 1986-2001

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Description and Spatial Analysis of Employment Change in New Zealand Regions 1986-2001*

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Abstract
Over the last two decades New Zealand has undergone fundamental economic restructuring, and phases of slow and rapid growth, which have resulted in some dramatic changes in the regional economies. This paper provides a detailed multi-period shift-share analysis over three intercensal periods between 1986 and 2001 on changes in regional employment outcomes at two levels of spatial disaggregation: 29 Administrative Regions (ARs), based on Regional Council areas, and 58 Labour Market Areas (LMAs) that have economically meaningful (commuting determined) boundaries. The contributions to employment outcomes of national trends, sectoral composition within regions, structural change, and local conditions are identified. A four-category disaggregation of regional employment into sex, age, occupation and industry is also undertaken. The results show a dichotomy between metropolitan and non-metropolitan areas, but also several distinct clusters among the latter. Regional competitive advantage is clearly linked with net inward migration. There is also evidence of significantly positive spatial autocorrelation in the competitive effect. Local indicators of spatial association help to identify regions that stand out in terms of being surrounded by similar regions, or by regions that are just the opposite, in terms of the competitive effect. Interestingly, regional population growth precedes the competitive component of employment growth rather than just being a symptom of it.

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***Keywords**:* Shift-Share Analysis, Cluster Analysis, Regional Competitiveness, Migration, Spatial Correlation

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1. Introduction

Many countries are witnessing growing diversity among sub-national regions. New Zealand is no exception. Traditionally, differences between New Zealand regions in economic conditions and the standard of living were rather small. A protected domestic economy with centralised wage bargaining and uniform prices, combined with export revenues generated by a narrow range of agricultural outputs produced in many parts of the country, led to a rather egalitarian society both interpersonally and spatially. In this context, regionally-specific policies were considered rather unnecessary.

This situation changed when a major recession in 1967/68 (triggered by a sharp decline in the terms of trade) affected some regions more than others and provided the impetus for an assessment of the need for regional policies. This assessment nonetheless advocated a rather "hands-off" approach (McDonald, 1969). Since then, the policy approach has gone through several cycles of greater or lesser emphasis on regionally-oriented measures (see Karagedikli et al. 2000 and Killerby et al. 2004 for overviews).

Two decades of economic reforms and globalisation forces have contributed to a widening of the income distribution, both across people and across regions (see, e.g., Karagedikli et al. 2002). Also more broadly we are witnessing growing diversity across New Zealand regions in terms of demographic, economic and social features (Pool et al, forthcoming). The need for a better understanding of what drives differences in regional outcomes is therefore greater than ever.

One classic hypothesis is that regional wellbeing is a function of a region's 'endowment' of industries. Deviation of regional growth from national growth can then be explained by the presence of industries in the region that have been growing above or below average nationwide. This hypothesis has led to a popular decomposition of regional employment growth into a national growth effect, an industry-mix effect and a residual. The latter is often labelled the competitive or differential effect.

This decomposition is referred to in the literature as shift-share analysis, which has been a popular descriptive tool of regional analysis since the 1960s (see, e.g. Loveridge and Selting 1998, Dinc et al. 1998, and Knudsen 2000 for surveys). Section 2 reviews the basic methodology.

Despite its enduring popularity, shift-share analysis has also attracted severe criticism over the years. The weaknesses of this technique include sensitivity to the level of industry aggregation and the omission of the impact of intra-regional inter-industry linkages. It is clear that shift-share analysis by itself is simply an accounting procedure and does not constitute a model of the regional economy. However, the decomposition of regional employment growth into a national growth effect, an industry mix effect and a residual effect can be a useful stepping stone for the further analysis of causes of regional growth differentials. This is the approach adopted in the present paper.

Shift-share analysis has had little application in New Zealand, with Patterson's (1989) study of regional employment change 1981-86 being one of the few exceptions. We present the results of a classic shift-share analysis of employment growth in New Zealand over three periods: 1986-1991, 1991-1996 and 1996-2001. We consider two types of regional partitioning of New Zealand. The first type splits New Zealand into 29 Administrative Regions (ARs) that are based on Regional Council regions. The second type splits the country into 58 Labour Market Areas (LMAs) that are defined by means of commuting patterns. Section 3 provides more information about the data. The use of two levels of spatial disaggregation enables us to identify robust features of employment change that are insensitive to the geographical breakdown.

The results of classic shift-share analysis are discussed in Section 4. The relative importance to a region of its industry mix effect in explaining regional employment growth differentials turns out to be rather stable over time. There is less stability in the relative importance of the competitive effect. Overall, the national business cycle has been rather important in all regions.

In a multi-period shift-share analysis it is possible to quantify the effect of changing industry shares on the industry mix component of regional employment change. The results are described in Section 5. It turns out that virtually no region has been going against national trends, i.e. industry shares changed consistent with national industry growth or decline.

Grouping regions in terms of the magnitude and direction of the industry mix and competitive effects generates a two-way classification that is useful for identifying clusters of regions. These clusters are described in Section 6.

When accounting for employment change across regions, it could be argued that labour markets are segmented and that within an industry employment may change differently across various sub-markets such as those defined by occupations, permanent versus casual employment, etc. Mulligan and Molin (2004) predicted population change in non-metropolitan U.S. communities by a disaggregation of aggregate employment change in shift-share analysis into change across industries and occupations. Effectively, this assumes that each industry by occupation combination operates as a segmented labour market. In this paper we go even further and disaggregate by age and gender as well. The results of recalculating the industry-mix effect and the competitive effect by means of such a four-way disaggregation of employment in New Zealand regions are discussed in Section 7.

Section 8 provides some alternative approaches to shift-share analysis that have been introduced in the literature in order to overcome some of the weaknesses of the classic method. However, it is shown that these refinements add little to our understanding of the role of the industry mix effect vis-à-vis competitive shift effect in regional growth.

To decompose the competitive effect into identifiable causes of competitive differences across regions and a "true" residual, a first attempt is made with a regression methodology in Section 9. Section 10 discusses an exploratory spatial data analysis of the industry mix and competitive effects. Section 11 sums up.

2. Classic Multi-Period Shift-Share Analysis

In a small open economy such as New Zealand, the demand for output in many sectors in any particular region is a function of national economic conditions and

international influences. It is plausible that regions do well when they are 'endowed' with industries that are experiencing a growth in demand nationwide, for example due to favourable terms of trade or booming demand overseas. Shift-share analysis is a simple tool to quantify the importance of this endowment effect. Of course, by carrying out the analysis for successive periods, the change in the regional 'endowment' of industries can be taken into account. In addition, we will explicitly quantify the impact of a change in industry shares on the industry-mix effect in each region in Section 5.

The methodology provides a decomposition of employment change but, beyond identifying the importance of an industry-mix effect, it does not constitute a model of regional employment change. It therefore complements rather than substitutes for regional econometric models such as Choy et al.'s (2002) Vector Autoregression (VAR) model of regional employment levels, unemployment rates, labour force participation and wages in New Zealand. In Section 9 we shall nonetheless formulate a simple econometric model to identify factors that can explain regional employment change after controlling for a national business cycle and a regional industry composition effect.

The importance of industry composition for the regional business cycles in New Zealand was recently confirmed by Hall and McDermott (2004). Using various statistical methods, Hall and McDermott identified meaningful regional business cycles and found that relatively rural (i.e. primary sector driven) regions are strongly influenced by external economic shocks such as the terms of trade and the real price of milk solids. Thus, with external influences playing a major role in the relative fortunes of New Zealand industries, the 'endowment effect' of industry composition in regions is likely to be rather important. Shift-share analysis that quantifies the industry mix effect provides therefore useful insight into regional employment growth.

However, before describing the calculations and the results, it is useful to elaborate on the limitations of the methodology (see also, e.g. Mulligan and Molin, 2004). First, the results are sensitive to the extent of disaggregation. The more industries are disaggregated, the more important the industry-mix effect is relative to the competitive effect. On the other hand, the more refined the regional breakdown, the more important is the competitive effect. In this paper we vary regional and industry disaggregation and thereby identify robust results that are not sensitive to the extent of disaggregation.

Interpretation problems also arise when the regions are of very different population sizes. In the present application, this is avoided at the AR level by breaking employment in metropolitan regions into constituent parts. Employment in the largest region is 10 times that of the smallest region. With LMAs, however, there is a much bigger gap between small and large regions: employment in the largest region is more than 150 times that in the smallest region.

Another common issue is the choice of the reference region, which can be the nation, but alternatively can also be some other benchmark. In our analysis the largest region (Auckland) accounts for between 10 to 20 percent of employment and the nation remains the natural benchmark.

Caution is also needed with the interpretation of the competitive effect as indicative of the average degree of competitiveness of all industries in the region. The competitive effect is simply calculated as a residual. A region can have a negative competitive effect when most of its industries are highly efficient and have

experienced rapid employment growth, but a few large industries in the region are in decline.

Another weakness of shift-share analysis is that it does not take intra-regional inter-industry linkages into account. For example, regional employment growth in an export sector (say, the dairy sector) is likely to spill over to the manufacturing sectors in that region even though manufacturing employment overall may have been in decline. The growth of manufacturing employment in that region is then quantified in the region's competitive component of overall employment change, but it would be wrong to interpret this as evidence of growing competitiveness of the manufacturing sector in that region. There is unfortunately no information available on regional input-output transactions in New Zealand, although there certainly is a demand for this type of information and a regional input-output table may be developed in the future (Statistics New Zealand 2003). Regional impact studies use multipliers derived by indirect methods such as described by Butcher (1985). Without input-output information, the extent of cross-industry intra-regional spillovers cannot be quantified.

However, the most important weakness of the shift-share methodology is that it says nothing about efficiency and productivity. In certain regions, rapid employment growth may be due to expansion of public services funded by central government. If such expansionary regional policy targets specific regions, shift-share analysis will suggest a large competitive growth component in those regions. This is, however, unlikely to be sustainable growth, as the employment is funded with income generated outside the region. Similarly, a boom in new dwelling construction or major infrastructure projects (e.g. motorway construction) in some regions may generate significant employment growth, but again of an unsustainable nature. Ideally, regional growth should disentangle capital productivity growth, labour productivity growth and total factor productivity growth (e.g., Haynes and Dinc, 1997). This line of research would require information on regional sectoral outputs and capital stocks, besides regional employment levels. The absence of such data makes productivity analysis at the regional level infeasible in New Zealand.

Despite these weaknesses, shift-share analysis remains a popular tool for regional economic analysis simply because the data demands are few and the basic idea of accounting for composition effects is as powerful as that of age standardisation in demography. As many authors (such as Dinc et al. 1998) have noted, the classic shift-share model and it extensions remain a useful descriptive technique that can provide various kinds of information about the regional economy.

We will now describe the shift-share decomposition formally. The classic decomposition is (Dunn, 1960):

$$\Delta E_{ij}^{t} \equiv E_{ij}^{t} - E_{ij}^{t-1} \equiv NE_{ij}^{t} + IM_{ij}^{t} + CE_{ij}^{t} \tag{1}$$

where E_{ij}^{t} is Employment in the i^{th} industry in the j^{th} region at time t; NE_{ij}^{t} is the National Growth Effect on industry i in the j^{th} region between times (t–1) and t; IM_{ij}^{t} is the Industry Mix Effect on industry i in the j^{th} region between times (t–1) and t; and CE_{ij}^{t} is the Competitive Effect on industry i in the j^{th} region between times (t–1) and t. The three effects are computed as follows:

$$NE_{ij}^{t} = g_{00}^{t} \times E_{ij}^{t-1} \tag{2}$$

$$IM_{ij}^{t} = \left(g_{i0}^{t} - g_{00}^{t}\right) \times E_{ij}^{t-1} \quad (3)$$

$$CE_{ij}^{t} = \left(g_{ij}^{t} - g_{i0}^{t}\right) \times E_{ij}^{t-1} \quad (4)$$

where g_{ij}^{t} is the growth rate of employment in industry *i* and region *j* between times (*t*–1) and *t*; g_{i0}^{t} is the growth rate of nationwide employment in industry *i* between times (*t*–1) and *t*; and g_{00}^{t} is the growth rate in nationwide total employment between times (*t*–1) and *t*.

Using (1) to (4) it is easy to see that if we aggregate employment in each region *j* over industries *i* and define g_{0j}^{t} as the growth rate of total employment in region *j* between times (*t*–1) and *t,* this growth rate can be decomposed in a national growth rate, a growth rate due to the industry-mix and a residual that is referred to as the competitive growth rate r_{j}^{t}. By definition, the competitive growth rate of the region *j* at time *t* can then be expressed mathematically as

$$r_{j}^{t} \equiv g_{0j}^{t} - g_{00}^{t} - \sum_{i} w_{ij}^{t-1}\left(g_{i0}^{t} - g_{00}^{t}\right) \quad (5)$$

where w_{ij}^{t-1} is the fraction of employment in region *j* that is in industry *i* at time (*t*–1). This equation clearly shows that a region's competitive growth rate is the region's total employment growth rate minus the national employment growth rate minus the growth due to the industry mix in the region. Equation (5) also shows that the industry-mix growth rate is a weighted average of national sectoral growth rates, with the weights being the shares of the various sectors in regional employment at the beginning of the period under consideration.

3. Data

The data for our analysis were obtained from the quinquennial New Zealand Census of Population and Dwellings 1986 to 2001. At the Administrative Region (AR) level, unpublished information was obtained on employment by age (15-24, 25-44, 45-64), sex, employment status (full-time and part-time), industry (7 categories), occupation (7 categories) and region (29 areas). Not specified responses are excluded. The extent of disaggregation is fairly limited, but was dictated by maintaining intercensal comparability. For example, due to difficulties in consistently defining ethnicity across the four censuses at this level of disaggregation, it was not possible to account for ethnic composition in this analysis. The list of industries and occupations are given in Appendix A, **Table A.1** and **Table A.2** respectively. The regions and their constituent Territorial Authorities are also defined in Appendix A, in **Table A.3** and shown in **Figure A.1**. Total employment has been calculated by converting part-time employment into fulltime equivalent (FTE) employment, using age and gender-specific average hours worked of part-time and full-time workers at the time of each census. The conversion factors are given in Appendix A, **Table A.4**.

At the Labour Market Area (LMA) level, data have been built up from census area unit level and made available for this research by Motu Economic and Public Policy Research. It has long been recognised that functional economic areas are the most appropriate unit of analysis for examining regional economic activity (Stabler,

1996, 206) as administrative areas such as Regional Council regions or territorial authorities tend to be rather arbitrary in terms of their boundaries in so far as they are reflective of economic relations. Administrative areas have largely served as the basis for most regional analysis in the past as most official statistics have been gathered or aggregated to administrative boundaries. These days, however, it is possible to build up regional data with any defined boundaries from very small geographical units of measurement, using GIS and related systems.

Consequently, there has been growth in the use of functional economic areas, notably in the analysis of various labour market phenomena (see for instance ONS and Coombes, 1998, Casado-Diaz, 2000, Newell and Papps, 2001 and Watts, 2004). Newell and Papps (2001) used travel to work data from the 1991 and 2001 censuses to define LMAs in New Zealand. This research yielded 140 LMAs for 1991 and 106 for 2001. This level of breakdown is too refined for linking to regional characteristics that come from sources other than the census. A level of disaggregation that permits the building up of a regional analysis with a wide range of regional indicators is that of 58 LMAs. The boundaries and names of these LMAs are shown in **Figure A.2**.

4. Results of Classic Shift-Share Analysis

Table B.1 reports FTE employment growth across the three intercensal periods 1986-91, 1991-96 and 1996-2001, plus 1986-2001 overall change. The industry breakdown with the AR data is somewhat different from that of the LMA data, but the changes are broadly consistent. RA data provide FTE employment change, but the LMA data are based on headcount employment and therefore give equal weight to change in full-time and change in part-time employment.

Table B.1 reinforces the well known fact that the 1986-91 period of radical economic reform, restructuring and a cyclical downturn at the end of the period coincided with sharp employment declines in most sectors except for business and financial services and public services, social services and utilities. Total FTE-employment declined by 9.7 percent and total head count employment declined by 7.6 percent. Manufacturing employment declined by about 27 percent on both head count and FTE measures of employment. The 1991-96 period saw a recovery with employment growth in most sectors, particularly in financial and business services and the hospitality industry, though the Utilities and small Mining sector continued to experience strong declines while Manufacturing employment stagnated. Although some commentators have interpreted this period as providing clear evidence of the payoff of economic liberalisation and reforms (e.g. Evans et al. 1996), and head count employment recovered strongly, overall FTE employment growth (6.6 percent) remained insufficient to return to 1986 levels. The disparity between FTE and head count employment growth indicating that employment creation in this period was biased in favour of part-time employment. It is now commonly, but not universally, accepted that a higher sustainable growth path nationwide emerged after 1996 and overall FTE employment growth was 7.5 percent during the 1996-01 period, although there were further declines in manufacturing and primary sector employment.

FTE employment in 1986 and growth over the three subsequent intercensal periods in each AR is reported in **Table B.2a**. Several regional council regions have been split into several constituent parts for which it is expected that they have rather different features. Thus, Auckland is split into North Shore, Auckland City, West Auckland and South Auckland. Waikato consists of North Waikato, Hamilton/Waipa,

South Waikato and Taupo/Rotorua. The Western Bay of Plenty is also distinct from the Eastern Bay of Plenty. The Wellington Regional Council Region is divided into Kapiti/Porirua, Hutt Valley, Wellington City and Wairarapa. In the South Island, Canterbury is divided into Rural Canterbury, South Canterbury and Christchurch City. Finally Otago is split into Dunedin City and Rural Otago. The largest resulting region Auckland City accounts with FTE employment of 127,304 for 9.4 percent of the New Zealand total in 1986, while the smallest region in terms of FTE employment at that time can be found in Marlborough District (13,020 or just under 1 percent of the total).

All regions experienced FTE employment decline over the 1986-91 period. Employment contraction of more than twice the national average of 9.7 percent occurred in Northland and Gisborne. Regions with a decline of less than half the national rate are North Shore, West Auckland, Marlborough and Rural Canterbury. During 1991-96 fast employment growth occurred in the Western Bay of Plenty and this remained the case during 1996-2001. The greatest decline in FTE employment over the 1991-96 period occurred in South Waikato and over the 1996-2001 period in Southland. Only Wanganui and Taranaki experienced persistent employment declines throughout the 1986-2001 period.

Figure B.1 depicts average FTE employment growth across 29 ARs over the 1986-2001 period. The three fastest growing regions are Western Bay of Plenty, Rural Canterbury and North Shore. The regions with the most employment decline overall are Gisborne, South Waikato and Wanganui.

Total employment in 1986 and growth over the three subsequent intercensal periods in each LMA is reported in **Table B.2b**. The largest LMA in 1986, Auckland, had total employment of close to 250,000, around 17 percent of total national employment while the smallest LMA, Kaikoura, with total employment of 1,410 accounted for less than a tenth of a percent of total national employment.

The rank order, by total employment, of LMAs remained relatively constant over the 1986-01 period with the median change in rank being 1.5 places and no change in the order of the eight largest LMAs occurring. Standing out from this pattern was the Queenstown LMA that improved its standing by 19 places while the LMAs of Tokoroa and Taumarunui ranking fell by 8 and 9 places respectively.

Of the 58 LMAs only 3 (Queenstown, Picton and Thames) experienced positive employment growth in the 1986-91 period. Queenstown experienced growth of over 16 percent while employment in the two other labour market areas increased at more modest levels of 1.5 and 0.6 percent respectively. In the 55 LMAs that saw contractions in the level of employment, the average fall in employment was around 9 percent with three LMAs (Taihape, Kaikohe and Tokoroa) having declines in employment of over 20 percent.

In the 1991-96 period only 5 LMAs (Ngaruawahia, Bulls, Kaikohe, Tokoroa and Taumarunui) experienced declines in total employment, while in other LMAs total employment grew on average at just over 15 percent, with Queenstown seeing employment growth of over 60 percent, over twice as rapid as the second fastest growing LMA, Tauranga.

In the final period, 1996-2001, total employment declined in 15 of the LMAs, by between 0.1 (Stratford) and 10.6 percent (Taihape). Employment growth nationally averaged 7.0 percent with 3 LMAs (Queenstown, Tauranga and Kerikeri) achieving growth of over 15 percent.

Table B.3a (for ARs) and **Table B.3b** (for LMAs) report the components of regional growth, as calculated by classic shift-share analysis. In **Table B.3a** the

regions are ranked from the one with the fastest three-period average growth rate (Western Bay of Plenty, 10.4 percent) to the one with the greatest employment decline (Wanganui, −7.6 percent). In **Table B.3b** the LMAs are also ranked in order from the one with the fastest three-period average growth rate (Queenstown, 30.6 percent) to the one with the greatest decline (Taumaranui, -10.5 percent).

The first point to note is that in virtually all regions the national growth component is large relative to the industry-mix and competitive components. This reinforces that no New Zealand region was sheltered from the massive employment changes that have taken place since 1986, particularly in the first decade.

The industry-mix effect is in many regions small relative to the competitive effect. But, as noted earlier, this is partially a function of the level of industrial disaggregation, so we cannot read too much into this. It is more useful to rank regions based on the average industry mix effect over the 1986-2001 period. The results are shown in **Table B.4a** and **Figure B.2** provides the corresponding map.

The ranking is quite stable over time. The four highest ranked ARs on the industry-mix effect criterion are Wellington City, North shore, Kapit/Porirua and Auckland City. Several regions where the industry composition has been particularly favourable for employment growth are in the Auckland or Wellington metropolitan areas. Karagedikli et al. (2000) identified a dichotomy in New Zealand of relatively fast economic growth in Auckland and Wellington, vis-à-vis the rest of New Zealand and **Table B.4a** suggests that a favourable employment structure (with a disproportionally large share of business and financial services) is one factor responsible for this outcome. The four ARs where industry mix has been the most disadvantageous are North Waikato, Southland, Eastern Bay of Plenty and South Waikato.

Table B.4b shows the LMA industry mix effects. The eight LMAs that have had an industry composition that has been most favourable to employment growth, as measured by the average industry mix 1986-01, are Wellington, Queenstown, Auckland, Hutt Valley, Dunedin, Rotorua, Tauranga and Christchurch. These LMAs have amongst the highest proportions of their employment in the Retail & Hospitality Financial and Government & Social Services industries. The eight LMAs with the most disadvantageous industry mixes are Motueka, Gore, Eketahuna, Te Puke, Waipukurau, Ngaruawahia, Tokoroa and Balclutha. It is noteworthy that employment in these three LMAs is dominated, or at least has been historically, by single large enterprises – meat processing in the case of Balclutha and Ngaruawahia and a pulp and paper mill in Tokoroa.

The stability in the rankings of the industry mix effects suggests that an advantageous or disadvantageous sector structure can only change very gradually. It also suggests that the only protection to sector-specific employment shocks is sectoral diversification, analogous to portfolio diversification in finance (see also, for example, Munro and Schachter 2000 on this issue in the European Union).

5. Structural change

Equation (5) above shows that the industry mix effect is calculated by means of industry shares at the beginning of the intercensal period. The question then arises to what extent over the intercensal period the regional shares adjust such that employment increases in sectors that are nationally doing well or whether some regions in fact go “against the trend” and increase the share of industries that are

nationally contracting. This can be investigated by means of decomposing the industry mix effect itself in the following way:

$$\sum_i w_{ij}^{t-1}(g_{i0}^t - g_{00}^t) \equiv \sum_i w_{ij}^t \left(g_{i0}^t - g_{00}^t\right) + \sum_i (w_{ij}^{t-1} - w_{ij}^t)(g_{i0}^t - g_{00}^t) \qquad (6)$$

The term on the most right now measures the effect of changing industry composition on the regional employment growth rate. We will refer to this as the structural change effect and to the industry-mix effect calculated by means of end-of-period weights as the modified industry-mix effect. The industry mix effect in its modified form, plus the structural change effect are reported for the ARs for all three intercensal periods in **Table B.5a**. The sum of the two is equal to the industry mix effect as reported in **Table B.4a**.

The modified industry mix effect signals the same phenomenon as before. Employment in regions that are primarily urban and service-sector focussed benefited from the growth in services. They include all parts of the greater Auckland region, except South Auckland; all parts of the greater Wellington region, except Wairarapa, Christchurch City, Dunedin City, Hamilton/Waipa and Taupo/Rotorua. In contrast, industry-mix has been detrimental to the rural hinterlands of South Waikato, Eastern Bay of Plenty, South Canterbury and Southland. In terms of magnitude, the industry-mix effect is in most regions the largest during the 1986-91 period.

The industry mix effect in its modified form, plus the structural change effect are reported for the LMAs for all three intercensal periods in **Table B.5b**. The modified industry mix effect averaged over the 3 intercensal periods exceeds 1 percent in 12 of the 58 LMAs. These LMAs are either one of the larger urban areas, Auckland, Wellington, Dunedin and Hamilton, or have strong connections with the tourism and/or retirement industries, such as Queenstown and Tauranga. In contrast the average modified industry mix effect over the 3 intercensal periods was less than -1 percent in 20 of the 58 LMAs. These LMAs are either predominantly rural service centres or are smaller provincial cities. In terms of magnitude the average modified industry mix for New Zealand was largest, overall, in 1986-1991 and was negative for the 1991-1996 and 1996-2001 periods.

For the ARs the structural effect is negative in almost all cases. The only exceptions are Wanganui and Marlborough during 1996-2001. Similarly for the LMAs the structural effect is also negative in all but the same cases (Wanganui and Blenheim). The negative sign indicates that regions/LMAs have generally not gone against the national trend in terms of structural change. If a sector grows faster (slower) than average nationally, its share in employment increases (decreases) in almost all regions. In addition, it is very clear from the magnitudes of the structural effects that the extent of structural employment change was the largest during the first intercensal period. This period coincided with initial phase of the post-1984 economic reforms during which international trade and financial services were liberalised and industry subsidies abolished (with labour market and social security reform following in 1991).

Turning now to the competitive growth rate calculated by equation (5), the results are reported in **Table B.6a** and illustrated in **Figure B.3** for the ARs. Regions have been ranked by the average competitive effect over the three periods. The four highest ranked regions are Western Bay of Plenty, Rural Canterbury, Marlborough and West Auckland. The four lowest ranked ARs are West Coast, Hutt Valley, Gisborne and Wanganui.

With respect to **Table B.6a**, the first point to note is that there is less stability in the ranking according to the competitive effect than according to the industry mix effect in **Tables B.4a** and **B.4b**. The relative persistence is quantified in **Table B.7**, which compares Spearman's rank correlation coefficients for regional growth rates, the industry mix growth rates and the competitive growth rates across pairs of intercensal periods for both ARs and LMAs. The highest rank correlation coefficients are found for the industry-mix growth rates, which reinforces an earlier point on relatively gradual change across regions in industrial composition. For both the LMAs and the ARs the lowest rank correlation is found for the competitive growth rates, except for comparison of 86/91 with 91/96 where the regional/LMA growth rates themselves have the lowest rank correlation (0.652 and 0.468 for the ARs and LMAs respectively). Nonetheless, all rank correlations are significant at the 1 percent level, illustrating the considerable persistence in the relative importance of the components of employment change across regions.

It should be recalled that the competitive effect is simply residual growth after national growth and industry-mix have been taken into account. By its very nature, such residual growth is more variable. Nonetheless, it is clear that employment growth in for example the Western Bay of Plenty, Rural Canterbury, Marlborough and West Auckland ARs has been much more than could have been expected based on national trends and their sectoral composition (the top four in **Table B.6a**), while ARs such as the West Coast, Hutt Valley, Gisborne and Wanganui have been doing much worse (the bottom four). A similar contrast can be observed with respect to employment growth in the Queenstown, Tauranga, Warkworth, Picton, Blenheim, Thames, Motueka and Kerikeri LMAs (the top eight in **Table B.6b**) compared to that experienced by Invercargill, Gisborne, Hutt Valley, Bulls, Kaikohe, Tokoroa, Taihape and Taumarunui (the bottom eight).

Having now decomposed regional employment growth into the industry-mix and competitive effects, it is useful to assess the extent to which regions are clustered on the basis of common patterns across industries. The next section defines such clusters.

6. Regional Clusters

Given the decomposition of regional FTE employment growth by means of classic shift-share analysis in the previous section, it is useful to assess to what extent there are natural groupings among the regions. For this purpose, we first classify growth effects as positive (1 percent or more), small or negligible (between –1 percent and +1 percent), or negative (–1 percent or less). Combining this division for both the industry-mix and competitive effects yields a three by three matrix, given in **Table B.8**. The outcomes for the 29 ARs have been allocated to the cells of this matrix.

Only two regions have had both positive industry mix and competitive effects (as defined above) on average over the 1986-2001 period. They are North Shore and Auckland City. In a sense, these are one region as employment in the census is recorded at the residential location of the worker and not at the workplace. Many suburban workers on the North Shore of Auckland work in Auckland city. Nonetheless, the result is interesting as it confirms the special role of Auckland in the New Zealand labour market as a traditional growth pole in a national context (Perroux 1950), which has now also extended that role to one of a New Zealand node in a global city system network that links the large-scale urban agglomerations of

developed and newly industrialising economies (see e.g. Poot, 2002). In a sense, Auckland is New Zealand's mega-city, in terms of providing a knowledge-driven, innovation-generating and globally connected economy, although with fulltime-equivalent employment around half a million it remains small by international standards. In any case, there is significant heterogeneity within the Auckland region, with West Auckland and South Auckland having positive competitive effects, but small and negative industry-mix effects respectively. Diagonally opposite the Auckland case is that of rural and peripheral regions. This group of regions has three sub-groups. The first comprises the North Island regions of Northland, South Waikato, Eastern Bay of Plenty and Hawke's Bay. They have in common a relatively large Maori population of more than 20 per cent of the total. Here disadvantage of region is obviously synonymous with disadvantage of people, with Maori more than proportionally employed in less skilled positions in declining industries. To disentangle the supply (occupation) and demand (industry) effects, a multi-factor shift-share analysis will be conducted later in Section 7.

The second group in the bottom right hand corner of **Table B.8** consists of Taranaki and Wairarapa, which are peripheral North Island regions. The third group comprises the South Island regions of West Coast, South Canterbury and Southland which are peripheral rural regions without diversified economies. The region which do well in terms of the competitive effect but not so well in terms of the industry mix effect are South Auckland, North Waikato, Nelson/Tasman, Rural Canterbury and Rural Otago. These are the regions which have had relatively rapid employment growth, but are not specialising in industries that are growing more than the national average.

Another interesting grouping is that of Hutt Valley and Wellington City, which are regions which specialise in industries that are growing more than the national average (public and private services) but with relatively slow employment growth overall. Again given the caveat of employment being recorded at the place of residence rather than the workplace this reflects more limited employment growth in public sector employment in Wellington city rather than the decline in manufacturing employment in the Hutt Valley.

Using the same system of classification for the LMAs yields a similar three by three matrix. However, with the definitions of "significant" growth as in Table B8 above, there is too much bunching of the LMAs in the cells with an industry mix effect of less than -1 percent.. Only two LMAs have had both a positive industry mix and competitive effect on average over 1986-2001. They are the Auckland and Queenstown LMAs. Queenstown's growth has been driven by both its development as a destination for international and local tourism (tourism related activities account for over a third of all business activity in the region) and very strong population growth (Polson Higgs & Co 2002, 18) resulting from both internal and international migration.

It is useful to delve a little deeper into the grouping of regions by considering the competitive effect for each industry separately as calculated by equation (4). **Table B.9a** reports the average of $\left(g_{ij}^{t} - g_{i0}^{t}\right)$ for each industry i and AR j over the three intercensal periods. Clusters of regions have been identified in terms of these data by standard cluster analysis (e.g. Everitt, 1993). The methodology adopted is based on average between-group linkage with similarity defined by means of squared Euclidean distance. The maximum number of clusters was set at nine.

The clusters that resulted are as follows:

1: Western Bay of Plenty; Rural Canterbury

2: Marlborough
3: West Auckland; South Auckland; North Shore; North Waikato; Nelson-Tasman; Rural Otago
4: Auckland City
5: Hamilton/Waipa; Christchurch City; Kapiti/Porirua; Wairarapa; Hawke's Bay; Manawatu
6: South Canterbury; Southland
7: Taupo/Rotorua; Northland; Eastern Bay of Plenty; South Waikato; Taranaki
8: West Coast; Gisborne; Wanganui
9: Dunedin City; Wellington City; Hutt Valley

The dendogram that identifies this and other levels of clustering is given in **Figure B.4**. Given the selected methodology, the resulting clusters are in fact closely correlated with the ranking of the aggregate competitive effect, as given in **Table B.8a**. Thus, Western Bay of Plenty and Rural Canterbury are in one cluster due to having the highest competitive effect, whereas regions such as West Coast, Gisborne and Wanganui are in a cluster of regions with very negative competitive effects.

The clustering is, however, also related to the industry-mix effect. The clusters are indicated in **Table B.8**. This shows that the earlier informal grouping based a cross-tabulation of positive, small or negative industry-mix and competitive effects is consistent with the clustering based on a formal cluster analysis. The latter can be sensitive to the order of variables and the distance measure adopted, so that it is comforting to find that the resulting clusters do permit a straightforward interpretation. The difference between regional sectoral growth and national sectoral growth for each of the nine industries across the 58 LMAs is reported in **Table B.9b**. A formal cluster analysis of the 58 LMAs did not yield an interpretation as straightforward as in **Table B.8** for ARs.

7. A Segmented Labour Market Approach

In a recent article, Mulligan and Molin (2004) extended shift-share analysis by considering employment by industry and occupation. Essentially this assumes that labour markets are segmented into industry by occupation groups. Employment growth for a particular occupation in a particular region will then not only depend on the factors outlined earlier (national growth, industry growth, regional industry composition, region-specific growth) but also on the differences between regions in the industry by occupation matrix. Mulligan and Molin (2004) find that this two-factor approach provides better data for a forecasting model of population change in U.S. communities.

Here we go even further than Mulligan and Molin (2004) and consider a four-dimensional analysis: industry by occupation by age by gender. Allowing for seven occupational groups (see Appendix **Table A.2**) and three age groups (15-24, 25-44, 45-64), a total of 7x7x3x2= 294 groups are generated who are observed in 29 RAs over three intercensal period. The conversion factors to convert part-time employment into full-time equivalents are given in Appendix **Table A.4**.

Applying the classic shift-share model to all 294 groups, rather than the original seven industry groups, generated a set of results that are reported in **Table B.10**. The regions are again ranked from the one with the fasted three-period average growth rate (Western Bay of Plenty, 9.3 percent) to the one with the greatest employment decline (Wanganui, –7.7 percent). It should be noted that the national

effect is not the same for 1991-96 and 1996-01 as in the earlier calculations reported in **Table B3a**. This is due to the exclusion of persons who did not specify their occupation, which carries through to employment by industry totals.

In order to assess the extent to which these result differ from the earlier ones, regions were again labelled in terms of a notable positive industry mix or competitive effect (greater than 1 percent contribution to growth), a small or negligible effect (a contribution to growth between –1 and +1 percent) effect, or a marked negative effect (a downward effect on growth of more than 1 percent). Interestingly, the results are largely the same as before. The only cases in which there are changes are indicated by arrows in **Table B.8**. For example, Auckland city shifts from a positive competitive effect to no competitive effect.

The striking conclusion from **Table B.8** is that despite the much greater level of disaggregation, the classification of regions remains more or less the same as before. Only six of the 29 regions shift along at most one cell. We see that the introduction of occupation by age by sex composition effects has removed the positive competitive effect of Auckland and the negative competitive effect of South Canterbury. However, Hamilton/Waipa now does exhibit a positive competitive effect. The composition or segmented labour market effect now removes the industry-mix advantage of Wellington City, and generates a negative industry mix effect on Marlborough, whereas it removes the negative industry mix effect in Nelson/Tasman.

8. Alternative Formulations

A common criticism of classic shift-share analysis is that in allocating causes of employment change, structural effects (due to differences in the regions between the distribution of employment across sectors) are mixed with regional size effects (due to a region's employment in an industry being small or large relative to national employment in that industry). In simple terms, when the number of persons employed in a particular industry in a particular region is increasing rapidly, this could be due to (i) a buoyant national economy (the national growth rate effect), (ii) rapid national growth in demand for output from that industry (the industry growth rate effect), (iii) slow national growth in demand for output from that industry, but a high proportion of that industry concentrated in that region (a "scale" effect); and (iv) employment creation in the industry having been relatively more than in other regions (the competitive effect). It was noted in the previous section that in classic shift-share analysis, the competitive effect is simply a residual. To separate out the scale effect from a "true" competitive effect, several extensions of the classic model have been suggested in the literature. These are reviewed by Loveridge and Selting (1998).

The scale effect referred to above tends to generate in some applications an inverse correlation between the industry mix effect and the competitive effect. This is particularly the case when the regions are of very different sizes and have very different sectoral compositions. To remove this correlation and account separately for a scale effect and a competitive effect, the extensions to shift share analysis first calculate so-called homothetic employment in industry i and region j, which is the expected level of employment in an industry i in a region j if the distribution of employment in that region across industries is the same as nationwide:

$$EH_{ij}^{t-1} = \frac{E_{i0}^{t-1} E_{0j}^{t-1}}{E_{00}^{t-1}} \tag{7}$$

Using homethetic employment, Esteban-Marquillas (1972) then proceeds to decompose the competitive effect as

$$CE_{ij}^{t} \equiv CEH_{ij}^{t} + AE_{ij}^{t} \equiv \left(g_{ij}^{t} - g_{i0}^{t}\right) \times EH_{ij}^{t-1} + \left(g_{ij}^{t} - g_{i0}^{t}\right) \times \left(E_{ij}^{t-1} - EH_{ij}^{t-1}\right) \tag{8}$$

The homothetic competitive effect CEH_{ij}^{t} measures a region's comparative advantage or disadvantage in industry i relative to the nation. To maintain the accounting identity, a new residual component is introduced, AE_{ij}^{t}, which is referred to by Esteban-Marquillas (1972) as the allocation effect.

The same distinction between homothetic and actual employment can also be made in terms of the industry-mix effect. Together, the resulting accounting identity is referred to as Esteban-Marquillas' (1972) second decomposition (hereafter EM2). Hence

$$E_{ij}^{t} - E_{ij}^{t-1} \equiv \Delta E_{ij}^{t} \equiv NEEM2_{ij}^{t} + IMEM2_{ij}^{t} + CEH_{ij}^{t} + AE_{ij}^{t} \tag{9}$$

$$NEEM2_{ij}^{t} = g_{i0}^{t} \times EH_{ij}^{t-1} \tag{10}$$

$$IMEM2_{ij}^{t} = g_{i0}^{t} \times \left(E_{ij}^{t-1} - EH_{ij}^{t-1}\right) \tag{11}$$

in which $NEEM2_{ij}^{t}$ is the Esteban-Marquillas modified National Growth Effect on industry i in the j^{th} region between times (t-1) and t, $IMEM2_{ij}^{t}$ is the Esteban-Marquillas modified Industry Mix Effect on industry i in the j^{th} region between times (t-1) and t, and CEH_{ij}^{t} and AE_{ij}^{t} are defined as above.

In applications, CEH_{ij}^{t} is generally less correlated with IM_{ij}^{t} than CE_{ij}^{t}. This is considered somewhat of an advantage of the homothetic method, because in this case the industry-mix and competitive effect appear to measure "different" (orthogonal) forces. We shall see that in our application the correlation between IM_{ij}^{t} and CE_{ij}^{t} is already small and statistically insignificant, so that CEH_{ij}^{t} provides little advantage over CE_{ij}^{t}.

It can be shown (Keil, 1992) that the totals aggregated over industries of the revised national effects $NEEM2_{ij}^{t}$ and industry mix effects $IMEM2_{ij}^{t}$ in each region are the same as in the classic decomposition, i.e.

$$\sum_{i} NEEM2_{ij}^{t} = \sum_{i} NE_{ij}^{t} \text{ and } \sum_{i} IMEM2_{ij}^{t} = \sum_{i} IM_{ij}^{t} \tag{12}$$

Consequently, the industry-mix effects reported for each region in Tables 4 and 5 remain the same when using EM2. There are some additional relationships between the classic method and EM2. First, it can be easily seen that CEH_{ij}^{t} is CE_{ij}^{t} divided by the location quotient:

$$CEH_{ij}^{t} = \frac{CE_{ij}^{t}}{LQ_{ij}^{t}} \tag{13}$$

in which the location quotient CE_{ij}^{t} is defined as the ratio of the share of industry *i* in region *j* over the share of industry *i* in the nation. The variance in CE_{ij}^{t} can be large at high levels of industrial disaggregation when some location quotients may be close to zero.

Also using the idea of homothetic employment, Bishop and Simpson (1972) modify equations (2) and (3) to calculate alternative national growth and industry-mix effects as follows:

$$\Delta E_{ij}^{t} \equiv E_{ij}^{t} - E_{ij}^{t-1} \equiv NEBIS_{ij}^{t} + IMBIS_{ij}^{t} + CE_{ij}^{t} \tag{14}$$

$$NEBIS_{ij}^{t} \equiv g_{00}^{t} \times E_{ij}^{t-1} + \left(g_{i0}^{t} - g_{00}^{t}\right) \times EH_{ij}^{t-1} \tag{15}$$

$$IMBIS_{ij}^{t} \equiv \left(g_{i0}^{t} - g_{00}^{t}\right) \times \left(E_{ij}^{t-1} - EH_{ij}^{t-1}\right) \tag{16}$$

in which $NEBIS_{ij}^{t}$ is the Bishop-Simpson modified National Growth Effect on industry *i* in the j^{th} region between times (*t*-1) and *t*, and $IMBIS_{ij}^{t}$ is the Bishop-Simpson modified Industry Mix Effect on industry *i* in the j^{th} region between times (*t*-1) and *t*.

Some further extensions of the EM2 decomposition given in equation (9) above were proposed by Arcelus (1984). This involves essentially the introduction of further homothetic and region-specific components. However, as noted by Loveridge and Selting (1998), the disadvantage of the additional complexity outweighs the benefits of these extensions in practical applications.

In order to gauge how closely related the different measures that were introduced above are, Pearson correlation coefficient have been calculated for each period and each measure with 7 industries and 29 regions, i.e. 203 observations per period.. This analysis was repeated for the 58 LMAs with 9 industries, i.e. 522 observations per period. The results are given in **Table B.11a** for the ARs and **B.11b** for the LMAs**.**

The results are similar to those of Loveridge and Selting (1998) for 77 industries across 87 counties of the state of Minnesota over the period 1979-88. That is, the correlation between alternative measures for the same effect is very high. *IM* is highly correlated with *IMBIS* and *IMEM2*; *CE* is highly correlated with *AE*, and NEBIS is highly correlated with NEEM2. Moreover, *IM* and *CE* are largely uncorrelated (except among LMAs for 1996-96).

The conclusions are straightforward. There is no gain in measuring the industry-mix effects by *IMBIS* or *IMEM2*. The much more easily interpretable IM effect generates similar numbers. Similarly, CE and CEH appear to provide the same information.

All the models above can be referred to as accounting-based models. Employment change in each region is decomposed into a set of deterministic components. There are no stochastic elements. Knudsen (2000) reviews probabilistic forms of shift-share analysis, such as analysis of variance (ANOVA) models and information-theoretic models. These have some advantages over the accounting methods in that it is straightforward to carry out hypothesis tests about the estimated

parameters, such as specific industry or regional effects. However, it can be shown that there is a close relationship between the various approaches. For example, Berzeg (1984) shows that ANOVA models estimated with weighted least squares (WLS) may generate identical effects to those of the classic shift-share model. Generally speaking, the type of information used in shift-share analysis is of the form of a panel of grouped data: groups of workers (by industry etc.) observed in different region over time. It is clear that panel models for grouped data are directly applicable. These econometric methodologies are not pursued here, but in the next section we introduce a simple regression model to identify a major factor that can be linked to the competitive effect.

9. A Regression Model of the Competitive Effect

So far this analysis has been purely descriptive. Causal effects such as national growth and industry-mix were identified but not formally tested in a statistical model. In this section we make a first start at causal linkages by assessing the relationship between the regional competitive effect on regional employment change and regional net migration.

Net migration consists of the sum of net internal and net international migration. This is not directly observed at the regional level but must be estimated. Census data on residence at the time of the previous census provide data on inward internal and international migration, internal outward migration, but outward international migration must be imputed. Since each census provides data on usually resident population in each region, it would seem straightforward to calculate total net migration as total population change minus natural increase. However, data on births and deaths at the regional level are not easily linked to generate good estimates of regional natural increase. A more straightforward method for estimating regional net migration is the Census Survival Rate (CSR) method. However, it should be noted that this method is not robust to significant regional variation in international immigration rates as is indeed present in New Zealand. For estimates of regional net migration based on deriving net migration from population change minus estimates of natural increase, see Poot (2005).

The CSR method is a method to estimate internal migration by following cohorts across successive censuses. The CSR is the ratio of the population aged $x+n$ at the second census to that aged x at the first census, where the censuses are taken n years apart. In New Zealand, $n = 5$. Thus, CSR $s_{x,g}^{x+n} = \dfrac{P_{x+n,NZ,g}^{t+n}}{P_{x,NZ,g}^{t}}$, where t is the date of the first census, x is age at the first census, and P is population of gender g (= m, f) (Siegel and Swanson, 2004, p.506). The ratios are then applied to the population of each region i from the first census to estimate the level of net migration M of age group $x+n$ and gender g: $M_{x+n,i,g} = P_{x+n,g}^{t+n} - s_{x,g}^{x+n} P_{x,i,g}^{t}$.

This method can be used for all ages except for children born in the period between the two census years. For children aged 0-4, area-specific children to women ratios from the second census were used to calculate net migration $M_{0-4,i,g} = 0.5 \times \dfrac{P_{0-4,i,g}^{t+n}}{P_{15-44,i,f}^{t+n}} \times M_{15-44,i,f}$ (i.e. this implies that half of the births to migrant women are assumed to occurred after migration).

The net migration estimates as a rate of the population at the beginning of the intercensal period are reported in **Table B.12a** and **B.12b** for ARs and LMAs respectively. They are also depicted for ARs in **Figure B.5**. For ARs these estimates have been done for both the total population and for the age group 15-64, whereas for LMAs they have been done for the population aged 5 years and over.

The potential causal linkages with regional net migration are investigated by a simple dynamic model that explains the regional competitive effect in terms of its own past (high autocorrelation or persistence) and the past of net migration. By strictly using values from previous intercensal periods, the potential joint endogeneity problem is avoided.

Various model specifications were considered, both with migration of persons aged 15-64 and of total net migration. It was found that a better correlation existed between total net migration and the competitive effect than between net migration of those aged 15-64 and the competitive effect. The relationship between AR average total net migration and the AR average competitive effect is shown in the bivariate scattergram **Figure B.6a**. In terms of calculations of the competitive effect, the original definition based on the seven-industry disaggregation (rather than the 294 segmented labour markets) provided more robust results. For the sake of brevity, only one set of equations will be presented here. These are given in **Table B.13a**.

It can be shown that the estimates given in **Table B.13a** are not time-dependent. It was found that time dummies have no effects on slopes and intercepts. **Table B.13a** suggests that there is persistence in the competitive effect (with an autocorrelation coefficient of 0.347), but much more so in the net migration rate (with an autocorrelation coefficient of 0.974). We saw already earlier that the ranking of the regions based on the competitive effect tended to change somewhat over time. The net migration rates across New Zealand regions are highly correlated over time. It is also clear that regional-specific shocks in the previous intercensal period have no impact on current net migration rates, at least in the simple specification considered here (which nonetheless explains about 78 percent of the variance in net migration rates). The predictive power of the model for the competitive effect is less, but here we see that net migration does have a positive impact with a coefficient of 0.391. The conclusion can be drawn that regions that are successful in attracting additional migrants do generate further employment growth that is reflected in a subsequent competititive effect (i.e. it is unrelated to the industry composition of the region).

A regression analysis of the relationship between net migration and competitive effect was also undertaken at the LMA level. The bivariate relationship between LMA average total net migration and the average competitive effect is shown in the bivariate scattergram **Figure B.6b**. A number of different specifications were considered, including, but not limited to, a range of variables representing human capital, the size of the labour market, density of the labour market (employment per square kilometre) and dependency (one minus the fraction of the total population that is of working age). In all of these models lagged net migration proved to be the single strongest factor in predicting the level of competitive effect. The inclusion of time dummies had no effects on slopes and intercepts. A representative example of the simple regression models used for the LMA level analysis is shown in **Table B.13b.**

There are two features of interest here. Firstly in comparison to the earlier AR model the lagged competitive effect term is no longer significant. This is perhaps unsurprising given the lower level of correlation between the competitive effects in successive intercensal periods for LMAs when compared with ARs**.** Secondly, there is an unexpected sign on the human capital variable (DEG), suggesting that a higher

proportion of degree holding amongst the population is negatively related to the observed competitive effect. It is possible that the use of head count rather than FTE employment may have contributed to this, with part-time employment growth being stronger in areas with lower levels of human capital. The variable that reflects the age structure of the population has the expected negative sign. We would expect that the competitive effect (i.e, region-specific employment growth) is less in regions where there the fraction of people outside the age groups 15 to 64 is relatively large. This effect is not statistically significant at the 10 percent level, however. Overall, it is clear that besides the strong link with net migration there is no easily identifiable regional characteristic that can explain the cross-regional variation in competitive/differential employment growth.

The equation for net migration in Table B.13b suggests again a simple autoregressive process that reflects the persistence in regional net migration rates. None of the other variables were statistically significant in this equation. However, the objective of the exercise was not to generate a fully-specified model of regional net migration rates but to simply assess the causality of the link between net migration and the competitive effect. The results do suggest that this links runs from net migration to the competitive effect.

10. Exploratory Spatial Analysis of Shift Share Components

The aim of this section is to undertake a preliminary analysis of the spatial distribution of the industry mix and competitive effect components of the shift share decomposition. This will be undertaken using a commonly used measure of global spatial auto correlation, Moran's *I*, and the derived measures of local spatial association (LISA) suggested by Anselin (1995).[1]

Spatial autocorrelation is the term used to describe the presence of systematic spatial variation in a variable (Haining, 2001, p.14763). When high or low values of a random variable tend to cluster in space there is said to be positive spatial autocorrelation while when geographical areas tend to be surrounded by neighbours with very dissimilar values and there is negative spatial autocorrelation.

Spatial autocorrelation is important statistically as it poses a major problem for the application of conventional statistics to the analysis of data that are in the form of a geographically-defined cross section, as conventional methods are premised on the random distribution of phenomena in space. Consequently, neglecting the possibility of spatial autocorrelation can lead to seriously biased parameter estimates and a flawed and misleading investigation (O'Sullivan & Unwin, 2003, 28-30). In any case, the essence of much research in the social sciences is the analysis of phenomena that are clustered in space, or as Tobler expresses it in the so called 'first law of geography': *"*Everything is related to everything else, but near things are more related than distant things*"(*Tobler, 1970, p.236*)*. Indeed if the world did not exhibit such spatial autocorrelation, space would not matter and there would be no point in disciplines such as geography (O'Sullivan & Unwin, 2003, 180-181).

A number of alternative measures of spatial autocorrelation exist, Moran's *I* (Moran, 1948), Geary's *c* (Geary, 1954) and the joint-count statistics (Congalton,

[1] Other measures of local spatial association have been suggested, most notably by Getis and Ord (1992).

1988; Griffith, 1987) being amongst the most common. As noted earlier, Moran's *I* forms the basis of this preliminary analysis.

The Moran's *I* statistic may be thought of as a translation of a non-spatial correlation coefficient, such as the Pearson's correlation coefficient, to a spatial context (O'Sullivan & Unwin, 2003, pp. 197-201). Mathematically, the similarity is strong with both the Pearson's correlation coefficient and Moran's *I* having a covariance term as numerator and the sample variance as a denominator. Also like the correlation coefficient, the values of Moran's *I* range from close to +1 meaning strong positive spatial autocorrelation, to 0 meaning a random pattern, to close to -1 indicating strong negative spatial autocorrelation (Oliveau & Guilmoto, 2005). Negative spatial autocorrelation is however rare in spatially referenced data (O'Sullivan & Unwin, 2003, pp. 197-201).

The precise definition of Moran's *I* is given below for a variable z_i, observed at location *i*, with $i = 1, 2, \ldots, n$.

$$I = \frac{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}(z_i - \bar{z})(z_j - \bar{z})}{\sigma^2(z)} \tag{17}$$

where W_{ij} are spatial weights (that add up to 1 when summing over *j*), $\bar{z}$ is the sample mean of *z* and $\sigma^2(z)$ is the sample variance of *z*.

Before scaling to rows with sum 1, the weights are usually 0 everywhere, except for contiguous locations *i* and *j* where they take the value 1. However, an extended definition of this contiguity matrix allows for the computation of Moran's *I* for a wide variety of concepts of both distance and contiguity. Indeed weights matrixes maybe constructed of the basis of any kind of spatial interaction, such as the flow of goods or persons or the regularity of air or train services between places. They are not restricted to linear measures of distance. Bavaud (1998) comprehensively covers many of the theoretical issues at stake in the construction of spatial weights matrixes.

However, the Moran's *I* statistic must be seen as a global statistic in that it provides a summary statistic that allows us to assess whether or not a spatial configuration is autocorrelated as a whole. This tends to average local variations in the strength of spatial autocorrelation and is of little use in identifying areas where values of a variable are significantly more extreme (spatial outliers) or geographically homogenous (clusters, hotspots and cold spots). To remedy this shortcoming a number of local indicators of spatial association (LISA) have been developed, most notably by Getis and Ord (1992) and Anselin (1995). Anselin (1995, p. 94) defines a Local Indicator of Spatial Association (LISA) as any statistic satisfying two criteria:

(i) The LISA for each observation gives an indication of significant spatial clustering of similar values around that observation;
(ii) The sum of the LISA for all observations is proportional to a global indicator of spatial association.

In the case of the local version of Moran's I statistic, the local Moran can be derived easily by rewriting equation (17) as below: [2]

[2] The local version of the Moran's *I*, while currently probably the most popular of the LISA statistics (Oliveau & Guilmoto, 2005), is not the only such measure. A number of other statistics, such as the *G* statistic (Ord & Getis, 1995) also meet Anselin's criteria.

$$I = \frac{1}{n\sigma^2(z)} \sum_{i=1}^{n} \left[(z_i - \bar{z}) \sum_{j=1}^{n} W_{ij}(z_j - \bar{z}) \right] \equiv \frac{1}{n\sigma^2(z)} \sum_{i=1}^{n} I_i \quad (18)$$

The expression in square brackets in equation (18) is referred to as the local Moran statistic, I_i. Anselin (1995, pp. 95-96) discusses several issues related to the assessment of the significance of the local Moran statistic. Firstly, the local Moran's I_i is not approximately normal distributed. This difficultly has been overcome in practice in a relatively straightforward manner by using a conditional randomisation or permutation approach to yield empirical pseudo significance levels (Anselin, 1995, p. 96).

A second complicating factor arises from the fact that the LISA statistics for individual locations will tend to be correlated which, along with the related problem of multiple comparisons, will lead to a flawed interpretation of the level of significance. Anselin suggests employing either the Bonferroni or Sidak corrections to account for the multiple comparisons. However, the assumption of multivariate normality in the case of the Sidak correction is unlikely to be met by spatial data, while the Bonferroni correction may be to conservative (Anselin, 1995, p. 96).[3]
Individual LISA statistics allow areas to be classified into one of five types:

- Locations with high values with similar neighbours: high-high (*hot spots*).
- Locations with low values with similar neighbours: low-low (*cold spots*).
- Locations with high values with low-value neighbours: high-low (*spatial outliers*).
- Locations with low values with high-value neighbours: low-high (*spatial outliers*).
- Locations with no significant local autocorrelation.

Both global and local measures of spatial association can be presented in several graphic formats. The Moran's scatterplot is a plot with the standardised value of the variable of interest in an area, or at a point, on the *x*-axis and the spatial lag on the *y*-axis – the spatial lag being the standardised average value of the variable of interest in the neighbouring areas or points (Anselin, 1996). The slope of a regression line fitted to these points is equal to the Moran's *I* of the spatial configuration in question (Anselin, 2005, p. 127) and the quadrants of the scatter plot correspond to the distinctions made in the classification above.

Statistically significant individual LISA statistics maybe be mapped either according to their level of significance (LISA Significance Maps) or according to the type of spatial association as in the above classification (Anselin, 2005; Anselin et al. 2004).

The analysis conducted here is largely descriptive and consists of presenting Moran's scatter plots, LISA significance and LISA cluster maps for the IM and CE components of the shift share analysis. The values for the IM and CE used were the average of the 3 intercensal periods used in the shift share analysis while the weights matrix used was a simple first order queen's contiguity matrix. The queen's criterion counts as contiguous areas those that have any corners or boundaries in common, as opposed to the rook's criterion which only counts as contiguous those areas which share a common boundary segment (Anselin, 2005, pp. 106-116) or the bishop's

[3] The Bonferroni correction suggests that for an overall significance level of α, the individual significance level must be set to α/m where m is the number of observations. The Sidak correction sets the individual significance level to $1-(1-\alpha)^{1/m}$.

criterion which counts only corners. This spatial weights matrix was generated with the spatial weights functionality of the freely available Geoda software.[4]

The Moran's Scatter Plot for the average IM effect is shown in **Figure B.7a.** The Moran's I is negative (-0.0380), but insignificant (pseudo p = 0.4311). This indicates that there is no overall pattern of spatial association for the IM effect. Inspection of the IM significance (**Figure B.8a**) and IM cluster maps (**Figure B.8b**) show some evidence of local spatial effects with hot spots centred on the South Auckland and Lower Hutt LMAs (see the above classification of LISA clusters) while Tauranga (Hi-Lo), Dunedin (Hi-Lo) and Levin (Lo-Hi) are spatial outliers. However, inspection of the significance map shows that the LISAs for these LMAs are only pseudo significant at the 5 percent level. These pseudo significance levels are uncorrected for the effects of multiple comparisons (see above), suggesting that these results be treated as at best indicative.[5]

For the CE effect, the Moran's scatter plot **(Figure B.7b)** shows a positive (0.1680) and pseudo significant (pseudo p=0.0245) Moran's I indicating the presence of spatial autocorrelation in the spatial configuration of the CE. The CE cluster map (**Figure B.9a**) shows a large cold spot (Lo-Lo) centred on the Stratford and Wanganui LMAs with the Taupo (Hi-Lo) and Gore (Lo-Hi) LMAs being spatial outliers. The CE significance map indicates that the LISAs for the clusters centred on the Stratford and Wanganui LMAs are pseudo significant at the 1 percent level, as is the spatial outlier Taupo.

The analysis above has an interesting economic interpretation. Firstly, the insignificance of the spatial correlation in the case of the industry mix effect suggests that New Zealand LMAs are in a spatial sense uniquely defined in terms of industry structure. Thus, while there are LMAs that have similar industrial structures, these are not in close proximity. This type of spatial configuration suggests that labour market adjustment might require worker migration over significant distances. The research of Choy et al. (2002) does suggest that migration plays a major role in labour market adjustment.

On the other hand, the spatial significance of the competitive effect measures suggests that regionally-specific shocks in employment do spill over to surrounding regions. This can be both through inter-regional inter-industry linkages, as well as final purchases and sales between regions. However, given the way the LMAs have been defined, such employment spillover effects cannot be due to changes in commuters spending in the home region after an employment shock in the work region, as such cross LMA commuting is negligible by design.

The analysis conducted above suggests several further spatially-oriented possible developments of our analysis. Firstly the presence of spatial autocorrelation in the spatial configuration of the CE component of the shift share suggests that our regression analysis of the CE should be modified to account for spatial autocorrelation, or to conduct spatial weighting of the sort suggested by Fotheringham et al (2002).[6] Secondly, the spatial analysis above has ignored the temporal

[4] For details of this software and a comprehensive manual, see http://sal.agecon.uiuc.edu/geodamain.php.

[5] Anselin (2005, p.140) cautions in respect of the GeoDA software "It should be noted that the results for p = 0.05 are somewhat unreliable, since they likely ignore problems associated with multiple comparisons (as a consequence, the true p-value is likely well above 0.05)".

[6] Both methodologies were adopted and compared in a spatial analysis of the inverse relationship between regional wages and unemployment rates by Longhi et al. (forthcoming).

dimension, by averaging the CE and IM shift share components. A spatio-temporal analysis would allow us to explore the change in the spatial structure of IM and CE over time. A starting point for this might be to take up Anselin's suggestion of using time as one variable in a multivariate LISA analysis (Anselin, 2005, pp. 155-164). A more advanced extension would be the development of a formal spatial panel model.

11. Conclusions

In this paper we used classic shift-share analysis and several variants to identify some forces of New Zealand regional employment change over the 1986-2001 period, which included a decade of drastic economic restructuring, liberalisation and reform. The introduction of a regional dimension greatly increases the complexity of any analysis of change. With 29 RAs and 58 LMAs in the present analysis there is a thirty fold and fifty nine fold, respectively, increase in the number of 'stories' to tell about the changes that have taken place in the New Zealand labour market. Shift-share analysis is just a simple technique to make such a description of change more manageable. This is further enhanced by cluster analysis.

In terms of the forces of change, shift-share analysis shows that the national growth effect has been dominant in all regions. No region could escape from the massive national changes that took place since 1986. Industry endowment also played a certain role, but not a major one in terms of its contribution to regional employment growth. Nonetheless, we do find that no region has been going against the trend: where industry mix signalled a disadvantage, the industry-structure was modified in the 'right' direction to ameliorate this disadvantage. The analysis also confirmed that most of the structural change took place during the first five years of the 1986-2001 period. Furthermore, regions exhibited rather spatially unique industry mix effects. Spatial correlation in employment growth due to industry mix is statistically insignificant.

The dichotomisation between the metropolitan regions, and their satellite cities, on the one hand, and the declining peripheral and rural regions on the other that has been identified in earlier research is reinforced here. The clustering highlights the chasm that has developed in New Zealand between metropolitan and other services-oriented regions vis-à-vis rural and peripheral regions. A decline in manufacturing and growth in what Pool et al. (forthcoming) refer to as the quaternary sector (business and financial services, and the knowledge industries of the 'new' economy) have shaped employment outcomes that are confirmed by clusters of prosperity and disadvantage.

The results are quite robust to variation in the techniques employed. These variations introduce the concept of homothetic employment to make a distinction between the effect of change on regions which dominate industries and industries which dominate regions. In the New Zealand case at least, classic shift-share analysis is as informative as its more sophisticated derivatives. In addition, disaggregating further to a four-way classification of employment (by industry, occupation, age and sex) has little effect on the clustering of regions.

After identifying the importance of national effects, industry-mix effects, structural change and a regional competitive effect, we identify at least one process that influences the latter, namely regional population change due to net migration. Regional competitive advantage is clearly linked with net inward migration. Interestingly, regional population growth precedes the competitive component of

employment growth rather than just being a symptom of it. In addition, our spatial analysis suggests that the effect of inward migration on competitive employment growth does spill over to surrounding regions. Here spatial correlation is statistically significant.

Several extensions of the present analysis are possible. By embedding the employment change in a spatial panel econometric model, other factors influencing the competitive effect can be identified. This is an extension of the ANOVA approached pioneered for New Zealand by Patterson (1989). The feasibility of this will depend on the availability of data that relate to regional economic output and capital stock (such as new investment in non-residential buildings, infrastructure, equipment, etc.). The usefulness of the shift-share technique (particularly in its multi-factor generalisation) for forecasting regional employment change, as recently shown by Mulligan and Molin (2004), can also be investigated.

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APPENDIX A Definitions of Industries, Occupations, Regions and Conversion of Part-time Employment into Full-time Equivalent Employment

Table A.1: Industrial Categories and the Concordance over Time

Industry		*NZSIC 87 - 2 digits (1991-1996)*	*ANZSIC96 v4 (2001)*
1	Business and Financial Services	81 Financing 82 Insurance 83 Real Estate and Business Services	K, L except (L774100, L774200, L781000, L783300, L786500, L786600)
2	Public Services, Social Services, Utilities	41 Electricity, Gas and Steam 42 Water Works and Supply 91 Public Administration and Defence 92 Sanitary and Cleaning Services 93 Social and Related Community Services 94 Recreational and Cultural Services 96 International and Extra-Territorial Bodies	D, L781000, L786500, L786600, M, N, O, P, Q961000, Q962100, Q962200, Q962900, Q963
3	Personal, Household, Restaurants and Hotels	63 Restaurants and Hotels 95 Personal and Household Services	G512500, G526, G532200, G532300, H, Q952100, Q952200, Q952300, Q952400, Q952600, Q952900, Q970000
4	Distribution and Exchange (retail and wholesale)	61 Wholesale Trade 62 Retail Trade 71 Transport and Storage 72 Communication	F, G except (G512500, G526, G532200, G532300), I, J, L774100, L774200, Q951100, Q951900
5	Building and Construction	51 Construction of Buildings 52 Construction other than Buildings 53 Ancillary Construction Services	E
6	Manufacturing	31 Food, Beverage, Tobacco 32 Textile, Apparel and Leathergoods 33 Wood Processing and Wood Product Manufacture 34 Manufacturing of Paper and Paper Products; Printing and Publishing 35 Manufacture of Chemicals and of Chemical, Petroleum, Coal, Rubber and Plastic Materials 36 Concrete, Clay, Glass, Plaster, Masonry, Asbestos and Related Mineral Product Manufacture 37 Basic Metal Industries 38 Manufacture of Fabricated Metal Products, Machinery and Equipment 39 Other Manufacturing Industries	C, L783300
7	Primary	11 Agriculture and Hunting 12 Forestry and Logging 13 Fishing 21 Coal Mining 22 Crude Petroleum and Natural Gas Production 23 Metal Ore Mining 29 Other Mining and Quarrying	A, B, Q952500
8	Not Specified	99 Unidentifiable/Not Specified	R

Table A.2: Occupation Categories and Concordance over Time

NZSCO68 (1986-1996)	NZSCO99 v1 (2001)
1 Professional, Technical and Related Workers	2, 31, 32, 3311, 33132, 3314, 33172, 332-338
2 Administrative and Managerial	11, 121, 1221-1225, 1227-1229
3 Clerical and Related Workers	4
4 Sales	12261-12263, 33121, 33131, 33151-33171, 33181, 33191, 52
5 Service	12264-12267, 51, 82641-82644, 82646, 91111
6 Agriculture, Forestry, Fishery and Hunters	6
7-9 Production, Transport, Trades and Elementary	7, 81, 83, 84, 82645, 8261-8263, 8265, 821-825, 827, 828, 91112, 91113, 912-915
Unidentifiable/Not specified	97, 99

Table A.3: Definition of Administrative Regions

Region	Territorial Authority
Northland	Far North
	Whangarei
	Kaipara
North Shore	Rodney (part – as below)
	North Shore
West Auckland	Rodney (part – as below)
	Waitakere
Central Auckland	Auckland
South Auckland	Manukau
	Papakura
	Franklin (part – as below)
North East Waikato	Franklin (part – as below)
	Thames Coromandel
	Hauraki
	Waikato
Central Waikato	Hamilton
	Waipa
Southern Waikato	Matamata-Piako
	Otorohanga
	South Waikato
	Waitomo
Taupo/Rotorua	Taupo
	Rotorua
Western Bay of Plenty	Western Bay of Plenty
	Tauranga
Eastern Bay of Plenty	Whakatane
	Kawerau
	Opotiki
Gisborne	Gisborne
Hawkes Bay	Wairoa

	Hastings
	Napier
	Central Hawkes Bay
	Chatham Islands
Taranaki	New Plymouth
	Stratford
	South Taranaki
Wanganui	Ruapehu
	Wanganui
	Rangitikei
Manawatu	Manawatu
	Palmerston North
	Tararua
	Horowhenua
Kapiti-Porirua	Kapiti Coast
	Porirua
Hutt Valley	Upper Hutt
	Lower Hutt
Wellington City	Wellington
Wairarapa	Masterton
	Carterton
	South Wairarapa
Nelson/Tasman	Tasman
	Nelson
Marlborough	Marlborough
West Coast	Buller
	Grey
	Westland
Christchurch	Christchurch
Rural Canterbury	Kaikoura
	Hurunui
	Waimakariri
	Banks Peninsula
	Selwyn
	Ashburton
South Canterbury	Timaru
	MacKenzie
	Waimate
Dunedin	Dunedin
Rural Otago	Waitaki
	Central Otago
	Clutha
	Queenstown-Lakes
Southland	Southland
	Gore
	Invercargill

Areas units of Franklin

Paerata-Cape Hill	Auckland
Eden Road-Hill Top	Auckland
Buckland	Waikato
Redoubt	Waikato
Opuawhanga	Waikato
Patumahoe	Auckland
Kingseat	Auckland
Pokeno	Waikato
Hunua	Auckland
Mangatawhiri	Waikato
Awhitu	Auckland
Glenbrook	Auckland
Otaua	Waikato
Bombay	Auckland
Whangapouri Creek	Auckland
Runciman	Auckland
Pukekohe North	Auckland
Pukekohe West	Auckland
Bledisloe Park	Auckland
Waiuku	Auckland
South Waiuku	Waikato
Tuakau	Waikato
Onewhero	Waikato

Wards of Rodney District

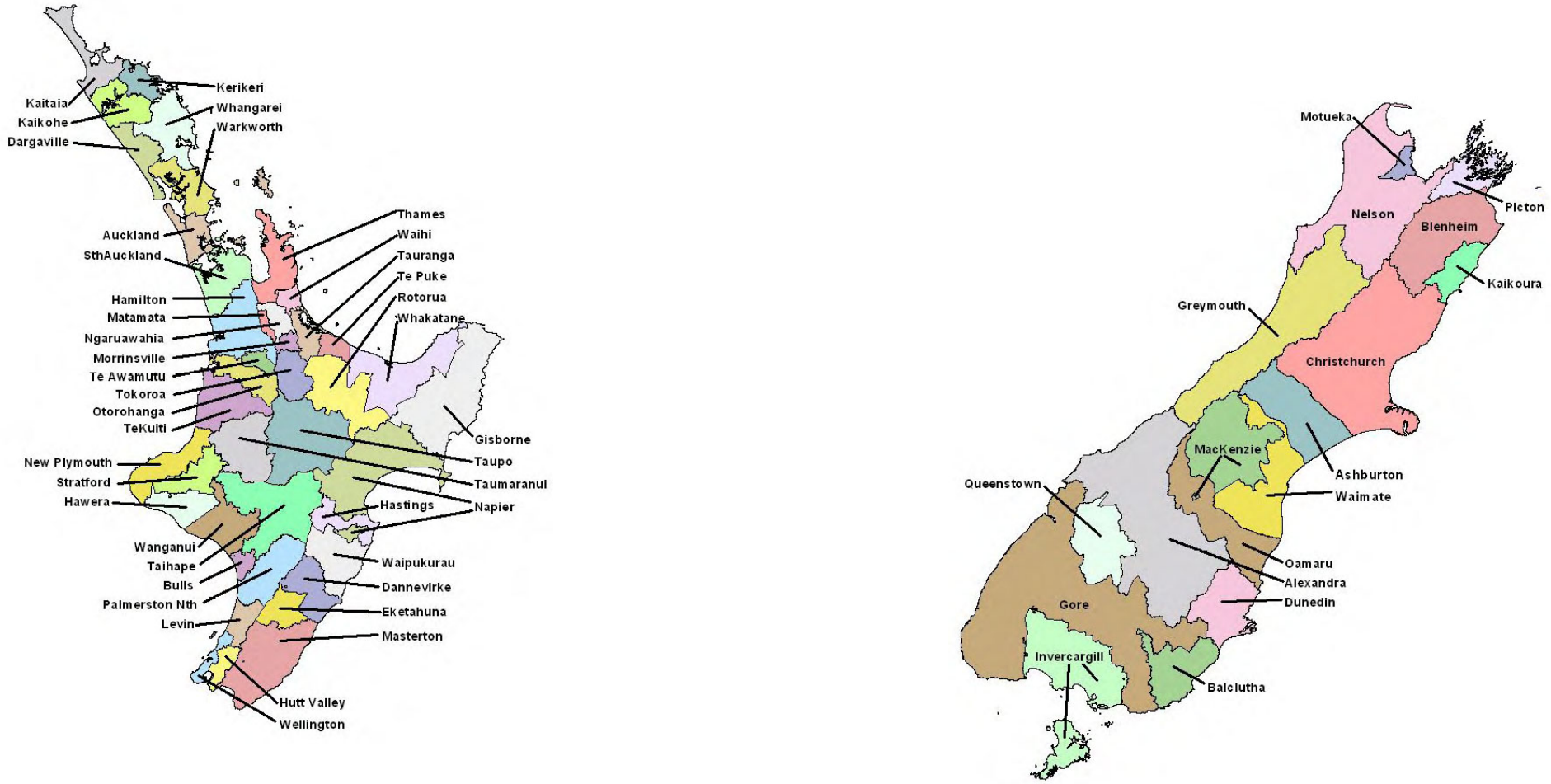
West Auckland	Kumeu Ward
	Helensville Ward
North Shore	Wellsford Ward
	Warkworth Ward
	Matakana Ward
	Wainui Ward
	Hibiscus Coast Ward

Table A.4: Full-time Equivalent Hours of Part-Time Workers by Age and Sex

	Males				Females			
Year	15-24	25-44	45-64	15-64	15-24	25-44	45-64	15-64
1986	0.27	0.34	0.35	0.32	0.31	0.39	0.41	0.39
1991	0.26	0.36	0.35	0.32	0.30	0.38	0.39	0.37
1996	0.25	0.29	0.30	0.27	0.28	0.36	0.37	0.34
2001	0.27	0.31	0.33	0.29	0.30	0.37	0.38	0.36

Figure A.1: New Zealand Regional Boundaries – 29 Administrative Regions

Figure A.2: New Zealand Labour Market Area Boundaries – 58 Labour Market Areas



Source: Maré, D. C., & Timmins, J. (2004). Internal Migration and Regional Labour Markets In New Zealand. Wellington: Motu Economic and Public Policy Research.

APPENDIX B Detailed Results for Administrative Regions and Labour Market Areas

Table B.1: National Total and Full-time Equivalent Employment, 1986-2001

		1986	1986-91	1991-96	1996-01	1986-01
Business and Financial Services[1]	FTE	113,779	29.5	16.8	14.8	73.7
Financial	*Total*	*122,901*	*31.2*	*32.8*	*15.2*	*100.5*
Public Services, Social Services, Utilities	FTE	290,155	2.0	2.5	14.7	19.9
Government and Social Services	*Total*	*357,672*	*3.0*	*1.9*	*15.2*	*20.9*
Utilities	*Total*	*15,693*	*-29.8*	*-19.7*	*-32.6*	*-62.0*
Personal, Household, Restaurants and Hotels	FTE	84,126	-13.6	23.4	5.9	12.9
Distribution and exchange (retail and wholesale)	FTE	312,808	-12.2	7.1	7.9	1.5
Retail and hospitality	*Total*	*292,143*	*-2.7*	*27.9*	*6.7*	*32.9*
Transport and Communications	*Total*	*110,871*	*-23.5*	*2.1*	*3.4*	*-19.2*
Building and Construction	FTE	97,255	-18.8	10.0	10.9	-0.9
Construction	*Total*	*102,033*	*-16.8*	*10.8*	*10.4*	*1.8*
Manufacturing	FTE	297,716	-27.1	-0.8	-3.1	-29.9
Manufacturing	*Total*	*316,137*	*-27.0*	*0.6*	*-3.7*	*29.2*
Primary	FTE	152,889	-14.5	4.3	-3.5	-14.0
Agriculture	*Total*	*161,349*	*-12.1*	*5.5*	*-4.5*	*-11.5*
Mining	*Total*	*6,048*	*-25.6*	*-9.4*	*-17.3*	*-44.2*
Total Employment	**FTE**	**1,348,729**	**-9.7**	**6.6**	**7.5**	**3.4**
Total Employment (excluding not specified industry)	***Total***	***1,484,847***	***-7.6***	***11.4***	***7.0***	***10.2***

[1] Italised text and numbers refers to *Total Employment* while plain text refers to FTE employment**.**

Table B.2a Administrative Region Full-Time Equivalent Employment, 1986-2001

Administrative Region	FTE Employment	Percentage change in employment by period			3 period average change in employment
	1986	1986-91	1991-96	1996-01	1986-01
Western Bay of Plenty	33,151	-5	17.2	18.9	10.4
Rural Canterbury	36,572	-1.7	12.1	14.8	8.4
North Shore	77,929	-0.6	12	9.2	6.9
Marlborough	13,020	-2	13.2	9.1	6.8
West Auckland	61,423	-3	11.5	11.7	6.7
Nelson-Tasman	27,887	-5.7	12.5	7.3	4.7
Auckland City	127,304	-10.1	11.4	12.4	4.6
South Auckland	111,465	-8	9.4	11.3	4.2
Hamilton/Waipa	53,894	-7.1	8.1	8.7	3.2
Kapiti/Porirua	28,490	-5.7	-1.3	15.3	2.8
Rural Otago	27,243	-9.7	11	5.3	2.2
Christchurch City	114,707	-9.2	9.4	6.2	2.1
North Waikato	31,843	-8.3	4.8	8.6	1.7
Wellington City	74,166	-8.2	3.5	8	1.1
Taupo/Rotorua	35,348	-14.8	7.8	3.8	-1.1
Wairarapa	14,460	-12.4	-0.1	9.2	-1.1
Manawatu	56,080	-8.2	2.5	1.2	-1.5
Hawke's Bay	54,261	-12.9	4.1	4.3	-1.5
South Canterbury	21,272	-14.6	5.5	2.3	-2.3
Northland	47,226	-19.8	5.4	7.4	-2.3
Dunedin City	44,226	-12.9	3.6	2.3	-2.3
Hutt Valley	58,312	-11.8	-2.7	3.5	-3.7
Eastern Bay of Plenty	17,059	-18.7	-0.4	4.4	-4.9
Southland	43,053	-12.8	1	-3.4	-5.1
West Coast	13,223	-17.8	1.5	0	-5.4
Taranaki	43,751	-14.6	-0.8	-0.9	-5.4
Gisborne	17,435	-22.5	0.2	3.5	-6.3
South Waikato	31,894	-15.6	-5.1	0.7	-6.7
Wanganui	31,177	-18.2	-2.6	-1.9	-7.6
Total New Zealand	1,347,869	-9.7	6.6	7.5	1.5

Table B.2b Labour Market Area Total Employment, 1986-2001

Labour Market Area	Total employment	Percentage change in employment by period			3 period average change in employment
	1986	1986-91	1991-96	1996-01	
Queenstown	3348	16.3	60.3	15.3	30.6
Tauranga	30441	-0.2	24.9	19.8	14.8
Warkworth	8112	-3.3	19.1	14.1	10.0
Picton	2547	1.5	19.5	8.5	9.8
Blenheim	11961	-0.6	17.7	9	8.7
Kerikeri	6429	-10.2	5.4	28.8	8.0
Auckland	249603	-2.1	16.1	10	8.0
Thames	9759	0.6	14.1	6.6	7.1
Christchurch	155034	-4.7	15.6	8.1	6.3
Nelson	29613	-4.1	15.7	7.2	6.3

SthAuckland	164115	-7.9	13.5	11.5	5.7
Motueka	4797	-4.6	14	6.4	5.3
Taupo	11166	-5.7	14.5	6.9	5.2
Hamilton	67977	-6.2	12.7	8.7	5.1
Ashburton	11229	-5	10.9	7.5	4.5
Kaikoura	1410	-12.6	19.7	6.3	4.5
Wellington	112614	-5.9	7.2	9.1	3.5
Te Awamutu	7167	-6.7	9.7	6	3.0
Te Puke	5571	-10.6	7.7	11.7	2.9
Kaitaia	5088	-12.3	15.5	5.5	2.9
Alexandra	8880	-12.5	12.5	8.1	2.7
Palmerston Nth	43818	-4.4	10.8	0.7	2.4
Morrinsville	3651	-6	7.1	5.8	2.3
Waihi	4992	-9	10.9	4	2.0
Waipukurau	5856	-8.4	10.8	3.1	1.8
Masterton	15225	-10.5	6.7	8	1.4
Dunedin	49995	-10.7	10.5	2.2	0.7
Napier	29301	-13.9	11.5	3.9	0.5
Levin	11457	-6	2.2	5	0.4
Matamata	4482	-8.3	5.7	2.7	0.0
Hastings	25380	-9.2	4.8	4.2	-0.1
Waimate	21885	-11.9	8.7	2.2	-0.3
Whangarei	28503	-18.3	10.7	6.6	-0.3
MacKenzie	2178	-17.1	18.6	-2.9	-0.5
Rotorua	29181	-16.3	11.2	2.6	-0.8
Otorohanga	4152	-11.3	6.4	1.8	-1.0
Whakatane	17079	-14.1	5.8	4.9	-1.1
Balclutha	7179	-11.6	6	1.7	-1.3
Gore	13704	-10.9	8.2	-2.3	-1.7
Hutt Valley	61269	-10.1	1.7	3.3	-1.7
TeKuiti	4524	-15.3	4.5	5.1	-1.9
Oamaru	8472	-9.6	5.7	-2.9	-2.3
Greymouth	10905	-16	8.8	0.3	-2.3
Wanganui	19059	-12.9	2.9	2.5	-2.5
Hawera	9180	-10.8	4.7	-1.7	-2.6
New Plymouth	32571	-11.9	4.3	-1.5	-3.0
Dannevirke	5256	-9	3.4	-4.2	-3.3
Eketahuna	3663	-8	0.2	-2.6	-3.5
Dargaville	4419	-16.4	8.2	-2.6	-3.6
Gisborne	19368	-20.9	6	3.3	-3.9
Invercargill	36141	-12.4	4.1	-4	-4.1
Stratford	5517	-16.4	3.7	-0.1	-4.3
Ngaruawahia	5496	-5.2	-2.8	-6.6	-4.9
Bulls	4731	-12.1	-2.2	-3.8	-6.0
Kaikohe	4653	-23.2	-4.2	6.4	-7.0
Taihape	6900	-22.9	6.7	-10.6	-8.9
Tokoroa	12933	-21.2	-6.6	-2	-9.9
Taumaranui	4911	-19.9	-5.3	-6.4	-10.5
New Zealand	1484847	-7.6	11.4	7	3.6

Table B.3a Classic Shift-Share Decomposition of Administrative Region Full-time Equivalent Employment Growth

	1986-91				1991-96				1996-01			
Administrative Region	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
Western Bay of Plenty	-5.0	-9.7	-0.7	5.4	17.2	6.6	0.0	10.5	18.9	7.5	-0.7	12.1
Rural Canterbury	-1.7	-9.7	-1.9	9.9	12.1	6.6	-0.9	6.3	14.8	7.5	-2.3	9.6
North Shore	-0.6	-9.7	2.6	6.6	12.0	6.6	1.1	4.4	9.2	7.5	1.5	0.2
Marlborough	-2.0	-9.7	-0.2	7.9	13.2	6.6	-0.7	7.3	9.1	7.5	-1.6	3.3
West Auckland	-3.0	-9.7	-1.3	8.1	11.5	6.6	0.1	4.8	11.7	7.5	0.4	3.8
Nelson-Tasman	-5.7	-9.7	-1.0	5.0	12.5	6.6	-0.5	6.3	7.3	7.5	-1.9	1.8
Auckland City	-10.1	-9.7	1.4	-1.8	11.4	6.6	1.1	3.7	12.4	7.5	1.7	3.3
South Auckland	-8.0	-9.7	-3.0	4.7	9.4	6.6	-0.5	3.3	11.3	7.5	-0.5	4.3
Hamilton/Waipa	-7.1	-9.7	1.6	1.0	8.1	6.6	0.0	1.5	8.7	7.5	0.8	0.5
Kapiti/Porirua	-5.7	-9.7	2.4	1.7	-1.3	6.6	0.6	-8.4	15.3	7.5	1.9	6.0
Rural Otago	-9.7	-9.7	-2.3	2.4	11.0	6.6	-0.1	4.5	5.3	7.5	-2.4	0.2
Christchurch City	-9.2	-9.7	0.0	0.6	9.4	6.6	0.1	2.7	6.2	7.5	0.6	-1.8
North Waikato	-8.3	-9.7	-2.2	3.7	4.8	6.6	-0.8	-1.0	8.6	7.5	-2.4	3.5
Wellington City	-8.2	-9.7	7.8	-6.2	3.5	6.6	1.9	-5.0	8.0	7.5	3.9	-3.3
Taupo/Rotorua	-14.8	-9.7	-0.3	-4.8	7.8	6.6	0.6	0.6	3.8	7.5	-0.2	-3.4
Wairarapa	-12.4	-9.7	-1.6	-1.0	-0.1	6.6	-0.5	-6.2	9.2	7.5	-1.6	3.4
Manawatu	-8.2	-9.7	-0.3	1.9	2.5	6.6	-0.9	-3.3	1.2	7.5	-0.4	-5.9
Hawke's Bay	-12.9	-9.7	-1.9	-1.3	4.1	6.6	-0.9	-1.6	4.3	7.5	-1.6	-1.6
South Canterbury	-14.6	-9.7	-1.7	-3.1	5.5	6.6	-0.9	-0.2	2.3	7.5	-2.3	-2.8
Northland	-19.8	-9.7	-1.5	-8.6	5.4	6.6	-0.3	-0.9	7.4	7.5	-1.4	1.3
Dunedin City	-12.9	-9.7	1.3	-4.5	3.6	6.6	0.0	-3.0	2.3	7.5	1.3	-6.4
Hutt Valley	-11.8	-9.7	1.8	-3.8	-2.7	6.6	0.5	-9.9	3.5	7.5	1.8	-5.7
Eastern Bay of Plenty	-18.7	-9.7	-3.7	-5.3	-0.4	6.6	-1.2	-5.8	4.4	7.5	-2.1	-1.0
Southland	-12.8	-9.7	-1.8	-1.2	1.0	6.6	-1.1	-4.5	-3.4	7.5	-2.5	-8.3
West Coast	-17.8	-9.7	-1.6	-6.5	1.5	6.6	-0.2	-4.9	0.0	7.5	-1.7	-5.8
Taranaki	-14.6	-9.7	-1.5	-3.4	-0.8	6.6	-0.9	-6.5	-0.9	7.5	-1.8	-6.6
Gisborne	-22.5	-9.7	-0.6	-12.1	0.2	6.6	-0.8	-5.6	3.5	7.5	-1.3	-2.7
South Waikato	-15.6	-9.7	-3.5	-2.3	-5.1	6.6	-1.4	-10.2	0.7	7.5	-3.9	-2.9
Wanganui	-18.2	-9.7	0.1	-8.6	-2.6	6.6	-0.9	-8.4	-1.9	7.5	-0.5	-8.9

Table B.3b Classic Shift-Share Decomposition of Labour Market Area Total Employment Growth

Labour Market Area	1986-1991				1991-1996				1996-2001			
	ΔE	NE	IM	CE	ΔE	NE	IM	CE	ΔE	NE	IM	CE
Queenstown	16.3	-7.6	2.1	21.8	60.3	11.4	4.8	44.1	15.3	7	1.2	7.1
Tauranga	-0.2	-7.6	0.2	7.2	24.9	11.4	0.3	13.1	19.8	7	-0.2	12.9
Warkworth	-3.3	-7.6	-2.8	7.1	19.1	11.4	-2	9.6	14.1	7	-3.5	10.5
Picton	1.5	-7.6	-3.4	12.6	19.5	11.4	-1.5	9.6	8.5	7	-2.9	4.4
Blenheim	-0.6	-7.6	0.2	6.9	17.7	11.4	-2.1	8.3	9	7	-1.4	3.4
Kerikeri	-10.2	-7.6	-0.6	-2	5.4	11.4	-0.2	-5.9	28.8	7	-0.8	22.5
Auckland	-2.1	-7.6	1.9	3.6	16.1	11.4	2.2	2.5	10	7	1.6	1.4
Thames	0.6	-7.6	-1.7	9.9	14.1	11.4	-1.1	3.7	6.6	7	-1.7	1.3
Christchurch	-4.7	-7.6	-0.2	3.1	15.6	11.4	0.1	4	8.1	7	0.2	0.8
Nelson	-4.1	-7.6	-0.8	4.3	15.7	11.4	-0.9	5.1	7.2	7	-1.2	1.4
SthAuckland	-7.9	-7.6	-2.7	2.5	13.5	11.4	0.1	1.9	11.5	7	-0.4	4.8
Motueka	-4.6	-7.6	-2.6	5.6	14	11.4	-2.5	5	6.4	7	-4.9	4.3
Taupo	-5.7	-7.6	-1.1	3.1	14.5	11.4	-0.5	3.6	6.9	7	-1.5	1.3
Hamilton	-6.2	-7.6	0.5	0.9	12.7	11.4	-0.6	1.9	8.7	7	0.2	1.5
Ashburton	-5	-7.6	-1.8	4.4	10.9	11.4	-1.9	1.4	7.5	7	-3.8	4.2
Kaikoura	-12.6	-7.6	-3	-2	19.7	11.4	-1.8	10	6.3	7	-2.4	1.7
Wellington	-5.9	-7.6	5.8	-4.1	7.2	11.4	2.6	-6.8	9.1	7	3.4	-1.3

Te Awamutu	-6.7	-7.6	1.4	-0.4	9.7	11.4	-1.9	0.1	6	7	-1.1	0
Te Puke	-10.6	-7.6	-3.3	0.3	7.7	11.4	-2.9	-0.8	11.7	7	-4	8.7
Kaitaia	-12.3	-7.6	0.3	-5	15.5	11.4	-1	5.1	5.5	7	-1.7	0.2
Alexandra	-12.5	-7.6	-1.4	-3.5	12.5	11.4	-0.8	1.9	8.1	7	-2.3	3.3
Palmerston Nth	-4.4	-7.6	0.4	2.8	10.8	11.4	-1.1	0.5	0.7	7	0.5	-6.8
Morrinsville	-6	-7.6	-2.4	4	7.1	11.4	-1.9	-2.4	5.8	7	-3.4	2.1
Waihi	-9	-7.6	-2.1	0.8	10.9	11.4	-1.4	0.9	4	7	-2.4	-0.6
Waipukurau	-8.4	-7.6	-3	2.3	10.8	11.4	-3	2.4	3.1	7	-4.7	0.7
Masterton	-10.5	-7.6	-1.5	-1.4	6.7	11.4	-1.3	-3.5	8	7	-1.6	2.5
Dunedin	-10.7	-7.6	1.1	-4.2	10.5	11.4	-0.4	-0.5	2.2	7	1.4	-6.3
Napier	-13.9	-7.6	-1.1	-5.2	11.5	11.4	-1.1	1.1	3.9	7	-0.8	-2.4
Levin	-6	-7.6	-1.8	3.4	2.2	11.4	-2.3	-6.9	5	7	-1	-1.1
Matamata	-8.3	-7.6	-1.4	0.7	5.7	11.4	-1.5	-4.2	2.7	7	-2.5	-1.8
Hastings	-9.2	-7.6	-2.3	0.7	4.8	11.4	-1.4	-5.2	4.2	7	-1.7	-1.1
Waimate	-11.9	-7.6	-1.7	-2.6	8.7	11.4	-1.9	-0.9	2.2	7	-2.2	-2.7
Whangarei	-18.3	-7.6	-1.4	-9.3	10.7	11.4	-0.7	0	6.6	7	-0.6	0.1
MacKenzie	-17.1	-7.6	-1.7	-7.7	18.6	11.4	-1.4	8.6	-2.9	7	-3.6	-6.3
Rotorua	-16.3	-7.6	0.4	-9.2	11.2	11.4	0.3	-0.6	2.6	7	0	-4.5
Otorohanga	-11.3	-7.6	-0.9	-2.8	6.4	11.4	-3.1	-1.9	1.8	7	-4.6	-0.6
Whakatane	-14.1	-7.6	-3.3	-3.2	5.8	11.4	-1.7	-4	4.9	7	-1.8	-0.3
Balclutha	-11.6	-7.6	-4.4	0.5	6	11.4	-3.8	-1.7	1.7	7	-4.9	-0.4
Gore	-10.9	-7.6	-2.8	-0.5	8.2	11.4	-2.5	-0.7	-2.3	7	-4.6	-4.7
Hutt Valley	-10.1	-7.6	1.2	-3.8	1.7	11.4	1.4	-11.1	3.3	7	1.8	-5.5
TeKuiti	-15.3	-7.6	-1.9	-5.8	4.5	11.4	-3.1	-3.9	5.1	7	-4.3	2.4
Oamaru	-9.6	-7.6	-2.6	0.6	5.7	11.4	-2.6	-3.1	-2.9	7	-3.2	-6.7
Greymouth	-16	-7.6	-1.8	-6.6	8.8	11.4	-2.8	0.2	0.3	7	-2.3	-4.5
Wanganui	-12.9	-7.6	-0.2	-5.1	2.9	11.4	-0.8	-7.7	2.5	7	0.2	-4.8
Hawera	-10.8	-7.6	-2.4	-0.8	4.7	11.4	-3.3	-3.4	-1.7	7	-3.9	-4.9
New Plymouth	-11.9	-7.6	-1.6	-2.6	4.3	11.4	-1.8	-5.3	-1.5	7	-1.2	-7.3
Dannevirke	-9	-7.6	-2.1	0.7	3.4	11.4	-3	-5	-4.2	7	-4.5	-6.7
Eketahuna	-8	-7.6	-2.8	2.4	0.2	11.4	-3.4	-7.9	-2.6	7	-4	-5.6
Dargaville	-16.4	-7.6	-2	-6.9	8.2	11.4	-2.5	-0.8	-2.6	7	-4.4	-5.2
Gisborne	-20.9	-7.6	-0.3	-12.9	6	11.4	-1.8	-3.7	3.3	7	-1.3	-2.5
Invercargill	-12.4	-7.6	-1.7	-3.1	4.1	11.4	-2	-5.4	-4	7	-1.7	-9.4
Stratford	-16.4	-7.6	-2.7	-6.2	3.7	11.4	-3.2	-4.5	-0.1	7	-3.8	-3.3
Ngaruawahia	-5.2	-7.6	-2.8	5.3	-2.8	11.4	-4	-10.2	-6.6	7	-5.7	-8
Bulls	-12.1	-7.6	0.4	-4.9	-2.2	11.4	-3.3	-10.3	-3.8	7	-0.6	-10.3
Kaikohe	-23.2	-7.6	-1	-14.6	-4.2	11.4	-1.8	-13.9	6.4	7	-1.5	0.8
Taihape	-22.9	-7.6	1.3	-16.6	6.7	11.4	-3.5	-1.2	-10.6	7	-1.1	-16.6
Tokoroa	-21.2	-7.6	-5.8	-7.8	-6.6	11.4	-3.4	-14.6	-2	7	-3.8	-5.3
Taumaranui	-19.9	-7.6	-1.5	-10.8	-5.3	11.4	-2.2	-14.5	-6.4	7	-2.3	-11.1

Table B.4a Administrative Regions Ranked in Terms of the Industry-Mix Effect

Administrative Region	1986-91		1991-96		1996-01		Average	
	%	Rank	%	Rank	%	Rank	%	Rank
Wellington City	7.8	1	1.9	1	3.9	1	4.5	1
North Shore	2.6	2	1.1	3	1.5	5	1.7	2
Kapiti/Porirua	2.4	3	0.6	5	1.9	2	1.6	3
Auckland City	1.4	6	1.1	2	1.7	4	1.4	4
Hutt Valley	1.8	4	0.5	6	1.8	3	1.4	5
Dunedin City	1.3	7	0.0	11	1.3	6	0.8	6
Hamilton/Waipa	1.6	5	0.0	10	0.8	7	0.8	7
Christchurch City	0.0	9	0.1	7	0.6	8	0.2	8
Taupo/Rotorua	-0.3	11	0.6	4	-0.2	10	0.0	9
West Auckland	-1.3	16	0.1	8	0.4	9	-0.3	10
Wanganui	0.1	8	-0.9	21	-0.5	12	-0.4	11
Western Bay of Plenty	-0.7	14	0.0	9	-0.7	14	-0.4	12
Manawatu	-0.3	12	-0.9	22	-0.4	11	-0.5	13
Marlborough	-0.2	10	-0.7	18	-1.6	19	-0.9	14

Gisborne	-0.6	13	-0.8	20	-1.3	15	-0.9	15
Northland	-1.5	17	-0.3	14	-1.4	16	-1.0	16
Nelson-Tasman	-1.0	15	-0.5	15	-1.9	22	-1.1	17
West Coast	-1.6	19	-0.2	13	-1.7	20	-1.2	18
Wairarapa	-1.6	20	-0.5	17	-1.6	17	-1.2	19
South Auckland	-3.0	27	-0.5	16	-0.5	13	-1.3	20
Taranaki	-1.5	18	-0.9	25	-1.8	21	-1.4	21
Hawke's Bay	-1.9	24	-0.9	26	-1.6	18	-1.5	22
Rural Otago	-2.3	26	-0.1	12	-2.4	27	-1.6	23
South Canterbury	-1.7	21	-0.9	24	-2.3	24	-1.6	24
Rural Canterbury	-1.9	23	-0.9	23	-2.3	25	-1.7	25
North Waikato	-2.2	25	-0.8	19	-2.4	26	-1.8	26
Southland	-1.8	22	-1.1	27	-2.5	28	-1.8	27
Eastern Bay of Plenty	-3.7	29	-1.2	28	-2.1	23	-2.3	28
South Waikato	-3.5	28	-1.4	29	-3.9	29	-2.9	29

Table B.4b Labour Market Areas Ranked in Terms of the Industry-Mix Effect

Labour Market Area	1986-1991		1991-1996		1996-2001		Average	
	%	Rank	%	Rank	%	Rank	%	Rank
Wellington	5.8	1	2.6	2	3.4	1	3.9	1
Queenstown	2.1	2	4.8	1	1.2	5	2.7	2
Auckland	1.9	3	2.2	3	1.6	3	1.9	3
Hutt Valley	1.2	6	1.4	4	1.8	2	1.5	4
Dunedin	1.1	7	-0.4	10	1.4	4	0.7	5
Rotorua	0.4	9	0.3	6	0	10	0.2	6
Tauranga	0.2	13	0.3	5	-0.2	11	0.1	7
Christchurch	-0.2	15	0.1	7	0.2	7	0.1	8
Hamilton	0.5	8	-0.6	12	0.2	9	0	9
Palmerston Nth	0.4	11	-1.1	20	0.5	6	-0.1	10
Wanganui	-0.2	16	-0.8	14	0.2	8	-0.3	11
Te Awamutu	1.4	4	-1.9	32	-1.1	18	-0.5	12
Kerikeri	-0.6	18	-0.2	9	-0.8	16	-0.5	13
Kaitaia	0.3	12	-1	17	-1.7	28	-0.8	14
Whangarei	-1.4	26	-0.7	13	-0.6	13	-0.9	15
Nelson	-0.8	19	-0.9	16	-1.2	21	-1	16
Napier	-1.1	22	-1.1	18	-0.8	15	-1	17
Taupo	-1.1	23	-0.5	11	-1.5	24	-1	19
SthAuckland	-2.7	47	0.1	8	-0.4	12	-1	18
Taihape	1.3	5	-3.5	56	-1.1	19	-1.1	20
Bulls	0.4	10	-3.3	53	-0.6	14	-1.1	22
Blenheim	0.2	14	-2.1	38	-1.4	23	-1.1	21
Gisborne	-0.3	17	-1.8	31	-1.3	22	-1.2	23
Kaikohe	-1	21	-1.8	29	-1.5	25	-1.4	24
Masterton	-1.5	27	-1.3	21	-1.6	26	-1.4	25
Alexandra	-1.4	24	-0.8	15	-2.3	35	-1.5	26
New Plymouth	-1.6	29	-1.8	30	-1.2	20	-1.5	28
Thames	-1.7	33	-1.1	19	-1.7	29	-1.5	27
Levin	-1.8	34	-2.3	40	-1	17	-1.7	29
Matamata	-1.4	25	-1.5	25	-2.5	38	-1.8	32
Invercargill	-1.7	31	-2	36	-1.7	27	-1.8	30
Hastings	-2.3	41	-1.4	24	-1.7	30	-1.8	31
Waimate	-1.7	30	-1.9	35	-2.2	32	-1.9	33
Taumaranui	-1.5	28	-2.2	39	-2.3	34	-2	35
Waihi	-2.1	40	-1.4	22	-2.4	37	-2	34
MacKenzie	-1.7	32	-1.4	23	-3.6	43	-2.3	36

Greymouth	-1.8	36	-2.8	45	-2.3	33	-2.3	38
Whakatane	-3.3	54	-1.7	27	-1.8	31	-2.3	37
Kaikoura	-3	52	-1.8	28	-2.4	36	-2.4	39
Ashburton	-1.8	35	-1.9	33	-3.8	44	-2.5	40
Morrinsville	-2.4	43	-1.9	34	-3.4	41	-2.6	41
Picton	-3.4	56	-1.5	26	-2.9	39	-2.6	42
Oamaru	-2.6	44	-2.6	44	-3.2	40	-2.8	44
Warkworth	-2.8	48	-2	37	-3.5	42	-2.8	43
Otorohanga	-0.9	20	-3.1	50	-4.6	53	-2.9	45
Dargaville	-2	38	-2.5	42	-4.4	51	-3	46
TeKuiti	-1.9	37	-3.1	49	-4.3	50	-3.1	47
Dannevirke	-2.1	39	-3	48	-4.5	52	-3.2	49
Hawera	-2.4	42	-3.3	52	-3.9	47	-3.2	48
Stratford	-2.7	46	-3.2	51	-3.8	46	-3.2	50
Motueka	-2.6	45	-2.5	41	-4.9	57	-3.3	52
Gore	-2.8	51	-2.5	43	-4.6	54	-3.3	51
Eketahuna	-2.8	49	-3.4	54	-4	49	-3.4	54
Te Puke	-3.3	55	-2.9	46	-4	48	-3.4	53
Waipukurau	-3	53	-3	47	-4.7	55	-3.6	55
Ngaruawahia	-2.8	50	-4	58	-5.7	58	-4.2	56
Tokoroa	-5.8	58	-3.4	55	-3.8	45	-4.3	57
Balclutha	-4.4	57	-3.8	57	-4.9	56	-4.4	58

Table B.5a The Modified Industry-Mix and Structural Change Effects on Administrative Region Full-time Equivalent Employment Growth

	Modified Industry Mix Effect				Structural Change Effect			
Administrative Region	1986-91	1991-96	1996-01	Average	1986-91	1991-96	1996-01	Average
Northland	0.9	-0.1	-0.7	0.1	-2.4	-0.2	-0.7	-1.1
North Shore	5.7	1.5	1.9	3.0	-3.1	-0.4	-0.4	-1.3
West Auckland	1.9	0.5	1.0	1.1	-3.1	-0.4	-0.6	-1.4
Auckland City	5.7	1.7	2.3	3.2	-4.2	-0.5	-0.6	-1.8
South Auckland	0.3	0.0	0.1	0.2	-3.3	-0.5	-0.6	-1.5
North Waikato	-0.6	-0.3	-1.5	-0.8	-1.6	-0.4	-0.9	-1.0
Hamilton/Waipa	3.8	0.4	1.1	1.8	-2.2	-0.4	-0.4	-1.0
South Waikato	-2.3	-1.1	-3.4	-2.3	-1.2	-0.3	-0.5	-0.7
Taupo/Rotorua	2.3	0.9	0.1	1.1	-2.6	-0.3	-0.4	-1.1
Western Bay of Plenty	1.0	0.4	-0.1	0.4	-1.7	-0.4	-0.6	-0.9
Eastern Bay of Plenty	-1.3	-0.9	-1.5	-1.2	-2.4	-0.3	-0.6	-1.1
Gisborne	1.0	-0.4	-1.2	-0.2	-1.7	-0.4	-0.1	-0.7
Hawke's Bay	0.2	-0.6	-1.3	-0.6	-2.0	-0.4	-0.3	-0.9
Taranaki	-0.1	-0.5	-1.4	-0.7	-1.4	-0.4	-0.4	-0.7
Wanganui	1.6	-0.5	-0.5	0.2	-1.6	-0.4	0.0	-0.6
Manawatu	1.5	-0.5	0.1	0.4	-1.8	-0.3	-0.5	-0.9
Kapiti/Porirua	5.4	0.9	2.5	2.9	-3.0	-0.3	-0.5	-1.3
Hutt Valley	5.6	0.8	2.3	2.9	-3.8	-0.3	-0.5	-1.5
Wellington City	11.4	2.3	4.1	5.9	-3.6	-0.4	-0.2	-1.4
Wairarapa	1.3	-0.4	-1.1	0.0	-3.0	-0.1	-0.5	-1.2
Nelson-Tasman	0.5	-0.1	-1.2	-0.3	-1.5	-0.4	-0.7	-0.8
Marlborough	0.1	-0.4	-1.8	-0.7	-0.3	-0.3	0.2	-0.2
West Coast	0.3	0.3	-1.3	-0.2	-1.9	-0.5	-0.4	-0.9
Christchurch City	2.9	0.5	1.0	1.5	-2.9	-0.3	-0.4	-1.2
Rural Canterbury	-0.4	-0.4	-1.7	-0.9	-1.5	-0.5	-0.6	-0.8
Dunedin City	4.0	0.4	1.5	2.0	-2.7	-0.4	-0.2	-1.1
Rural Otago	-1.0	0.6	-2.1	-0.8	-1.3	-0.7	-0.3	-0.8
South Canterbury	-0.7	-0.6	-2.2	-1.2	-1.0	-0.3	-0.1	-0.5
Southland	-1.2	-0.6	-2.4	-1.4	-0.6	-0.5	-0.1	-0.4

Table B.5b The Modified Industry-Mix and Structural Change Effects on Labour Market Area Employment Growth

Labour Market Area	Modified Industry Mix Efect			Structural Change Effect		
	1986-91	1991-96	1996-01	1986-91	1991-96	1996-01
Kaitaia	2.1	-0.2	-1	-1.8	-0.9	-0.7
Kerikeri	1.7	2.2	-0.4	-2.3	-2.3	-0.4
Kaikohe	1.9	-1.1	-1.1	-2.9	-0.7	-0.3
Whangarei	1.9	0.6	0.3	-3.4	-1.3	-0.9
Dargaville	-0.8	-1.8	-3.3	-1.1	-0.6	-1.1
Warkworth	-1.3	-1	-2.1	-1.5	-1	-1.4
Auckland	5.5	3.7	2.3	-3.6	-1.5	-0.7
SthAuckland	1	2	0.3	-3.7	-1.9	-0.7
Thames	0	0.6	-1	-1.7	-1.6	-0.7
Waihi	0.2	-0.7	-0.7	-2.4	-0.7	-1.7
Ngaruawahia	-2.6	-2.8	-4.9	-0.2	-1.3	-0.8
Morrinsville	-1.7	-0.7	-2.2	-0.7	-1.2	-1.2
Matamata	-0.4	0.2	-2	-1.1	-1.7	-0.5
Hamilton	3.3	1.3	0.8	-2.8	-1.9	-0.6
Te Awamutu	1.9	-0.3	-0.7	-0.5	-1.6	-0.4
Otorohanga	-0.3	-2.4	-4.1	-0.5	-0.7	-0.5
Tokoroa	-3.4	-2.2	-3.1	-2.4	-1.3	-0.7
TeKuiti	-0.9	-2.3	-3.9	-1	-0.7	-0.4
Taupo	1.4	1.4	-0.3	-2.5	-1.9	-1.2
Te Puke	-1.8	-1.9	-3.4	-1.5	-1	-0.6
Tauranga	2.2	1.6	0.6	-2	-1.3	-0.8
Rotorua	3.3	1.9	0.4	-2.9	-1.6	-0.4
Whakatane	-0.3	-0.6	-1	-3	-1	-0.9
Gisborne	1.5	-0.5	-1	-1.9	-1.3	-0.3
Hastings	0.2	0	-1.2	-2.5	-1.4	-0.6
Napier	1.5	0.2	-0.4	-2.6	-1.3	-0.4
Waipukurau	-1.5	-2.7	-4.1	-1.5	-0.3	-0.6
New Plymouth	0.6	0.2	-0.5	-2.2	-1.9	-0.6
Stratford	-1.4	-1.8	-3.5	-1.3	-1.4	-0.4
Hawera	-1.6	-1.7	-2.9	-0.8	-1.6	-0.9
Taumaranui	0	-1.2	-1.9	-1.6	-1	-0.4
Taihape	2.1	-2.8	-1.6	-0.8	-0.8	0.6
Wanganui	2.3	0.3	0.2	-2.6	-1.1	0.1
Bulls	2.1	-1.5	-0.2	-1.7	-1.8	-0.4
Palmerston Nth	2.8	0.9	1.2	-2.4	-2	-0.7
Dannevirke	-1.7	-2.2	-4.2	-0.4	-0.8	-0.3
Eketahuna	-2.4	-2.1	-3.2	-0.4	-1.3	-0.8
Levin	0.8	-0.6	-0.4	-2.5	-1.7	-0.5
Hutt Valley	5.4	2.7	2.4	-4.2	-1.3	-0.6
Wellington	9.5	3.9	3.8	-3.6	-1.3	-0.4
Masterton	1.9	-0.3	-0.9	-3.3	-0.9	-0.7
Motueka	-1.3	-1.4	-3.6	-1.3	-1.1	-1.3
Nelson	1.5	0.6	-0.5	-2.3	-1.4	-0.7
Picton	-2	0.1	-2	-1.4	-1.6	-0.9
Blenheim	0.8	-0.7	-1.6	-0.6	-1.4	0.2
Kaikoura	-0.9	0.3	-1.6	-2	-2	-0.8
Greymouth	-0.2	-0.9	-1.3	-1.7	-1.9	-1
Christchurch	2.8	1.5	0.8	-3	-1.4	-0.5
Ashburton	-0.7	-0.9	-3.4	-1.1	-1	-0.4
Waimate	-0.2	-0.9	-1.8	-1.5	-1.1	-0.4
MacKenzie	-0.5	0.8	-3	-1.2	-2.2	-0.6
Oamaru	-1.8	-1.5	-2.6	-0.8	-1.1	-0.6
Alexandra	0.7	1	-1.7	-2	-1.8	-0.6
Queenstown	4.4	6.4	1.5	-2.3	-1.7	-0.3

Dunedin	4.3	1.1	1.7	-3.1	-1.6	-0.3
Balclutha	-2.9	-2.8	-4.5	-1.5	-1	-0.4
Gore	-2.1	-1.5	-4.2	-0.7	-1	-0.4
Invercargill	-0.4	-0.1	-1.5	-1.3	-1.9	-0.2

Table B.6a Administrative Regions Ranked In Terms of the Competitive Effect of Shift-Share Analysis

Administrative Region	1986-91		1991-96		1996-01		Average	
	%	Rank	%	Rank	%	Rank	%	Rank
Western Bay of Plenty	5.4	5	10.5	1	12.1	1	9.4	1
Rural Canterbury	9.9	1	6.3	3	9.6	2	8.6	2
Marlborough	7.9	3	7.3	2	3.3	8	6.2	3
West Auckland	8.1	2	4.8	5	3.8	5	5.6	4
Nelson-Tasman	5.0	6	6.3	4	1.8	10	4.4	5
South Auckland	4.7	7	3.3	9	4.3	4	4.1	6
North Shore	6.6	4	4.4	7	0.2	13	3.7	7
Rural Otago	2.4	9	4.5	6	0.2	14	2.4	8
North Waikato	3.7	8	-1.0	15	3.5	6	2.0	9
Auckland City	-1.8	17	3.7	8	3.3	9	1.7	10
Hamilton/Waipa	1.0	12	1.5	11	0.5	12	1.0	11
Christchurch City	0.6	13	2.7	10	-1.8	17	0.5	12
Kapiti/Porirua	1.7	11	-8.4	27	6.0	3	-0.3	13
Wairarapa	-1.0	14	-6.2	24	3.4	7	-1.3	14
Hawke's Bay	-1.3	16	-1.6	16	-1.6	16	-1.5	15
South Canterbury	-3.1	19	-0.2	13	-2.8	19	-2.1	16
Manawatu	1.9	10	-3.3	18	-5.9	25	-2.4	17
Taupo/Rotorua	-4.8	23	0.6	12	-3.4	22	-2.5	18
Northland	-8.6	27	-0.9	14	1.3	11	-2.7	19
Eastern Bay of Plenty	-5.3	24	-5.8	23	-1.0	15	-4.0	20
Dunedin City	-4.5	22	-3.0	17	-6.4	26	-4.6	21
Southland	-1.2	15	-4.5	19	-8.3	28	-4.7	22
Wellington City	-6.2	25	-5.0	21	-3.3	21	-4.8	23
South Waikato	-2.3	18	-10.2	29	-2.9	20	-5.1	24
Taranaki	-3.4	20	-6.5	25	-6.6	27	-5.5	25
West Coast	-6.5	26	-4.9	20	-5.8	24	-5.7	26
Hutt Valley	-3.8	21	-9.9	28	-5.7	23	-6.5	27
Gisborne	-12.1	29	-5.6	22	-2.7	18	-6.8	28
Wanganui	-8.6	28	-8.4	26	-8.9	29	-8.6	29

Table B.6b Labour Market Areas Ranked in Terms of the Competitive Effect of Shift-Share Analysis

Labour Market Area	1986-1991		1991-1996		1996-2001		Average	
	%	Rank	%	Rank	%	Rank	%	Rank
Queenstown	21.8	1	44.1	1	7.1	5	24.4	1
Tauranga	7.2	4	13.1	2	12.9	2	11.1	2
Warkworth	7.1	5	9.6	4	10.5	3	9.1	3
Picton	12.6	2	9.6	5	4.4	7	8.8	4
Blenheim	6.9	6	8.3	7	3.4	10	6.2	5
Thames	9.9	3	3.7	12	1.3	20	5	6
Motueka	5.6	7	5	10	4.3	8	5	7

Kerikeri	-2	33	-5.9	48	22.5	1	4.9	8
Nelson	4.3	10	5.1	8	1.4	18	3.6	9
Ashburton	4.4	9	1.4	19	4.2	9	3.3	10
Kaikoura	-2	32	10	3	1.7	15	3.3	11
SthAuckland	2.5	17	1.9	16	4.8	6	3.1	12
Te Puke	0.3	27	-0.8	30	8.7	4	2.7	13
Taupo	3.1	14	3.6	13	1.3	19	2.7	14
Christchurch	3.1	15	4	11	0.8	21	2.6	15
Auckland	3.6	12	2.5	14	1.4	17	2.5	16
Waipukurau	2.3	19	2.4	15	0.7	23	1.8	17
Hamilton	0.9	20	1.9	18	1.5	16	1.5	18
Morrinsville	4	11	-2.4	35	2.1	14	1.2	19
Alexandra	-3.5	39	1.9	17	3.3	11	0.6	20
Waihi	0.8	21	0.9	21	-0.6	29	0.4	21
Kaitaia	-5	44	5.1	9	0.2	24	0.1	22
Te Awamutu	-0.4	28	0.1	24	0	26	-0.1	23
Balclutha	0.5	26	-1.7	33	-0.4	28	-0.6	24
Masterton	-1.4	31	-3.5	38	2.5	12	-0.8	25
Palmerston Nth	2.8	16	0.5	22	-6.8	52	-1.2	26
Levin	3.4	13	-6.9	50	-1.1	31	-1.6	27
Matamata	0.7	22	-4.2	42	-1.8	34	-1.8	28
Otorohanga	-2.8	36	-1.9	34	-0.6	30	-1.8	29
MacKenzie	-7.7	51	8.6	6	-6.3	49	-1.8	30
Hastings	0.7	24	-5.2	45	-1.1	32	-1.9	31
Gore	-0.5	29	-0.7	28	-4.7	41	-2	32
Waimate	-2.6	34	-0.9	31	-2.7	37	-2	33
Napier	-5.2	46	1.1	20	-2.4	35	-2.2	34
TeKuiti	-5.8	47	-3.9	40	2.4	13	-2.4	35
Whakatane	-3.2	38	-4	41	-0.3	27	-2.5	36
Whangarei	-9.3	54	0	25	0.1	25	-3.1	37
Hawera	-0.8	30	-3.4	37	-4.9	43	-3.1	38
Oamaru	0.6	25	-3.1	36	-6.7	50	-3.1	39
Greymouth	-6.6	49	0.2	23	-4.5	40	-3.6	40
Dunedin	-4.2	42	-0.5	26	-6.3	48	-3.7	41
Dannevirke	0.7	23	-5	44	-6.7	51	-3.7	42
Eketahuna	2.4	18	-7.9	52	-5.6	47	-3.7	43
Wellington	-4.1	41	-6.8	49	-1.3	33	-4.1	44
Dargaville	-6.9	50	-0.8	29	-5.2	44	-4.3	45
Ngaruawahia	5.3	8	-10.2	53	-8	54	-4.3	46
Stratford	-6.2	48	-4.5	43	-3.3	38	-4.7	47
Rotorua	-9.2	53	-0.6	27	-4.5	39	-4.7	48
New Plymouth	-2.6	35	-5.3	46	-7.3	53	-5.1	49
Wanganui	-5.1	45	-7.7	51	-4.8	42	-5.9	50
Invercargill	-3.1	37	-5.4	47	-9.4	55	-6	51
Gisborne	-12.9	56	-3.7	39	-2.5	36	-6.3	52
Hutt Valley	-3.8	40	-11.1	55	-5.5	46	-6.8	53
Bulls	-4.9	43	-10.3	54	-10.3	56	-8.5	54
Kaikohe	-14.6	57	-13.9	56	0.8	22	-9.2	55
Tokoroa	-7.8	52	-14.6	58	-5.3	45	-9.3	56
Taihape	-16.6	58	-1.2	32	-16.6	58	-11.5	57
Taumaranui	-10.8	55	-14.5	57	-11.1	57	-12.1	58

Table B.7: Persistence in Regional Employment Change and its Components

Compare Ranking	Type of data	Regional Growth Rate	Industry Mix Growth Rate	Competitive Growth Rate
86/91 with 91/96	29 ARs	0.652	0.711	0.684
86/91 with 91/96	58 LMAs	0.468	0.583	0.473
91/96 with 96/01	29 ARs	0.608	0.863	0.569
91/96 with 96/01	58 LMAs	0.605	0.767	0.574
86/91 with 96/01	29 ARs	0.706	0.796	0.665
86/91 with 96/01	58 LMAs	0.533	0.794	0.509

Note: The table reports Spearman's Rank Correlation Coefficients. All correlations are significant at the 1% level.

Table B.8: Grouping of 29 Administrative Regions Based on the Competitive and Industry Mix Effects

		Competitive Effect		
		+	**0**	**–**
Industrial Mix Effect	+	Auckland City – c4 (→) North Shore – c3	Kapiti/Porirua – c5	Hutt Valley – c9 (↓) Wellington City – c9
	0	West Auckland – c3 Marlborough – c2 (↓) W Bay of Plenty – c1	(←) Hamilton/Waipa – c5 Christchurch City –c5	Dunedin City – c9 Gisborne – c8 Wanganui – c8 Manawatu – c5 Taupo/Rotorua – c7
	–	Rural Canterbury – c1 South Auckland – c3 North Waikato – c3 Nelson-Tasman – c3 (↑) Rural Otago – c3		Hawke's Bay – c5 Northland – c7 Wairarapa – c5 South Waikato – c7 E Bay of Plenty – c7 Taranaki – c7 West Coast – c8 (←)South Canterbury – c6 Southland – c6

Note: "–" means growth <=–0.01; "0" means –0.01 < growth < 0.01; "+" means growth > 0.01

Table B9a The Difference Between Regional Sectoral Growth and National Sectoral Growth, 1986-2001 Average, 29 Administrative Regions

Administrative Region	Business and Financial Services	Public Services, Social Services, Utilities	Personal, Household, Restaur-ants and Hotels	Distribu-tion and Exchange (Retail and Whole-sale)	Building and Construc-tion	Manu-factur-ing	Primary
Northland	-3.8	0.3	-5.8	-2.0	-9.2	-0.9	-2.1
North Shore	1.8	5.5	2.5	3.8	7.4	3.0	0.3
West Auckland	8.3	10.3	2.2	5.3	10.0	1.1	0.1
Auckland City	8.2	4.4	0.4	2.0	-2.9	-6.3	14.5
South Auckland	6.4	4.5	3.7	9.4	6.1	-1.0	0.2
North Waikato	13.1	1.2	5.9	8.2	6.1	5.0	-6.3
Hamilton/Waipa	-5.0	1.3	1.0	0.9	0.2	4.3	3.5
South Waikato	-7.9	-6.3	-12.6	-5.1	-7.5	-2.3	-4.7
Western Bay of Plenty	8.0	14.0	5.0	9.0	13.9	13.6	0.5
Eastern Bay of Plenty	-3.2	3.8	-7.7	-3.4	-5.3	-6.8	-6.7
Taupo/Rotorua	-6.6	-2.2	-2.2	-0.2	-8.4	3.3	-5.3
Gisborne	-19.9	-6.4	-11.2	-8.3	-8.6	-9.2	1.5
Hawke's Bay	-8.3	-1.7	-4.4	-3.4	-2.2	-0.4	4.4
Taranaki	-5.5	-6.8	-7.0	-7.4	-11.7	0.9	-5.5
Wanganui	-16.5	-11.3	-10.0	-10.7	-15.7	-1.1	-1.8
Manawatu	-7.2	-1.7	-3.6	-3.6	-2.7	-3.1	1.2
Kapiti/Porirua	1.2	1.4	4.1	-2.6	4.1	-5.2	2.3
Hutt Valley	-5.6	-6.3	-5.0	-6.4	-0.3	-10.2	15.7
Wellington City	-4.2	-2.6	0.2	-9.1	-6.1	-6.2	7.8
Wairarapa	-1.6	-0.6	-0.5	-2.7	2.5	-3.0	1.3
Nelson-Tasman	4.7	0.2	5.4	5.3	5.6	7.6	4.2
Marlborough	0.4	-3.6	8.3	-0.9	4.9	23.5	14.3
West Coast	-13.7	-8.7	0.3	-5.2	-7.6	-4.9	-2.9
Christchurch City	0.0	-1.7	4.1	0.5	4.5	1.0	10.0
Rural Canterbury	21.1	5.7	8.2	8.7	17.5	16.7	1.7
South Canterbury	-11.3	-8.5	-6.5	-6.6	-1.4	7.1	4.3
Dunedin City	-15.0	-1.3	1.1	-9.6	-6.8	-1.3	10.8
Rural Otago	6.2	-1.5	7.4	1.3	-3.9	11.3	1.6
Southland	-15.4	-8.8	-9.6	-8.4	-0.2	2.6	-0.2

Table B9b The Difference Between Sectoral Growth and National Sectoral Growth, 1986-2001, 58 Labour Market Areas

Labour Market Area	Agri	Mining	Manuf	Utilities	Constr	Retail & Hosp	Transport & Com	Financial	Govt & Social Services	Total
Kaitaia	-4.5	26.1	54.8	8.1	-26.5	0.0	-18.9	-40.5	2.2	-3.2
Kerikeri	-7.5	32.5	4.5	95.3	22.0	22.1	9.5	37.0	30.5	11.7
Kaikohe	-15.3	77.6	-36.6	27.0	-45.7	-31.6	-37.9	-60.1	-21.4	-31.9
Whangarei	6.4	-3.1	-9.9	0.6	-46.8	-11.5	-16.0	-14.8	2.4	-13.8
Dargaville	-9.3	94.2	2.1	2.0	-44.1	-16.2	-13.6	-47.3	-18.5	-22.1
Warkworth	-6.4	89.7	59.7	-25.0	42.9	49.6	-1.4	96.7	70.9	21.1

Auckland	-11.5	21.4	-3.7	12.1	15.0	7.9	8.8	19.4	15.8	14.8
SthAuckland	-8.4	20.2	-5.5	13.6	16.3	20.4	35.4	36.9	10.0	6.3
Thames	-9.8	101.4	13.6	-0.1	16.5	47.4	29.7	39.6	22.8	12.2
Waihi	2.9	15.1	-6.4	-22.2	-6.0	-3.8	-9.7	19.7	9.3	-5.2
Ngaruawahia	-17.7	94.2	31.8	-22.9	-24.3	-19.1	67.0	-33.3	-29.8	-24.2
Morrinsville	-7.8	-30.8	21.5	-8.0	-3.0	-14.2	37.5	8.2	10.3	-3.7
Matamata	-7.1	-14.1	7.6	-21.3	-8.8	-16.9	-2.5	-59.8	17.9	-10.7
Hamilton	-1.6	-31.4	12.0	-1.9	3.4	7.8	5.4	4.8	4.4	4.7
Te Awamutu	0.3	4.2	16.9	21.1	6.7	11.3	35.7	-36.8	-16.3	-1.7
Otorohanga	-5.3	60.9	38.1	33.4	-13.1	-25.4	19.2	-18.3	-16.6	-14.1
Tokoroa	-11.5	4.2	-23.3	-22.6	-36.2	-44.6	-7.5	-23.7	-27.7	-38.1
TeKuiti	-8.1	-3.3	84.2	20.1	-27.0	-31.1	-27.3	-26.5	-19.8	-17.2
Taupo	-5.3	-39.8	13.8	-13.8	-25.3	19.2	40.2	56.9	14.8	5.3
Te Puke	-11.3	119.2	16.3	-23.7	22.0	16.3	43.2	22.3	45.6	-2.6
Tauranga	5.4	84.2	46.2	0.3	50.0	37.3	23.3	44.2	54.6	39.1
Rotorua	-28.3	2.6	5.1	7.7	-29.7	-18.0	-8.5	-32.9	-11.2	-14.8
Whakatane	-7.1	44.2	-14.0	-17.1	-7.9	-16.7	-10.6	-21.0	18.3	-14.9
Gisborne	3.1	-5.8	-20.1	-16.7	-28.1	-35.1	-14.3	-82.7	-19.1	-23.6
Hastings	17.4	-11.3	-12.7	-7.3	-4.2	-19.8	16.9	-43.8	6.5	-11.0
Napier	8.4	69.2	3.2	-23.2	-10.9	-12.8	-24.6	-34.3	-7.9	-10.5
Waipukurau	9.6	36.6	28.5	-2.3	-19.9	-7.0	-4.0	-22.9	-10.9	-5.5
New Plymouth	-8.1	-4.0	-8.7	-4.5	-34.3	-22.5	-20.6	-48.7	-3.3	-19.6
Stratford	-8.9	7.9	43.1	-25.9	-49.8	-35.6	-30.8	-37.1	-30.7	-23.6
Hawera	-13.1	-22.4	22.7	-19.0	-20.4	-27.4	-11.4	52.3	-30.6	-18.4
Taumaranui	-9.1	-30.8	-37.8	6.7	-37.6	-47.8	-49.6	-87.6	-35.7	-39.2
Taihape	-6.6		20.7	-21.3	-58.5	-37.9	-37.1	-48.7	-57.2	-36.7
Wanganui	-1.9	-40.9	2.9	16.4	-37.9	-22.1	-34.4	-70.9	-14.0	-18.3
Bulls	-3.6	-27.2	-7.5	-9.4	-32.1	-32.0	-23.6	-54.5	-38.1	-27.5
Palmerston Nth	8.4	277.6	-7.9	-14.0	-6.6	0.8	-23.0	-2.4	-2.4	-3.6
Dannevirke	-4.9	-5.8	31.6	-2.3	-24.9	-34.9	-33.4	-56.7	-29.9	-20.0
Eketahuna	-2.1		-14.1	-13.0	-16.3	-21.4	-10.4	-70.5	-3.1	-20.4
Levin	2.2	19.2	-8.5	28.7	11.3	-6.6	-9.9	41.9	-11.7	-9.4
Hutt Valley	3.8	66.5	-22.1	-12.7	0.3	-23.1	-9.0	-28.9	-20.4	-15.7
Wellington	12.4	-21.1	-14.7	21.7	-5.4	-14.6	-20.5	-23.9	-7.0	-0.1
Masterton	1.5	22.8	-9.7	-14.9	7.9	0.2	-14.0	-10.3	1.9	-7.1
Motueka	-3.0	69.2	31.7	-4.7	28.1	32.7	25.5	49.5	39.3	5.5
Nelson	14.2	-15.2	17.5	-10.9	8.5	22.0	9.1	32.6	-2.3	8.8
Picton	11.9		57.9	-13.0	43.2	22.3	-10.6	338.4	37.9	21.5
Blenheim	50.9	24.2	77.0	26.1	14.6	10.1	-16.8	5.6	-11.8	17.4
Kaikoura	-16.6	-35.8	36.2	-38.0	-23.2	55.6	-19.1	156.6	27.7	1.1
Greymouth	3.3	0.1	-2.5	-32.8	-19.2	-7.7	-18.8	-51.8	-24.0	-18.5
Christchurch	8.4	67.9	7.4	9.8	27.2	12.0	9.0	21.6	0.5	8.9
Ashburton	10.4	15.7	51.3	10.9	8.1	-9.4	4.2	0.1	-9.1	3.1
Waimate	15.1	84.2	14.2	-7.4	0.5	-21.4	-24.7	-44.2	-23.9	-12.3
MacKenzie	3.8	44.2	66.7	-9.1	-57.8	-8.8	14.3	174.5	-25.9	-14.7
Oamaru	6.0	52.6	22.5	-25.5	-16.9	-38.6	-21.3	-43.8	-22.6	-17.4
Alexandra	10.0	44.2	57.6	33.2	-54.3	7.3	-4.0	22.1	12.0	-3.7
Queenstown	-6.2	177.6	163.4	82.0	57.0	89.6	105.9	248.8	114.0	104.9
Dunedin	16.1	200.8	-2.9	6.2	-19.4	-14.8	-28.3	-45.7	-5.9	-9.4
Balclutha	3.6	56.7	12.6	-14.0	13.8	-28.7	-5.8	-39.7	-14.1	-14.9
Gore	-2.7	20.4	22.0	-18.4	-8.5	-27.0	6.3	-54.2	-20.1	-16.0
Invercargill	6.1	-35.0	-0.7	-22.9	-14.6	-34.0	-25.8	-65.5	-25.2	-22.7

Table B.10: Four-Factor Shift-Share Analysis Using Industry, Occupation, Age and Sex, 29 Administrative Regions.

Administrative Region	1986-91				1991-96				1996-01			
	ΔE	NE	IM	CE	ΔE	NE	IM	CE	ΔE	NE	IM	CE
Western Bay of Plenty	-5.3	-9.7	-0.9	5.3	17.1	5.6	1.0	10.5	16.2	5.8	-0.2	10.6
Rural Canterbury	-2.1	-9.7	-2.6	10.3	11.7	5.6	-2.3	8.3	12.6	5.8	-2.7	9.5
North Shore	-0.4	-9.7	4.6	4.7	10.8	5.6	2.4	2.8	8.1	5.8	2.4	-0.2
West Auckland	-2.8	-9.7	-1.5	8.3	10.4	5.6	-0.7	5.4	10.3	5.8	-0.6	5.1
Marlborough	-2.0	-9.7	-1.2	9.0	12.3	5.6	-2.2	8.9	6.8	5.8	-2.1	3.1
Auckland City	-9.7	-9.7	3.2	-3.3	10.3	5.6	3.2	1.4	11.7	5.8	4.8	1.1
Nelson-Tasman	-5.3	-9.7	-1.5	5.9	11.5	5.6	0.2	5.7	5.9	5.8	-1.2	1.3
South Auckland	-7.5	-9.7	-3.1	5.2	7.9	5.6	-0.6	2.9	9.6	5.8	-1.1	4.9
Hamilton/Waipa	-7.1	-9.7	1.2	1.3	7.2	5.6	-0.1	1.6	7.2	5.8	0.2	1.2
Kapiti/Porirua	-5.8	-9.7	2.8	1.0	-2.6	5.6	1.0	-9.2	13.6	5.8	2.4	5.5
Christchurch City	-8.9	-9.7	-0.2	0.9	8.3	5.6	-0.1	2.8	5.0	5.8	0.1	-0.9
Rural Otago	-10.0	-9.7	-3.1	2.8	10.6	5.6	-0.9	5.9	3.1	5.8	-3.3	0.6
North Waikato	-9.0	-9.7	-3.3	4.0	4.6	5.6	-0.9	-0.2	6.2	5.8	-2.1	2.5
Wellington City	-7.9	-9.7	9.7	-8.0	2.0	5.6	3.5	-7.2	7.1	5.8	7.0	-5.7
Taupo/Lakes	-14.8	-9.7	-0.1	-5.1	7.3	5.6	1.1	0.6	2.0	5.8	0.5	-4.3
Wairarapa	-12.1	-9.7	-2.1	-0.3	-1.2	5.6	-1.7	-5.2	6.9	5.8	-0.9	2.1
Hawke's Bay	-13.0	-9.7	-2.4	-0.9	3.5	5.6	-0.7	-1.5	2.1	5.8	-1.9	-1.8
Manawatu	-8.3	-9.7	-1.4	2.8	1.8	5.6	-2.3	-1.6	-1.0	5.8	-2.4	-4.4
Dunedin City	-12.8	-9.7	0.8	-3.9	2.5	5.6	-0.9	-2.2	1.3	5.8	0.0	-4.5
South Canterbury	-14.7	-9.7	-2.6	-2.4	4.4	5.6	-2.3	1.1	0.8	5.8	-4.1	-1.0
Northland	-20.3	-9.7	-1.6	-8.9	4.7	5.6	-0.8	-0.2	5.0	5.8	-1.8	1.0
Hutt Valley	-11.3	-9.7	2.0	-3.6	-3.9	5.6	0.0	-9.6	1.9	5.8	0.9	-4.8
Eastern Bay of Plenty	-19.2	-9.7	-3.8	-5.8	-1.0	5.6	-0.2	-6.5	2.2	5.8	-3.1	-0.5
Southland	-13.0	-9.7	-3.0	-0.3	0.5	5.6	-2.8	-2.4	-5.6	5.8	-3.9	-7.5
West Coast	-17.5	-9.7	-2.8	-5.0	0.7	5.6	0.5	-5.4	-1.6	5.8	-2.2	-5.2
Taranaki	-14.6	-9.7	-2.4	-2.5	-1.5	5.6	-1.6	-5.6	-3.8	5.8	-2.9	-6.6
Gisborne	-23.1	-9.7	-1.7	-11.7	-0.8	5.6	-1.4	-5.0	1.9	5.8	-1.9	-2.0
South Waikato	-15.9	-9.7	-4.9	-1.3	-5.8	5.6	-2.8	-8.6	-1.8	5.8	-6.3	-1.3
Wanganui	-18.7	-9.7	-1.7	-7.3	-3.1	5.6	-3.0	-5.7	-4.2	5.8	-3.0	-7.0

Table B.11a Simple Correlations between Shift-Share Components, 29 Administrative Regions

1986-1991

	IM	*CE*	*CEH*	*AE*	*NEBIS*	*IMBIS*	*NEEM2*	*IMEM2*
IM	1							
CE	-0.110	1						
CEH	-0.092	**0.716**	1					
AE	-0.104	**0.980**	**0.563**	1				
NEBIS	**0.545**	-0.070	**-0.330**	0.011	1			
IMBIS	**0.947**	-0.100	0.020	-0.124	**0.245**	1		
NEEM2	**0.580**	-0.048	*-0.169*	-0.008	**0.952**	**0.304**	1	
IMEM2	**0.960**	-0.111	-0.049	-0.117	**0.304**	**0.993**	**0.327**	1

1991-1996

	IM	*CE*	*CEH*	*AE*	*NEBIS*	*IMBIS*	*NEEM2*	*IMEM2*
IM	1							
CE	-0.063	1						
CEH	-0.098	**0.788**	1					
AE	-0.054	**0.993**	**0.712**	1				
NEBIS	**0.555**	-0.065	**-0.465**	0.012	1			
IMBIS	**0.967**	-0.052	0.031	-0.064	**0.325**	1		
NEEM2	**0.344**	-0.060	**-0.454**	0.016	**0.891**	0.119	1	
IMEM2	**0.936**	-0.045	0.066	-0.063	**0.256**	**0.985**	-0.009	1

1996-2001

	IM	*CE*	*CEH*	*AE*	*NEBIS*	*IMBIS*	*NEEM2*	*IMEM2*
IM	1							
CE	*-0.155*	1						
CEH	-0.056	**0.791**	1					
AE	*-0.168*	**0.992**	**0.705**	1				
NEBIS	**0.689**	-0.037	**0.222**	-0.089	1			
IMBIS	**0.974**	*-0.173*	-0.136	*-0.172*	**0.509**	1		
NEEM2	**0.554**	0.013	**0.328**	-0.054	**0.848**	**0.396**	1	
IMEM2	**0.928**	**-0.188**	**-0.213**	*-0.173*	**0.431**	**0.969**	**0.204**	1

Notes: *n* = 203. **Bold - Significant at 1% level (2 tailed)** *Italics - Significant at 5% level (2 tailed)*
Correlation coefficients greater than 0.8 or less than -0.8 are underlined.

Table B.11b Simple Correlations between Shift-Share Components, 58 Labour Market Areas

1986-1991

	IM	*CE*	*CEH*	*AE*	*NEBIS*	*IMBIS*	*NEEM2*	*IMEM2*
IM	1							
CE	-.049	1						
CEH	.097	**.926**	1					
AE	-.099	-.203	**-.557**	1				
NEBIS	.240	**.920**	**.866**	-.240	1			
IMBIS	**.998**	-.105	.049	-.092	.189	1		
NEEM2	.198	**.951**	**.892**	-.237	**.945**	.143	1	
IMEM2	**.997**	.031	.164	-.113	*.316*	**.991**	*-.274*	1

1991-1996

	IM	*CE*	*CEH*	*AE*	*NEBIS*	*IMBIS*	*NEEM2*	*IMEM2*
IM	1							
CE	**.500**	1						
CEH	**.433**	**.962**	1					
AE	-.117	**-.514**	**-.727**	1				
NEBIS	**.515**	**.921**	**.890**	**-.490**	1			
IMBIS	**.999**	**.468**	**.402**	-.098	**.487**	1		
NEEM2	**.631**	**.986**	**.941**	**-.482**	**.919**	**.602**	1	
IMEM2	**.935**	.161	.103	.075	.209	**.947**	*.316*	1

1996-2001

	IM	*CE*	*CEH*	*AE*	*NEBIS*	*IMBIS*	*NEEM2*	*IMEM2*
IM	1							
CE	.049	1						
CEH	.076	**.958**	1					
AE	-.090	**-.478**	**-.711**	1				
NEBIS	.173	**.672**	**.667**	**-.392**	1			
IMBIS	**.999**	.040	.067	-.086	.168	1		
NEEM2	*.333*	**.951**	**.922**	**-.491**	**.700**	*.325*	1	
IMEM2	**.992**	-.073	-.040	-.036	.092	**.993**	.217	1

Notes: **Bold - Significant at 1% level (2 tailed)** *Italics - Significant at 5% level (2 tailed)*
Correlation coefficients of 0.8 or above are underlined

Table B.12a Net Migration as a Percentage of Initial Population Using the Census Survivorship Method, 29 Administrative Regions

	Total			15-64		
	1986-91	1991-96	1996-01	1986-91	1991-96	1996-01
Northland	-1.9	-0.4	-1.7	-3.8	-1.5	-2.3
North Shore	7.1	8.9	4.9	7.6	8.2	4.5
West Auckland	5.6	4.0	5.8	6.9	4.4	7.2
Auckland City	2.6	6.8	3.7	5.1	9.7	6.5
South Auckland	4.1	1.9	4.0	3.6	1.5	4.2
North Waikato	1.2	-0.7	-2.5	1.4	-1.5	-2.9
Central Waikato	1.9	0.9	1.8	1.7	0.9	1.2
South Waikato	-9.6	-11.6	-8.4	-11.5	-13.1	-9.9
Taupo/Rotorua	-2.0	-3.2	-4.1	-2.8	-3.5	-4.1
Western Bay of Plenty	9.8	10.7	11.9	9.6	10.6	11.5
Eastern Bay of Plenty	-4.1	-8.3	-8.1	-5.6	-10.3	-9.5
Gisborne	-8.4	-5.7	-9.0	-9.7	-6.7	-10.3
Hawke's Bay	-4.7	-4.1	-3.3	-6.3	-5.2	-4.6
Taranaki	-5.3	-7.5	-6.3	-6.9	-9.1	-8.6
Wanganui	-7.2	-7.8	-10.3	-8.5	-8.8	-11.9
Manawatu	0.3	-4.0	-4.8	0.4	-4.6	-6.4
Kapiti/Porirua	2.8	-3.4	1.4	3.5	-4.3	1.3
Hutt Valley	-3.9	-7.2	-4.5	-3.5	-8.0	-4.6
Wellington City	-1.4	-0.4	1.0	0.5	1.2	3.0
Wairarapa	-0.6	-7.2	-3.5	-1.7	-9.1	-4.5
Nelson/Tasman	2.1	5.0	3.7	1.3	5.0	2.7
Marlborough	2.8	3.3	1.1	2.7	2.7	0.5
West Coast	-7.8	-4.4	-9.1	-8.2	-4.6	-10.0
Rural Canterbury	0.3	3.6	4.6	0.2	4.3	4.0
Christchurch City	1.2	1.9	0.9	1.5	2.4	1.0
South Canterbury	-4.4	-4.4	-4.1	-6.4	-5.6	-5.8
Dunedin City	-0.4	-1.3	-3.6	0.4	-0.7	-3.9
Rural Otago	-4.7	-0.2	-2.1	-5.7	0.1	-2.2
Southland	-7.8	-9.9	-9.0	-9.2	-11.5	-10.7

Table B.12b Net Migration as a Percentage of Initial Population Using the Census Survivorship Method, 58 Labour Market Areas

	% Net Migration 5+		
lma	**1986-91**	**1991-96**	**1996-2001**
Kaitaia	6.1	2.9	-0.9
Kerikeri	3.3	10.6	7.5
Kaikohe	-1.7	-4.3	-8.0
Whangarei	-3.2	0.6	-0.1
Dargaville	-6.2	-9.1	-3.3
Warkworth	6.0	5.7	8.3
Auckland	5.6	8.6	6.6
SthAuckland	3.7	3.6	4.1
Thames	9.4	7.3	1.6
Waihi	7.3	-0.5	-2.8
Ngaruawahia	-6.1	-11.9	-8.5
Morrinsville	0.3	-5.2	0.3
Matamata	-3.7	-6.3	-0.7
Hamilton	1.2	1.0	2.5
Te Awamutu	1.0	-2.2	-2.8
Otorohanga	-7.5	-2.3	-7.9
Tokoroa	-15.0	-17.1	-13.1
TeKuiti	-9.6	-12.7	-6.8
Taupo	-1.1	2.4	-0.2
Te Puke	1.4	0.6	2.5
Tauranga	12.6	14.7	16.5
Rotorua	-2.9	-4.9	-5.2
Whakatane	-1.7	-6.6	-6.3
Gisborne	-7.7	-4.8	-7.9
Hastings	-2.3	-3.9	-1.2
Napier	-4.4	-1.5	-2.0
Waipukurau	-6.8	-5.1	-3.7
New Plymouth	-2.6	-4.4	-3.4
Stratford	-7.9	-11.5	-6.4
Hawera	-6.5	-9.7	-8.9
Taumaranui	-13.9	-13.5	-16.3
Taihape	-22.1	-10.7	-19.6
Wanganui	-0.3	-4.1	-4.2
Bulls	-6.5	-6.8	-10.4
Palmerston Nth	3.1	-1.1	-3.0
Dannevirke	-6.5	-10.0	-9.0
Eketahuna	-4.1	-13.2	-8.0
Levin	5.0	-1.2	0.7
Hutt Valley	-3.3	-6.6	-3.6
Wellington	0.3	-0.8	2.2
Masterton	0.7	-5.3	-1.5
Motueka	3.3	4.8	4.2
Nelson	2.3	5.5	4.0
Picton	7.1	12.3	0.0
Blenheim	3.6	3.3	3.4
Kaikoura	-4.8	1.8	-1.0
Greymouth	-7.8	-2.2	-7.1

Christchurch	2.5	4.2	3.6
Ashburton	-1.4	-1.9	1.9
Waimate	-2.1	-3.1	-1.4
MacKenzie	-13.1	0.7	-13.0
Oamaru	-1.9	-3.8	-4.2
Alexandra	-8.3	0.4	3.7
Queenstown	21.7	41.1	12.7
Dunedin	0.7	0.2	-2.0
Balclutha	-7.8	-8.1	-5.6
Gore	-9.9	-7.1	-8.0
Invercargill	-6.4	-9.7	-8.1

Table B.13a A Simple Dynamic Model of Net Migration and the Shift-Share Competitive Effect, 29 Administrative Regions

	Constant	CE_{t-1}	NM_{t-1}	R^2	Obs
CE_t	0.046	*0.347*	*0.391*	0.494	58
	(0.087)	(2.220)	(2.263)		
NM_t	-0.371	-0.052	**0.974**	0.778	58
	(-1.029)	(-0.483)	(8.632)		

Notes : *t* statistics in parentheses ;
Bold indicates significance at the 1% level
Italic indicates significance at the 5% level

CE_t = Competitive effect current period
CE_{t-1} = Competitive effect previous period
NM_t = Net migration rate current period
NM_{t-1} = Net migration rate previous period

Table B.13b A Simple Dynamic Model of Net Migration and the Shift-Share Competitive Effect, 58 Labour Market Areas

	Constant	CE_{t-1}	NM_{t-1}	DEG	NWA	R^2	Obs
CE_t	22.792	-0.023	**0.578**	*-0.888*	-53.565	0.378	116
	(1.714)	(-.164)	(4.498)	(-2.143)	(-1.589)		
NM_t	0.067	-0.001	**0.780**	0.089	-0.211	0.602	116
	(.603)	(-.727)	(7.282)	(.258)	(-.752)		

Notes : *t* statistics in parentheses ;
Bold indicates significance at the 1% level
Italics indicates significance at the 5% level

CE_t = Competitive effect current period.
CE_{t-1} = Competitive effect previous period.
NM_t = Net migration rate current period
NM_{t-1} = Net migration rate previous period.
DEG = Proportion usually resident population with a degree at the beginning of current period.
NWA = Proportion usually resident population not in working age population at the beginning of current period.

Figure B.1 Average Full-time Equivalent Employment Growth in 29 Administrative Regions 1986-2001

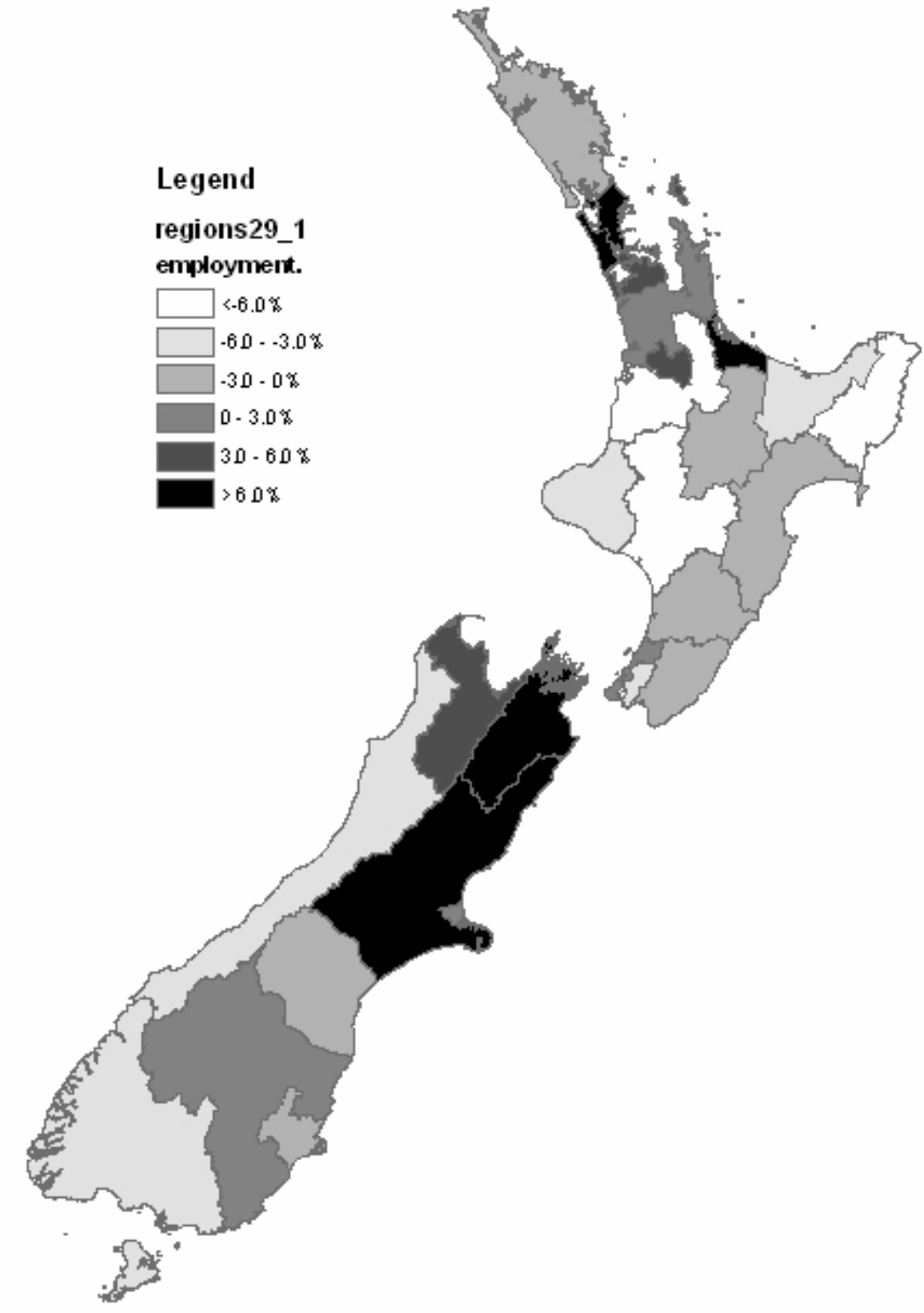


Figure B.2 Average Industry-Mix Effect from Shift-Share Analysis, 29 Administrative Regions, 1986-2001

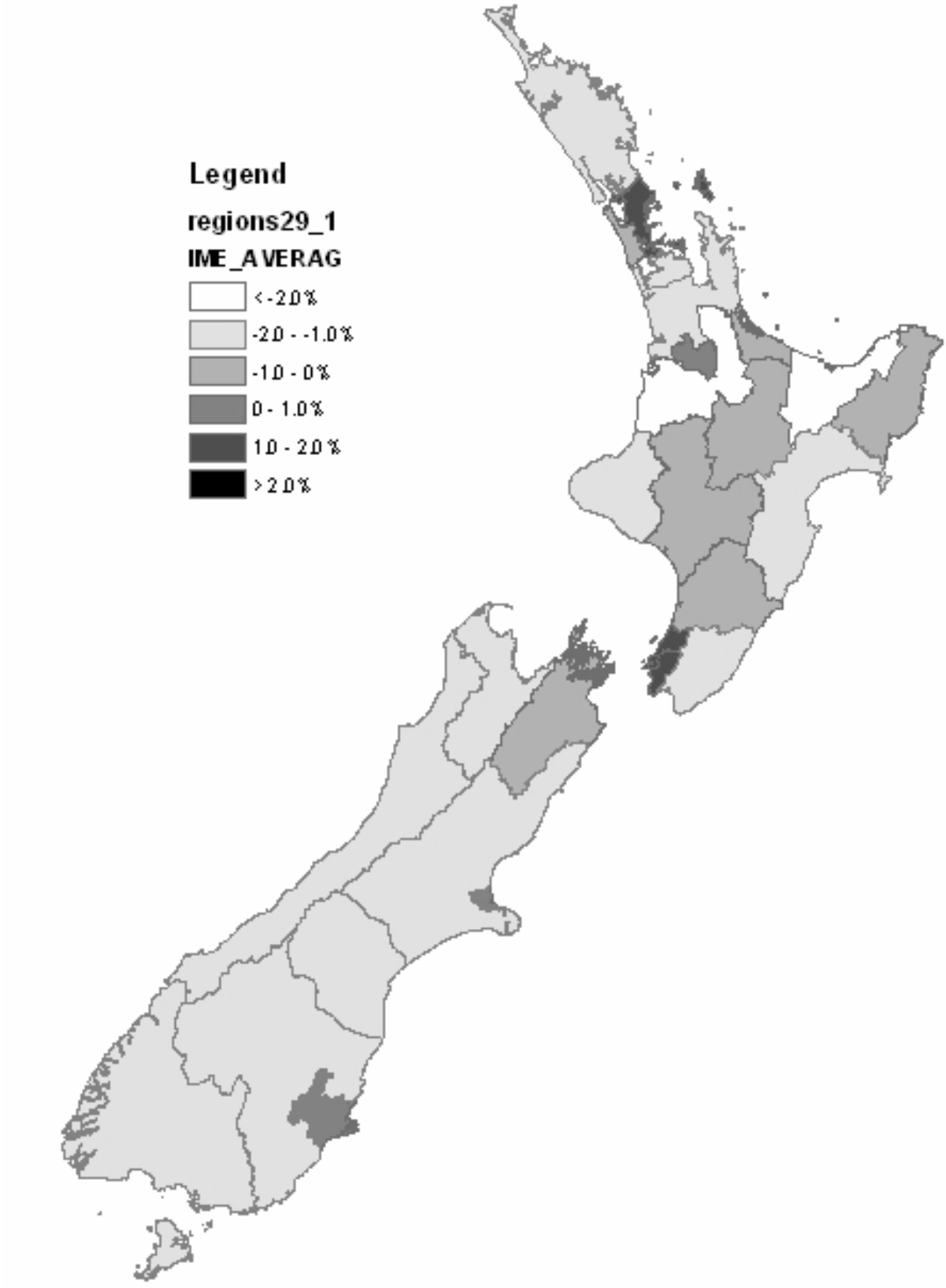


Figure B.3 Average Competitive Effect from Shift-Share Analysis, 29 Administrative Regions, 1986-2001

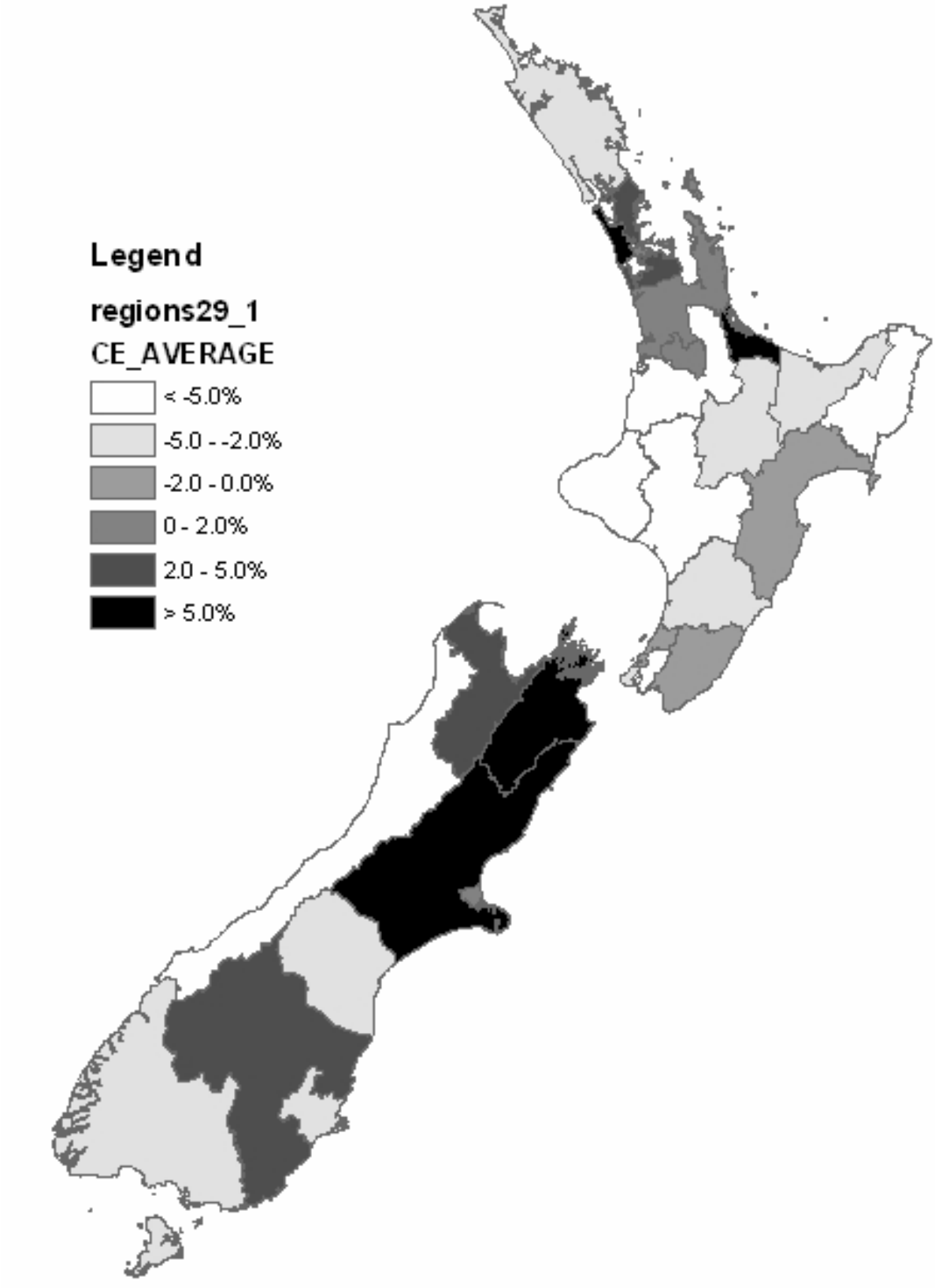
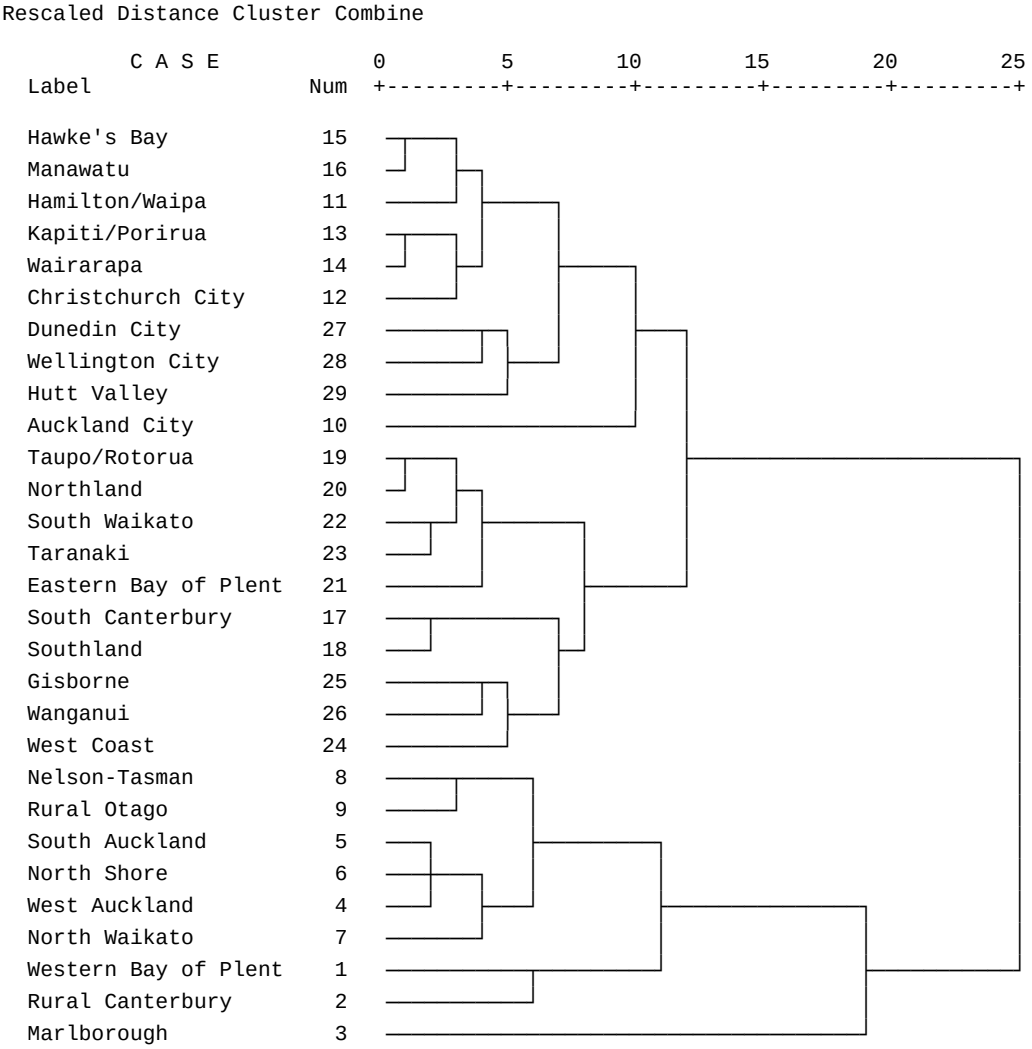


Figure B.4 Dendogram of Hierarchical Cluster Analysis Based on the Average Shift-Share Competitive Effect by Industry, 29 Administrative Regions, 1986-2001



Note: Clusters based on average linkage (between groups)

Figure B.5 Net Migration Rates, Total Population, 29 Administrative Regions, 1986-2001

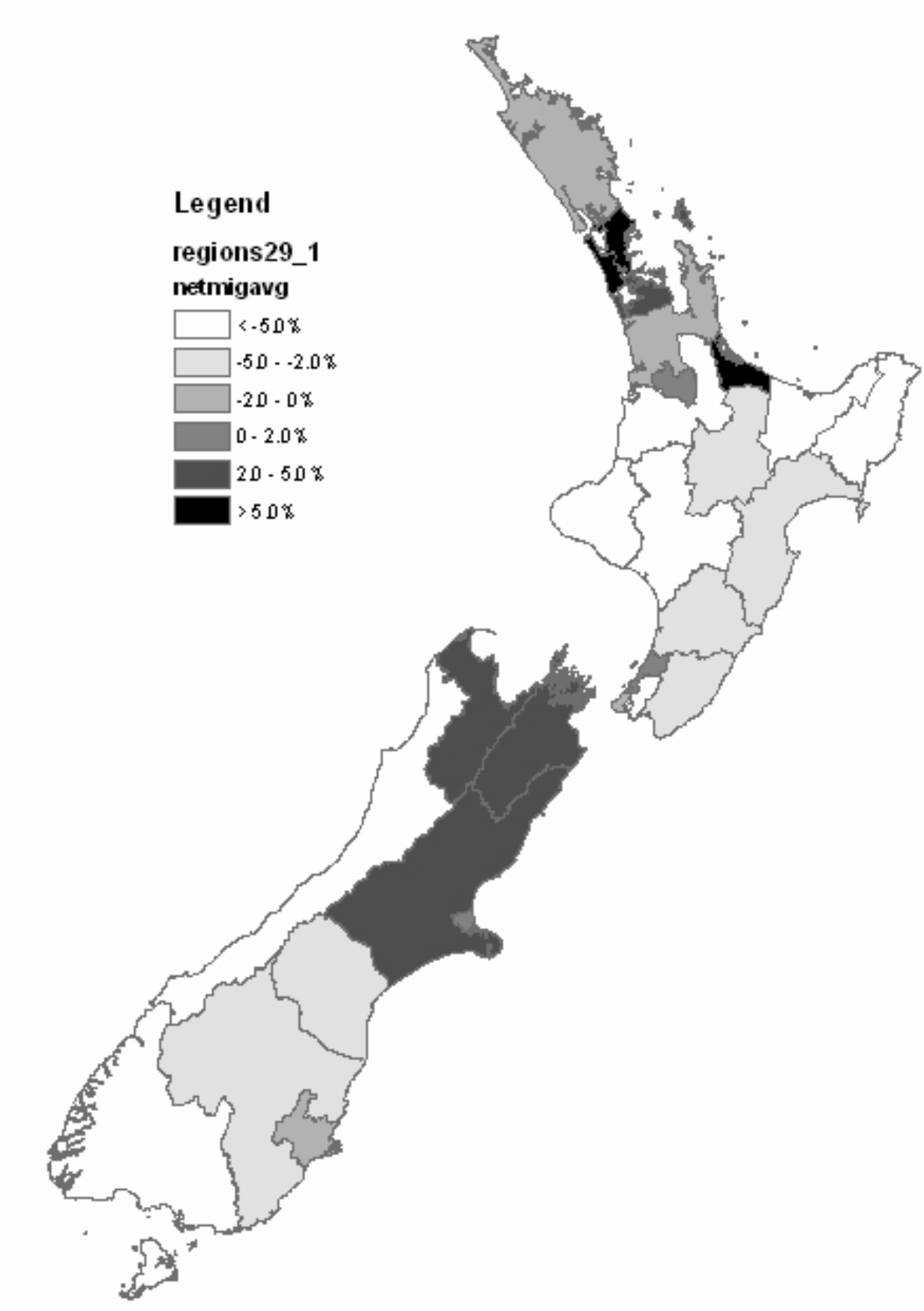


Figure B.6a Average Net Migration and Average Competitive Effect, 29 Administrative Regions

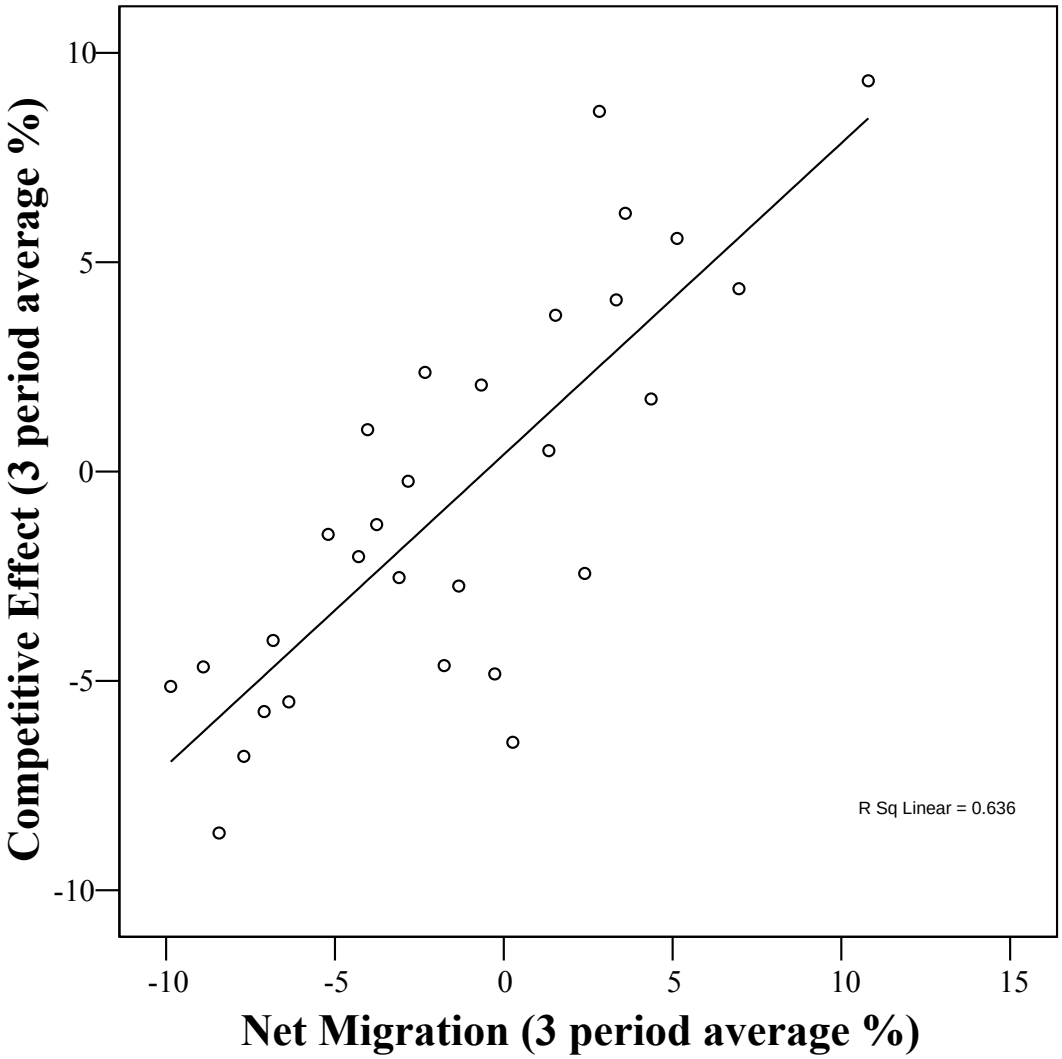


Figure B.6b Average Net Migration and Average Competitive Effect, 58 Labour Market Areas

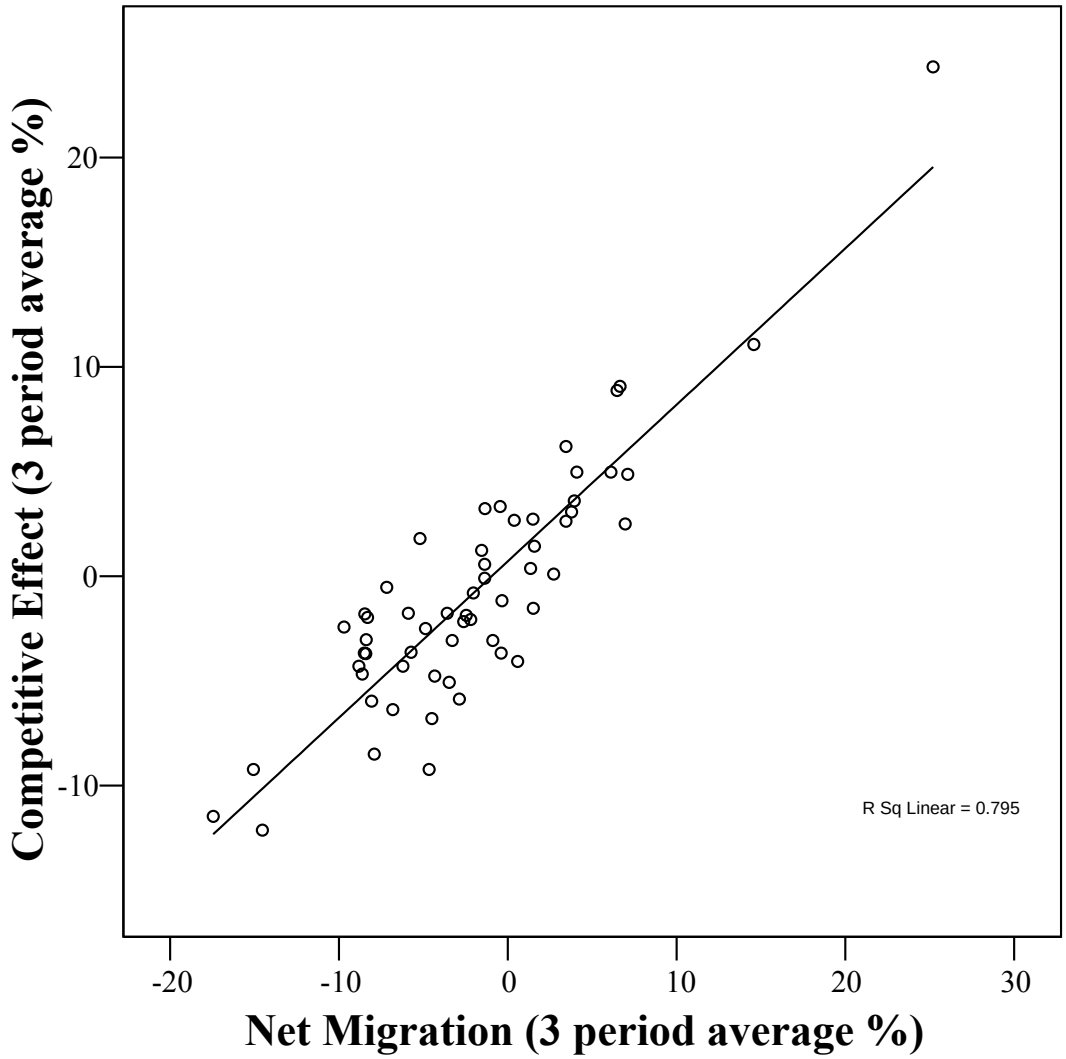
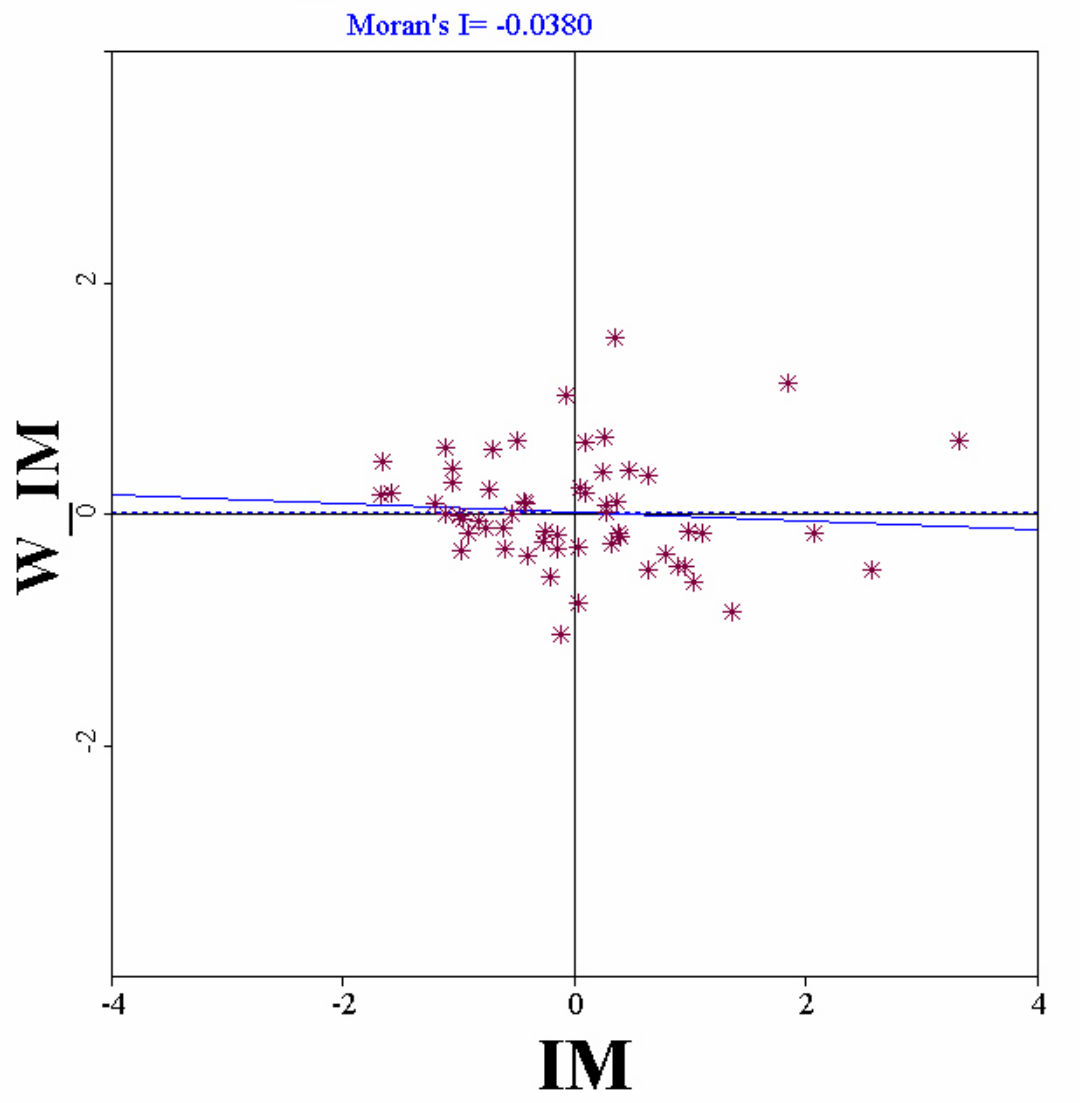


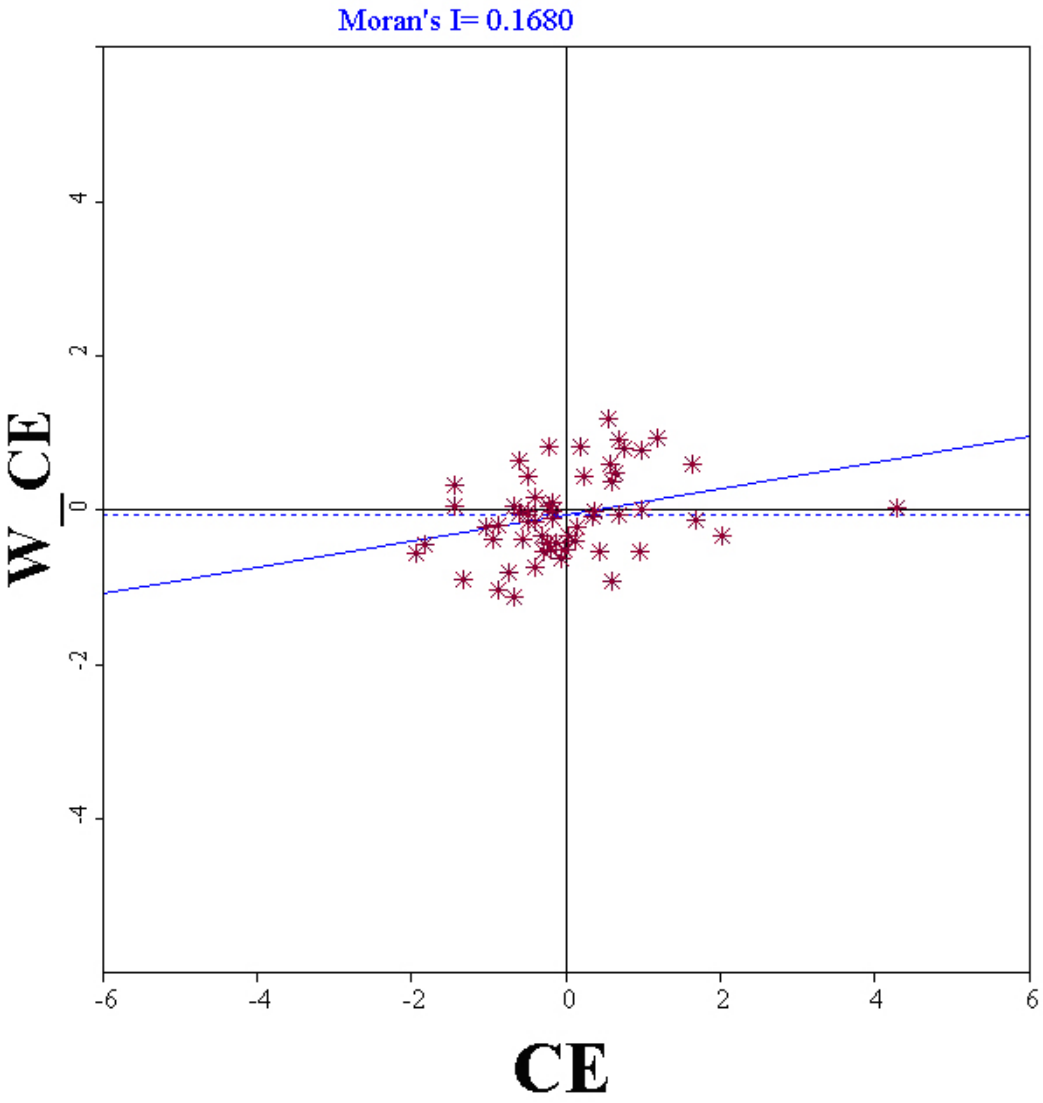
Figure B.7a Moran's Scatter Plot, Industry Mix Effect (average of 3 inter-censal periods)



Morans I = -0.0380

Pseudo Sig = 0.4311

Figure B.7b Moran's Scatter Plot, Competitive Effect (average of 3 inter-censal periods)



Morans I = 0.1680

Pseudo Sig = 0.0245

Figure B.8a LISA – Industry Mix Significance Map (3 inter-censal period average)

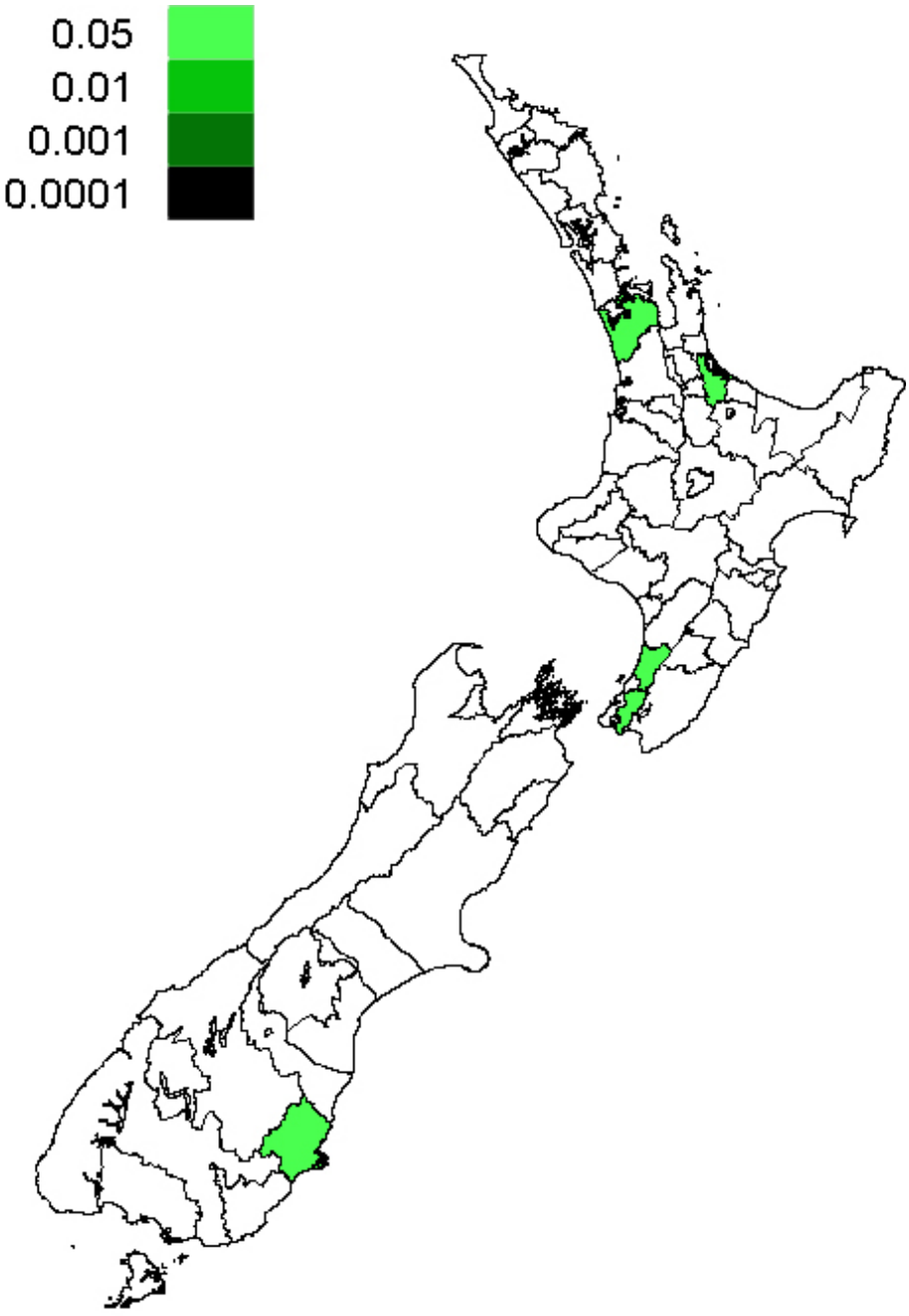


Figure B.8b LISA – Industry Mix Cluster Map (3 inter-censal period average)

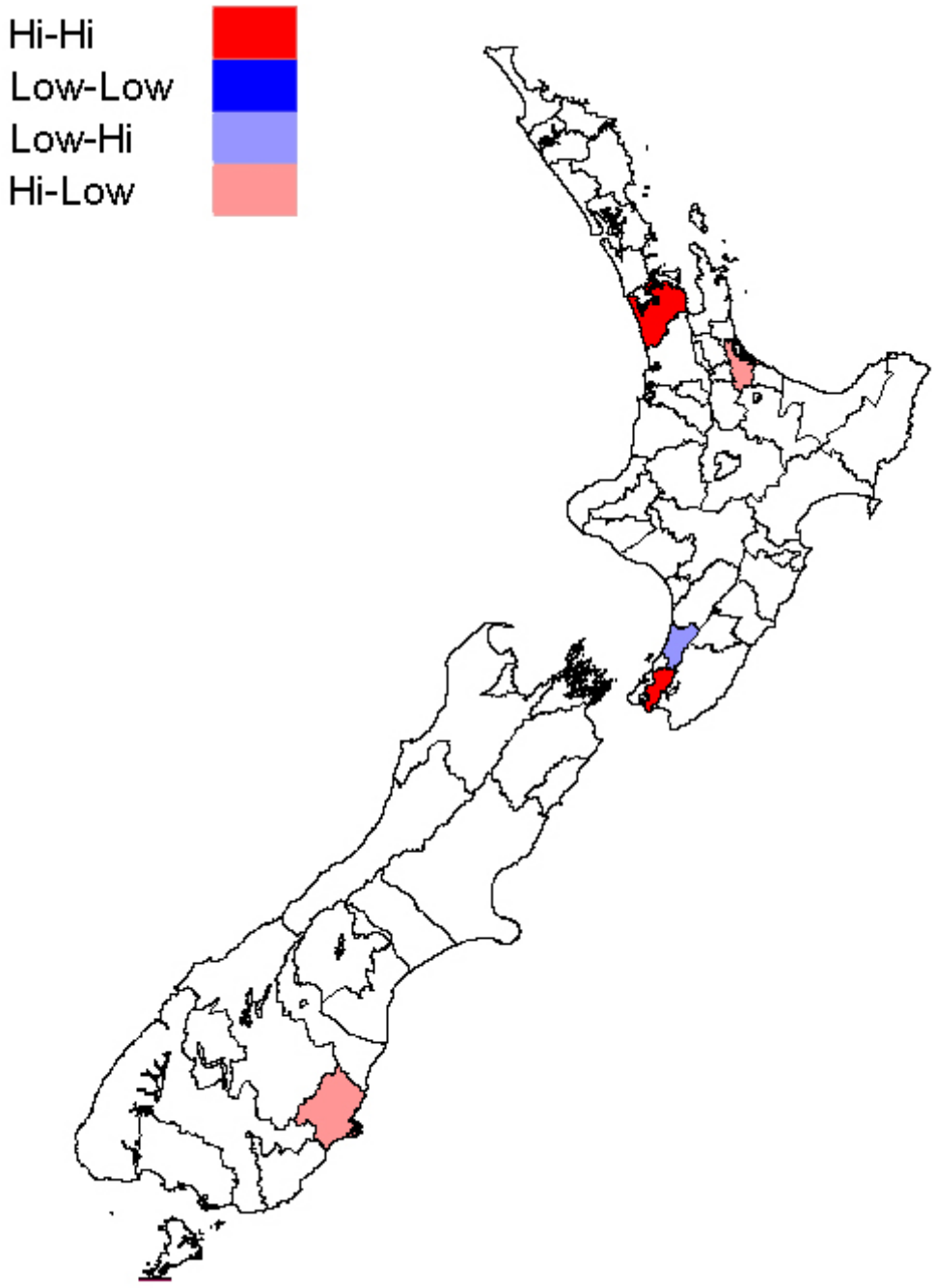


Figure B.9a LISA – Competitive Effect Significance Map (3 inter-censal period average)

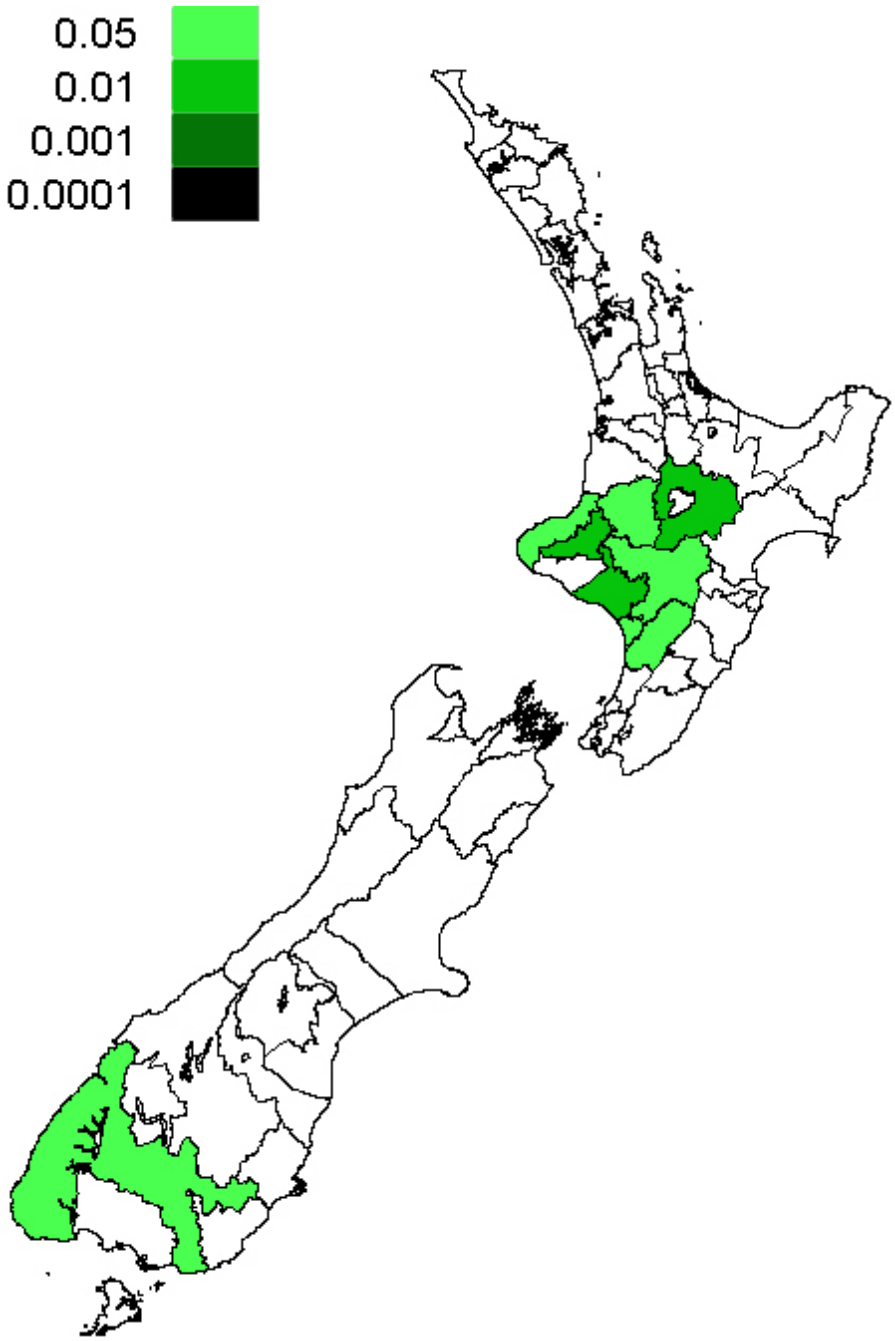
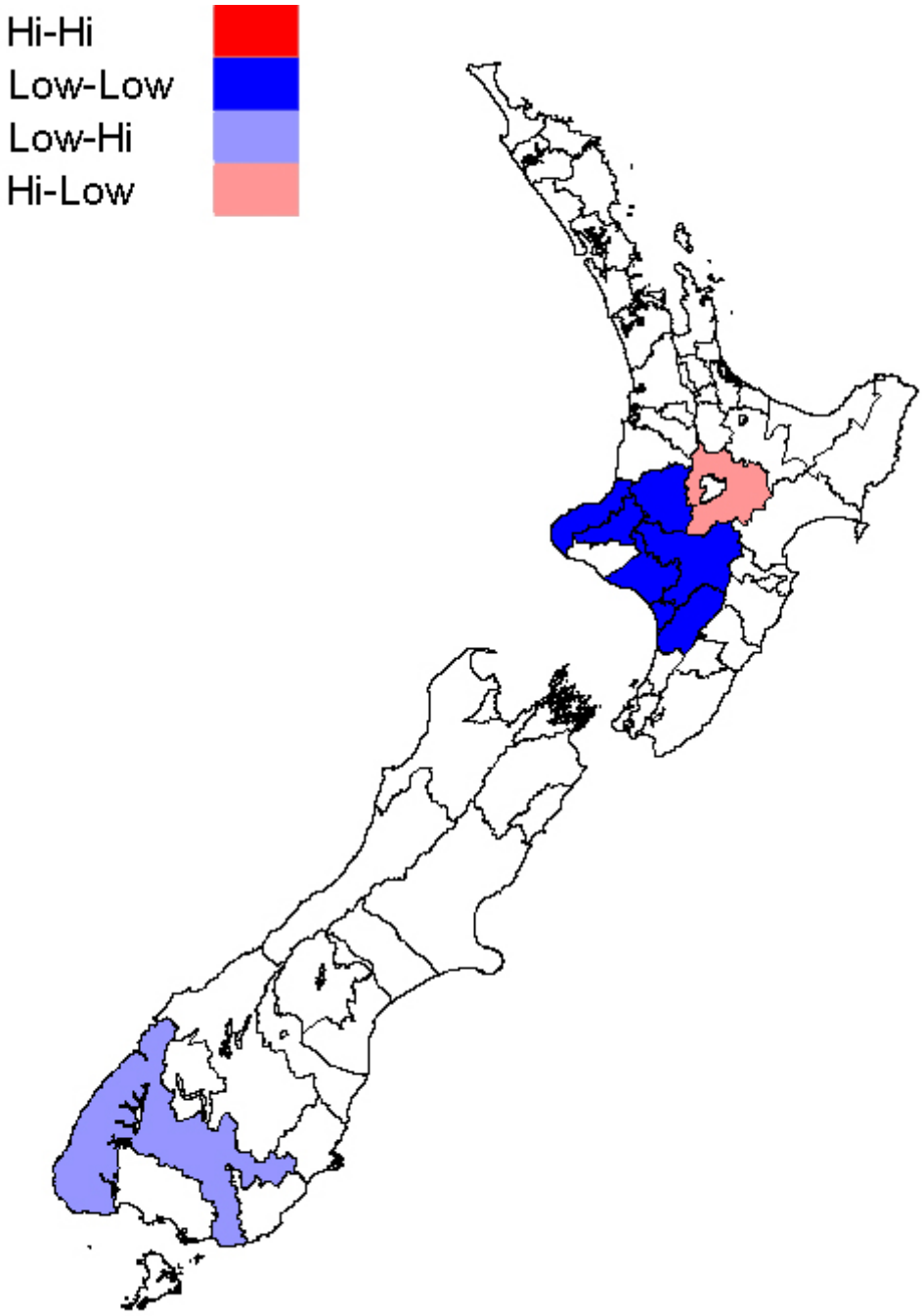


Figure B.9b LISA – Competitive Effect Cluster Map (3 inter-censal period average)



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