Evaluating the composition of employment changes in industries and occupations across the regions: Insights from a shift-share analysis

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Abstract

This paper explores the components of employment changes by occupation and industry within regions using the traditional shift-share analysis. The results suggest that while the industry mix matters, factors inherent to the region tended to contribute more to regional employment changes. Regions that experienced greater competitive advantage have enjoyed greater than average growth. Wellington, Auckland, Canterbury and Waikato were most advantaged by their industrial mix, while provincial regions such as Taranaki, Bay of Plenty and Gisborne/Hawke's Bay were notably disadvantaged. Agriculture is the mainstay that boosted employment in most provincial regions, but as they have a less diversified industry mix, they are less likely to benefit from the increasing share of employment in service and construction industries. However, there are regions and industries that benefit more from this national growth, exerting greater upward "push" on employment in highly skilled occupations particularly associated with these industries.

1. Introduction

Employment changes over time are influenced by developments in the drivers of economic activity in different industries, and the composition of occupations often diverges across regions. During the different phases of the business cycles, including the shock of the Global Financial Crisis (GFC), the drivers of economic activity impacting on employment vary by industry, with manufacturing and some service activities impacted more than the others. The impact on specific occupations is also often skewed with highly skilled occupations less adversely affected than other groups such as the trades.

A shift-share analysis was carried out to analyse regional employment changes by industry, occupation and region between 2003 and 2014, and a forecast period between 2015 and 2018. These periods are distinct, reflecting different economic conditions. The analysis decomposes employment changes by region into three components: national growth, industry mix and regional shift, covering 11 regions, 28 industries and 97 occupational groups. Within the 2003 to 2014 period, two historical sub-periods were analysed: 2003 and 2008, set against a strong economic and employment growth until the GFC; and 2009 and 2014, set against a period of poor economic conditions following the GFC with consequent impact on a number of industries, resulting in a much slower employment growth. The 2015 to 2018 forecast period is characterised by economic recovery, with a much stronger economic and employment growth compared to the 2009 to 2014 period. A separate shift-share analysis is undertaken for each of the three periods.

The shift-share analysis was also applied to occupation data to gain further insight into regional components of employment growth. This allowed us to determine how employment growth can be broken down to growth across occupations by region. Changes in regional employment can then be decomposed into national growth, the occupation mix and the competitive share in terms of occupational categories. Applying the shift-share analysis to occupation data in conjunction with the traditional industry mix analysis provides an opportunity to test for consistency, while assessing the employment growth prospects of a particular region.

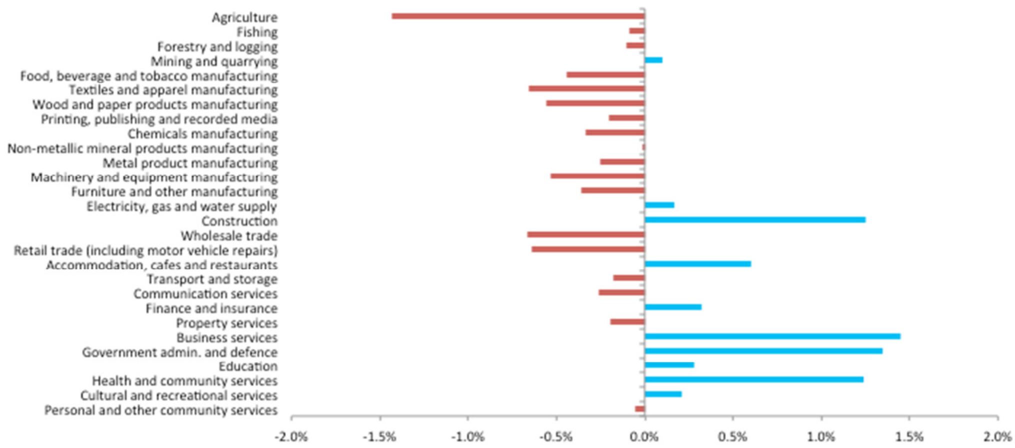
The paper is organised as follows. In Section 2, the employment trend between 2003 and 2014 is outlined. This provides a brief context for the period covered in the analysis of regional employment changes. Section 3 is a description of the analytical framework, and the method and data sources are outlined in Section 4 .The results are then presented in Section 5, while Section 6 summarises the findings and outlines insights drawn from the analysis.

2. Employment trends

This section outlines the changes in employment share by industry in from 2003 to 2014. Changes at the national level will impact the regions in different ways.

Figure 1 shows that the national employment profile has changed between 2003 and 2014. There is a pronounced decline in the manufacturing sector's share of employment, reflecting a shift towards the service sector, particularly the business services and health and community services. Figure 1 also shows the recent surge in employment in the utilities and construction sector due to the construction boom between 2003 and 2008, the on-going rebuild activities in Canterbury and residential and non-residential building work in the Auckland and Waikato regions. Employment in the agriculture sector remained static but has declined in terms of its share of employment.

Figure 1. Percentage point change in share of employment of an industry to total employment between 2003 and 2014



Source: Detailed Regional Employment Estimates (DREE), Ministry of Business Innovation and Employment

The 2003 to 2014 period was analysed in two historical periods. These periods have distinctly different economic and employment conditions. The first period, 2003-08, was characterised by strong employment growth across the regions. This growth was largely driven by activities in the construction, business services and hospitality industries. During this period, the share of employment in skilled and semi-skilled occupations increased. During 2009-14 the share in highly skilled occupations rose at the expense of the other three groups, especially the skilled and elementary skilled group. The Ministry of Business, Innovation and Employment (MBIE) forecasts the occupational composition of employment to continue improve over the 2015-18 forecast period, where building and construction activity for the Canterbury rebuild, along with business services will drive employment growth. The rise in the share of highly skilled occupations is forecast to continue but at a slower rate.

The changes in the industry and occupational structure of employment at the national level can impact differently in different regions. Regions that have high concentration of employment in industries that have a declining share of total employment are likely to experience much slower growth or a decline in employment. On the other hand, regions that have a relatively higher share of employment in growing sectors (such as services, construction and health and community services) are likely to see faster employment growth relative to other regions. Occupation mixes within regions are also likely to reflect these changes at the industry level.

3. Analytical framework

The analytical framework assumes that regional employment growth over time is influenced by 1) overall national employment growth; 2) national employment growth of industries present in the region; and 3) by region-specific factors.

Shift-share analysis is one way to account for a region's competitiveness, which could be driven by region-specific factors. It provides a picture of how well a region's mix of industries is performing. It also shows how well individual industries within each region are doing. This paper uses the conventional shift-share method, which involves assessing the region's employment by industry and occupation in relation to national employment.

In general, shift-share analysis breaks down regional employment growth into three components: 1) national growth share (NG); 2) industry mix (IM); and 3) regional shift (RS) or competitive effect. The NG component is the share of regional employment growth attributable to growth of the (Baxaendine, Cochrane, & Poot, 2004) national economy. The NG measures the growth that would have occurred had industries within the region grown at the same rate as overall employment. Implicitly, the analysis assumes that the industries in the region will grow at approximately the rate of national industries unless the region has a competitive advantage or disadvantage.

The IM[1] component captures the change in employment growth attributable to the region's mix of industries compared with the national mix. This component in the shift-share analysis captures regional variations in industrial composition (Cochrane and Poot, 2008). A positive effect for industry mix suggests that the region has a 'favourable mix' of industries that, nationally, are experiencing growth greater growth than the overall national average (Mulligan & Molin, 2004). In contrast, a negative effect for industry mix implies that a region has a greater than average proportion of people employed in industries that are growing at a slower rate than the average growth of all industries.

The sum of the growth effects for national growth and the industry mix is referred to as the region's share of growth. These components are exogenous factors that are determined by national growth rates, rather than regional factors. Taking the NG and IM together, they can be interpreted as the region's expected growth should the region's industries grow at the same rate as the mix of the

[1] The industry mix component has also been referred to as the compositional mix, structural effect, and the proportionality effect.

nation as a whole. Given the profile of employment by industry and the national employment growth, we can infer regional employment outcomes, assuming no other factors affect growth.

The RS[2] component accounts for regional employment growth in addition to growth expected if the region's industry grew at the national growth and industry rates. The RS component can be interpreted as a spatial redistribution of employment within industries (Jones, 2012). This residual is attributed to endogenous factors that are inherent to the region (Dawson, 1982), and can be thought of as a measurement of a region's competitive edge or comparative advantage in the production of the goods or services. Thus in this paper, we refer to RS as the region's competitive advantage.

The change in regional employment at time t (end year) and $t-1$ (beginning year) is therefore expressed as the additive sum of the three components described above:

$$\frac{e_i^t}{e_i^{t-1}} = \underbrace{\frac{E^t}{E^{t-1}}}_{NG} + \underbrace{\left(\frac{E_i^t}{E_i^{t-1}} - \frac{E^t}{E^{t-1}}\right)}_{IM} + \underbrace{\left(\frac{e_i^t}{e_i^{t-1}} - \frac{E_i^t}{E_i^{t-1}}\right)}_{RS} \quad (1)$$

where e_i^t refers to regional employment for industry i at time t and E_i^t denotes national employment for industry i at time t, and E^t denotes overall employment (total all industries). Equation (1) may be rearranged so that the regional employment growth can be expressed in terms of employment totals and employment shares, as presented in Jones (2012):

$$g_i^t = G^t + (1+G_t)\Delta_i^t + (1+G_i^t)\delta_i^t \quad (2)$$

where $g^t = \left(\frac{e_i^t}{e_i^{t-1}} - 1\right)$, refers to regional employment growth rate, $G^t = \left(\frac{E^t}{E^{t-1}} - 1\right)$ relates to national growth rate (all industries) and $G_i^t = \left(\frac{E_i^t}{E_i^{t-1}} - 1\right)$ denotes the change in national employment in industry i at time t (end year). The Δ_i^t coefficient relates to the changing shares of national employment by industry, with the expression summarising the change over time while the δ_i^t coefficient refers to the shares of industry employment by region, also summarising the change over time. Summing across industries, we get the regional employment growth rate, $g_t = \sum \theta_i^{t-1} g_i^t$ where θ_i^{t-1} relates to the proportion of regional employment in industry i at time $t-1$ (beginning year). Regional employment growth is therefore decomposed as the three components' marginal contribution:

$$g^t = \underbrace{[G^t]}_{[NG]} + \underbrace{[(1+G^t)\textstyle\sum_i \theta_i^{t-1}\Delta_i^t]}_{[IM]} + \underbrace{[\textstyle\sum_i \theta_i^{t-1}\ (1+G_i^t)\,\delta_i^t]}_{[RS]} \quad (3)^3$$

Equation (3) expresses IM and RS components as relative contribution of each industry to the regional economy in the beginning year $t-1$.

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[2] This component has also been referred to as competitive effect, regional shift, regional proportion, and differential shift.

Since IM is calculated using industry shares at the beginning year, we would like to see how regional shares adjust to employment changes at the national level. Baxadine, Cochrane and Poot (2004) analysis of employment change in New Zealand from 1986 to 2001 used the equation below to measure the effect of changing industry composition on the regional employment growth rate:

$$IM_i^t = w_i^t \left[\left(\frac{E_i^t}{E_i^{t-1}}\right) - \left(\frac{E^t}{E^{t-1}}\right)\right] + \left(w_i^{t-1} - w_i^t\right)\left[\left(\frac{E_i^t}{E_i^{t-1}}\right) - \left(\frac{E^t}{E^{t-1}}\right)\right] \quad (4)$$

where w_i^t is the share of an industry to a region's total employment. The first term of Equation (4) is a modified industry mix effect and the second term is the structural change effect. The modified industry mix is interpreted as IM in Equation (3).

4. Method and data

The three components in Equation (3) are estimated using 2-digit Australia and New Zealand Standard Industry Classification 2006 (ANZSIC06) industry employment data for the three study periods. The above framework is also applied to occupation data to look at the impact of regional economic growth or decline in 97 occupational groups based on the Australia and New Zealand Standard Classification of Occupations (ANZSCO). In this case however, growth for occupation mix [OM] is substituted for IM. OM[4]- this is analogous to the IM measure and is simply the growth of each occupation nationally minus the total employment growth nationwide. This allows for the isolation of the competitive growth effect by region, after deriving national and occupational growth effects. By extending the analysis to occupations within regions, we are able to test the consistency of the competitiveness component for each region measured against both industry and occupation growth for these regions. Three digit-ANZSCO categories were used to reflect the relative skill level (as determined by the required qualification or education) by occupation category.

The conventional shift-share analysis, as outlined above, for both industry and occupation data, is applied to 11 regions: Northland, Auckland, Waikato, Bay of Plenty, Gisborne/Hawke's Bay, Taranaki, Manawatu-Wanganui, Wellington, Nelson/Tasman/ Marlborough/West Coast, Canterbury and Otago/Southland. The shift-share components for each of these regions are calculated for three periods: two historical 2003 and 2008, 2009 and 2014, and forecast for 2015 and 2018. The industry and occupation data were drawn from the MBIE's Detailed Regional Employment Estimates (DREE)[5] database.

While the shift-share analysis is able to provide insights into the direction and magnitude of change in employment, the shift-share analysis cannot identify which regional factors support or limit a region's growth. There are a number of reasons for differences in growth performance among regions, which may include different levels of natural resources, human capital formation and policy structures. This analysis also assumes that there is no spatial interaction between regions, and that each region is independent from other regions, even if they happen to be geographically or economically close to one another. A number of studies have investigated the importance of spatial interaction, in the light of inter-regional migration, as an important aspect of change.

[4] In Brox, Carvalho, & Mackay(2010), this is referred to as 'human capital effect'.

[5] The detailed industry and occupation employment estimates by regional council have as their basis the employment counts by industry from the Linked-Employer-Employee database (LEED) of Statistics New Zealand, adjusted based on the occupational profile of industry employment from the 2006 and 2013 Censuses of Population and Dwellings.

5. Results

This section summarises the results from a point-to-point analysis of regional employment changes for 28 industries and 97 occupational groups over the 2003-08, 2009-14 and 2015-18 periods. Overall, the results are consistent with the expectation that more competitive regions are likely to have a higher employment growth. The result is also consistent with the decomposition of industry and occupational employment changes.

Industry Mix

Figure 2 shows the industry mix contribution to growth for the 2003 and 2008 period. The figure shows broadly similar industry effects by region, with large contributions from business services, construction and government administration and defence contributing in all regions. While agriculture remained a major industry providing employment, there was 6.6 per cent fall in employment in the industry in the 2003-08 period. This decline affected most regions but has a larger negative impact on the provincial regions (Northland, Bay of Plenty, Gisborne/Hawke's Bay and Otago/Southland). The expansion of the business services and government administration and defence industries, during this period resulted in positive contributions to growth across regions, but with larger impact in the Wellington, Auckland and Waikato regions. Positive effects from the construction and hospitality (accommodation, café and restaurants) industries during this period resulted in growth of broadly the same rate across regions.

The largest differences are apparent in the agriculture industry. Negative effects from this industry vary somewhat, with the provincial regions of Bay of Plenty, Gisborne/Hawke's Bay and Otago/Southland feeling the effect the most. Between 2003 and 2008, negative industry effects from manufacturing industries contributed to declines in employment in most regions. The declines in employment in most manufacturing industries were broadly similar in all regions. However, larger differences among regions were observed for food, beverage and tobacco, and wood and paper products manufacturing. The overall industry mix effect on the employment change is positive for most regions, except for Gisborne/Hawke's Bay and Otago/Southland for the 2003-08 period.

For the 2009-14 period, the negative industry effects in a number of industries were balanced by positive effects, albeit small, across a number of industries in the service sector (see Figure 3). Unlike the earlier period, the positive industry effect from the construction industry almost disappeared with the exemption of Bay of Plenty and Gisborne/Hawke's Bay regions, reflecting the effects of the GFC and overall decline in economic growth and employment during this period. While Gisborne/Hawke's Bay and Bay of Plenty regions benefitted most from the positive effect from the construction industry, the effect was offset by a much larger negative effect from the agriculture industry. Again, the industry mix effects for this period suggests that national growth in the service (business, health and community, and hospitality) and education sectors supported employment in most regions.

Compared to industry mix effects for 2003-08, there is greater variability across industries. The negative effects from agriculture, forestry and manufacturing of food, textiles and wood and paper products were most felt in the Bay of Plenty and Gisborne/Hawke's Bay regions. Summing the industry effects by region, the analysis finds that Wellington region was most advantaged by the composition of its industrial base whereas Gisborne/Hawke's Bay, Bay of Plenty and Taranaki were disadvantaged. Figure 3 also shows greater variability by industry with the GFC adversely affecting a number of industries and broadly similar effects by industry across regions.

Over the forecast period 2015-18, construction, business services and hospitality are expected to support employment across the regions. As expected, the Canterbury and Otago/Southland region are expected to benefit the most from positive effects from the construction industry. Given an improved economic and employment outlook relative to the 2009-14, the negative effects from national trends in the manufacturing sector is much smaller in magnitude in all regions.

The results shown in Figures 2 to 4 suggest that there is greater variance by industry rather than by region, with a greater mix of positive and negative industry mix effects in the 2009-14 period due to the GFC. The detailed results for industry-mix effects for the 28 industries by region are presented in Tables A1 to A3 in the Appendices.

Structural change

Error! Reference source not found. shows that the structural effect is negative for all the regions across the three periods. This means that industry trends within regions were in the same as the national trends in terms of structural change. This result is consistent with the observation of Baxaendine, Cochrane, & Poot (2004) using full-time equivalent data from 1986-2001. Overall, the industry composition within regions has remained static, with the magnitude of change largest in the 2003-08 period. This period coincides with strong economic and employment growth driven by construction, services and the public sector[6].

Table 1. Structural change effect by region

	Modified industry mix			Structural change effect		
	2003-08	2009-14	2015-18	2003-08	2009-14	2015-18
Northland	0.99%	0.62%	-0.05%	-2.25%	-0.36%	-0.07%
Auckland	2.25%	0.14%	0.11%	-1.10%	-0.43%	-0.07%
Waikato	1.18%	0.47%	0.26%	-1.63%	-0.37%	-0.15%
Bay of Plenty	0.82%	0.47%	-0.03%	-2.00%	-0.38%	0.00%
Gisborne/ Hawkes' Bay	-1.31%	0.29%	-0.06%	-1.33%	-0.40%	-0.01%
Taranaki	0.05%	0.13%	-0.03%	-1.96%	-0.25%	-0.01%
Manawatu-Wanganui	0.89%	0.73%	-0.08%	-1.66%	-0.52%	-0.01%
Wellington	4.70%	1.65%	-0.08%	-1.06%	-0.42%	-0.02%
Nelson/Tasman/Marlborough/West Coast	-0.57%	0.25%	-0.03%	-1.84%	-0.32%	0.00%
Canterbury	1.05%	0.14%	-0.07%	-1.52%	-0.45%	-0.02%
Otago/Southland	-0.21%	0.17%	-0.04%	-1.75%	-0.30%	-0.01%

[6] This includes government administration and defence, education and health and community services industries.

Figure 2. Industry mix effect by region, 2003-08

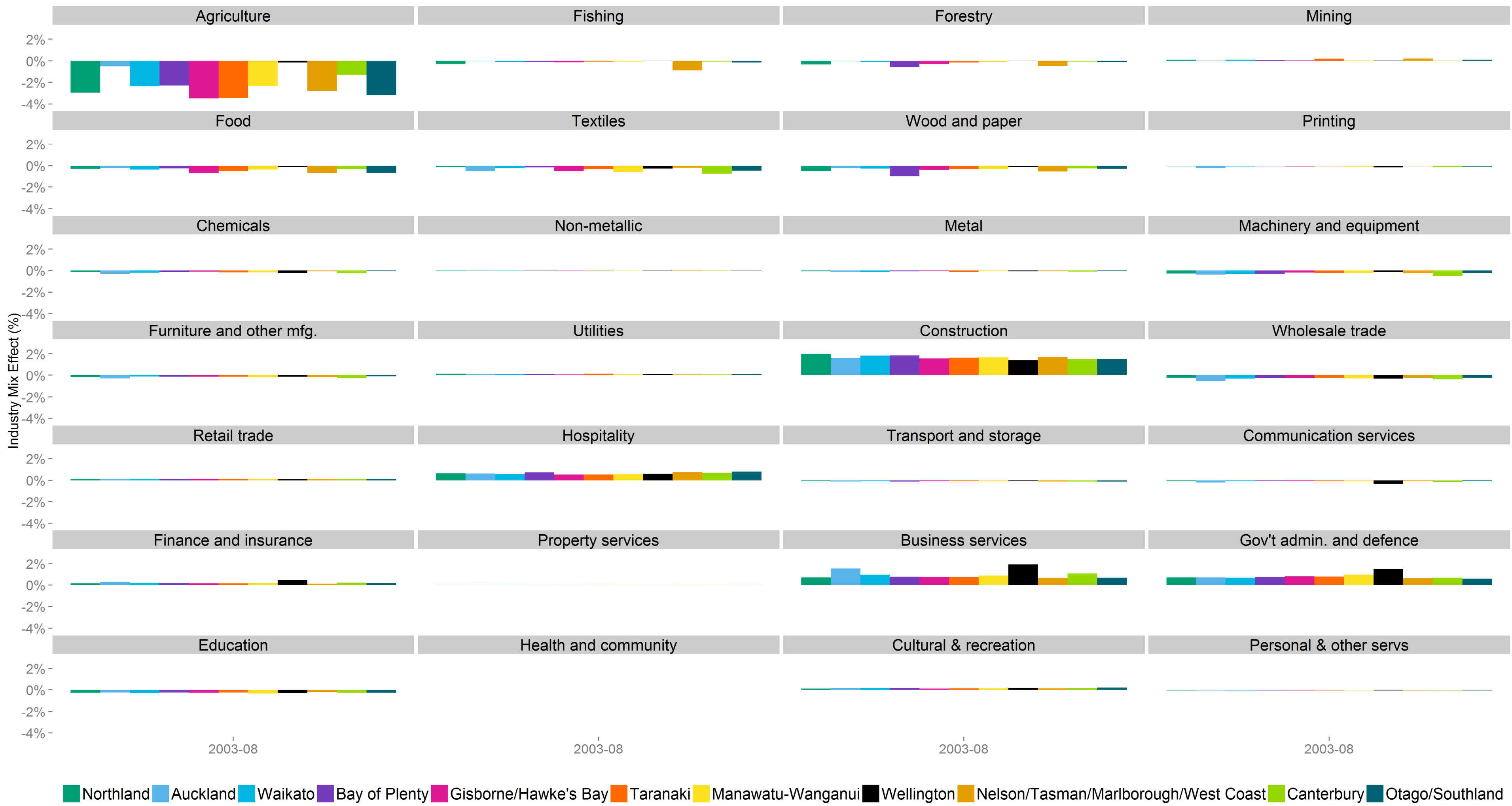


Figure 3. Industry mix effect (%) by region, 2009-14

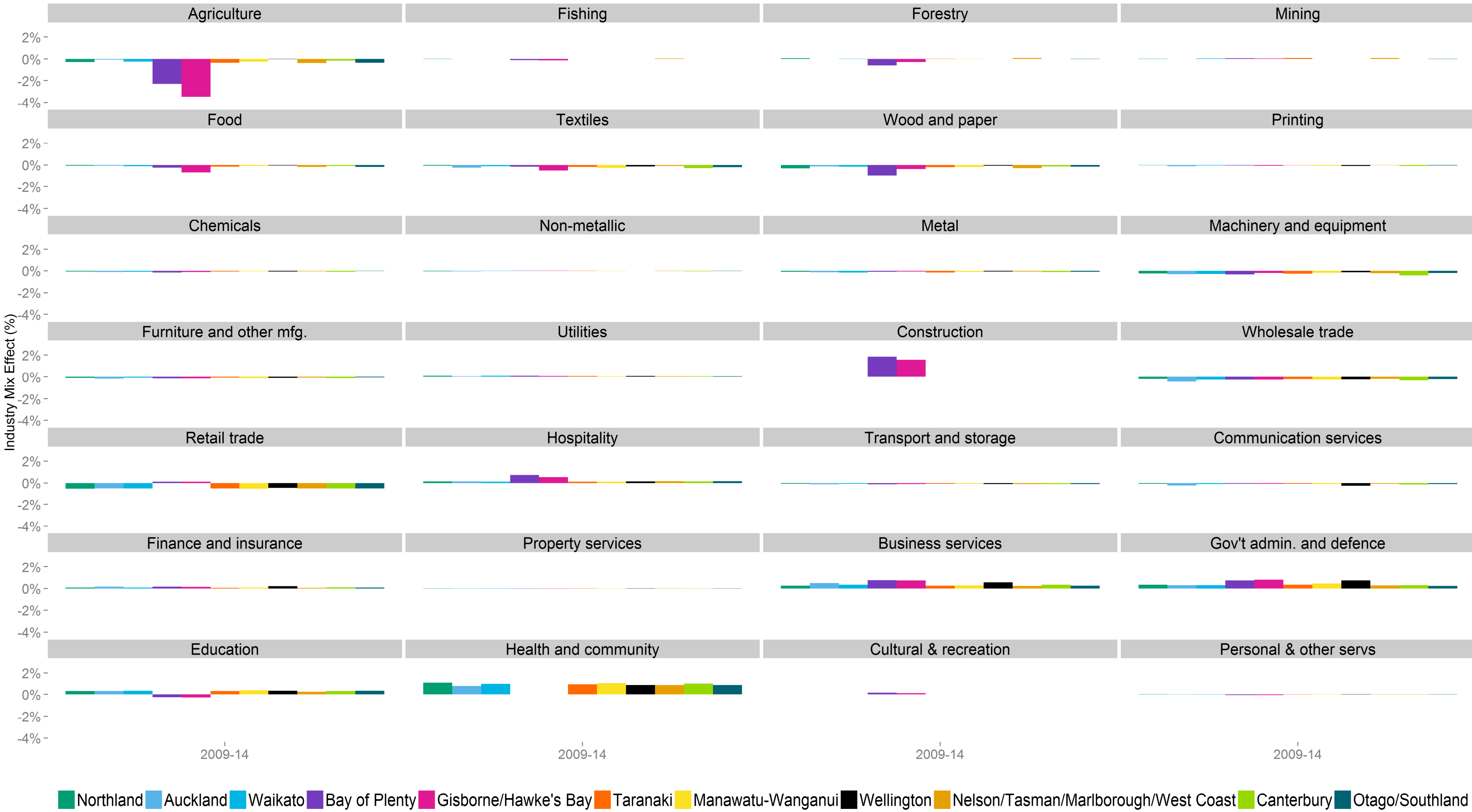
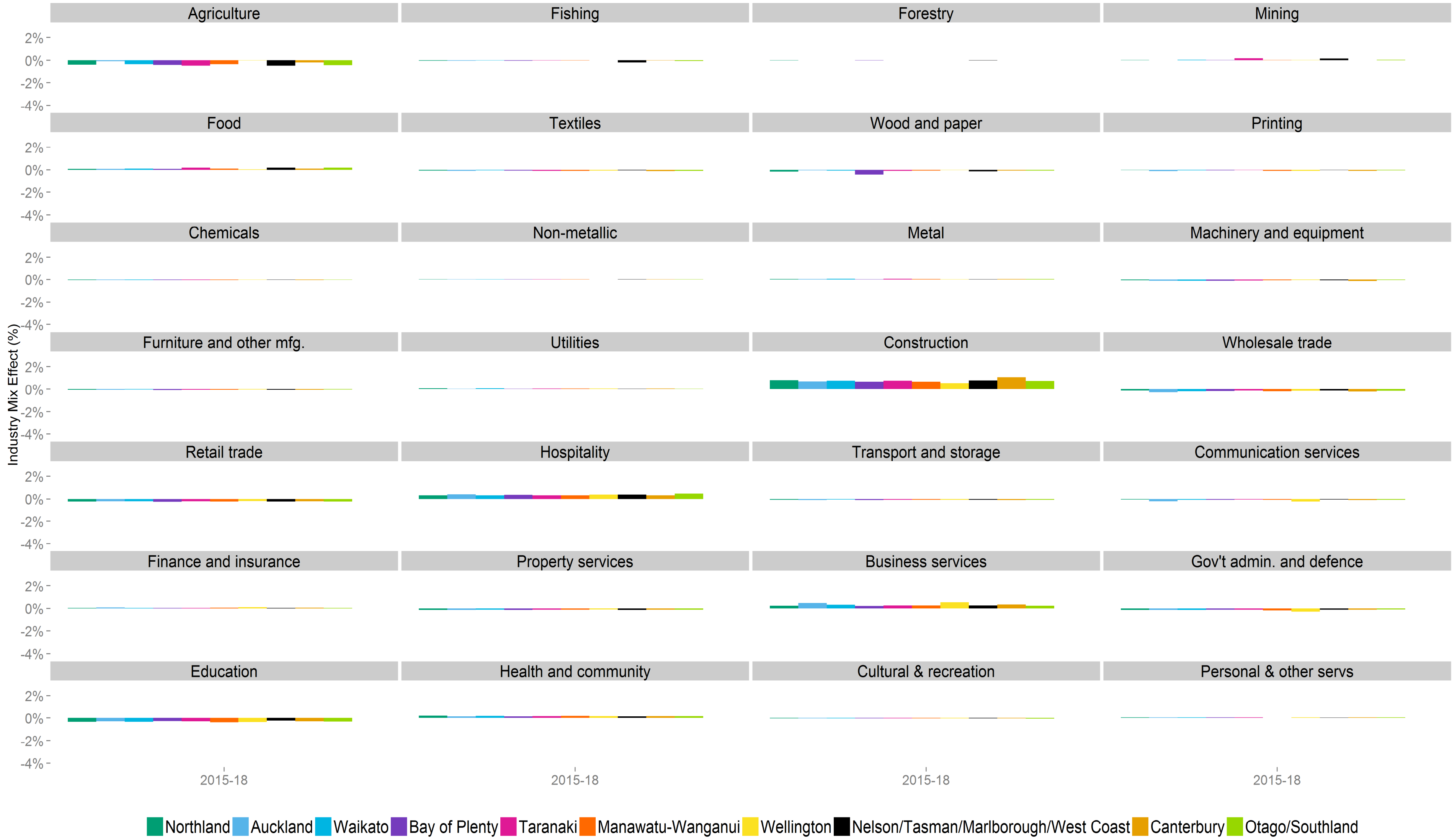


Figure 4. Industry mix effect (%) by region, 2015-18



Regional Competitiveness Effect

Figure 5 shows employment growth rates and competitive growth rates by region for the three periods. There are positive competitive effects for six of the 11 regions which are on the upper-right-hand quadrant of the scatter plot for 2003-08. These regions also experienced higher employment growth compared to regions in the upper-left hand quadrant of the plot for the 2003-08 period.

Relative to other regions, Waikato and Otago/Southland experienced stronger growth for the 2009-14 and 2015-18 periods. These regions also have industries that are more competitive, in terms of ability to grow employment above the national average.

Figure 5. Comparison of employment and regional competitive advantage, 2000-08, 2009-14 and 2015-18 periods

Note: Horizontal line marks the national growth rate for 2003-08 (13.7 per cent), 2009-14 (4.4 per cent) historical periods and 2015-18 (6.1 per cent) forecast period.

Figure 5 also shows that some regions (i.e. Taranaki, Northland and Gisborne/Hawke's Bay) over the 2009-14 period experienced decline in overall employment and had industries that performed below the national average. Over the forecast period, growth differentials are largely due to regional factors and national industry trends, with construction and business services driving much of the increase in employment.

Figures 6 to 8 provide insights into the regions' position on the charts in Figure 5. Regions on the upper-right hand quadrant of the plots for the two historical periods had local industries that created employment at a much faster rate than in those same industries nationally. During the 2003-08 period, the leading industries with the largest regional competitiveness effect in most regions were agriculture, food and beverage manufacturing and textile and apparel manufacturing. During this period, employment by industry tends to shift into regions in the upper North Island and away from regions in the central North Island and in the Otago/Southland region.

In the 2009-14 period, the industries that drove employment growth within the regions had changed from primary industries and manufacturing to wholesale and retail trade and service industries.

During this period, there was a larger regional shift of employment away from provincial regions to Auckland and Waikato regions in the North Island, to the regions in the South Island. Over the forecast period, agriculture, education and retail trade were among the leading industries in most regions. Spatial distribution of employment is more balanced compared to the 2009-14 period but remained in favour of Waikato and Otago/Southland regions.

In general, regions with a positive overall regional competitiveness effect tended to have higher growth rates over the three periods, and are positioned in the upper –right hand quadrant of the plots in Figure 5. These regions also have higher than average employment growth rates. Figures 6 to 8 also suggests a general pattern. Employment by industry tended to be spatially concentrated in larger regions like Auckland, Waikato and Canterbury and away from smaller and provincial regions like Northland, Taranaki and Gisborne/Hawke's Bay. Otago/Southland region was rather unique, in part due to the region having above average employment growth in most industries. There is also a continued net shift of employment away from Wellington region.

Regional clusters

Plotting together the industry mix (IM) and the regional share (RS) shift effects on regional employment change provides a way to describe regional employment performance over the three sub-periods.

Figure 9 shows a clustering of regions in terms of the magnitude and direction of industry mix and competitiveness effects. The regions on the top left (Wellington, Bay of Plenty, Manawatu-Wanganui and Nelson/Tasman/Marlborough/West Coast) had employment growth that was driven by industry trends and growth nationally rather than regionally. Wellington region's position for 2003-08 and 2009-14 periods suggests that the region had high employment growth industries but its overall employment growth is much slower compared to regions with higher regional competitive growth rates. Regions on the bottom-left (Taranaki, Gisborne/Hawkes' Bay and Northland) had declining employment, with local industries that did not perform as well as the national average. These regions were also specialising in industries (e.g. agriculture, manufacturing) that were not growing nationally and have seen falls in employment over this period. Regions on the bottom-right had strong employment growth but were not specialising in industries that were growing more at a national level. (See A1 to A3 in the Appendices)

Figure 6. Regional competitive advantage, 2003-08

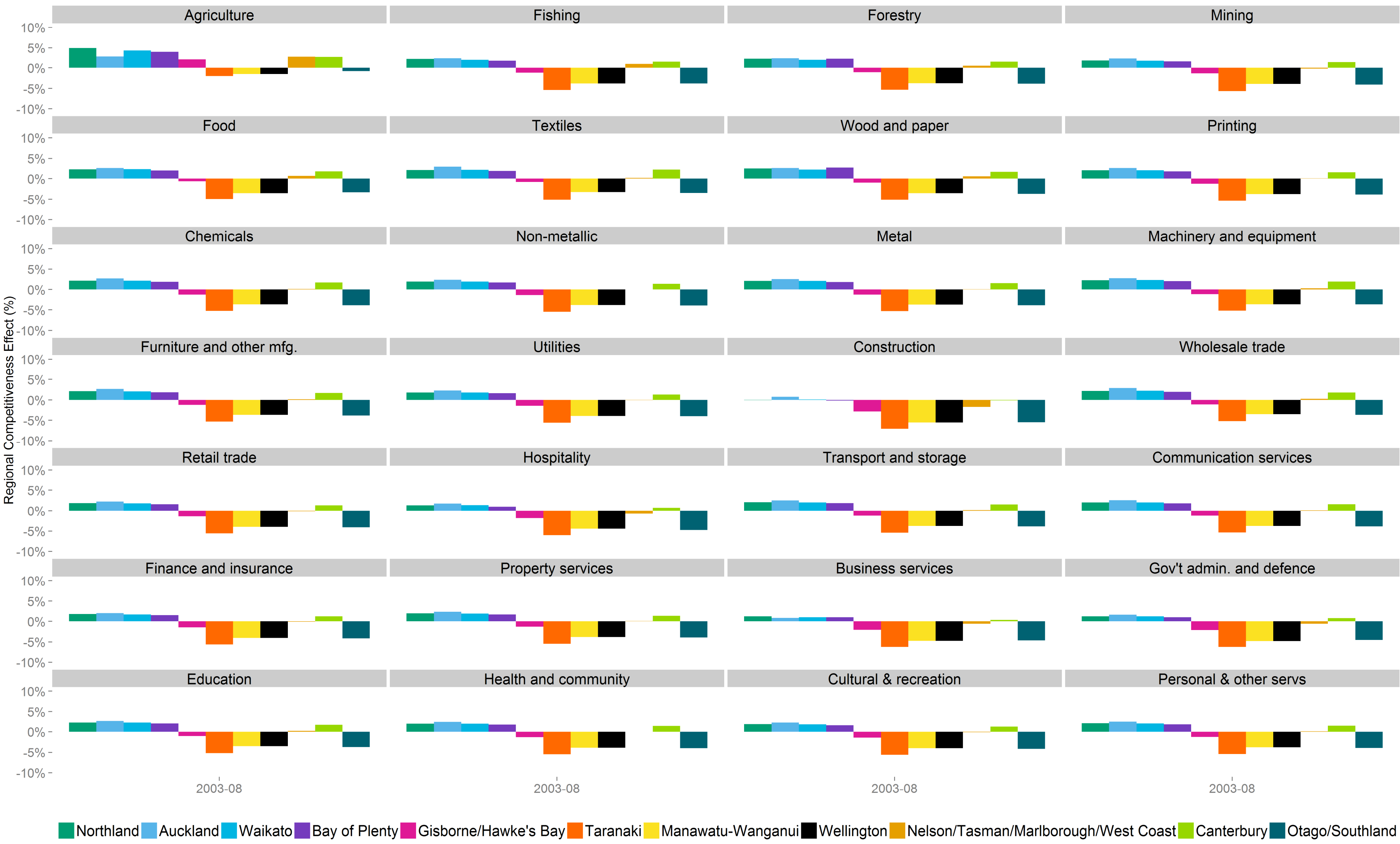


Figure 7. Regional competitive advantage, 2009-14

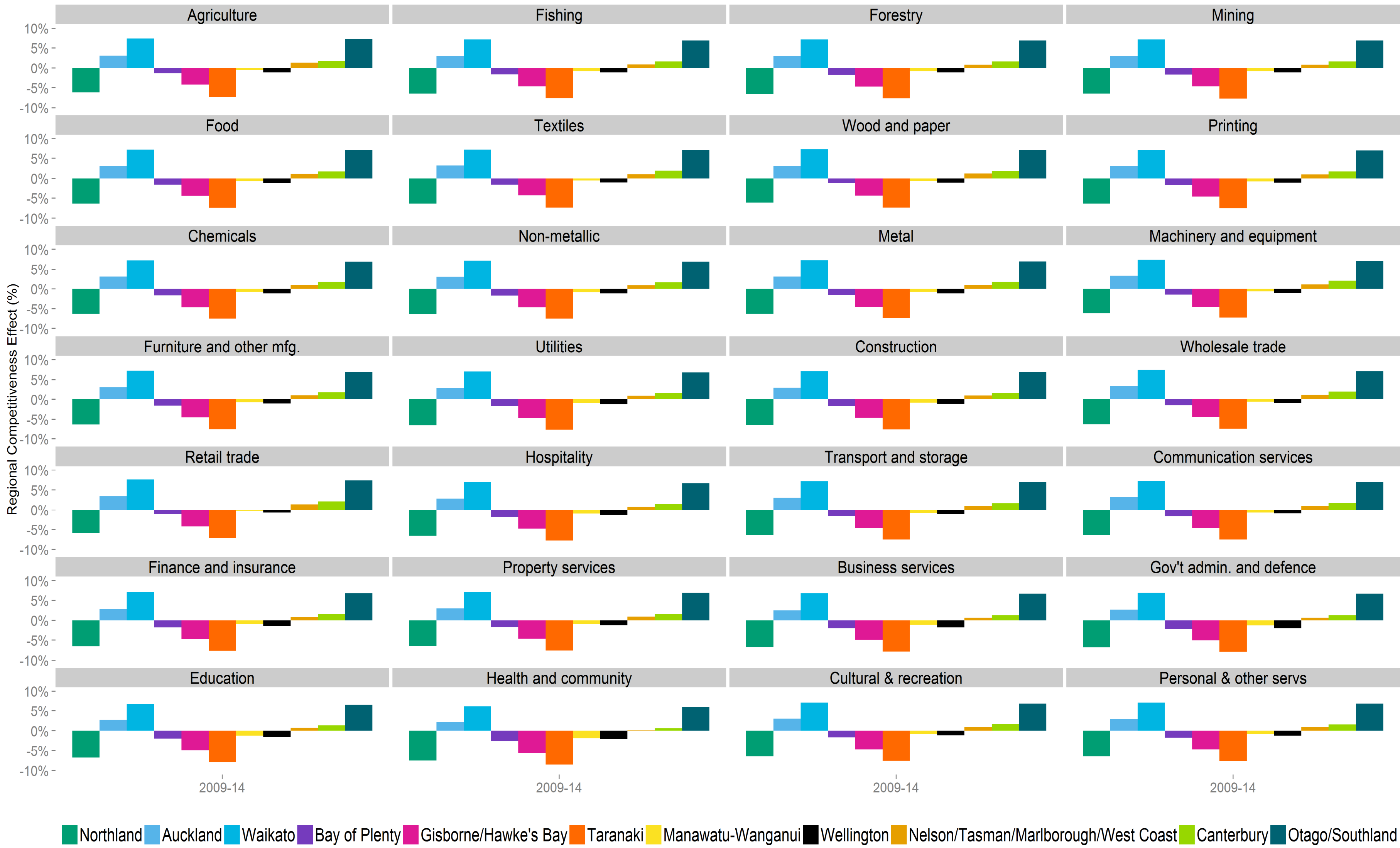


Figure 8. Regional competitiveness advantage, 2015-18

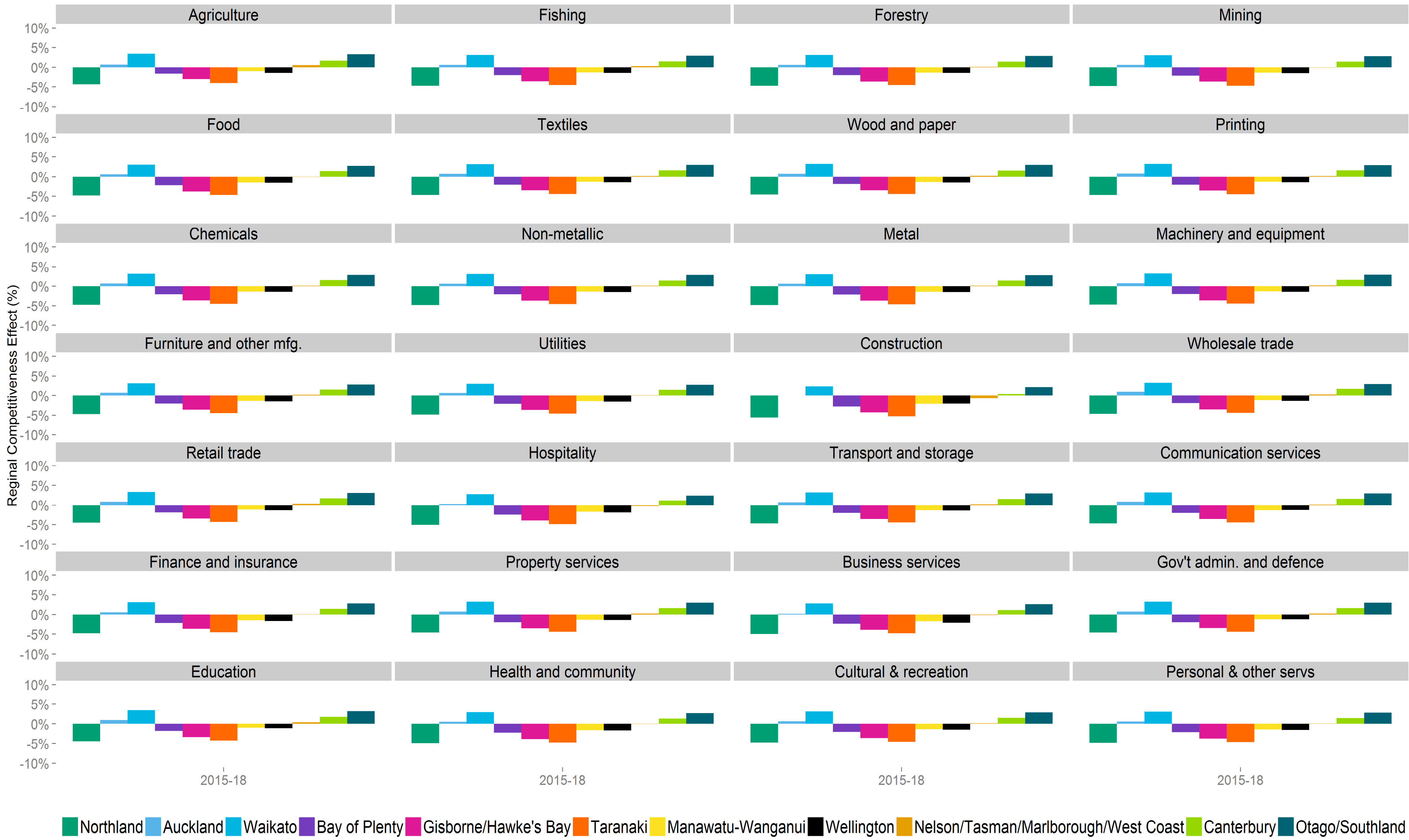


Figure 9. Industry mix and regional competitiveness effects, 2000-08, 2009-14 and 2015-18 periods

Note: The size of the bubble represents employment growth for 2003-08, 2009-14 and 2015-18 periods.

Regions on the top-right (Auckland, Waikato, Canterbury and Otago/Southland) had local industries that were able to generate employment due to their relative competitive position. These regions had industries that were growing faster than the national average. About 28 per cent of the total increase in employment in the Auckland region was generated locally. This compares with about 13 per cent for Canterbury region (mainly due to construction activities). Auckland's communication services, retail trade and hospitality grew faster that the national employment as whole.

Table 2 compares Spearman rank correlation[7] coefficients for the industry mix rate and the regional competitive growth rates across the three periods. The highest rank correlation was found for the regional competitive growth rate. This indicates statistically significant association between regional employment growth and regional competitive growth rates, confirming the visual pattern shown in Figure 3.

[7] Spearman rank correlation is a nonparametric version of the Pearson-product-moment correlation that measures the strength of the association between two ranked variables. In this case, we ranked the regions based on the employment growth rates, industry mix and regional competitive growth rates. This statistics was used given the monotonic relationship between regional employment growth rate and the two shift-share components.

Table 2. Spearman rank correlation (rho)

Period	Industry mix	Regional competitive advantage
2003-08	0.46364	0.74773*
2009-14	-0.02727	0.99091*
2015-18	0.40909	0.99091*

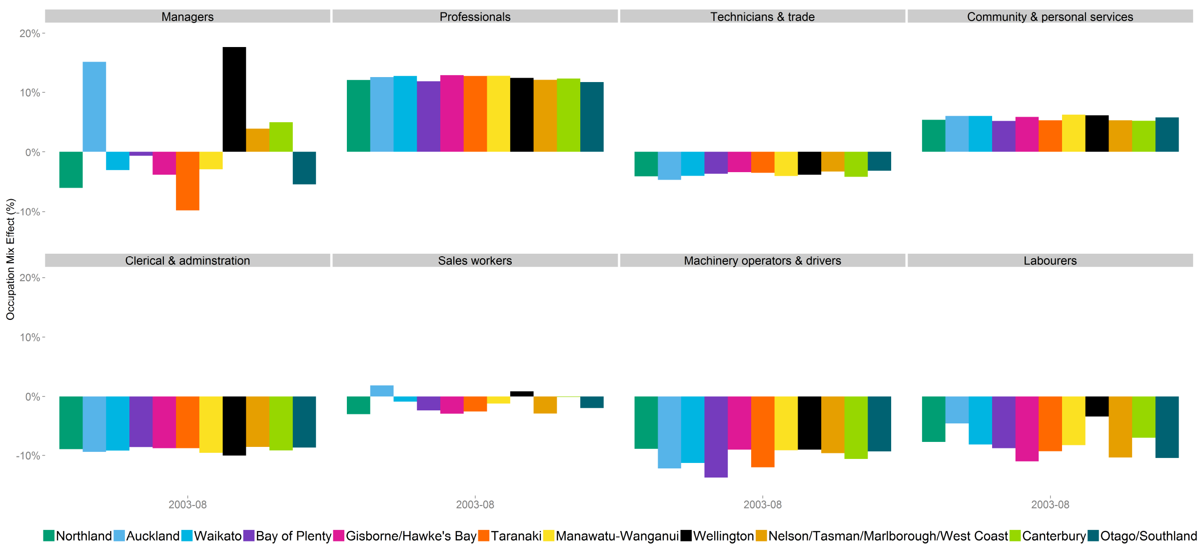
* significant at alpha =.01

Occupation

As shown in Figure 10, skilled occupations had positive growth between 2003 and 2008, with the professional and community and personal service occupation groups growing across all regions. Growth for professional occupation groups was almost twice as fast as the growth from technicians and trade in all regions. As expected, growth for managerial occupations benefitted Auckland and Wellington regions the most, followed by other larger regions like Waikato and Bay of Plenty. On the other hand, employment in lower skilled occupations (except for sales workers in the Auckland and Wellington regions) decreased between 2003 and 2008. This was most disadvantageous for provincial regions than for urban regions. This pattern is similar to the positive industry effects from the business services, government administration and defence, and construction industries, and negative effects from the primary and manufacturing industries for the 2003-08 period.

Amongst the occupational groups, employment of farmers and farm managers and retail managers, wood trade workers and farm, forestry and garden workers declined in all regions. Employment among labourers in manufacturing industries and clerical workers also contracted in all regions between 2003 and 2008.[8]

Figure 10. Occupation mix growth, major occupation groups by region, 2003 and 2008



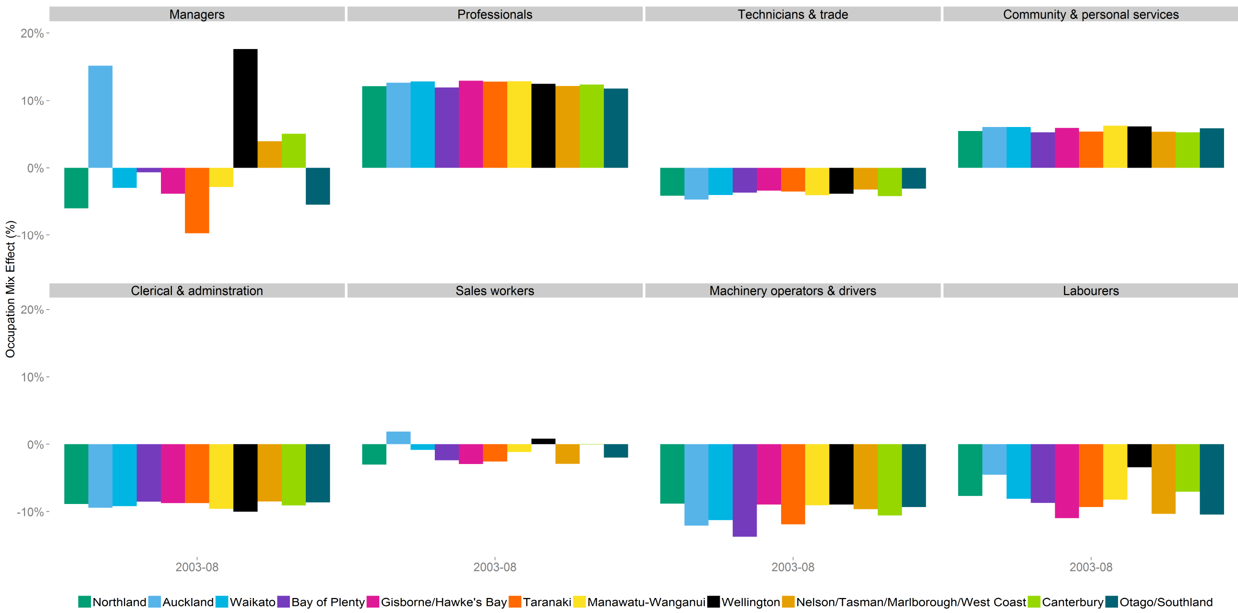
Between 2009 and 2014, as shown in Figure 11, a similar pattern of occupation profiles are seen within regions with growth of skilled occupations and decline of lower skilled occupations, albeit smaller in scale. The regional employment changes due to occupation mix were smaller compared to

[8] A detailed occupation mix effect table for 97 occupational groups is available from the authors upon request.

the 2003 and 2008 period. Following the GFC, a number of industries including hospitality, construction and business services were impacted, resulting in nationwide decline in employment. The positive effect from growth of managerial and professional occupations was also slower in all regions compared to the growth experienced between 2003 and 2008, which displayed a stronger growth (over 10 per cent from 2003 levels) in skilled occupations.

Industry trends during this period, particularly the contraction of activities in manufacturing, business service and construction industries resulted in negative occupation mix effects and this declines in employment for construction, distribution and production managers, sales and marketing professionals, financial and investment advisers and in a number of clerical and technicians and trade occupations. This period also saw a decline in employment of sales workers that negatively affected employment in all regions. Overall, regional employment growth between 2009 and 2014 was skewed in favour of higher-skilled and semi-skilled workers.

Figure 11. Occupation mix effect, major occupation groups by region, 2009 and 2014



The occupation mix growth over the forecast period 2015-18, as shown in Figure 12, reflects the impact of on-going rebuilding activities in the Canterbury region, and residential and non-residential construction activities across the country. Unlike the two historical periods, all regions are forecast to experience growth in the technicians and trade occupations. This results in a more balanced picture of the distribution of employment across the eight occupation groups. The forecast employment growth for professionals, community and personal services workers (even for managerial occupations) in the Auckland and Wellington regions is modest compared to the growth experienced for 2003-08 and 2009-14 periods in all regions.

Figure 12. Occupation mix growth, major occupation groups by region, 2015-18

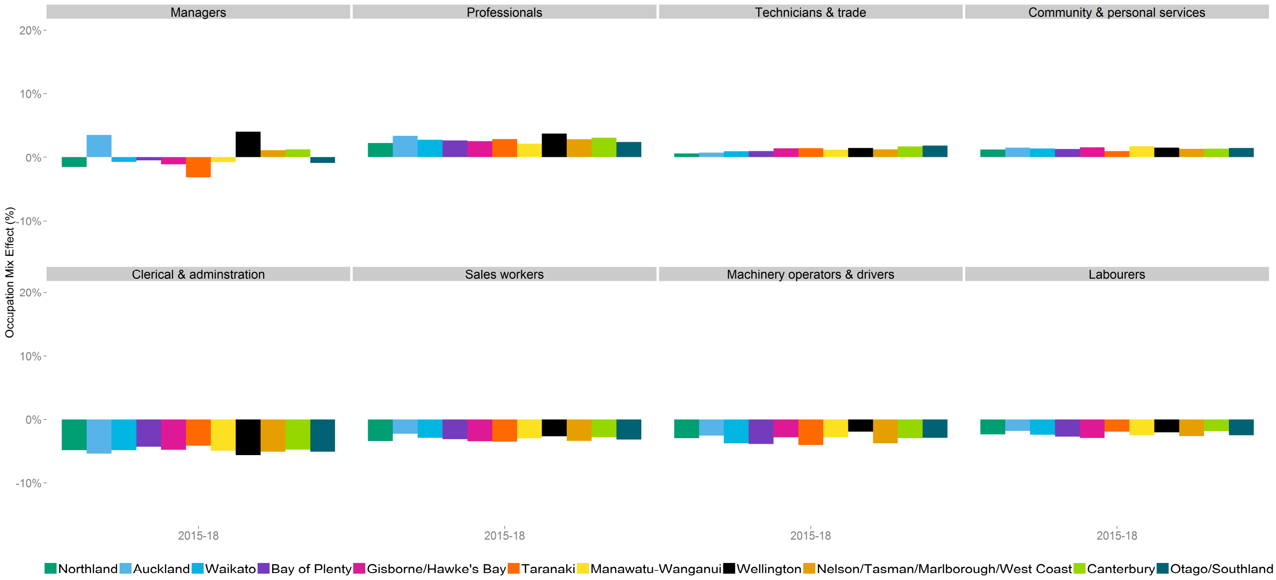


Figure 13 presents a picture consistent with the impact of industry mix on regional employment change. The observed variation in employment across the regions reflects the expansion and contraction of certain industries at the national level such as occupations linked to the building and construction activities, and business services. This explains the relative position of urban areas like Auckland, Wellington and Canterbury. These regions tend to have an occupation mix that is skewed towards highly skilled and skilled workers. It also follows that occupations that are associated with contraction in the manufacturing and agricultural industries, and those associated with less diversified regional economies would exhibit declines in employment.

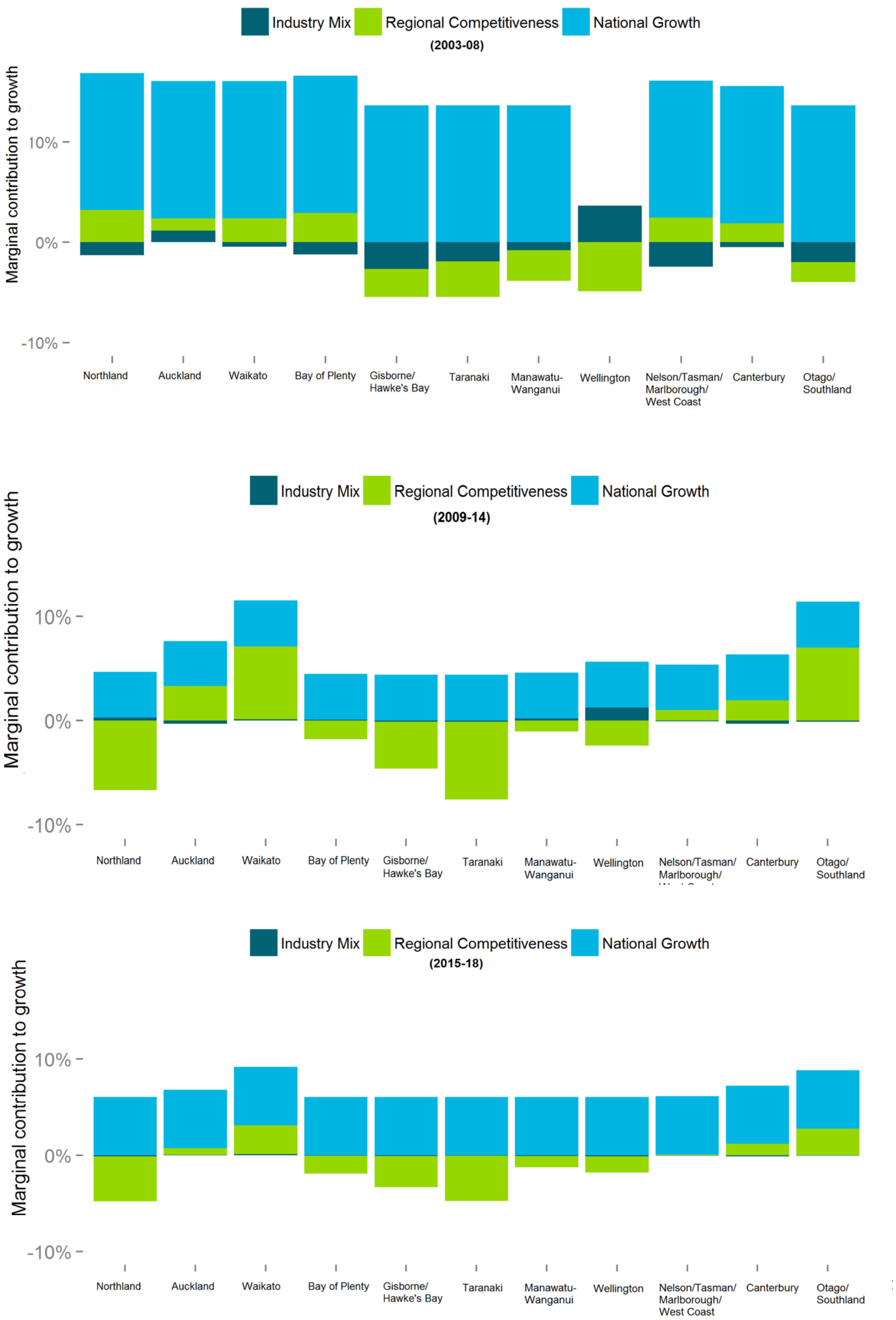
Figure 13. Occupation mix and regional competitive advantage

Note: The size of the bubble represents the employment growth rates for 2003-08, 2009-14 and 2015-18 periods.

Shift-share summary

Figures 14 and 15 summarise the results from the shift share analysis of regional employment changes for three periods, from 2003 to 2018. The results show that the largest marginal contribution to regional employment change was national growth. This means that overall economic and employment conditions, tend to support regional economies. However, the marginal contribution from regional factors or competitiveness effect tends to explain variations in observed growth differentials across regions. The largest regional changes were in the Waikato and Otago and Southland regions due to their competitiveness relative to the national economy. This was followed by major urban regions like Auckland, Canterbury and Wellington, largely due to these regions industry and occupation mix.

Figure 14. Shift-share analysis by region (industry employment)



6. Conclusion

The shift-share analysis provides a way to allocate regional employment changes among the three shift-share components. The results suggest that while industry specialisation matters, factors inherent to the region tend to contribute significantly to regional employment change. Regions that experienced higher competitiveness growth rates have enjoyed faster employment growth relative to other regions.

Wellington, Auckland, Canterbury and Waikato were most advantaged by the composition of their industrial bases, whereas provincial regions such as Taranaki, Northland, and Gisborne/Hawke's Bay were notably disadvantaged. While agriculture is the mainstay that boosts employment in most provincial regions, these regions have a less diversified industry mix and are therefore less likely to benefit from increasing share of service and construction industries to total employment. Further, dependency on its traditional industries is likely to limit growth in these regions. However, the overall regional competitive effects were more pronounced than industry effects in terms of association with employment growth. A potential extension from this work is to focus on identifying the source of the region's competitive advantage and leverage from this in order to promote economic growth.

The main implication of the findings is that manufacturing and agriculture, which are considered as major areas of employment within provincial regions, are no longer the major contributors to employment growth. Instead, the services and construction sectors have become more relevant to growing employment in the regions. Regions that are more service-focused particularly the Auckland and Waikato regions in the North Island, and Otago/Southland and Canterbury regions in the South Island, benefited more from national employment growth in the three periods analysed in this paper. Retail trade and business service industries in these regions grew faster than the national employment, suggesting that these are more favourable to employment growth relative to other industries.

Overall, employment can expand employment in some regions and industries. However, there are regions and industries that benefit more from this overall growth, thus exerting an upward "push" to employment in occupations particularly associated with those industries. In the three periods analysed, employment in higher skilled occupations, particularly for professionals has increased while employment growth for lower skilled occupations had been modest, if not declined for all the regions.

7. Appendices

A1. Industry mix growth rate, 2003-08

ANSIC06	Northland	Auckland	Waikato	Bay of Plenty	Gisborne/ Hawkes' Bay	Taranaki	Manawatu-Wanganui	Wellington	Nelson/Tasman /Marlborough/ West Coast	Canterbury	Otago/Southland
Agriculture	-2.95%	-0.49%	-2.38%	-2.29%	-3.48%	-3.47%	-2.33%	-0.14%	-2.80%	-1.32%	-3.19%
Fishing	-0.26%	-0.03%	-0.10%	-0.10%	-0.13%	-0.06%	-0.06%	-0.03%	-0.91%	-0.06%	-0.15%
Forestry and logging	-0.33%	-0.03%	-0.08%	-0.59%	-0.27%	-0.14%	-0.11%	-0.02%	-0.47%	-0.06%	-0.11%
Mining and quarrying	0.11%	0.02%	0.12%	0.07%	0.04%	0.21%	0.04%	0.02%	0.22%	0.03%	0.11%
Food, beverage and tobacco manufacturing	-0.29%	-0.21%	-0.36%	-0.25%	-0.68%	-0.52%	-0.35%	-0.15%	-0.67%	-0.34%	-0.67%
Textiles and apparel manufacturing	-0.14%	-0.51%	-0.22%	-0.17%	-0.51%	-0.33%	-0.59%	-0.26%	-0.17%	-0.76%	-0.47%
Wood and paper products manufacturing	-0.48%	-0.22%	-0.28%	-0.97%	-0.38%	-0.34%	-0.30%	-0.13%	-0.52%	-0.25%	-0.30%
Printing, publishing and recorded media	-0.05%	-0.20%	-0.07%	-0.05%	-0.07%	-0.04%	-0.11%	-0.17%	-0.05%	-0.15%	-0.09%
Chemicals manufacturing	-0.16%	-0.30%	-0.22%	-0.14%	-0.11%	-0.18%	-0.18%	-0.24%	-0.10%	-0.27%	-0.07%
Non-metallic mineral products manufacturing	0.04%	0.03%	0.03%	0.02%	0.02%	0.02%	0.02%	0.01%	0.03%	0.03%	0.02%
Metal product manufacturing	-0.10%	-0.16%	-0.16%	-0.08%	-0.07%	-0.14%	-0.08%	-0.08%	-0.06%	-0.11%	-0.07%
Machinery and equipment manufacturing	-0.29%	-0.39%	-0.34%	-0.32%	-0.20%	-0.25%	-0.25%	-0.16%	-0.26%	-0.50%	-0.25%
Furniture and other manufacturing	-0.17%	-0.30%	-0.13%	-0.14%	-0.14%	-0.14%	-0.18%	-0.14%	-0.17%	-0.26%	-0.11%
Electricity, gas and water supply	0.14%	0.09%	0.12%	0.09%	0.07%	0.14%	0.10%	0.08%	0.07%	0.08%	0.09%
Construction	2.00%	1.62%	1.84%	1.86%	1.58%	1.65%	1.68%	1.40%	1.73%	1.52%	1.54%
Wholesale trade	-0.24%	-0.53%	-0.32%	-0.26%	-0.26%	-0.24%	-0.29%	-0.32%	-0.23%	-0.38%	-0.24%
Retail trade (including motor vehicle repairs)	0.12%	0.11%	0.12%	0.13%	0.11%	0.11%	0.13%	0.11%	0.12%	0.12%	0.12%
Accommodation, cafes and restaurants	0.64%	0.62%	0.56%	0.73%	0.54%	0.55%	0.57%	0.61%	0.76%	0.69%	0.80%
Transport and storage	-0.10%	-0.13%	-0.09%	-0.13%	-0.10%	-0.09%	-0.09%	-0.10%	-0.12%	-0.12%	-0.11%
Communication services	-0.07%	-0.20%	-0.10%	-0.07%	-0.07%	-0.09%	-0.10%	-0.31%	-0.08%	-0.14%	-0.10%
Finance and insurance	0.15%	0.31%	0.20%	0.16%	0.15%	0.14%	0.19%	0.47%	0.13%	0.21%	0.17%
Property services	-0.02%	-0.02%	-0.02%	-0.02%	-0.01%	-0.01%	-0.02%	-0.01%	-0.02%	-0.02%	-0.01%
Business services	0.70%	1.53%	0.95%	0.77%	0.74%	0.73%	0.86%	1.90%	0.65%	1.07%	0.68%
Government admin. and defence	0.69%	0.70%	0.67%	0.75%	0.80%	0.77%	0.96%	1.48%	0.63%	0.67%	0.58%
Education	-0.28%	-0.26%	-0.31%	-0.26%	-0.27%	-0.27%	-0.35%	-0.29%	-0.21%	-0.28%	-0.27%
Health and community services	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Cultural and recreational services	0.12%	0.17%	0.17%	0.16%	0.11%	0.14%	0.13%	0.18%	0.15%	0.17%	0.21%
Personal and other community services	-0.07%	-0.06%	-0.06%	-0.07%	-0.06%	-0.06%	-0.07%	-0.07%	-0.06%	-0.06%	-0.05%
Total	**-1.27%**	**1.15%**	**-0.45%**	**-1.18%**	**-2.64%**	**-1.90%**	**-0.77%**	**3.64%**	**-2.42%**	**-0.47%**	**-1.96%**

Note: Negative values indicate that the local industry employment did not grow as quickly as employment rates in that same industry at the national level. Positive values indicate that the local industry employment grew faster than employment in that same industry at the national level. The industry mix effect is weighted against the regional economy in the base period t-1.

A2. Industry mix growth, 2009-14

	Northland	Auckland	Waikato	Bay of Plenty	Gisborne/ Hawkes' Bay	Taranaki	Manawatu-Wanganui	Wellington	Nelson/tasman /Marlborough/ West Coast	Canterbury	Otago/Southland
Agriculture	-0.28%	-0.06%	-0.24%	-2.29%	-3.48%	-0.33%	-0.24%	-0.02%	-0.36%	-0.15%	-0.35%
Fishing	0.02%	0.00%	0.01%	-0.10%	-0.13%	0.00%	0.00%	0.00%	0.04%	0.00%	0.01%
Forestry and logging	0.08%	0.01%	0.02%	-0.59%	-0.27%	0.04%	0.03%	0.00%	0.10%	0.01%	0.03%
Mining and quarrying	0.02%	0.01%	0.04%	0.07%	0.04%	0.09%	0.01%	0.01%	0.10%	0.01%	0.03%
Food, beverage and tobacco manufacturing	-0.07%	-0.07%	-0.12%	-0.25%	-0.68%	-0.17%	-0.10%	-0.04%	-0.18%	-0.10%	-0.18%
Textiles and apparel manufacturing	-0.09%	-0.25%	-0.11%	-0.17%	-0.51%	-0.19%	-0.27%	-0.14%	-0.10%	-0.30%	-0.21%
Wood and paper products manufacturing	-0.31%	-0.13%	-0.17%	-0.97%	-0.38%	-0.21%	-0.19%	-0.07%	-0.29%	-0.15%	-0.17%
Printing, publishing and recorded media	-0.03%	-0.12%	-0.05%	-0.05%	-0.07%	-0.03%	-0.07%	-0.09%	-0.03%	-0.10%	-0.05%
Chemicals manufacturing	-0.07%	-0.11%	-0.09%	-0.14%	-0.11%	-0.06%	-0.05%	-0.06%	-0.04%	-0.09%	-0.03%
Non-metallic mineral products manufacturing	-0.05%	-0.04%	-0.03%	0.02%	0.02%	-0.03%	-0.02%	-0.01%	-0.03%	-0.03%	-0.03%
Metal product manufacturing	-0.10%	-0.14%	-0.16%	-0.08%	-0.07%	-0.16%	-0.09%	-0.06%	-0.07%	-0.11%	-0.08%
Machinery and equipment manufacturing	-0.24%	-0.31%	-0.29%	-0.32%	-0.20%	-0.27%	-0.17%	-0.13%	-0.21%	-0.41%	-0.21%
Furniture and other manufacturing	-0.10%	-0.17%	-0.08%	-0.14%	-0.14%	-0.09%	-0.13%	-0.10%	-0.09%	-0.13%	-0.06%
Electricity, gas and water supply	0.10%	0.05%	0.08%	0.09%	0.07%	0.08%	0.06%	0.07%	0.05%	0.06%	0.06%
Construction	0.01%	0.00%	0.01%	1.86%	1.58%	0.01%	0.01%	0.00%	0.01%	0.00%	0.01%
Wholesale trade	-0.19%	-0.43%	-0.26%	-0.26%	-0.26%	-0.20%	-0.25%	-0.24%	-0.19%	-0.32%	-0.20%
Retail trade (including motor vehicle repairs)	-0.56%	-0.48%	-0.51%	0.13%	0.11%	-0.50%	-0.56%	-0.45%	-0.51%	-0.52%	-0.50%
Accommodation, cafes and restaurants	0.15%	0.14%	0.13%	0.73%	0.54%	0.13%	0.12%	0.14%	0.17%	0.15%	0.17%
Transport and storage	-0.08%	-0.11%	-0.08%	-0.13%	-0.10%	-0.08%	-0.08%	-0.09%	-0.09%	-0.11%	-0.09%
Communication services	-0.07%	-0.22%	-0.09%	-0.07%	-0.07%	-0.08%	-0.10%	-0.25%	-0.08%	-0.14%	-0.10%
Finance and insurance	0.08%	0.18%	0.09%	0.16%	0.15%	0.07%	0.10%	0.21%	0.06%	0.10%	0.08%
Property services	0.02%	0.02%	0.02%	-0.02%	-0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
Business services	0.25%	0.50%	0.35%	0.77%	0.74%	0.25%	0.28%	0.58%	0.24%	0.36%	0.25%
Government admin. and defence	0.35%	0.31%	0.31%	0.75%	0.80%	0.34%	0.45%	0.74%	0.27%	0.30%	0.25%
Education	0.32%	0.30%	0.34%	-0.26%	-0.27%	0.30%	0.39%	0.34%	0.24%	0.31%	0.33%
Health and community services	1.07%	0.78%	0.96%	0.01%	0.01%	0.93%	1.04%	0.85%	0.86%	0.98%	0.86%
Cultural and recreational services	0.00%	0.00%	0.00%	0.16%	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Personal and other community services	0.03%	0.03%	0.03%	-0.07%	-0.06%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
Total	**0.26%**	**-0.29%**	**0.10%**	**-1.18%**	**-2.64%**	**-0.12%**	**0.20%**	**1.23%**	**-0.07%**	**-0.32%**	**-0.13%**

A3. Industry mix growth, 2015-18

	Northland	Auckland	Waikato	Bay of Plenty	Gisborne/ Hawkes' Bay	Taranaki	Manawatu-Wanganui	Wellington	Nelson/Tasman /Marlborough/ West Coast	Canterbury	Otago/Southland
Agriculture	-0.39%	-0.08%	-0.34%	-0.42%	-0.63%	-0.47%	-0.34%	-0.02%	-0.48%	-0.19%	-0.42%
Fishing	-0.05%	-0.03%	-0.02%	-0.04%	-0.05%	-0.01%	-0.02%	-0.01%	-0.19%	-0.02%	-0.05%
Forestry and logging	-0.01%	0.00%	0.00%	-0.02%	-0.01%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%
Mining and quarrying	0.03%	0.01%	0.06%	0.03%	0.02%	0.18%	0.03%	0.02%	0.16%	0.01%	0.05%
Food, beverage and tobacco manufacturing	0.07%	0.07%	0.11%	0.08%	0.21%	0.18%	0.10%	0.04%	0.18%	0.09%	0.18%
Textiles and apparel manufacturing	-0.07%	-0.09%	-0.05%	-0.09%	-0.26%	-0.11%	-0.09%	-0.07%	-0.05%	-0.11%	-0.09%
Wood and paper products manufacturing	-0.16%	-0.06%	-0.06%	-0.42%	-0.16%	-0.11%	-0.07%	-0.03%	-0.13%	-0.08%	-0.07%
Printing, publishing and recorded media	-0.03%	-0.12%	-0.06%	-0.05%	-0.07%	-0.04%	-0.09%	-0.10%	-0.03%	-0.10%	-0.05%
Chemicals manufacturing	-0.05%	-0.05%	-0.05%	-0.04%	-0.03%	-0.04%	-0.04%	-0.03%	-0.02%	-0.05%	-0.02%
Non-metallic mineral products manufacturing	0.02%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.01%
Metal product manufacturing	0.03%	0.04%	0.06%	0.03%	0.03%	0.06%	0.03%	0.02%	0.02%	0.04%	0.04%
Machinery and equipment manufacturing	-0.07%	-0.10%	-0.10%	-0.11%	-0.07%	-0.09%	-0.06%	-0.04%	-0.06%	-0.13%	-0.05%
Furniture and other manufacturing	-0.06%	-0.07%	-0.05%	-0.07%	-0.07%	-0.06%	-0.05%	-0.04%	-0.05%	-0.06%	-0.04%
Electricity, gas and water supply	0.07%	0.02%	0.06%	0.03%	0.02%	0.05%	0.05%	0.05%	0.03%	0.05%	0.04%
Construction	0.81%	0.70%	0.77%	0.68%	0.57%	0.77%	0.69%	0.56%	0.78%	1.06%	0.76%
Wholesale trade	-0.13%	-0.29%	-0.20%	-0.17%	-0.17%	-0.13%	-0.19%	-0.15%	-0.13%	-0.22%	-0.15%
Retail trade (including motor vehicle repairs)	-0.22%	-0.21%	-0.21%	-0.25%	-0.21%	-0.20%	-0.22%	-0.18%	-0.22%	-0.21%	-0.22%
Accommodation, cafes and restaurants	0.33%	0.41%	0.32%	0.37%	0.27%	0.32%	0.31%	0.37%	0.39%	0.32%	0.47%
Transport and storage	-0.08%	-0.09%	-0.06%	-0.10%	-0.08%	-0.07%	-0.07%	-0.07%	-0.08%	-0.09%	-0.08%
Communication services	-0.05%	-0.19%	-0.07%	-0.07%	-0.07%	-0.06%	-0.07%	-0.22%	-0.06%	-0.09%	-0.08%
Finance and insurance	0.05%	0.10%	0.04%	0.04%	0.04%	0.04%	0.06%	0.11%	0.04%	0.06%	0.04%
Property services	-0.13%	-0.13%	-0.11%	-0.14%	-0.10%	-0.10%	-0.11%	-0.09%	-0.12%	-0.12%	-0.12%
Business services	0.23%	0.47%	0.32%	0.21%	0.21%	0.25%	0.27%	0.55%	0.27%	0.35%	0.23%
Government admin. and defence	-0.13%	-0.13%	-0.13%	-0.11%	-0.12%	-0.12%	-0.18%	-0.28%	-0.11%	-0.12%	-0.10%
Education	-0.34%	-0.30%	-0.34%	-0.29%	-0.30%	-0.29%	-0.38%	-0.36%	-0.24%	-0.30%	-0.33%
Health and community services	0.20%	0.13%	0.18%	0.14%	0.14%	0.17%	0.19%	0.15%	0.15%	0.16%	0.15%
Cultural and recreational services	-0.04%	-0.03%	-0.04%	-0.03%	-0.02%	-0.03%	-0.03%	-0.05%	-0.04%	-0.03%	-0.05%
Personal and other community services	0.05%	0.04%	0.04%	0.05%	0.04%	0.04%	0.00%	0.04%	0.04%	0.04%	0.04%
Total	**-0.11%**	**0.04%**	**0.11%**	**-0.74%**	**-0.87%**	**0.15%**	**-0.29%**	**0.19%**	**0.03%**	**0.28%**	**0.10%**

A4. Regional competitive advantage growth, 2003-08

	Northland	Auckland	Waikato	Bay of Plenty	Gisborne/ Hawkes' Bay	Taranaki	Manawatu-Wanganui	Wellington	Nelson/Tasman /Marlborough/ West Coast	Canterbury	Otago/Southland
Agriculture	4.92%	2.87%	4.32%	4.02%	2.16%	-1.98%	-1.51%	-1.51%	2.83%	2.74%	-0.77%
Fishing	2.23%	2.41%	2.04%	1.83%	-1.19%	-5.39%	-3.79%	-3.79%	0.93%	1.48%	-3.80%
Forestry and logging	2.31%	2.40%	2.02%	2.32%	-1.06%	-5.31%	-3.73%	-3.73%	0.49%	1.48%	-3.84%
Mining and quarrying	1.86%	2.35%	1.83%	1.66%	-1.36%	-5.66%	-3.89%	-3.89%	-0.19%	1.39%	-4.06%
Food, beverage and tobacco manufacturing	2.26%	2.59%	2.30%	1.98%	-0.64%	-4.93%	-3.50%	-3.50%	0.70%	1.76%	-3.28%
Textiles and apparel manufacturing	2.12%	2.89%	2.16%	1.90%	-0.81%	-5.12%	-3.26%	-3.26%	0.20%	2.18%	-3.48%
Wood and paper products manufacturing	2.45%	2.60%	2.22%	2.70%	-0.94%	-5.11%	-3.54%	-3.54%	0.55%	1.67%	-3.66%
Printing, publishing and recorded media	2.02%	2.58%	2.02%	1.78%	-1.25%	-5.40%	-3.74%	-3.74%	0.07%	1.57%	-3.87%
Chemicals manufacturing	2.13%	2.68%	2.16%	1.87%	-1.21%	-5.27%	-3.67%	-3.67%	0.12%	1.69%	-3.88%
Non-metallic mineral products manufacturing	1.93%	2.34%	1.91%	1.71%	-1.34%	-5.47%	-3.87%	-3.87%	-0.01%	1.40%	-3.98%
Metal product manufacturing	2.07%	2.53%	2.10%	1.81%	-1.26%	-5.31%	-3.77%	-3.77%	0.09%	1.53%	-3.88%
Machinery and equipment manufacturing	2.27%	2.76%	2.28%	2.05%	-1.13%	-5.20%	-3.60%	-3.60%	0.28%	1.93%	-3.70%
Furniture and other manufacturing	2.15%	2.67%	2.07%	1.87%	-1.19%	-5.31%	-3.67%	-3.67%	0.20%	1.69%	-3.84%
Electricity, gas and water supply	1.83%	2.29%	1.82%	1.63%	-1.40%	-5.59%	-3.94%	-3.94%	-0.04%	1.35%	-4.04%
Construction	-0.03%	0.75%	0.10%	-0.13%	-2.90%	-7.10%	-5.53%	-5.53%	-1.70%	-0.09%	-5.50%
Wholesale trade	2.21%	2.91%	2.26%	1.99%	-1.06%	-5.21%	-3.55%	-3.55%	0.26%	1.80%	-3.72%
Retail trade (including motor vehicle repairs)	1.85%	2.26%	1.82%	1.60%	-1.43%	-5.56%	-3.97%	-3.97%	-0.09%	1.31%	-4.07%
Accommodation, cafes and restaurants	1.34%	1.75%	1.38%	1.00%	-1.86%	-5.99%	-4.41%	-4.41%	-0.73%	0.73%	-4.75%
Transport and storage	2.07%	2.50%	2.03%	1.85%	-1.22%	-5.36%	-3.76%	-3.76%	0.14%	1.55%	-3.85%
Communication services	2.04%	2.58%	2.04%	1.80%	-1.25%	-5.36%	-3.74%	-3.74%	0.10%	1.57%	-3.86%
Finance and insurance	1.83%	2.07%	1.74%	1.56%	-1.47%	-5.59%	-4.04%	-4.04%	-0.10%	1.22%	-4.12%
Property services	1.99%	2.39%	1.96%	1.74%	-1.31%	-5.44%	-3.83%	-3.83%	0.04%	1.44%	-3.94%
Business services	1.28%	0.85%	0.99%	0.96%	-2.06%	-6.18%	-4.71%	-4.71%	-0.62%	0.36%	-4.64%
Government admin. and defence	1.28%	1.68%	1.27%	0.98%	-2.12%	-6.22%	-4.81%	-4.81%	-0.60%	0.75%	-4.53%
Education	2.25%	2.64%	2.25%	1.99%	-1.06%	-5.18%	-3.50%	-3.50%	0.23%	1.70%	-3.68%
Health and community services	1.97%	2.37%	1.93%	1.72%	-1.33%	-5.46%	-3.85%	-3.85%	0.02%	1.42%	-3.96%
Cultural and recreational services	1.85%	2.21%	1.77%	1.57%	-1.44%	-5.59%	-3.98%	-3.98%	-0.12%	1.26%	-4.16%
Personal and other community services	2.04%	2.44%	2.01%	1.80%	-1.27%	-5.39%	-3.78%	-3.78%	0.08%	1.49%	-3.90%
Total	**3.24%**	**1.23%**	**2.40%**	**2.91%**	**-2.81%**	**-3.55%**	**-3.08%**	**-3.08%**	**2.44%**	**1.90%**	**-1.99%**

A5. Regional competitive advantage growth, 2009-14

	Northland	Auckland	Waikato	Bay of Plenty	Gisborne/ Hawkes' Bay	Taranaki	Manawatu-Wanganui	Wellington	Nelson/Tasman /Marlborough/ West Coast	Canterbury	Otago/Southland
Agriculture	-6.17%	3.04%	7.38%	-1.42%	-4.23%	-7.26%	-0.59%	-1.15%	1.29%	1.78%	7.23%
Fishing	-6.46%	2.98%	7.13%	-1.69%	-4.66%	-7.60%	-0.83%	-1.17%	0.88%	1.63%	6.87%
Forestry and logging	-6.52%	2.98%	7.12%	-1.80%	-4.74%	-7.63%	-0.86%	-1.17%	0.82%	1.62%	6.85%
Mining and quarrying	-6.47%	2.98%	7.10%	-1.71%	-4.67%	-7.68%	-0.84%	-1.18%	0.83%	1.62%	6.85%
Food, beverage and tobacco manufacturing	-6.38%	3.05%	7.25%	-1.61%	-4.46%	-7.43%	-0.73%	-1.13%	1.11%	1.73%	7.06%
Textiles and apparel manufacturing	-6.36%	3.23%	7.24%	-1.60%	-4.35%	-7.40%	-0.56%	-1.03%	1.02%	1.93%	7.09%
Wood and paper products manufacturing	-6.13%	3.11%	7.30%	-1.21%	-4.41%	-7.38%	-0.65%	-1.10%	1.21%	1.78%	7.04%
Printing, publishing and recorded media	-6.41%	3.10%	7.18%	-1.65%	-4.62%	-7.56%	-0.76%	-1.08%	0.95%	1.73%	6.93%
Chemicals manufacturing	-6.38%	3.09%	7.23%	-1.63%	-4.63%	-7.53%	-0.78%	-1.11%	0.96%	1.72%	6.91%
Non-metallic mineral products manufacturing	-6.40%	3.02%	7.16%	-1.66%	-4.64%	-7.57%	-0.81%	-1.16%	0.96%	1.66%	6.91%
Metal product manufacturing	-6.35%	3.12%	7.29%	-1.59%	-4.58%	-7.43%	-0.74%	-1.11%	1.00%	1.74%	6.96%
Machinery and equipment manufacturing	-6.20%	3.30%	7.42%	-1.44%	-4.52%	-7.32%	-0.66%	-1.04%	1.13%	2.04%	7.08%
Furniture and other manufacturing	-6.35%	3.15%	7.22%	-1.60%	-4.55%	-7.51%	-0.70%	-1.07%	1.01%	1.76%	6.94%
Electricity, gas and water supply	-6.54%	2.93%	7.05%	-1.75%	-4.71%	-7.67%	-0.89%	-1.24%	0.88%	1.57%	6.82%
Construction	-6.45%	2.98%	7.13%	-1.69%	-4.66%	-7.60%	-0.84%	-1.17%	0.92%	1.62%	6.87%
Wholesale trade	-6.26%	3.41%	7.39%	-1.48%	-4.46%	-7.39%	-0.58%	-0.93%	1.11%	1.95%	7.08%
Retail trade (including motor vehicle repairs)	-5.89%	3.46%	7.64%	-1.14%	-4.19%	-7.10%	-0.27%	-0.72%	1.43%	2.14%	7.38%
Accommodation, cafes and restaurants	-6.59%	2.85%	7.01%	-1.83%	-4.78%	-7.72%	-0.96%	-1.31%	0.76%	1.48%	6.70%
Transport and storage	-6.36%	3.09%	7.21%	-1.59%	-4.57%	-7.52%	-0.75%	-1.08%	1.02%	1.73%	6.97%
Communication services	-6.38%	3.21%	7.23%	-1.62%	-4.59%	-7.51%	-0.73%	-0.92%	1.00%	1.76%	6.97%
Finance and insurance	-6.52%	2.81%	7.05%	-1.76%	-4.73%	-7.67%	-0.93%	-1.39%	0.86%	1.53%	6.80%
Property services	-6.47%	2.96%	7.12%	-1.71%	-4.67%	-7.61%	-0.85%	-1.19%	0.90%	1.61%	6.86%
Business services	-6.70%	2.49%	6.79%	-1.95%	-4.90%	-7.85%	-1.11%	-1.75%	0.68%	1.27%	6.62%
Government admin. and defence	-6.80%	2.67%	6.82%	-2.16%	-5.06%	-7.93%	-1.28%	-1.91%	0.65%	1.33%	6.63%
Education	-6.77%	2.68%	6.79%	-1.99%	-4.97%	-7.90%	-1.22%	-1.51%	0.68%	1.31%	6.55%
Health and community services	-7.51%	2.21%	6.18%	-2.60%	-5.60%	-8.52%	-1.87%	-2.02%	0.06%	0.65%	6.01%
Cultural and recreational services	-6.45%	2.98%	7.13%	-1.69%	-4.66%	-7.60%	-0.83%	-1.17%	0.92%	1.63%	6.88%
Personal and other community services	-6.48%	2.95%	7.10%	-1.72%	-4.68%	-7.63%	-0.86%	-1.20%	0.90%	1.60%	6.85%
Total	**-6.71%**	**3.28%**	**7.03%**	**-1.77%**	**-4.54%**	**-7.48%**	**-1.03%**	**-2.40%**	**0.99%**	**1.94%**	**7.01%**

A6. Regional competitive advantage growth, 2015-18

	Northland	Auckland	Waikato	Bay of Plenty	Gisborne/ Hawkes' Bay	Taranaki	Manawatu-Wanganui	Wellington	Nelson/Tasman /Marlborough/ West Coast	Canterbury	Otago/Southland
Agriculture	-4.37%	0.71%	3.46%	-1.68%	-3.07%	-4.07%	-1.05%	-1.48%	0.59%	1.67%	3.28%
Fishing	-4.72%	0.65%	3.15%	-2.05%	-3.62%	-4.53%	-1.38%	-1.49%	0.31%	1.49%	2.91%
Forestry and logging	-4.75%	0.64%	3.12%	-2.07%	-3.64%	-4.54%	-1.39%	-1.50%	0.12%	1.47%	2.86%
Mining and quarrying	-4.79%	0.63%	3.07%	-2.16%	-3.67%	-4.72%	-1.42%	-1.52%	-0.04%	1.46%	2.81%
Food, beverage and tobacco manufacturing	-4.84%	0.57%	3.01%	-2.15%	-3.83%	-4.72%	-1.49%	-1.54%	-0.06%	1.38%	2.68%
Textiles and apparel manufacturing	-4.69%	0.74%	3.18%	-2.03%	-3.51%	-4.43%	-1.31%	-1.43%	0.17%	1.59%	2.95%
Wood and paper products manufacturing	-4.61%	0.70%	3.19%	-1.85%	-3.54%	-4.43%	-1.32%	-1.47%	0.25%	1.55%	2.93%
Printing, publishing and recorded media	-4.73%	0.77%	3.18%	-2.04%	-3.59%	-4.50%	-1.31%	-1.39%	0.15%	1.57%	2.91%
Chemicals manufacturing	-4.71%	0.70%	3.18%	-2.05%	-3.63%	-4.50%	-1.36%	-1.47%	0.14%	1.52%	2.88%
Non-metallic mineral products manufacturing	-4.78%	0.62%	3.10%	-2.09%	-3.66%	-4.55%	-1.41%	-1.50%	0.10%	1.45%	2.85%
Metal product manufacturing	-4.79%	0.59%	3.06%	-2.11%	-3.68%	-4.60%	-1.43%	-1.51%	0.09%	1.43%	2.82%
Machinery and equipment manufacturing	-4.69%	0.74%	3.22%	-1.99%	-3.60%	-4.45%	-1.33%	-1.46%	0.18%	1.61%	2.91%
Furniture and other manufacturing	-4.70%	0.71%	3.17%	-2.04%	-3.59%	-4.48%	-1.34%	-1.46%	0.17%	1.53%	2.90%
Electricity, gas and water supply	-4.83%	0.61%	3.06%	-2.13%	-3.69%	-4.59%	-1.44%	-1.54%	0.08%	1.42%	2.82%
Construction	-5.57%	-0.01%	2.35%	-2.79%	-4.28%	-5.31%	-2.08%	-2.05%	-0.67%	0.41%	2.10%
Wholesale trade	-4.63%	0.93%	3.32%	-1.92%	-3.51%	-4.41%	-1.20%	-1.34%	0.24%	1.70%	3.01%
Retail trade (including motor vehicle repairs)	-4.54%	0.84%	3.33%	-1.87%	-3.46%	-4.34%	-1.17%	-1.31%	0.33%	1.68%	3.08%
Accommodation, cafes and restaurants	-5.09%	0.27%	2.80%	-2.45%	-3.94%	-4.85%	-1.71%	-1.87%	-0.27%	1.15%	2.39%
Transport and storage	-4.68%	0.73%	3.18%	-1.99%	-3.59%	-4.47%	-1.33%	-1.42%	0.20%	1.56%	2.94%
Communication services	-4.72%	0.83%	3.19%	-2.04%	-3.60%	-4.48%	-1.32%	-1.28%	0.17%	1.56%	2.94%
Finance and insurance	-4.81%	0.54%	3.08%	-2.12%	-3.71%	-4.58%	-1.45%	-1.61%	0.08%	1.42%	2.82%
Property services	-4.63%	0.76%	3.23%	-1.97%	-3.56%	-4.44%	-1.29%	-1.41%	0.24%	1.59%	2.98%
Business services	-4.99%	0.17%	2.80%	-2.34%	-3.91%	-4.79%	-1.66%	-2.05%	-0.15%	1.12%	2.63%
Government admin. and defence	-4.63%	0.77%	3.25%	-1.91%	-3.49%	-4.42%	-1.21%	-1.22%	0.23%	1.59%	2.96%
Education	-4.42%	0.94%	3.46%	-1.77%	-3.34%	-4.25%	-1.01%	-1.13%	0.36%	1.77%	3.19%
Health and community services	-4.96%	0.50%	2.94%	-2.25%	-3.82%	-4.71%	-1.58%	-1.65%	-0.03%	1.31%	2.71%
Cultural and recreational services	-4.72%	0.67%	3.16%	-2.04%	-3.63%	-4.51%	-1.36%	-1.45%	0.15%	1.50%	2.91%
Personal and other community services	-4.81%	0.59%	3.08%	-2.13%	-3.69%	-4.58%	-1.44%	-1.54%	0.08%	1.43%	2.82%
Total	**-4.65%**	**0.71%**	**3.02%**	**-1.87%**	**-3.21%**	**-4.69%**	**-1.14%**	**-1.69%**	**0.09%**	**1.19%**	**2.76%**

Table 3. Shift-share analysis results: 2003-08

	Growth Rate			
	Actual Growth	Competitive	Industry Mix	National Growth
Northland	15.6%	3.2%	-1.27%	13.7%
Auckland	16.0%	1.2%	1.15%	13.7%
Waikato	15.6%	2.4%	-0.45%	13.7%
Bay of Plenty	15.4%	2.9%	-1.18%	13.7%
Gisborne/ Hawkes' Bay	12.3%	-2.8%	-2.64%	13.7%
Taranaki	8.2%	-3.5%	-1.90%	13.7%
Manawatu-Wanganui	9.8%	-3.1%	-0.77%	13.7%
Wellington	12.4%	-4.9%	3.64%	13.7%
Nelson/Tasman/Marlborough/West Coast	13.7%	2.4%	-2.42%	13.7%
Canterbury	15.1%	1.9%	-0.47%	13.7%
Otago/Southland	9.7%	-2.0%	-1.96%	13.7%

Table 4. Shift-share results: 2009-14

	Growth Rate			
	Actual Growth	Competitive	Industry Mix	National Growth
Northland	-2.1%	-6.7%	0.26%	4.4%
Auckland	7.4%	3.3%	-0.29%	4.4%
Waikato	11.5%	7.0%	0.10%	4.4%
Bay of Plenty	2.7%	-1.8%	0.09%	4.4%
Gisborne/ Hawkes' Bay	-0.3%	-4.5%	-0.11%	4.4%
Taranaki	-3.2%	-7.5%	-0.12%	4.4%
Manawatu-Wanganui	3.5%	-1.0%	0.20%	4.4%
Wellington	3.2%	-2.4%	1.23%	4.4%
Nelson/Tasman/Marlborough/West Coast	5.3%	1.0%	-0.07%	4.4%
Canterbury	6.0%	1.9%	-0.32%	4.4%
Otago/Southland	11.3%	7.0%	-0.13%	4.4%

Table 5. Shift-share result: 2015-18

	Growth Rate			
	Actual Growth	Competitive	Industry Mix	National Growth
Northland	1.3%	-4.6%	-0.11%	6.1%
Auckland	6.7%	0.7%	0.04%	6.1%
Waikato	9.2%	3.0%	0.11%	6.1%
Bay of Plenty	4.0%	-1.9%	-0.04%	6.1%
Gisborne/ Hawkes' Bay	2.4%	-3.2%	-0.07%	6.1%
Taranaki	1.5%	-4.7%	-0.04%	6.1%
Manawatu-Wanganui	4.7%	-1.1%	-0.09%	6.1%
Wellington	4.6%	-1.7%	-0.10%	6.1%
Nelson/Tasman/Marlborough/West Coast	6.2%	0.1%	-0.03%	6.1%
Canterbury	7.5%	1.2%	-0.10%	6.1%
Otago/Southland	8.9%	2.8%	-0.05%	6.1%

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