

Regional Capitals in the WA Settlement Hierarchy

Briefing Paper 6: Employment Growth and Local
Occupational Structures

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SCHOOL OF EARTH AND ENVIRONMENT**



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The views expressed and the conclusions reached in this publication are those of the author(s) and not necessarily those of persons consulted.

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1. Key Findings

This report provides a detailed examination of the role of broader scale changes in the composition of employment, as measured by occupational structure, and localized place-based labor market characteristics to account for employment growth for member of the Western Australian Regional Capitals Alliance (WARCA) over the period 2001-2011. This report is the sixth in a series of reports that are intended to enhance understanding of the growth potential and local competitiveness of the members of WARCA both now and into the future. The evidence presented in this report suggests the following regarding recent changes in the prevailing occupational structures of the WARCA economies:

- Decomposing the employment structure of WARCA economies by occupation gives results that are broadly consistent with the finding based upon industry structure: economic success depends on both how localities engage with the global economy and the attributes of those local economies.
- The impact of broader changes in the geography of employment has been an important driver of employment growth across WARCA members.
- Nonetheless, local competitiveness factors which impact upon the occupational structures are critical to the process of job creation for the members of WARCA.
- In contrast to the analysis based upon industrial structure, there exists diversity and segmentation of local occupational structures across all WARCA labour markets.
- The existence of segmented local labor markets highlights the need to have a better understanding of the mobility of workers, both between occupations and between places, skills and education requirements, and the capacity for retention and recruitment.
- As a corollary, the evidence of labour market segmentation cautions against the tendency to think in terms of policies oriented towards a single integrated or unified local labour market. Policies related to training, attraction and retention all need to be tailored to specific parts of the occupational structure.
- Regional policy needs to be attuned to how segmented labour market processes affect regions and communities in differential ways.

2. Overview

Over the past decade there is evidence indicating that Western Australia has experienced quite diverse patterns of economic development across its regions and communities. While there has been a strong and consistent pattern of employment growth throughout this period, the gap between localities has been widening. The precepts of a competitive market-oriented policy orientation predict that rates of growth across localities should converge over time, with smaller economies catching up with larger localities.

In *Briefing Paper #2* in this series, we found evidence showing that the Western Australian settlement hierarchy is quite the opposite, with larger localities dominated by mining tending to forge ahead of smaller settlements (*Regional Capitals in the WA Settlement Hierarchy: Employment Change and Job Creation*). Although there is considerably variability amongst members of the Western Australian Regional Capitals Alliance (WARCA) in terms of job creation, there is clear evidence that the regional capitals are making an increasingly significant contribution to the evolution and performance of the Western Australian economy.

In *Briefing Paper #4* we showed that the differential performance of the WARCA members depends on how each locality engages with the global economy, at least in as far as differences in industrial structure play out in each locality. Nonetheless, local competitiveness is critical in both allowing localities to overcome an unfavourable industry mix or capitalize on their

industrial structure (*Regional Capitals in the WA Settlement Hierarchy: Endogenous Growth and Local Competitiveness*).

In this briefing paper we consider the changing geography of employment from an alternative perspective, unpacking the dynamics of labour through the lens of occupational rather than industrial structures. The number of persons working in an occupation reflects the demand for different skills and different types of labour in a locality. Accounting for the distribution of workers across occupations provides insights into both human capital and the extent to which there exist different segments within a local labour market.

3. Data Description: Employment by Occupational Category

This report uses Australian Bureau of Statistics (ABS) Census of Population and Housing time series profiles which provide occupational data based on place of enumeration for all 138 local government areas in Western Australia (LGAs) for the census periods 2001, 2006, 2011. The members of the Western Australia Regional Capitals Alliance (WACRA) are Albany, Broome, Bunbury, Kalgoorlie-Boulder, Geraldton, Port Hedland, and Roebourne. Boundaries for all LGAs are according to the ABS 2011 definition. The occupations used here are based on the Australian and New Zealand Standard Occupational Classification (ANZSIC) first digit industry of occupation coding ¹. It should be noted that one limitation widely reported by regional local governments is the likely undercount of employees by the ABS. This arises out of the difficulty in capturing fly-in/fly-out workers and other temporary residents. There is no immediate means

¹ Found at <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/2901.0Chapter5802011>

of overcoming this data limitation, except to use ‘place of enumeration’ data as has been done here.

4. Accounting for Structural and Local Occupational Change

The extent to which different rates of employment growth between places is the result of broader changes in the economy, as opposed to place based or local employment characteristics, can be explored through a widely used and relatively simple policy tool called shift share analysis. Essentially, shift share is a simple decomposition technique that allows us to answer three questions (The analytical foundations and derivation of the broader structural and local occupational components of employment change are presented in Appendix B):

- (1) What is the impact of the overall geography of employment on growth?
- (2) What is the impact of place based or local employment characteristics on growth?
- (3) What is the relative importance of overall changes in the wider economy and local employment characteristics in accounting for differential growth rates between localities?

To answer these questions the shift-share technique can be interpreted as follows:

- (a) ***Employment Growth Differentials***: defined as the difference between the growth rate in a locality and the growth rate in a reference economy, in this case Western Australia
- (b) ***Structural Occupational Change***: defined as the employment growth in a locality that can be attributed to the mix of faster or slower than average growing occupations. We interpret this component as a measure of the way in which broader labour market processes play out differently in places because of the composition of their occupational structure. If a place specialized in occupations that are growing relatively rapidly (slowly) in the reference economy then that locality will have a positive (negative) human capital mix component.

(c) **Local Occupational Characteristics:** defined as the employment growth in a locality that can be attributed to all factors other than wider changes in the economy and labour market. This 'residual' measures the overall impact of the growth of an occupation in a place relative to the growth rate of the same occupation in the Western Australian economy. A positive number means that local growth is at a faster rate than the State economy, and negative means that it is at a lower rate.

As a corollary, by comparing the relative size of the Structural Changes in Occupations (b) and local occupational characteristics effect (c) we can use a shift share to evaluate the importance of broader scale processes relative to the types of processes occurring locally.

5. Shift Share Decomposition by Regional Capital, 2001-2011

Table 1 shows the shift share decomposition by occupational structure for employment growth in each regional city for the period 2001-2011. In terms of exploring the consistency between industrial sectors and occupational categories, this table can be read in conjunction with Table 1 from *Briefing Paper #4*.

For the 2001-2006 period, Albany and Roebourne created jobs at a faster rate than the Western Australian average, with the remaining members of WARCA lagging behind the State average. Both Albany and Roebourne had a favourable relative specialization in those occupations that were growing the fastest at the State level.

The positive impact of this specialisation was reinforced by positive local occupational characteristics. Similarly, Broome and Port Hedland specialized in relatively rapidly growing

occupations, at least relative to the rest of Western Australia. However, this effect was dominated by the negative impact of the local occupational characteristics of these localities.

For the remaining localities, the impact of specialization in occupations that are growing relatively slowly was reinforced by the negative impact of local occupational characteristics. Accordingly, job creation during this period reflects the impact of distinct patterns of occupational specialization across the member of WARCA, with broader economic processes and local characteristics playing out quite differently across the localities.

Overall, the results from the occupational shift-share mirror the results of our previous Briefing Paper #2 (*Regional Capitals in Western Australian Settlement Hierarchy: Endogenous Growth and Local Competitiveness*) which identified the dominance of negative local competitiveness as the main driver of the relatively poor performance of the regional capitals during this period.

Indeed, if anything, the impact of local labour market conditions seems more pronounced in terms of net impact of occupational structure on job creation. Although there is a high degree of consistency between the results based upon industrial sectors, there are significant differences for Albany and Brome, who experienced a negative industry mix but positive occupational structures. In contrast, during this period Bunbury was characterized by a positive industry mix effect but had an occupational structure that held back employment growth.

As noted in the *Briefing Report #4*, by 2006-2011, circumstances had begun to change quite dramatically, with three distinct groups of local economies emerging across WARCA:

Roebourne and Port Hedland experienced rapid rates of job creation, Geraldton and Broome grew in line with the Western Australian average, whilst Albany and Bunbury lagged behind. Whilst both Roebourne and Port Hedland had favourable broader occupational structures, the most significant contributing factor to their ability to create jobs was the local occupational characteristics in these localities.

This contrasts with the results from the analysis of industrial structure, which identified relative specialization in the high growth mining sectors (industry mix) as a more substantive contributor to the economic success during this period. The dominance of local occupational characteristics over broader socio-economic processes is particularly stark in the case of Kalgoorlie where the local effects overwhelmed the impact of broader changes in the Western Australian occupational structure.

The dominance for local occupational characteristics is replicated in the remaining WARCA localities, although the relationship between broader processes and local characteristics plays out differently across the localities. During this period, Broome and Geraldton created jobs at about the same rate as the State as a whole, with both experiencing a negative impact of broader changes in the Western Australian occupational structure of the same order of magnitude.

The slightly better performance of Geraldton can be attributed to the impact its local occupational characteristics, at least relative to the State and Broome. In contrast Albany and Bunbury tended to create jobs in occupations that were both growing at a relatively slow rate across the State, which was reinforced by relatively poor local occupational environments.

Table 1 Shift Share Decomposition by Regional City, 2001-2011

Local Government Area	Employment Growth Rate (g_r)	Difference (A_r)	Human Capital Mix (HC_r)	Local Employment Structure (LC_r)
<i>2001-2006</i>				
Albany	0.1430	0.0113	0.0011	0.0101
Broome	0.0526	-0.0790	0.0032	-0.0822
Bunbury	0.0968	-0.0348	-0.0018	-0.0328
Geraldton-Greenough	0.1148	-0.0168	-0.0015	-0.0153
Kalgoorlie-Boulder	0.0179	-0.113	-0.0073	-0.1065
Port Hedland	-0.0884	-0.2201	0.0010	-0.2210
Roebourne	0.1646	0.0329	0.0006	0.0325
<i>2006-2011</i>				
Albany	0.0669	-0.1104	-0.0080	-0.1021
Broome	0.1651	-0.0122	-0.0032	-0.0091
Bunbury	0.0629	-0.1144	-0.0054	-0.1092
Geraldton-Greenough	0.1941	0.0169	-0.0035	0.0202
Kalgoorlie-Boulder	0.1061	-0.0712	0.0066	-0.0779
Port Hedland	0.6953	0.5180	0.0005	0.5175
Roebourne	0.6844	0.5071	0.0027	0.5043

6. Occupational Shift Share Patterns, 2001-2011

The overall picture of consistency in the results for industrial structure and occupational categories masks significant differences in the sources of differentiation between localities across the recent resource boom.

Figures 2 and 3 show these patterns and enable the identification of occupations that contribute most to both the overall structure of occupations and local occupational components of change

(see appendix A for the occupational classification abbreviations used in this paper). These figures should be read in conjunctions with the corresponding figures in *Briefing report #4*.

Taking Figure 2 and Figure 3 together, it is evident that there is a complex and differentiated structure of occupations across the regional capitals for both 2001-2006 and the 2006-2011 period. Indeed, the overall impression is that there is more diversity across occupational categories, especially in the case of the resource based mining and petroleum communities, than is the case for industry mix. Furthermore, across both periods, the impact of local labor market characteristics appears more pronounced than in the case of the industry sector decomposition.

In contrast with the impact of their relative specialization in the rapidly growing mining economies, the job creation process in Kalgoorlie, Port Hedland, and Roebourne was dominated by factors impacting on the local characteristics of the workforce. That is, employment growth was dominated by local occupational characteristics rather than specializing in those occupations that were growing rapidly across the Western Australian economy.

In the 2001-2006 period the dominance of local occupational structures had a largely negative impact on employment growth: a process that was reversed in the 2006-2011 period. In 2001-2006 the local impact was spread across most occupations in Port Hedland, whereas it tended to be more segmented in Kalgoorlie, focused primarily on Technicians and Trade Workers (TECH), Machine Operators and Drivers (MOD), Labourers (LAB), and Clerical and Administrative Workers (CAW). In Roebourne the picture was yet more differentiated, suggesting an equally more segmented labor market. In particular, this locality experienced a strong positive impact

from growth in technicians and trade workers (TECH) and a positive impact from the growth in the number of workers employed as machine operators and drivers (MOD).

By 2006-2011 the impact of local competitiveness over relative specialization in rapidly growing occupations had become more pronounced, especially in Port Hedland and Roebourne. Furthermore, these local occupational structures were having a positive impact on employment growth in these localities. Significantly, the employment growth in these localities was also dominated by a similar occupational pattern, focused primarily on Clerical and Administrative workers (CAW), labourers (LAB), machine operators and drivers (MOD), professionals (PRO), and technical and trade workers (TECH). In contrast Kalgoorlie's job creation was dominated by its lack of local competitiveness in managerial (MAN) and professional (PRO) occupations. To an extent this is also the case for machine operators and drives (MOD), although this is offset by the fact that these are occupations that are growing relatively rapidly across the State.

The non-mining localities present an equally diverse picture of the operation of local labour markets. Lying behind the aggregate picture of local differentiation within a broader structure of occupations is a complex and segmented occupational structure driving employment growth. Perhaps the clearest pattern of occupational specialization is in Broom, where the relatively slow growth in labourers (LAB) had a significant impact of employment growth in both 2001-2006 and 2006-2011.

For the remaining localities of Albany, Bunbury, and Geraldton job creation across occupations was dominated by local structures rather than the broader structure of occupations across

Western Australian. Furthermore, those local occupational characteristics that contributed either positively or negatively to overall employment growth varied considerable between these localities and over time.

For Albany in 2001-2006 the negative impacts of MAN and PRO were set against the positive impacts of labourers (LAB) and machine operators and drivers (MOD). By 2001-2006 the situation had changed dramatically, with the local occupational characteristics constraining employment growth across most of the economy. Noteworthy, is a reversal in the local impact of labourers (LAB) and machine operators and drivers (MOD) and the emergence of technicians and trade workers (TECH) as contributors to the decline in employment growth during this period.

A similar reversal of fortune is apparent in Bunbury, where offsetting positive and negative local competitiveness in 2001-2006 was replaced with negative local impacts in 2006-2011. In much the same way as Albany, this reversal in local impact was centered around LAB, MOD and TECH. Finally, the reversal of fortunes in Geraldton between 2001-2006 and 2006-2011 can be primarily attributed to the local capacity to create jobs in LAB, MOD, MAN and CRW.

TABLE 5: Occupational Shift-Share Patterns, 2001-2006

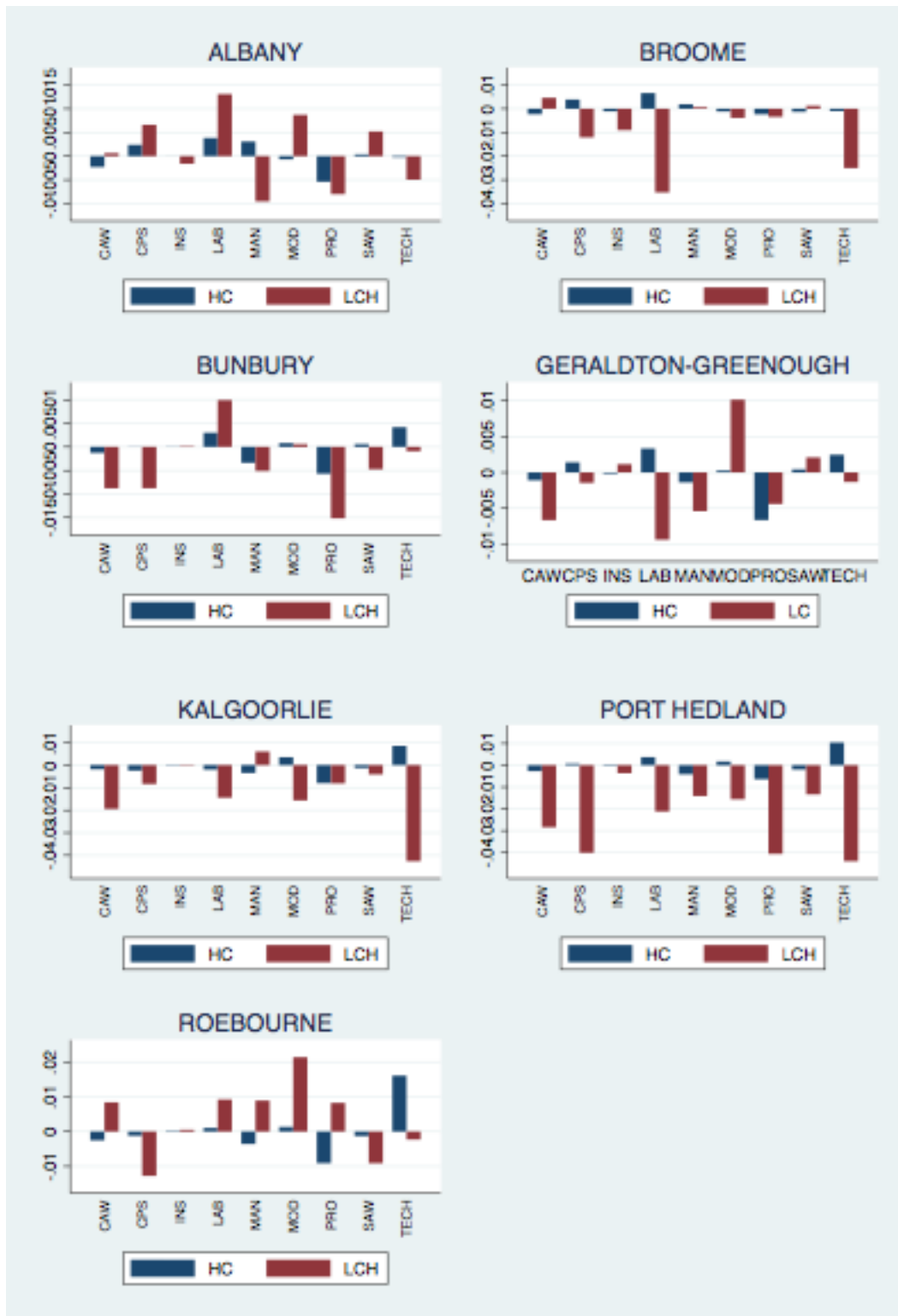
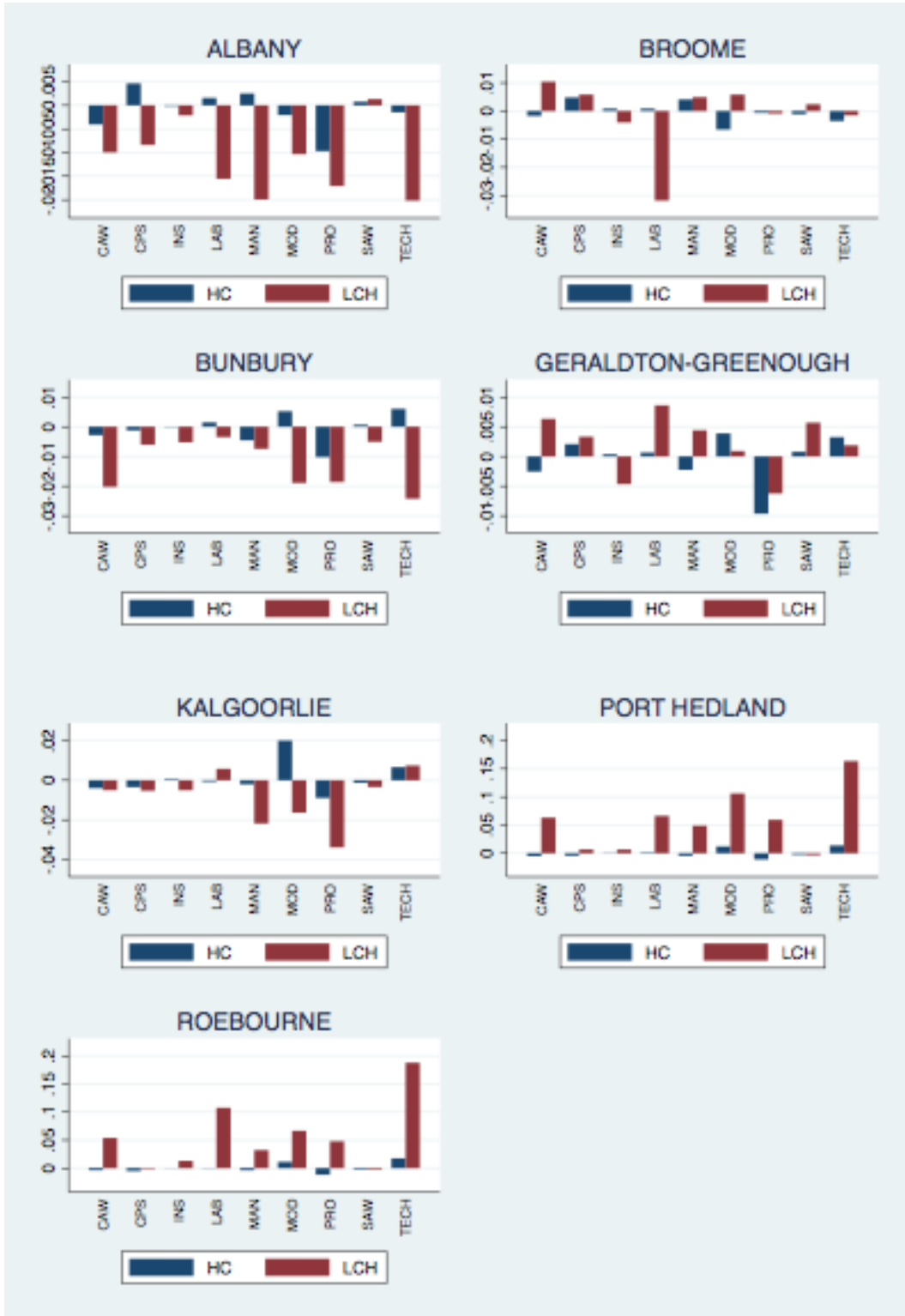


TABLE 6: Occupational Shift-Share Patterns, 2006-2011



7. Implications for Regional Policy

The overall picture of job creation across the WARCA labour markets is broadly consistent with the findings based upon the dynamics of industrial restructuring presented in Briefing Report #4: economic success depends on both the evolution of the structure of occupations across Western Australia and place-based occupational factors. However, the key theme that emerges from this report is that the notion of an integrated and coherent local labour market is probably a chaotic concept. There isn't a local labour market but rather many different labour markets within a locality: a fact that is only compounded by the increasing prevalence of fly-in/fly-out and temporary workers. Within and between each locality the structure of occupations is differentiated and segmented across occupational categories. This has significant implications for how we might think about regional development policy. Changes in the geography of employment continues to restructure in response to the rapidly structural, technological and institutional changes that are taking place in the demand for labour across the global economy. These changes cannot be ignored. The challenge facing policymakers and practitioners is that these broader processes play out differently in different localities but are difficult to influence at the local level, impacting on the long run resilience of local labour markets. More direct influence can be exerted over local occupational structures, where it is possible to target specific occupations and localities. In this regard, the prevalent segmented labour markets within a locality points towards a greater engagement with more nuanced and comprehensive analytical strategies that can begin to unpack the processes driving job creation. Specifically, there is a need to have a better understanding of the mobility of workers both between occupations and

localities, enhancing the skill and education capacity of the local workforce, set within a broader framework that enables WARCA members to recruit and retain workers.

8. APPENDIX A: AUSTRALIAN AND NEW ZEALAND STANDARD OCCUPATIONAL CLASSIFICATION

ANZAC Classification	Mnemonic
Managers	MAN
Professionals	PRO
Technicians and Trades Workers	TECH
Community and Personal Service Workers	CPS
Clerical and Administrative Workers	CAW
Sales Workers	SAW
Machine Operators and Drivers	MOD
Labourers	LAB
Inadequately Described/Not States	INS

9. Appendix B: Formal Specification of a Shift-Share Decomposition

For each census period, t , let the regional economy be sub-divided into r localities ($r = 1, \dots, R$) defined in terms of Local Government Areas (LGAs) across Western Australia. The economic activity in each locality is measured in terms of the number of persons employed (E) disaggregated by occupational category i , where the locality has $i=1, \dots, N$ occupational categories. Accordingly, the number of persons employed in occupation i in locality r at time t is E_{ir}^t and the growth rate in employment between period t and period $t-1$ in region r , occupation i is defined as:

$$g_{ir} = \frac{E_{ir}^t}{E_{ir}^{t-1}} - 1 \quad (1)$$

And, repeating the definition of the local growth rate in locality r :

$$g_r^t = \frac{\overset{N}{\underset{i}{\overset{\circ}{\sum}}} E_{ir}^t}{\overset{N}{\underset{i}{\overset{\circ}{\sum}}} E_{ir}^{t-1}} - 1 = \overset{N}{\underset{i=1}{\overset{\circ}{\sum}}} q_{ir}^{t-1} g_{ir}^t \quad (2)$$

Where $q_{ir}^{t-1} = \frac{E_{ir}^{t-1}}{\overset{N}{\underset{i=1}{\overset{\circ}{\sum}}} E_{ir}^{t-1}}$ is the regional share of employment in occupation i , region r .

Similarly, the growth rate in occupational category i across the reference economy is:

$$g_i = \frac{\overset{R}{\underset{r}{\overset{\circ}{\sum}}} E_{ir}^t}{\overset{R}{\underset{r}{\overset{\circ}{\sum}}} E_{ir}^{t-1}} - 1 \quad (3)$$

And, the growth rate in a reference economy is:

$$g_N^t = \overset{N}{\underset{i}{\overset{\circ}{\sum}}} l_i^{t-1} g_i^t \quad (4)$$

Where $l_i^{t-1} = \frac{E_i^{t-1}}{\overset{N}{\underset{i=1}{\overset{\circ}{\sum}}} E_i^{t-1}}$ is the share of employment in occupation i in the reference economy, in

this instance Western Australia.

The aim of shift-share decomposition is to account for differential growth rates between local and reference economy (A_r), which can be expressed as follows:

$$A_r^t = g_r^t - g_n^t = \overset{\circ}{\mathbf{a}} \sum_{i=1}^N q_{ir}^{t-1} g_{ir}^t - \overset{\circ}{\mathbf{a}} \sum_{i=1}^N l_i^{t-1} g_i^t \quad (5)$$

Accordingly, employment differentials depend on the local (q_{ir}^t) and reference economy (l_i^t) sectoral weightings (shares) and the occupation growth rates in the local and reference economy respectively. We define the human capital effect by weighting the occupation growth rate in the reference economy by the difference between the share of employment in that occupational category in the local economy compared to the share of employment in the same occupational category in the reference economy:

$$IM_r^t = \frac{\overset{\circ}{\mathbf{a}} \sum_{i=1}^N E_{ir}^{t-1} g_i^t}{\overset{\circ}{\mathbf{a}} \sum_{i=1}^N E_{ir}^{t-1}} - \overset{\circ}{\mathbf{a}} \sum_{i=1}^N l_i^{t-1} g_i^t = \overset{\circ}{\mathbf{a}} \sum_{i=1}^N (q_{ir}^{t-1} - l_i^{t-1}) g_i^t \quad (6)$$

A local economy will have a favourable human capital effect if it is relatively specialized in occupations that are growing rapidly in the reference economy. To maintain the balance of the accounting identity in equation (5), the local occupational effect (LC_r) is defined as the difference between the local and reference economy growth rate in industry i weighted by the local share of employment in that occupation:

$$LC_r^t = \overset{\circ}{\mathbf{a}} \sum_{i=1}^N q_{ir}^{t-1} (g_{ir}^{t-1} - g_i^{t-1}) \quad (7)$$

Combining equations (5), (6) and (7) gives the shift-share decomposition:

$$g_r^t - g_n^t = \overset{\circ}{\mathbf{a}} \sum_{i=1}^N (q_{ir}^{t-1} - l_i^{t-1}) g_i^t + \overset{\circ}{\mathbf{a}} \sum_{i=1}^N q_{ir}^t (g_{ir}^{t-1} - g_i^{t-1}) \quad (8)$$