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Regional Unemployment and Regional Industrial Diversity in New South Wales Statistical Districts 1996 to 2006

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Abstract

This paper explores the link between regional industry diversity and unemployment outcomes within the Australian Bureau of Statistics (ABS) New South Wales (NSW) statistical districts, using 1996, 2001 and 2006 Census of Population and Housing data.

This paper found that while there had been a considerable improvement in unemployment outcomes from 1996 to 2006 in all NSW SDists and especially those coming off high unemployment levels, variation from region to region still occur. Moreover, industry diversity, as measured by the National Averages Index approach, and as suggested in much of the literature as improving unemployment outcomes was not always able to explain this variation.

Indeed, from this research, there seems to be no clear advantage, in itself, for either industry diversification or industry specialisation as a regional strategy for improving labour market performance. Further research seeking associations between level of industry specialisation/diversification and additional labour market variables is needed.

Introduction

Emanating from the depression era of the 1930s was the view that industrially specialised regional economies were more susceptible to economic hardship than regional economies which were more industrially diversified (McLaughlin 1930, Rodgers 1957, Bahl, Firestone, and Phares 1971, and Attaran and Zwick 1987).

Implicit thus, in much of the literature is an overarching assumption that a diverse regional economy will enjoy stable employment growth, shielded to some extent from external economic shocks (Jackson 1984, Malizia and Ke 1993, Trendle 2006). Moreover, labour force equilibrium may be reached in a timelier manner, in regions where a diverse range of industries exist (Sykes 1950).

Some research however has shown that regional industry specialisation generates better economic outcomes to a regional economy than industrial diversification (Diamond & Simon 1990). This paper is a further exploration of that theme. Indeed, the analysis in this paper not only suggests that many regional economies in NSW are specialist economies, with varying unemployment outcomes but additionally suggests that an industrially diverse regional economy may not necessarily improve unemployment outcomes at any greater rate than an industrially specialised economy.

Industrial Specialisation or Industrial Diversification

Economic theory suggests that economic growth may be better served from industry specialisation based on a nations or regions competitive advantage in resource endowments and/or superior value added techniques (Wagner 2000, Izraeli and Murphy 2003). Industrial specialisation policy should therefore attempt to expand an economy through promoting specific established and specialised industries (Diamond and Simon 1990).

Industrial diversification advocates suggest however that industrial diversity is associated with reduced regional instability Kort (1981), Brewer and Moomaw (1985) and Malizia and Ke (1993) with industrial specialisation policies creating higher unemployment, specifically, due to the limited employment diversity within a region (Sykes 1950).

Sykes (1950) argues that admitting further diversification industries into an industrial specialised region creates competing demands for the factors of production, which may curtail their supply and diminish the low costs attainable from specialisation. Valuable external economies; such as industrial and commercial linkages, transport facilities and other specific service facilities; may also be impugned (Sykes 1950).

Diamond and Simon (1990) state that industrial specialisation creates diversity, by attracting subsidiary industries into the area to support the specialised industry, and in time these subsidiary industries create their own markets for goods and services.

Irrespective, the focus of many policy development efforts was and is, as such, to cultivate a diverse industrial makeup (Mack, Grubestic and Kessler 2007). Diversity, while appearing to contradict specialisation growth theory, is expected to increase the stability of local economies, and enhance the potential for growth (Killian and Hady (1988). A diversified industry base also affords an unemployed worker a much greater opportunity to find employment with other industries in the area (Izraeli and Murphy 2003).

Measuring the industry specialisation / diversity levels of individual regional economies

The use of indices as summary measures of regional diversity enables syntheses of vast amounts of information into a single number (Wagner 2000). These indices calculate industry diversity relative to a benchmark, generally the nation, which enables a ranking system to be devised, and comparisons made, based on a standardised measure (Siegel, Johnson, and Alwang 1995).

Classic index measurements include the national average approach as used in this study, the minimum and adjusted minimum requirements method, the Ogive approach, and the Herfindahl index (Mack, Grubestic and Kessler 2007). More recently developed measurements include the Entropy index, Markowitz Portfolio theory and Krugman Similarity index (Mason 2011).

In evaluating the alternate measures of industrial diversity Jackson (1984) found a substantial amount of variation among the results. Jackson (1984) concluded that the concept of industrial diversity as a policy framework suffered from definitional ambiguity and was lacking in empirical substantiation. Coming to a similar conclusion Attaran (1986) studied 10

years of annual data for 50 US states finding that no strict relationship existed between economic diversity and the economic performance of a region.

A 2003 Australian study of industrial diversity in regional Queensland by Trendle and Shorney using the Entropy index of industrial diversity measurement found that regional industrial diversification has a significant influence on regional economic performance. However, the relationship between the unemployment rate and industrial diversity varies with labour force size, given that Trendle and Shorney (2003) also found that for regions with a labour force above 10,000 persons, the correlation coefficient of the unemployment rate with the Entropy index was found to be negative at -0.53 while it was found to be positive at +0.45 for regions with a labour force below 10,000 personnel.

National average index of industrial diversity measurement

Drawing on regional business cycle theory it has been hypothesised that the more similar a regions industrial mix is to that of its nation the more stable this region will be (Siegel, Johnson, and Alwang, 1995).

The method adopted in this paper to measure the industry diversity of regional economies within NSW is the national average approach which benchmarks regional industrial diversity to the nations. Other approaches are useful but national industry data (Australia) is readily available from the ABS wherein national averages can be readily calculated.

Bahl, Firestine and Phares (1971) argue that the national average index is a credible measurement of industrial diversity on the grounds that national urban average employment more closely approximates an industry norm or employment outcome.

The national average index is calculated as follows:

$$\sum \frac{(P_i - M_i)^2}{M_i} \quad i = 1, 2, \dots, 39$$

: where:

P_i = the percent of employment in the i th industry class

M_i = national percent of employment in industry i .

Bahl, Firestine and Phares (1971) demonstrated by using the national average index approach that in the US, larger regions tended to be more diversified and smaller regions tended to be more specialised. These findings are similar to those of Trendle and Shorney (2003), in their study of industrial diversity in regional Queensland, as discussed above.

In 2004 Hammond and Thompson used the national averages index approach to investigate the effects of industrial diversity and population characteristics on the variability of metropolitan and non metropolitan employment outcomes for the contiguous US. These authors found that the influence of population characteristics and the level of industrial specialisation vary significantly across metropolitan and non metropolitan regions.

Mack, Grubestic and Kessler (2007), used the national averages index, in a study of resource endowments at the county level in the US, to evaluate the indexes applicability for benchmarking local and regional economies, in terms of resource endowments.

This study suggested that the conceptual alteration of the classic index of national averages held great promise for wide applicability in the public and private sectors (Mack, Grubestic and Kessler 2007).

The outcomes of this current study using the national average approach to measuring industrial diversity in regional NSW SDists are identified in the 'Findings' section of this paper.

Measuring Unemployment

The national rather than regional labour markets have tended to be the focus of studies into causes of unemployment in Australia (Dawkins and Freebairn 1996, Mitchell and Carlson 2003). This research neglects the characteristics of state and territory unemployment rates in Australia and the impact on unemployment outcomes of region specific shocks (Dixon and Shepherd, 2001).

In their study of 1999, Howard and Buultjens used ABS unemployment census data to assess the level of variations in the performance of regional labour markets within each state of Australia, for the period 1986 to 1996. These authors found that in NSW and Queensland in particular, there were regions with very high levels of unemployment, in comparison to state averages. Alternatively, each state, except Tasmania had regions consistently demonstrating rates of unemployment considerably lower than their State averages (Howard and Buultjens, 1999).

Commenting on regional unemployment disparities in 2003 Mitchell and Carlson noted that disparities in unemployment between Australian regions have not only persisted over time but in many cases have increased. However, Cunningham and Davis (2011) note that in the past decade the range of regional unemployment disparities has narrowed, as the benefits of economic growth spreads across the nation.

Whilst research clearly shows significant variations in labour market performance between regions, few studies have considered the causes of these variations (Howard and Buultjens, 1999). Of those that have, factors such as labour market participation rates, job growth and labour market programs (Buultjens, Howard and Moffat, 2002), regional migration (Howard 1999, McGuire, 2001, and Lawson and Dwyer, 2002) and unskilled labour (Dugas and Croce, 2000) have been identified.

Other research by Karmel, McHugh and Pawsey (1993), Hunter (1994), Gregory and Hunter (1995) and McGuire (2001) identified educational attainment as a possible cause of regional unemployment differentials, while the Bureau of Industry Economics (BIE) (2003) looked at regional industry composition. Mitchell and Carlson (2003) argued that there is a relationship between regional employment growth and the business cycle (Mitchell and Carlson 2003).

While there can be a number of reasons for variations in regional unemployment outcomes, this study will focus on the impact of industrial diversity on regional unemployment outcomes.

Various data sets are gathered over different periods of time to measure unemployment outcomes from the national to the state to the regional (ABS defined SD, SDist, LGA, SLA for example), including –

- ABS monthly Labour Force Surveys
- DEEWR quarterly Small Area Labour Markets reports
- DEEWR quarterly Australian Regional Labour Markets (ARLM) reports
- ABS five yearly Census data

This paper has chosen to use ABS Census data to measure unemployment levels because it is relatively current (2006), more extensive in its reach than any other unemployment data source and is available at the SDist level throughout Australia.

Further, industry by employment data gathered by the ABS is available for the same census period and this allows comparisons between employment and industry diversity outcomes

Methodology

The national average approach to measuring industrial diversity is used in this study to measure and compare the industrial diversity of regional economies (SDists) within NSW.

The national and NSW SDist regional industry employment data for 1996 to 2006 was obtained from the ABS Census of Population and Housing catalogue 2068 Industry of Employment (2006) and these SDists are listed at Table No 1.

The regional unemployment data for the period 1996 to 2006 at the SDist level for NSW was obtained from the ABS Census of Population and Housing data for 2006 (2068.0). The category selected from this catalogue no. 2068.0 was labour force status by age by sex – time series statistics 1996, 2001 and 2006 census years.

The NSW SDists all have an allocated name and number which differentiates them from the national, state and other regional data. The regions (SDists) as identified by the ABS category 2068.0 and used in this study are: New South Wales (State 1), Newcastle (1003), Wollongong (1006), Nowra – Bomaderry (1008), Lismore (1015), Coffs Harbour (1021), Port Macquarie (1024), Tamworth (1027), Dubbo (1030), Wagga Wagga (1033), Bathurst (1036), Orange (1039), Albury – Wodonga (1218), Gold Coast – Tweed (3139) and Canberra – Queanbeyan (8196).

Findings

Table 1 below is a summary table for unemployment levels and industry diversity outcomes derived from ABS unemployment census data and industry of employment for NSW SDists. The ABS orders industry of employment into 19 categories as shown in Appendix 1.

Table 1 is ordered by unemployment rates 2006, from highest to lowest last. Column 2 gives the percentage unemployment outcomes for 2006, 2001 and 1996. Column 3 provides the unemployment ranking of the NSW SDists for 2006, 2001 and 1996 with 1 representing the

highest unemployment outcome and 14 representing the lowest. Column 4 provides the industry diversity index calculations for 2006, 2001 and 1996 while column 5 provides the ranking on industry diversity (1 most specialised, 14 most diverse).

Table 1: Unemployment levels and industrial diversity measurements for New South Wales SDists 2006, 2001, 1996.

Region	Unemploy% 06/01/96	Rank 06/01/96	Divers.Index 06/01/96	Rank 06/01/96
Lismore	9.3/12.6/14.1	1/2/4	11.76/10.02/11.0	6/8//6
Coffs Harbour	8.8/12.6/17.0	2/1/1	12.33/12.91/11.28	5/5/5
Nowra-Bomaderry	8.6/12.2/14.3	3/3/3	14.23/16.15/9.97	3/3/7
Port Macquarie	8.3/10.2/16.5	4/4/2	24.94/18.86/14.92	2/2/3
Wollongong	7.3/8.9/11.6	5/7/6	5.00/5.15/5.42	11/13/14
Newcastle	7.1/10.1/11.4	6/6/7	4.77/6.69/9.35	13/10/9
Tamworth	6.9/8.6/10.4	7/9/8	4.73/4.89/6.38	14/14/13
Bathurst	6.5/8.8/8.2	8/8/12	10.60/10.15/13.04	8/7/4
Wagga Wagga	5.9/7.5/8.3	8/10/11	10.13/10.30/9.85	9/6/8
Orange	5.8/7.2/8.3	10/12/10	11.47/8.47/6.55	7/9/12
Dubbo	5.6/6.9/7.9	11/13/13	4.85/ 5.46/7.40	12/12/11
GoldCoast-TweedHeads	5.5/10.1/12.9	12/5/5	12.60/13.85/17.95	4/4/2
Albury - Wodonga	5.3/7.4/10.2	13/11/9	5.92/6.09/9.25	10/11/10
Canberra Queanbeyan	3.3/5.0/7.3	14/14/14	92.60/76.45/86.86	1/1/1
Average for NSW non metropolitan	6.7/9.2/11.3			
Average for NSW incl. metropolitan	5.9/7.1/11.3			

Source: Census data, ABS, Catalogue 2068.0 (1996, 2001, 2006) State 1, Statistical Districts; 1015, 1021, 1008, 1024, 1006, 1003, 1027, 1036, 1033, 1039, 1030, 3139, 1218, 8196.

First of all, over the study period 1996 to 2006, regional unemployment disparities are seen to be quite large with the range between highest unemployment levels and lowest unemployment levels being 9.7% in 1996 but closing to 6.0% by 2006.

Second, given the literature that commends industry diversity, a high ranking (1) unemployment outcome in the Table should equate to a high ranking industry specialisation outcome (1) in the Table. But this is not the case and further there are variations and changes between years as to rankings of unemployment outcomes versus industrial specialisation; outcomes that contradict that literature.

In 2006, the SDist in NSW with the greatest measured level of industrial diversity was Tamworth at an index of 4.73 as it was in 2001 (4.89). Tamworth was also the second most diverse at 6.38 in 1996 behind Wollongong at 5.42. For the Census year 2006, the SDist of NSW with the greatest measured level of industrial specialisation is Canberra Queanbeyan (92.60). Canberra Queanbeyan is a special case, housing as it does a large part of the Federal bureaucracy (in the industry category of Public Administration and Safety), and so distorting calculations associated with the national average index outcome and findings about industry diversity/specialisation, so this study will largely ignore it.

As a side-note however, this SDist became more industry specialised by 16.15 index points from 2001 after becoming industrially more diversified between 1996 to 2001 (11.45 index points) and experienced a decrease in unemployment from 7.3% in 1996 to 5.0% in 2001 to 3.3% by 2006, which was lower than the Australian national average of 5.2%.

Port Macquarie then, at (24.94) was found to be the most specialised (and increasingly so) industrial economy in the NSW SDists, as it was in 2001 (18.86). In 1996 at 14.92 it was second most specialised behind Gold Coast – Tweed Heads (17.95).

Comparing census years 1996, 2001 and 2006, and employing a median industrial diversity:

- In census year 1996 there were nine SDists with industrial diversity measurement of above the median with four below.
- In census year 2001 there were seven SDists with industrial diversity measurement of above the median with six below.
- By 2006 eight SDists were measured with industrial diversity measurement above the median with five registering a diversity index below.

Over the years then, industrial specialisation has been consistently higher in the NSW SDists on national averages.

Six SDists consistently demonstrate increasing industry diversity from 1996 to 2006. Overall change in industrial diversity level is presented in the first set of brackets with overall change in unemployment being presented in the final set of brackets:

- Tamworth 4.73 in 2006, 4.89 in 2001 and 6.38 in 1996. (-1.65), (-3.5%)
- Newcastle 4.77 in 2006, 6.69 in 2001 and 9.35 in 1996. (-4.58), (-4.3%)
- Dubbo 4.85 in 2006, 5.46 in 2001 and 7.40 in 1996. (-2.55), (-2.3%)
- Wollongong 5.00 in 2006, 5.15 in 2001 and 5.42 in 1996. (-0.42), (-4.3%)
- Albury - Wodonga 5.92 in 2006, 6.09 in 2001 and 9.25 in 1996. (-3.33), (-4.9%)
- Gold Coast Tweed 12.60 in 2006, 14.85 in 2001 and 17.95 in 1996. (-5.35), (-7.4%)

Two SDists experienced the opposite, namely, greater industrial specialisation from 1996 to 2006:

- Orange 11.47 in 2006, 8.47 in 2001 and 6.55 in 1996. (+4.92), (-2.5%)
- Port Macquarie 24.94 in 2006, 18.86 in 2001 and 14.92 in 1996. (+10.02), (-8.2%)

Using averages, industrial specialisation decreased by 2.98 points while unemployment fell by an average of 4.45% in the SDists that increased industry diversity.

Again, where specialisation increased it was by an average of 4.34 points, while unemployment fell on average by 5.35%. So it is not clear that the increasingly diverse regions are outpacing the increasingly specialised.

Some SDists experienced greater industrial specialisation in 2001 than in 1996 but less industrial specialisation in 2006 than in 2001:

- Wagga Wagga 10.13 in 2006, 10.32 in 2001 and 9.85 in 1996. (+0.28), (-2.4%)
- Coffs Harbour 12.33 in 2006, 12.91 in 2001 and 11.28 in 1996. (+1.05), (-8.2%)
- Nowra - Bombaderry 14.23 in 2006, 16.15 in 2001 and 9.97 in 1996. (+4.26), (-5.7%)

If their indices are added and averaged, these SDists experienced an increase in industrial specialisation of 1.87 points and a reduction of unemployment of -5.43%

The remaining SDists then experienced less industrial specialisation in 2001 than in 1996 but more industrial specialisation in 2006 than in 2001.

- Bathurst 10.60 in 2006, 10.15 in 2001 and 13.04 in 1996. (-2.44), (-1.7%)
- Lismore 11.76 in 2006, 10.02 in 2001 and 11.00 in 1996. (+0.76), (-4.8%)
- Canberra Queanbeyan 92.60 in 2006, 77.41 in 2001 and 88.86 in 1996. (+3.74), (-4%)

Overall these SDists experienced a decrease in industrial specialisation on average of 0.83 and a reduction of unemployment of 3.25%. Again, the evidence is far from clear cut that diversification strategy generates better employment outcomes.

Rudimentary correlation analysis does however suggest that industry diversification may be associated with lower unemployment rates. In Table 2, Pearson Correlation Coefficients were calculated for 1996, 2001 and 2006, between the industry diversity index and the prevailing unemployment rate for each SDist (Canberra – Queanbeyan excluded).

Table 2: Correlation coefficients for industrial diversity measurements and unemployment levels for New South Wales SDists for 1996, 2001 and 2006

Statistic	Diversification-Index			Unemployment-Rate		
	1996	2001	2006	1996	2001	2006
Mean	11.42	9.06	9.59	9.5	9.30	6.91
Biased Variance	9.02	17.11	32.92	16.96	3.93	1.71
Biased Stand. Deviation	3.01	4.13	5.73	4.12	1.98	1.30
Covariance				6.58	5.91	3.87
Correlation				0.49	0.66	0.48
Determination				0.24	0.44	0.22
T-Test				1.97	3.12	1.88
P – value (2 sided)				0.08	0.008	0.08
P – value (1 sided)				0.04	0.004	0.04
Degrees of Freedom				12	12	12
Number of Observations				14	14	14

Table reprinted from calculator - http://www.wessa.net/rwasp_correlation.wasp#output

Overall the correlation between higher levels of diversification and lower levels of unemployment were found to be positive at 0.48 for 2006, 0.67 for 2001 and 0.49 for 1996. Indeed, given the higher correlation statistic and the p values, the correlation is seen to be stronger in 2001 than for 1996 and 2006 suggesting that the role industrial diversity plays in reducing unemployment changes over time.

Further research would be advantageous in investigating the changing correlation rates especially in 2001. Hypothesis for this outcome may include impacts caused by the Olympic Games in NSW in 2000, an introduction of an Australian national Goods and Services tax in 2000, and declining international Gross Domestic Product from 1999 through 2001. The latter may have caused demand for specialised regional resource markets to decline in comparison to more industrially diversified regional markets. Also of interest would be research into the correlation between industrial diversity and unemployment outcomes for 1996 to 2006, for all of Australia's SDists, in comparison to NSW SDists At this point

however, a tentative conclusion could be drawn, that industrial diversity may be more advantageous during periods of economic shock, a view sustained in much of the literature (Jackson 1984, Malizia and Ke 1993, Trendle 2006).

It is also noted that all SDists in NSW experienced lower unemployment levels of in 2006 than in 2001 and often by significant numbers. The same could be said about the 1996 to 2001 period, except for Bathurst SDist where unemployment increased by 0.6%.

In total, six SDists out of thirteen have a higher level of industrial specialisation in 2006 than they did in 1996. Clearly increased specialisation has not inevitably led to higher unemployment, but then Hackbart and Anderson (1975) and St Louis (1980) might argue that spillover effects from the national business cycle (ie, recession or growth) can influence employment outcomes at the sub-national economic level.

With Australia enjoying twenty years without a recession, lower unemployment across all SDists of NSW between 1996 and 2006 might have been inevitable, irrespective of changes in industrial diversity. Mitchell and Carlson (2003) note, although that expansion in national aggregate demand does not always improve the unemployment outcomes for all regions. We are in a two-speed economy.

Concluding comments

This study found some support for the theoretical view in the literature; that industrial diversity is associated with lower unemployment rates in regional economies; at least in so far as selected SDists in NSW are concerned. So, the application of the National Average Approach (index) was useful to that extent. It was also found however, that the alternate view, that industrial specialisation can lead to greater unemployment outcomes, were not supported over the study period.

In terms of studies of industrial diversity, and suggested regional unemployment and industry policy initiatives, an arbitrary industry diversity index outcome would not be sufficient to make unemployment policy decisions without investigating the derivation of the index via investigation of individual industry categories within selected SDists.

It was also pointed out that a variety of other factors beyond industrial diversity potentially influence unemployment rates including changes to the size of the labour force, or through participation, labour mobility, education, industry composition, labour market programs and the state of the business cycle. Along with the national average index approach it would be useful to further the research into variations in regional unemployment outcomes by attempting to find associations with other labour market variables.

Another potential extension of this research would be in attempting to explain why the correlation statistics between industry diversity and unemployment rates changed, and quite substantially between 1996, 2001 and 2006. A measurement of industrial diversity using the national average index approach throughout all Australian SDists for the years 1996, 2001 and 2006 may shed light on whether this is a NSW only outcome, or a more national one.

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Appendix 1 19 Industry categories and industrial diversity measurement for Gold Coast – Tweed Heads - sample

Gold Coast – Tweed Heads 1996

Industry	National employment (M _i) %	District employment (P _i) %	(P _i - M _i) ²	(P _i - M _i) ² / M _i	(P _i - M _i) ² / (n-1)
Agriculture Forestry Fishing	4.25	1.04	10.30	2.42	
Mining	1.10	0.32	0.08	0.07	
Manufacturing	12.09	9.17	8.53	0.71	
Electricity, gas & water supply	0.92	0.51	0.17	0.18	
Construction	6.17	9.71	12.53	2.03	
Wholesale trade	5.54	4.69	0.72	0.13	
Retail trade	10.19	12.90	7.34	0.72	
Accommodation and food services	6.24	11.13	23.91	3.83	
Transport, postal and warehousing	4.71	3.78	0.86	0.18	
Information media & telecoms	2.52	2.18	0.12	0.05	
Finance & insurance	3.87	2.77	1.21	0.31	
Rental, hiring & real estate	1.55	3.54	3.96	2.55	
Professional scientific and technical	6.12	5.12	1.00	0.16	
Administration & support services	2.77	3.57	0.64	0.23	
Public administration & safety	6.11	3.64	6.10	1.00	
Education & training	7.32	5.91	1.99	0.27	
Health care & social assistance	9.38	8.19	1.42	0.15	
Arts & recreation services	1.42	3.45	4.12	2.90	
Other services	4.38	4.84	0.21	0.05	
Not stated	3.35	3.54	0.04	0.01	
Total	100.00	100.00	85.25	17.95	4.49