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Abstract

The national averages index and Australian Bureau of Statistics (ABS) Census data (2001 and 2006) were used to explore links between industrial diversity and unemployment for ABS, statistical districts (SDist) of New South Wales (NSW).

This study found that in 2001 and 2006 Port Macquarie was the most specialised economy and Tamworth the most diverse. Unemployment rates however, varied in terms of rank. In 2001, Coffs Harbour had the highest unemployment and Dubbo the lowest. In 2006, Lismore had the highest unemployment and Albury – Wodonga the lowest.

The study found that the nexus between greater industrial diversity and lower unemployment, per the commonly held view in the literature, was somewhat supported. While all SDists in NSW experienced a decline in unemployment rates between 2001 and 2006, the SDists with greater diversity, appeared to have lower unemployment rates on average.

Correlation analysis supports this conclusion, although caution should be exercised given a variety of factors influence unemployment outcomes.

Introduction

Within the literature lies, in many cases, the implicit assumption that a diverse regional economy will enjoy a stable employment growth rate, with the diversity acting to shield the regional economy from fluctuations in the market for its products (Jackson 1984 and Malizia and Ke 1993).

Opinion from the depression era of the 1930s maintained that industrially specialised regional economies were more susceptible to economic distress than regional economies which were more diversified (McLaughlin 1930, Rodgers 1957, Bahl, Firestine, and Phares 1971, and Attaran and Zwick 1987). The focus of many policy development efforts was, therefore, to "cultivate a diverse industrial makeup" (Mack, Grubesic and Kessler 2007).

Jackson (1984) however found only limited support for this relationship, while Attaran (1986) concluded that labour market adjustment capacity is not related to regional industrial diversity. Some research has also shown that regional industry specialisation in fact generates greater employment in a regional economy than industrial diversification (Diamond & Simon 1990).

Wagner and Deller (1998) consider that the principal causes of the measured inconsistencies include the use of highly aggregated data sets, theoretically poor measures of diversity and overly simplistic statistical methods

This paper explores these themes by analysing whether there is a correlation between regional industry diversity and regional employment outcomes in regional NSW SDists between 2001 and 2006.

A SDist is an Australian Standard Geographical Classification (ASGC) region, which encompasses an urban centre and a population of at least 25,000, with boundaries which encompass anticipated urban spread over the next twenty years (ABS 2006). The SDist is considered to be a useful data area for analysis and the application of government policy at the sub-national level (Organisation for Economic Cooperation and Development (OECD) 1990).

Industrial Specialisation versus Industrial Diversity

An industrial specialisation strategy attempts to develop an economy through the expansion of specific already existing industries in which that economy has a competitive advantage (Diamond and Simon 1990). An industrial diversification strategy, conversely, attempts to develop an economy through development and further diversification of its industry base, countering the localisation in specific economies of industries of similar and complementary types (Skyes 1950).

Industrial specialisation was founded upon the 'classical economists' theory that specialisation and trade are beneficial to a country. These benefits derive as countries specialise in goods and services in which they have a comparative advantage by way of resource endowments and/or superior value added techniques (Izraeli and Murphy 2003).
Economies of scale become available whereby industrial specialisation lowers the cost of production Skyes (1950).

Industrial specialisation advocates state that the low costs of production attainable are diminished by industrial diversification strategies. This is caused by the relocation of a portion of the specialised industries elsewhere or by changing part of their focus to new industries (Skyes 1950). In the latter case, Skyes (1950) suggests that competing demands for the factors of production by the newly introduced industries curtail supply and so drive up their costs to the specialised industries. Valuable external economies; such as industrial and commercial linkages, transport facilities and other specific service facilities; may also be reduced.

Industrial diversification advocates state, that it would be rare for industrial diversification to raise the costs of specialised industries and cause these industries to relocate to inferior locations, for such industries ordinarily do not lend themselves to transfer. Many of the specialised industries are 'chained to the spot' because they are extractive industries. Other specialised industries depend on existing factors of production (e.g. a trained labour force) which would not be easily assembled elsewhere (Skyes 1950).

Industrial specialisation advocates note however that industrial specialisation and the history of industrial growth shows that after a certain point, specialisation itself generates diversity (Diamond and Simon 1990) and this diversity creates more rapid employment growth (Lawson and Dwyer 2002). This is achieved by attracting industries subsidiary to the main industry. Later on these subsidiary industries enter upon production of their own distinct goods and services (Diamond and Simon 1990).

Industrial specialisation/diversity and labour

A major debate about industrial specialization concerns labour market outcomes. Diamond and Simon (1990) suggest that industrially specialised cities are more likely to experience stable employment but may also have higher rates of unemployment on average compared to regions with greater industrial diversity. Within an industrial specialisation city, the labour force is subject to high mobility costs between geographic markets, and between industries and, economic shocks increase the probability of unemployment in the short run (Skyes 1950).

Industrial diversity it has been argued is an answer to this problem. A diversified industry base can mean that an unemployed worker may be able to adjust quickly and find employment with other industries in the area (Izraeli and Murphy 2003). The diversity of potential employment opportunities creates a “portfolio effect” in the regions labour market, giving workers alternate choice in the labour market (Diamond and Simon 1990).

In 2003 Izreali and Murphy used pooled data techniques to study the effects of industrial concentration levels on unemployment for the U.S. finding compelling evidence that industrial diversity decreases unemployment.

A study by Trendle and Shorney in 2003 in part used data from the ABS Census from 1996 and 2001 to assess regional economic performance in terms of unemployment outcomes for Queensland’s ABS defined Local Government Areas (LGAs). Using the Entropy index for measuring industrial diversity Trendle and Shorney (2003) concluded that the relationship between the unemployment rate and industrial diversity suggested that outcomes vary with labour force size.

In particular Trendle and Shorney (2003) 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.

Studies by Smith and Gibson (1988), Malizia and Shanzi Ke (1992), Wundt (1992) and Izreali and Murphy (2003) using multivariate techniques to measure regional industry diversification suggest that it is unlikely that regional diversity is the sole determinant of regional economic performance. Industry structure, occupation structure, region size and the performance of the national economy can all be considered as influential on eventual regional economic outcomes (Trendle and Shorney 2003)

Measuring the industry diversity of regional economies

The use of indices as summary measures of regional diversity is particularly appealing because of their ability to synthesize vast amounts of information into a single, easily interpreted number (Wagner 2000). These indices calculate industry diversity relative to a benchmark, generally the nation which then affords the opportunity for the comparison and ranking of, for example, regional economies within that nation based on a calculated, standardised measure (Siegel, Johnson, and Alwang 1995).

Historically several index methods have been developed to measure the level of industrial diversity of regional economies. These classic indices include the minimum and adjusted minimum requirements method, the Ogive method, the national average approach and the Herfindahl index (Mack, Grubesic and Kessler 2007). More recent measurements include the Entropy index, Krugman Similarity index and Markowitz Portfolio theory.

While it is not the purpose of this paper to explore in detail the efficacy of alternate measures of regional industrial diversity, there is considerable debate over the use and outcomes of these differing measurements.

Jackson (1984) suggests that the concept of industrial diversity as a policy framework suffers from definitional ambiguity and is lacking in empirical substantiation. Attaran (1986) in his study of 10 years of annual data for the 50 states of the U.S. concludes that no strict relationship exists between economic diversity and the economic performance of a region.

However, the large volume of current research addressing measurement of industrial diversity suggests that these tools have maintained their relevancy since their inception some sixty years ago (Mack, Grubesic and Kessler 2007). The search for the best way in which to foster diversity (if this is considered the best way forward for regional growth) remains of great importance for researchers and policy makers (Conroy 1975, Attaran and Zwick 1987, Wagner 2000, Dissart 2003).

This current paper uses the regional SDists of NSW to measure industrial diversity and these SDists all have labour force populations above 10,000.

National average index of industrial diversity measurement

The method adopted in this paper to measure the industry diversity of regional economies within NSW SDists is the national average approach. This method was chosen due to the availability of relatively current (2006) industry employment by category statistics from the ABS, enabling comparisons of industrial diversity measured outcomes. The national average (Australia) data is readily available from the ABS.

Further, as Bahl, Firestine and Phares (1971) argue the national average index may be accepted as 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 approach assumes M_i is equal to the national average employment in the i^{th} industry. The approach, similar to the minimum requirements approach uses a limited

numerator in determining the industry diversity within a region (Bahl, Firestine and Phares 1971). The calculation of the national averages approach (index) is shown to be:

$$\Sigma \frac{(P_i - M_i)^2}{M_i} \qquad i = 1,2, \ldots ,39$$

Whereby:

P_i = the percent of employment in the ith industry class
M_i = national percent of employment in industry *i*.

The national averages approach determines the nation as completely diverse at 0.00. The further the recorded index is away from 0.00 then the greater becomes the level of specialisation.

Using the national average approach in the United States (U.S.) Bahl, Firestine and Phares (1971) demonstrated that larger regions tended to be more diversified and that smaller regions were far more specialised. This is in line with the findings of Trendle and Shorney (2003) in their study of industrial diversity in regional Queensland. Steigenga (1955) also utilised national average employment data by calculating the variance as the indicator of diversity, explicitly identifying the national average employment in each industry as the 'norm' from which industry diversity was computed.

Hammond and Thompson (2004) used the national averages approach to examine the effects of industrial diversity and population characteristics on the variability of metropolitan and non metropolitan employment for the contiguous U.S. These authors found that the influence of population characteristics and industrial specialisation varies significantly across metropolitan and non metropolitan regions.

In 2007 Mack, Grubesic and Kessler used the national average index (amongst others) of industrial composition to evaluate the composition of regional economic resources at the county level in the U.S This study sought to revisit the classic index of national averages but from a different perspective. Instead of explicitly examining industrial diversity, this study used the national averages index to evaluate their applicability for benchmarking local and regional economies.

The study explored whether this index might be extended beyond more traditional definitions of diversity to produce a multivariate evaluation of the relative concentrations of (U.S.) county level resources and a ranking of these regions accordingly. Further, this study suggested that this conceptual alteration of the classic index of national averages held great promise for wide applicability in the public and private sectors, because of its more intuitive interpretation and computational simplicity, relative to other diversity measures (Mack, Grubesic 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 Regional Unemployment

The traditional perception of regional labour markets has been one where many believed that rural labour markets had not responded as well as metropolitan areas, to micro-economic reform and consequently had inferior labour market performance (Powell, 1997, Borland, 1998 and Sorenson 2000). However, the reality is and was that significant variations in performance have been found between regions (Howard, 1999). Some regional labour markets have performed quite well, better than metropolitan areas, whilst other regions have performed quite poorly (Howard, 1999).

Of the studies that have investigated the causes of unemployment in Australia, the majority have examined changes in the labour market that have affected the rate of unemployment at the national rather than regional level (Dawkins and Freebairn 1996, Mitchell and Carlson 2003). This research failed to account for the characteristics of state and territory unemployment rates in Australia and the impact of region specific shocks (Dixon and Shepherd, 2001).

While the scope of this paper is limited to investigating specialisation/diversification levels in regional SDists of NSW and comparing them with unemployment outcomes, there are a number of other theories that may help explain regional unemployment disparities. They also implicitly suggest consequences for the level of industrial diversity/specialisation that may characterise a region at any given point in time.

Life-cycle theory posits that regions and thus unemployment rise and fall as their products and infrastructure evolve. A region can become locked in depressed conditions – for example, high unemployment via reduced consumption expenditure inhibits business development and job growth (Howard and Buultjens, 1999)

Labour mobility and regional migration may also account for differences between regions (McGuire 2001, Lawson and Dwyer 2002). Regions which experience positive migration almost always experience a positive effect on unemployment (Howard 1999; McGuire 2001; Lawson and Dwyer 2002).

In terms of the direct effects and contrary to some overseas evidence (Robinson 2000), significant positive outcomes have been measured for participants of Australian Labour Market Programs (LMPs) (Department of Employment Education and Training 1997, Stromback, Dockery and Ying 1999). During the period 1993 to 1995, a period which corresponds with the deployment of labour market programs throughout regional Australia, improvements in unemployment rates occurred (Howard and Buultjens 2004).

The correlation between the job growth rate and the participation rate may also account for variances in regional unemployment levels (Buultjens, Howard and Moffat 2003). Howard (1999) found that there is a reasonably high negative correlation between unemployment rates and participation rates across regional Australia. Howard and Buultjens (1999) found a tremendous variation in participation rates across regional Australia accounting for more than a 20% range from one region to another.

In terms of job growth rates Bradley and Gans (1998) found that faster employment growth in the 1980s in regional Australia was positively related to a town's initial size, its previous growth rate, industrial diversification and its level of human capital.

Mitchell and Carlson (2003) found evidence of region groupings into high growth, moderate growth and low growth employment outcomes. High employment growth regions were able to resist aggregate fluctuations better than low employment growth regions. However many regions appeared to respond to aggregate fluctuations in different ways, with region specific factors also playing a role in outcomes (Mitchell and Carlson 2003, p. 24).

Another possible explanation for differences in regional unemployment rates is differences in educational attainment (McGuire 2001). At the individual level persons with higher educational attainment have much lower unemployment rates than persons with lower educational attainment (McGuire 2001). Successful regions have skills and innovation, training and lifelong learning with a skilled and competitive workforce (Dugas and Croce 2000).

In 1999, Howard and Buultjens used ABS Statistical Division (SD) data from 1986 to 1996 to establish that rural and regional Australia exhibited a great deal of inconsistency of outcomes in terms of levels of unemployment.

In New South Wales and Queensland in particular, there were regions with very high levels of unemployment, in comparison to state averages over the study period. For instance the adjoining coastal regional areas of Wide - Bay Burnett, Moreton, (Queensland) and Richmond-Tweed and the Mid North Coast (NSW), experienced persistent and very high levels of unemployment.

Conversely each state, except Tasmania had regions consistently exhibiting rates of unemployment considerably lower than the State averages. In Queensland they were the Darling Downs and Western regions. In New South Wales these regions were Central west, South east, Murrumbidgee and Murray (Buultjens and Howard, 1999). Disparities in unemployment between Australian regions have not only persisted over time but in many cases have increased (Mitchell and Carlson, 2003).

Several sets of data gathered over different periods of time are available to measure unemployment from the national to the state to the regional (SD, SDist, LGA for example) level, including -

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

This paper has chosen to use ABS Census data to measure unemployment levels as 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.

The following section outlines the data source and method for the unemployment analysis of this study.

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 2006 was obtained from the ABS Census of Population and Housing catalogue 2068 Industry of Employment and these SDists are listed at Table No 1

The regional employment data for the period 2001 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 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), Canberra – Queanbeyan (8196).

Findings

Table 1 below is a summary table for industrial diversity and unemployment levels derived from the 2006 ABS industry of employment census data and unemployment census data for NSW SDists . The ABS orders industry of employment in to 19 categories as shown in Appendix 1.

Table 1 is ordered by industry diversity level outcomes, with the lowest number being first (New South Wales, national average index 0.98) representing the greatest diversity. The column also shows how this changed from 2001 to 2006.

The highest number is Canberra – Queanbeyan (with a national average index of 92.60) indicating the highest level of specialisation on the list.

The right hand column provides unemployment rates for the SDists and how this has changed between 2001 and 2006.

Table 1: Industrial diversity indices and unemployment levels for New South Wales SDists for 2001 and 2006 with changes between 2001 and 2006

NSW Region (SDist)	National Average $(P_i - M_i)^2/M_i$			Variance $(P_i - M_i)^2/(n-1)$			Unemployment %		
	2006	change	2001	2006	change	2001	2006	change	2001
1) New South Wales (6)	0.98	**-0.79**	1.77	0.22	**-0.13**	0.35	5.9	**-1.2**	7.1
2) Tamworth (9)	4.73	**-0.16**	4.89	1.42	**-0.07**	1.49	6.9	**-1.7**	8.6
3) Newcastle (10)	4.77	**-1.92**	6.69	0.96	**-0.34**	1.30	7.1	**-3.0**	10.1
4) Dubbo (4)	4.85	**-0.61**	5.46	1.89	**-0.22**	2.11	5.6	**-1.3**	6.9
5) Wollongong (11)	5.00	**-0.15**	5.15	1.17	**-0.31**	1.48	7.3	**-2.6**	8.9
6) Albury Wodonga (2)	5.96	**-0.17**	6.09	1.76	**+0.12**	1.64	5.3	**-2.1**	7.4
7) Wagga Wagga (7)	10.13	**-0.19**	10.32	3.21	**-0.03**	3.24	5.9	**-1.6**	7.5
8) Bathurst (8)	10.60	**+0.45**	10.15	2.94	**+0.42**	2.52	6.5	**-2.3**	8.8
9) Orange (5)	11.47	**+3.00**	8.47	2.15	**-0.52**	1.63	5.8	**-1.4**	7.2
10) Lismore (15)	11.76	**+1.74**	10.02	4.90	**+0.77**	4.27	9.3	**-3.3**	12.6
11) Coffs Harbour (14)	12.33	**-0.58**	12.91	4.74	**-0.26**	5.00	8.8	**-3.8**	12.6
12) Gold Coast/Tweed (3)	12.60	**-1.25**	13.85	3.33	**+0.19**	3.14	5.5	**-4.6**	10.1
13) Nowra – Bombaderr(13)	14.23	**-1.92**	16.15	4.38	**-0.34**	4.72	8.6	**-3.6**	12.2
14) Port MacQuarie (12)	24.94	**+6.08**	18.86	6.38	**+0.38**	6.01	8.3	**-1.9**	10.2
15) Canberra Quenbeyan (1)	92.60	**+16.15**	76.45	32.54	**+7.10**	25.44	3.3	**-1.7**	5.0

Note: The number in brackets besides the name of the SDists is its rank in terms of unemployment rate at 2006.

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

In 2006 the SDist in NSW with the greatest measured level of industrial diversity was Tamworth at an index of 4.73. For the Census year 2006 the SDist of NSW with the greatest measured level of industrial specialization is Canberra Queanbeyan (92.60). As this SDist has nearly a third of all employment (77.41 of 92.60) in the industry category of Public Administration and Safety, distorting the national average index outcome, this study will largely ignore it.

It is of interest however, that this SDist became more industry specialised by 16.15 index points from 2001 and experienced a decrease in unemployment from 5.0% to 3.3%, (lower than the Australian national average of 5.2%. On the face of it, this contradicts the findings for the rest of the NSW SDists.

Port Macquarie then, at (24.94) was found to be the most specialised (and increasingly so) industry economy in NSW SDists, as it was in 2001 (18.86).

Comparing census years 2001 and 2006, and employing an approximate median industrial diversity of nine:

- In census year 2001 there were seven SDists with industrial diversity measurement of above nine with six below.

- By 2006 eight SDists were measured with industrial diversity measurement above nine with five registering a diversity index below nine, an increase of one from 2001.

The following lists the SDists and their industry diversity measure that experienced greater industrial diversity in 2006 than in 2001. Change in unemployment is presented in brackets.

- Tamworth 4.73 (4.89 in 2001) (-1.7)

- Newcastle 4.77 (6.69 in 2001) (-3.0)

- Dubbo 4.85 (5.46 in 2001) (-1.3)

- Wollongong 5.00 (5.15 in 2001) (-2.6)

- Albury - Wodonga 5.92 (6.09 in 2001) (-2.1)

- Wagga Wagga 10.13 in 2006 (10.32 in 2001) (-1.6)

- Coffs Harbour 12.33 in 2006 (12.91 in 2001) (-3.8)

- Gold Coast Tweed Heads 12.60 (14.85 in 2001) (-4.6)

- Nowra - Bombaderry 14.23 (16.15 in 2001) (-3.6)

The remaining SDists experienced greater industrial specialisation in 2006 than in 2001.

- Orange 11.47 (8.47 in 2001) (-1.4)

- Bathurst 10.60 (10.15 in 2001) (-2.3)

- Lismore 11.76 (10.02 in 2001) (-3.3)

- Port Macquarie 24.94 (18.86 in 2001) (-1.9)

- Canberra Queanbeyan 92.60.(77.41 in 2001) (-1.7).

Overall, unemployment fell by an average of 1.8% (Canberra – Quenbeyan excluded) in the SDists that increased industry diversity, compared to 2.1% in those that went the other way.

Rudimentary correlation analysis also suggests that industry diversification is associated with lower unemployment rates. In Tables 2 and 3, Pearson Correlation Coefficients were calculated for 2001 and 2006, between the industry diversity index and the prevailing unemployment rate for each SDist (Canberra – Quenbeyan excluded).[i]

Table 2: Pearson Product Moment Correlation – 2001 Data		
Statistic	**Diversification-Index**	**Unemployment-Rate**
Mean	9.060000	9.300000
Biased Variance	17.117043	3.931429
Biased Stand. Deviation	4.137275	1.982783
Covariance	5.913385	
Correlation	0.669363	
Determination	0.448047	
T-Test	3.121056	
P – value (2 sided)	0.008837	
P – value (1 sided)	0.004419	
Degrees of Freedom	12	
Number of Observations	14	

Table 3: Pearson Product Moment Correlation – 2006 Data		
Statistic	**Diversification-Index**	**Unemployment-Rate**
Mean	9.5964286	6.9142857
Biased Variance	32.9264944	1.7140816
Biased Stand. Deviation	5.7381612	1.3092294
Covariance	3.8726703	
Correlation	0.4786713	
Determination	0.2291262	
T-Test	1.8885841	
P – value (2 sided)	0.0833532	
P – value (1 sided)	0.0416766	
Degrees of Freedom	12	
Number of Observations	14	

Overall the correlation between higher levels of diversification and lower levels of unemployment are positive at .48 for 2006 and .67 for 2001. Indeed given the higher correlation statistics and the p values, the correlation is stronger in 2001, suggesting the role of diversification in reducing unemployment changes over time.

It is also notable that all SDists in NSW experienced lower unemployment (1% or more) in 2006 than in 2001

For the five SDists, greater specialisation has not lead to higher unemployment but Hackbart and Anderson (1975) and St Louis (1980) argue that spillover effects of the national business cycle (ie, recession or growth) on the sub-national economies can lead to improved outcomes for unemployment.

With Australia experiencing continual economic growth over the past twenty years this outcome cannot be discounted as a reason for lower unemployment across all SDists of NSW between 2001 and 2006 and 2001 irrespective of changes (greater and lesser), in industrial diversity measurements between 2001 and 2006 across NSW's SDists. Although, Mitchell and Carlson (2003) suggest that national aggregate demand expansion may not always improve the unemployment outcomes for all regions.

To sum up, this study found 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 NSW are concerned. So, the application of the National Average Approach (index) was useful to that extent. 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, through participation or labour mobility. Indeed, further research, along with the use of the National Average Approach would be useful in 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 2001 and 2006.

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Appendix 1 Industrial diversity measurements for New South Wales for 2006 by industry of employment category

New South Wales

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	3.09	2.70	0.15	0.05	
Mining	1.17	0.70	0.22	0.19	
Manufacturing	10.46	9.53	0.86	0.08	
Electricity, gas & water supply	0.98	1.00	0.00	0.00	
Construction	7.80	7.31	0.24	0.03	
Wholesale trade	4.35	4.70	0.12	0.03	
Retail trade	11.35	11.13	0.05	0.00	
Accommodation and food services	6.32	6.55	0.05	0.00	
Transport, postal and warehousing	4.70	5.00	0.09	0.02	
Information media & telecoms	1.94	2.37	0.18	0.09	
Finance & insurance	3.83	4.98	1.32	0.34	.
Rental, hiring & real estate	1.69	1.74	0.00	0.00	
Professional scientific and technical	6.61	7.33	0.52	0.08	
Administration & support services	3.15	3.11	0.00	0.00	
Public administration & safety	6.68	6.01	0.45	0.07	
Education & training	7.66	7.57	0.00	0.00	
Health care & social assistance	10.50	10.46	0.00	0.00	
Arts & recreation services	1.40	1.38	0.00	0.00	
Other services	3.71	3.78	0.00	0.00	
Not stated	2.61	2.65	0.00	0.00	
Total	**100.00**	**100.00**	**4.25**	**0.98**	**0.22**

[i] The calculator at http://www.wessa.net/rwasp_cerrelation.wasp#output was employed.