A TYPOLOGY OF ECONOMIC AND HUMAN CAPITAL PERFORMANCE ACROSS AUSTRALIA'S LARGE AND MEDIUM SIZED REGIONAL TOWNS[1]

Robert Stimson
Centre for Research into Sustainable Urban and Regional Futures (CR-SURF), School of Geography, Architecture and Planning, University of Queensland, St Lucia QLD 4072.

Scott Baum
Centre for Research into Sustainable Urban and Regional Futures (CR-SURF), School of Geography, Architecture and Planning, University of Queensland, St Lucia QLD 4072.

Yolanda van Gellecum
Centre for Research into Sustainable Urban and Regional Futures (CR-SURF), School of Geography, Architecture and Planning, University of Queensland, St Lucia QLD 4072.

ABSTRACT: This paper uses census data for the period 1991-2001 to develop a typology of performance of both large regional cities and towns and medium size regional towns across Australia with respect to human capital and other economic measures using a cluster analysis approach. Multiple discriminant analysis is then used to identify key factors differentiating between the performance clusters. Both large and medium size towns are ranked on an opportunity-vulnerability continuum which measures their relative economic and human capital performance. The spatial patterns of differential performance are mapped and analysed.

1. INTRODUCTION

This paper develops a typology of economic and human capital performance over the decade 1991-2001 both for Australia's large regional cities and towns, and for its medium size regional towns, using a cluster analysis model. Multiple discriminant analysis is then used to identify the factors that discriminate between those clusters. The position of the large and the medium size regional towns on a continuum of opportunity-vulnerability measuring that performance is determined and the patterns are mapped and discussed.

2. DATA AND METHODOLOGY

2.1 The Approach

The objective is to develop a typology of performance for both large and medium size regional towns based on measures of human capital and labour-force characteristics for the period 1991-2001. An approach by Hill, *et al.* (1998)

[1] This paper was presented to the Australian and New Zealand Regional Science Association International (ANZRSAI) Conference, Wollongong NSW, Sept-Oct 2004.

in a study of US central cities, and adapted in previous regional analysis in Australia by Baum, *et al.* (1999), is used. That involves both hierarchical cluster analysis and descriptive discriminant analysis in what is essentially a two-stage process. Initially a clustering procedure is used to group spatial units (in this case SLAs-statistical local areas-or amalgamations of them that approximate the large regional cities and towns and the medium size towns) based on a battery of socio-economic derived from the census.

The discriminant analysis functions and associated outputs are then used to determine which variables discriminate between the resultant clusters. These analyses are undertaken using the SPSS package. The outputs from those analyses are then used to generate further measures of SLA performance, such as their position on a performance continuum as measured by SLA summary scores on the discriminant functions. That is called an opportunity–vulnerability continuum.

2.2 Data Variables Used

The data used in the analyses come from the Australian Bureau of Statistics (ABS) Census of Population and Housing, 2001, and include change-over-time data for the decade 1991 to 2001. Initially a large number of variables relating to employment, skills another socio-economic phenomenon were screened for incorporation into the agglomerative clustering procedure. Numerous variables were eliminated because of multicolinearity For example, variables measuring employment in occupations and industries show a great deal of multicolinearity, particularly with variables relating to human capital and labour-force characteristics, and thus should not be—and were not—included in the clustering procedure. However, because of their central importance in describing SLAs, occupation and industry employment variables were set aside for the descriptive part of the analysis, which used ANOVA (analysis of variance) to compare the cluster means on variables.

The 18 variables finally chosen as suitable to use in the clustering procedure and the subsequent discriminant analysis are listed in Table 1. Table 2 lists six broad industry employment and three broad occupation employment variables which could not be included in the cluster and discriminant modelling because of multicolinearity issues, but which are considered in the ANOVA component of the analyses.

2.3 Spatial Unit of Analysis

SLAs were chosen because data is available on standardized boundaries over time thus permitting the inclusion of both static and dynamic measures in the analysis. The SLAs, or amalgamations of them used in the analysis, are relatively good representations of regional towns. Ideally urban centres and localities (UCLs) would have been used, but change-over-time data is not available for those spatial units using standardized boundaries.

Table 1. The 18 Variables Included in the Final Clustering Model

Category	Variable
Education participation	Post-school participation: university
	Post-school participation: technical
Qualifications	Qualifications: diploma, degree or postgraduate degree
	Qualifications: certificate
	Qualifications: no qualification
Labour-force characteristics	Labour-force participation: males
	Labour-force participation: females
	Labour-force engagement: full-time
	Labour-force engagement: part-time
	Labour-force engagement: unemployment
Household income	Household weekly income $399 or less
	Household weekly income $1,500 or more
Change variables	Change in qualifications: diploma, degree or postgraduate
	Change in qualifications: certificate
	Change in qualifications: no qualification
	Change in labour-force participation: males
	Change in labour-force participation: females
	Change in labour-force engagement: unemployment

The analysis is undertaken in two parts:

- An analysis is of larger cities and towns located outside the mega-metropolitan regions (as defined by O'Connor and Stimson, 1995) with populations of 10,000 and above at the 2001 census. There are a total of 138 SLAs or amalgamations of SLAs that approximate such large regional cities and towns.
- An analysis is of the smaller medium size regional towns. A population cut-off for these places is SLAs with populations of 5,000 to 10,000. There are 124 such SLAs.

2.4 The Modelling

The objective is to use multivariate statistical tools to classify the SLAs into clusters or groups of regional towns that exhibit similarity with respect to the variables listed in Table 1 in order to form a typology across both the large regional cities and towns and across the medium-size towns. This produces what we refer to as a typology of opportunity–vulnerability with respect to the performance of those clusters vis-à-vis the variables used in the analysis. There is also a need to be able to determine the most important factors (individual variables or groupings of variables) that explain or account for the differences between the clusters forming the typology. Well-tried multivariate analytic tools

known as cluster analysis and multiple discriminant analysis are typically used for these purposes.

Table 2. Variables in Addition to those Listed in Table 1 Chosen for Final Model and used in the ANOVA Analysis

Category	Variable
Industries	Extractive activities (agriculture, forestry & fishing; mining) Transformative industries (manufacturing; electricity, gas & water supply; construction) Distributive services (wholesale trade; retail trade; transport & storage; communication services) Producer services (finance & insurance; property & business services) Social services (government administration & defence; education; health & community services) Personal services (accommodation, cafes & restaurants: cultural and recreational services; personal & other services)
Occupations	Symbolic analysts (managers & administrators; professionals) In-person service workers (associate professionals; advanced clerical & service workers; intermediate clerical, sales & service workers; intermediate production & transport workers) Routine production workers (tradespersons & related workers; elementary clerical, sales & service workers; labourers & related workers)

Agglomerative hierarchical cluster analysis is a useful and effective procedure when the objective is to classify observations into groups of like individuals or areas that can then be profiled for their socio-economic similarities and differences (Everitt, 1993; Hair and Anderson, 1987). These cluster groupings however may be constructed by minimising the variance of the squared Euclidean distances for each variable within observations using the Ward method. While there is no one agreed method of selecting the most appropriate cluster solution (Aldenderfer and Blashfield, 1984; Everitt, 1993), a number of options have been suggested, including analysing the agglomeration schedule to identify 'marked increases' in the value of the coefficient between two stages in the hierarchical clustering process. However, the final cluster solution is typically chosen according to the interpretability of the clusters, the manageability of the cluster numbers, and the number of observations included in each cluster.

Having derived a cluster solution, descriptive discriminant analysis is then used to further analyse the cluster groupings. This is an appropriate methodology because there is a categorical dependent variable (the cluster groups) while there

are metric independent variables. The tool focuses on revealing major differences among predetermined groups, in this case the clusters of SLAs (Stevens, 1996), and it involves producing a linear combination of the *independent variables* that will best discriminate between the previously specified cluster groups. This allows for identification of those variables that drive the classification process whereby the typology of clusters are formed. For the analyses reported in this paper, stepwise discriminant analysis was used, which involves introducing variables into the analysis one at a time and maximizing the between-group variance relative to the within-group variance. The result is a series of discriminant functions, each with particular qualities that depend on the relationship between the *independent variables* and the cluster solutions (*dependent variable*). The discriminant function analysis is used to assess which variables are able to discriminate between the different clusters. If the resultant *cluster means* (averages) significantly differ between the different cluster groups, those variables are then said to discriminate well between the cluster groups, and they may be used to help us to define and to describe the clusters. Variables for which the means do not vary between clusters are automatically dropped from the analysis as they are redundant.

The output from this modeling is used in several ways:

- For each observation (SLA), the analysis produces a series of discriminant scores which are then compared with the centroids for each cluster. That provides a general structure for identifying the way the characteristics of each cluster differs from the other clusters.
- The discriminant analysis produces correlations between individual discriminant functions and the independent variables. Those are reported in the 'function matrix' in SPSS, and are used to identify the properties of each function. Once identified, they are then used in the interpretation and analysis of the clusters.

Discriminant analysis does have limitations, being sensitive to multicolinearity in the data. Both discriminant and cluster analysis are limited in the number of variables that can be included in modelling by the ratio of cases (i.e. SLAs) to variables. As a general rule, it is preferable to have at least 10 cases for every variable if modelling is to remain stable. We are only able to partially achieve that in the analyses repeated here. Only a core set of variables can, therefore, be included in initial modelling. As mentioned earlier, the discriminant procedure itself automatically drops from the analysis variables that do not discriminate well between clusters. Although this core set of variables statistically distinguishes between the clusters, it is still important to examine other theoretically noteworthy variables. This study, therefore, we follow the cluster and discriminant modelling with ANOVA. ANOVAs are applied to all pertinent variables, and in this way the procedure is used to see how the variable means differ across the cluster groups. That helps to further describe final cluster solutions and provides a richer description of those SLAs that form a cluster.

2.5 Compiling an Opportunity-Vulnerability Continuum to Rank Town Performance

On the discriminant functions SLAs may be then given a ranking based on their summary discriminant score so that each SLA may be directly compared with other SLAs vis-a-vis their positions on the opportunity–vulnerability continuum of performance.

The discriminant functions are multiplied by the percentage of variance they explain, summed, and then divided by the total number of discriminant scores in the analysis. The following formula is used to construct the index:

$$\frac{(F_1 \times V_1) + (F_2 \times V_2) + ... + (F_n \times V_n)}{N_F}$$

where: F is the discriminant function; V is the variance explained by the discriminant function; and N_F is the total number of discriminant functions.

The total number of discriminant scores (N_F) for the large regional cities and towns is four, and for the medium-size regional towns it is three. The discriminant index scores calculated for each of the SLAs range from positive (representing an opportunity) to negative (representing vulnerability). Places with the highest discriminant index score are those with most opportunity, and are towns with low scores (those most negative) are those which are most vulnerable.

3. RESULTS

3.1 The Large Regional Cities and Towns

The *cluster analysis* resulted in the 138 SLAs comprising these large regional cities and towns being clustered into *five* groupings of opportunity–vulnerability; two *opportunity* clusters, two *vulnerable* clusters, and one *average* cluster. The *discriminant analysis* identifies *four functions* that account for all 100 per cent of the total variance in differentiating between the clusters of opportunity–vulnerability. Those discriminant functions, and the percentage of total variance they account for, are:

Function 1: *Socio-economic status/human capital* (54 percent).
Function 2: *University participation* (22 percent).
Function 3: *Technical participation and certification* (18 percent).
Function 4: *Labour force participation and engagement* (6 percent).

The *five clusters* forming the typology are described as follows:

Opportunity Clusters

Cluster 4: (N = 20 SLAs): *Human capital attainment, socio-economic advantaged mining and tourism centers opportunity cluster* (15 percent of large regional cities and towns populations).

Cluster 3: (N = 7 SLAs): *Regional university service centres, high human capital opportunity cluster* (9 percent of large regional cities and towns populations).

Average Cluster

Cluster 1: (N = 49 SLAs): *Large regional service centres, average socio-economic status and human capital cluster* (40 percent of large regional cities and towns populations).

Vulnerable Clusters

Cluster 5: (N = 35 SLAs): *Regional service centres with low human capital and average labour force outcomes vulnerable cluster* (16 percent of large regional cities and towns populations).

Cluster 2: (N = 27 SLAs): *Coastal growth and old industrial low socio-economic status and low human capital vulnerable cluster* (20 percent of large regional cities and town populations).

The names of SLAs representing the large regional cities and towns that comprise those five opportunity/vulnerability clusters are listed in Table 3, and the pattern of distribution of those clusters is mapped in Figure 1.

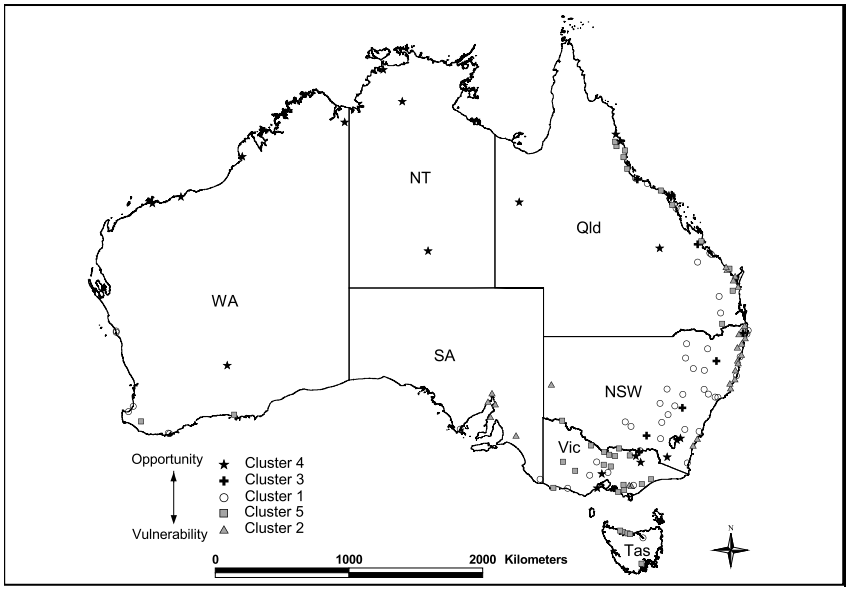

Figure 1. Australia's Large Regional Cities and Towns: Patterns for the Opportunity-Vulnerability Clusters defined above.

There is an over-representation of larger regional cities and towns in the opportunity clusters in Western Australia and Queensland, and there is 100 percent representation of SLAs is in the opportunity clusters in the Northern Territory (only Darwin, Alice Springs and Katherine are in the large regional cities and towns category in the Northern Territory). There is an over-representation of SLAs in the vulnerable clusters for Tasmania, South Australia and Victoria. Queensland has about average representation of SLAs in both the opportunity and the vulnerable cluster. New South Wales has an under-

representation of large regional centres and towns in both the opportunity and the vulnerable clusters.

Table 3. SLA's Comprising the Five Opportunity-Vulnerability Clusters for the 138 Large Regional Cities and Towns.

Opportunity Cluster 4: Human capital attainment, socio-economic advantaged mining and tourism centres opportunity cluster

NSW	**QLD**	**WA**
Queanbeyan	Cairns	Kalgoorlie/Boulder–Pt A
Yarrowlumla–Pt A	Emerald	Port Hedland
Snowy River	Whitsunday	Roebourne
VICT	Douglas	Wyndham-East Kimberley
Surf Coast–East	Mount Isa	Broome
Macedon Ranges Bal		**NT**
Indigo–Pt A		Darwin
Alpine–East		Katherine
		Alice springs

Opportunity Cluster 3: Regional university service centres, high human capital opportunity cluster

NSW	**VICT**
Lismore–Pt A	Wodonga
Armidale	
Dumaresq–City	**QLD**
Bathurst	Townsville
Wagga Wagga–Pt A	Rockhampton

Average Cluster 1: Large regional service centres, average socio-economic status and human capital cluster

NSW	**NSW (ctd)**	**QLD**
Maitland	Cowra	Kingaroy
Port Stephens	Parkes	Toowoomba
Muswellbrook	Goulburn	Calliope–Pt A
Singleton	Young	Gladstone
Shoalhaven–Pt A	Bega Valley	Banana
Ballina	Tumut	Mackay–Pt A
Byron	Griffith	Thuringowa City–Pt A
Lismore–Pt B	Leeton	Burdekin
Coffs Harbour– Pt A	Albury	**SA**
Hastings–Pt A	**VICT**	Mount Gambier
Tamworth	Ballarat City	Port Lincoln
Gunnedah	Greater Bendigo City Pt A	**WA**
Inverell–Pt B	Warrnambool	Bunbury
Moree Plains	Mitchell–South	Busselton
Narrabri	Latrobe–Traralgon	Albany–Central
Dubbo–Pt A	**TAS**	Albany Bal
Mudgee	Greater Launceston	Geraldton
Orange		Greenough–Pt A

Table 3 (continued).

Vulnerable cluster 5: Regional service centres with low human capital and average labour force outcomes vulnerable cluster

VICT	**VICT (ctd)**	**QLD (ctd)**
Greater Shepparton	Wellington–Sale	Cardwell
Wangaratta	Baw Baw–Pt B West	Johnstone
Glenelg–Portland	Bass Coast–Bal	Mareeba
Ararat	South Gippsland–Central	**WA**
Horsham–Central	**QLD**	Manjimup
Mildura–Pt A	Burnett–Pt A	Esperance
Gannawarra	Cooloola–Gympie only	**TAS**
Gr. Bendigo–Pt B	Warwick–Central	Huon Valley
Campaspe–Echuca	Livingstone	Burnie–Pt A
Campaspe–Kyabram	Bowen	Central Coast–Pt A
Moira–West	Mackay–Pt B	Devonport
Mitchell–North	Hinchinbrook excl. Palm I.	Waratah/Wynyard–Pt A
E. Gippsland–Bairnsdale	Atherton	

Vulnerable cluster 2: Coastal growth and old industrial low socio-economic status and low human capital vulnerable cluster

NSW	**NSW (ctd)**	**QLD**
Great Lakes	Greater Taree	Bundaberg
Shoalhaven–Pt B	Hastings–Pt B	Hervey Bay–Pt A
Richmond Valley–Casino	Kempsey	Burnett–Pt B
Richmond Valley Bal	Eurobodalla	Cooloola (excl. Gympie)
Tweed–Pt B	Broken Hill	Maryborough
Bellingen	**VICT**	**SA**
Coffs Harbour–Pt B	Latrobe–Moe	Copper Coast
Grafton	Latrobe–Morwell	Murray Bridge
Maclean		Whyalla
Nambucca		Port Pirie–City
		Port Augusta

The spatial pattern of distribution of the large regional cities and towns varies according to town membership of the opportunity and vulnerability clusters. Figure 1 clearly depicts a marked concentration of the coastal growth and old industrial low socio-economic status and low human capital vulnerable cluster (cluster 2) along the east coast of New South Wales and Queensland and in the 'iron triangle' gulf of South Australia. Another clear spatial pattern is apparent in the predominance of the large regional service centres, average socio-economic status and human capital average cluster (cluster 1) across the wheat–sheep belt of New South Wales and Queensland, plus some of the farming areas of Victoria's Western District and the coastal centres of New South Wales, Queensland and Western Australia. The pattern for the human capital attainment, socio-economic advantage mining and tourism centres opportunities cluster (cluster 4) highlights both the remote and the spatially selective coastal and alpine locations of those towns. There does not seem to be any distinctive spatial pattern for the other two clusters, cluster 3, regional university service

centres, high human capital opportunity cluster and cluster 5, regional service centres with low human capital and average labour force outcomes vulnerable cluster.

Space limitations prevent inclusion of the rank order listing of large regional cities and towns by state and territory in terms of their position on the continuum of opportunity-vulnerability formed according to their aggregate discriminant score. The SLAs ranked in the 'top ten' on that continuum are: Yarrowlumba–Pt A, Snowy River and Armidale–Dumaresq in New South Wales; Surf Coast–East, Macedon Ranges–Balance, and Alpine–East in Victoria; Port Headland and Roebourne in Western Australia; and Alice Springs and Darwin in the Northern Territory. Both New South Wales and Queensland have eight SLAs in the 'top 30 list' of large regional cities and towns on the opportunity–vulnerability continuum, while Victoria and Western Australia both have six SLAs and the Northern Territory has two SLAs in the 'top 30 list'.

The SLAs that are ranked in the 'bottom 10' on the opportunity–vulnerability continuum are: Port Pirie, Copper Coast and Murray Bridge in South Australia; Nambucca, Kempsey, McLean, and Great Lakes in New South Wales; and Hervey Bay–Pt A, Cooloola (excl. Gympie) and Burnett–Pt B in Queensland. New South Wales has 15 and Queensland has seven SLAs on the 'bottom 30 list' of large regional cities and towns on the continuum, and those places are all located along the east coast of Australia and are mostly rapidly growing towns. The rest of the places on that list comprise of five SLAs in South Australia, two in Tasmania and one in Victoria, and all of them are old industrial towns.

3.2 The Medium Size Regional Towns

The cluster analysis resulted in the 124 SLAs comprising Australia's medium size regional towns being clustered into just four groupings of opportunity–vulnerability; two opportunity clusters, and two vulnerable clusters. The discriminant analysis identifies just three functions that account for all 100 per cent of the total variance in differentiating between the clusters of opportunity–vulnerability. Those discriminant functions and the percentage of the total variance they account for are:

Factor 1: *Socio-economic status* (56 percent).
Factor 2: *Labor force participation and engagement* (23 percent).
Factor 3: *Human capital* (21 percent).

The *four clusters* forming the typology are described as follows:

Opportunity clusters

Cluster 4: (N = 5 SLAs): *High income opportunity mining towns cluster* (4 percent of medium size towns populations).

Cluster 1: (N = 40 SLAs): *Human capital opportunity but lower socio-economic status rural service towns cluster* (33 percent of medium size towns populations).

Vulnerable clusters

Cluster 3(N = 33 SLAs): *Rural service towns cluster of human capital vulnerability, margin socio-economic status, but positive labour force outcomes* (51 per cent of medium size towns populations).

Cluster 2: (N = 16 SLAs): *Socio-economic disadvantage, low human capital, poor labour force performance vulnerable cluster* (12 percent of medium size towns populations).
The names of the SLAs representing the medium size regional towns that comprise those five clusters are listed in Table 4, and the pattern of distribution of the clusters is mapped in Figure 2.

There is a marked over representation of SLAs in the opportunity clusters in Western Australia (with its many mining towns), and less so in Queensland and New South Wales. There is a marked over-representation of SLAs in the vulnerable clusters in the Northern Territory, Tasmania and South Australia, and those states or territories do not have any SLAs in the two opportunity clusters.

The spatial pattern of distribution of the four opportunity-vulnerability clusters for the medium-size regional towns in Figure 2, clearly depicts how the opportunity clusters are found in the often remote mining towns (for cluster 4) high income opportunity mining towns cluster. In the case of cluster 1 (human capital opportunity, but lower socio-economic status rural service towns cluster), they are SLAs located widely across coastal locations and some small inland areas of New South Wales and Victoria. The vulnerable clusters show a very dispersed pattern of locations, cluster 3 (rural service towns cluster of human capital inevitability, marginal social-economic status, but positive labour force outcomes) SLAs spreading across the wheat–sheep belt and the agricultural areas of Victoria, New South Wales and Queensland. The most vulnerable cluster 2 (socio-economic disadvantaged low human capital poor labour force performance vulnerable cluster) towns are often the smaller and more remote places that are sometimes mining towns or towns on the sugar coast of Queensland.

The position of SLAs on the continuum of opportunity-vulnerability formed according to the rank order of their aggregate discriminant score shows that the SLAs ranked in the 'top 10'are: Ashburton, East Pilbara, and Harvey–Pt A in Western Australia; Broadsound, Belyando, and Duranga in Queensland; Yass and Cobar in New South Wales; and Macedon Ranges–Romsey and Corangamite–South in Victoria. They are mining towns, except in Victoria. Victoria has nine SLAs on the 'top 30 list' of medium size regional towns on the opportunity-vulnerability continuum, and there are six from Western Australia and Queensland, four from New South Wales, four from South Australia, and one from Tasmania.

The SLAs ranked in the 'bottom 10' on the opportunity–vulnerability continuum are: Tanami in the Northern Territory; Isis, Herberton, and Nanango in Queensland; Pristine Waters–Ulmarra and Junee in New South Wales; Kentish and Southern Midlands in Tasmania; and Central Goldfields–Bal and Hepburn–West in Victoria. Victoria has nine and New South Wales has eight SLAs in the 'bottom 30 list', and there are five in Queensland, three in Tasmania, two in both Western Australia and the Northern Territory, and one in South Australia.

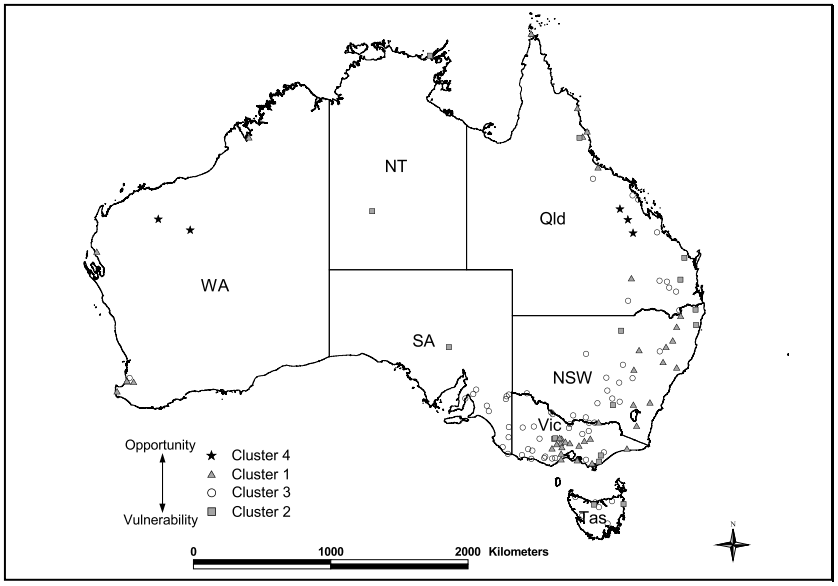

Figure 2. Australia's Medium-size Regional Towns: Patterns for the Opportunity-Vulnerability Clusters

Table 4. SLAs Representing the Four Opportunity- Vulnerability Clusters for the 124 Medium Size Regional Towns

Opportunity cluster 1: Human capital opportunity but lower socio-economic status rural service towns cluster

NSW	**VICT**	**QLD**
Dungog	Surf Coast–West	Roma
Scone	Golden Plains–North-West	Thuringowa–Pt B
Parry–Pt A	Golden Plains–South-East	Cairns–Pt B
Glen Innes	Hepburn–East	Cook (excl. Weipa)
Tenterfield	Hepburn–West	Eacham
Uralla	Moorabool–Ballan	Torres
Coonabarabran	Mount Alexander–C'maine	
Wellington	Mount Alexander–Bal	
Mulwaree	Macedon Ranges–Kyneton	
Yass	Macedon Ranges–Romsey	
Cooma–Monaro	Delatite-South	**WA**
Hume	Murrindindi–East	Dardanup–Pt A
	Murrindindi–West	Harvey–Pt A
	E. Gippsland–Orbost	Collie
	Bass Coast–Phillip Is.	
	South Gippsland–East	

Table 4 (continued).

Opportunity cluster 4: High income opportunity mining towns cluster

QLD	**WA**
Duaringa	East Pilbara
Belyando	Ashburton
Broadsound	

Vulnerable Cluster 3: Rural service towns cluster of human capital vulnerability, margin socio-economic status, but positive labour force outcomes

NSW	**VIC(ctd)**	**SA**
Parry–Pt B	S. Grampians Bal	Yorke Peninsula–North
Narromine	N. Grampians–Stawell	Clare and Gilbert Valleys
Cobar	Hindmarsh	Wakefield
Bland	Yarriambiack–South	Berri & Barmera - Berri
Cabonne–Pt C	Swan Hill–Central	Loxton Waikerie–East
Forbes	Swan Hill Bal	Mid Murray
Lachlan	Campaspe–Rochester	Renmark Paringa–Renmark
Cootamundra	Moira–East	The Coorong
Narrandera	Delatite–Benalla	Naracoorte and Lucindale
Temora	Strathbogie	Tatiara
Corowa	Wellington–Maffra	Grant
Berrigan	South-Gippsland -West	Wattle Range–West
Deniliquin	**QLD**	**WA**
Murray	Chinchilla	Harvey–Pt B
Wentworth	Dalby	**TAS**
VICT	Jondaryan - Pt B	Southern Midlands
Colac-Otway–Colac	Stanthorpe	Meander Valley–Pt B
Colac-Otway–North	Wambo	Dorset
Corangamite–North	Balonne	Latrobe–Pt A
Corangamite–South	Fitzroy–Pt B	Circular Head
Moyne - South	Mirani	West Coast
Glenelg–Heywood	Sarina	
S. Grampians–Hamilton	Charters Towers	

Vulnerable Cluster 2: Socio-economic disadvantage, low human capital, poor labour force performance vulnerable cluster

NSW	**VIC**	**QLD**
Kyogle	C. Goldfields-M'borough	Isis
Pristine Waters-Ulmarra	C. Goldfields-Bal	Nanango
Walgett	Wellington -Alberton	Herberton
Junee	Wellington-Rosedale	**TAS**
SA	**NT**	Break O'Day
Unincop. Far North	East Arnhem-Bal	Kentish

4. CONCLUSION

It has been suggested in other research, such as that by O'Connor, et al. (2001), that both people-based and place-based divides are becoming more apparent (both socially and spatially) across multiple dimensions in Australian society. Evidence from the earlier work on modelling patterns of community

opportunity and vulnerability across Australia's cities and regional towns by Baum, et al. (1999) suggests that the most powerful differentiating factors in community performance largely refer to differentials in levels of human capital and on difference in labour-force participation and engagement. The number reported in this report confirms the earlier finding.

Two general overriding conclusions may be drawn:

- where people live can dramatically affect the diversity of job opportunities with respect to industry, occupation and skills, and it can affect the overall levels of labour-market participation and engagement; thus, place does matter
- level of human capital is a crucial discriminating factor—along with labour-market engagement and participation and with socio-economic status (which human capital levels influence)—in differentiating between places in their performance; thus, people skills do matter.

The detailed report by Stimson, et al. (2004) shows how in Australia there is a dichotomy at a general aggregate level between the capital cities and the regional urban areas in performance with respect to work, employment and skills, and in particular for human capital performance. The capital cities generally are shown to have higher levels of performance, and especially for university qualifications and participation. That city/regional differentiation is seen as well through the 'digital divide', and also in the incidence of jobs in the 'knowledge-based' and 'information-intensive' occupations and industries with their higher level skills requirements.

But it is also evident that all is not evenly 'good' across the mega-metro city regions, there being considerable variation between the capital cities in their overall performance.

The results of the analysis presented in this paper show that across the 138 large regional cities and towns in Australia about 55 percent of them are either places of opportunity or average on the opportunity–vulnerability continuum, with the opportunity places accounting for 24 percent of the populations of the large regional cities and towns and the average places accounting for 40 percent of their populations. That leaves about 36 percent of the population of the large regional cities and towns living in 45 percent of these places of vulnerability. However, the incidence of vulnerability increases in the medium-size regional towns, with only 35 percent of them being places of opportunity, and 65 percent of them being vulnerable. Those vulnerable places account for 63 percent of the total populations of the medium-size towns.

The implications of that types of regional differential presents a policy conundrum for governments regarding an appropriate mix of people-based as against place-based policies. Earlier research by Baum, et al. (1999) and O'Connor, et al. (2001) concludes that what is needed is a mixture of both people-based and place-based policy approaches.

It would seem to be important that people-based approaches be targeted towards enhancing human capital development; thus post-secondary education and training become critical. And enhancing geographical access to those education and training services is also important.

There seems to be strong evidence that investment in human capital development as a people-based policy is associated with advantageous place-based outcomes, as well as with advantageous outcomes for people. Stimson, et al. (2004) point out that the places that are incorporated within the communities of opportunity collectively represent the most dynamic and highly productive parts of the urban-based segments of Australia's economy, both within the capital city regions and across the cities and towns of regional Australia. It might be argued that public policy needs to ensure appropriate types and levels of public and private investments occurs in these places to ensure they remain high-performing places with high-performing people. That investment benefits the nation's aggregate economic performance, and it is feasible to argue that it is essential to have explicit public policies to ensure that this continues so that the nation maintains and improves its international competitiveness.

But it is also necessary from a social equity perspective for public policy to be directed also towards appropriate interventions in those places characterised as vulnerable. Such places need attention to reverse their low levels of performance with respect to their levels of human capital and with respect to labour-force participation and engagement. Such places have been shown in other research (for example Stimson, et al., 2001; Stimson, et al., 2003) to be highly dependent on Commonwealth income support schemes to bolster household income. Results such as those reported in this paper may provide an improved evidence base for policy formulation and program intervention, particularly by identifying places that might be targets for such action.

ACKNOWLEDGMENTS

The research on which this paper is based was funded through a grant to CR-SURF at the University of Queensland by the Australian National Training Authority (ANTA) for one of the ANTA national projects. That research was conducted in 2003-04. The authors wish to thank Paul Skyy in CR-SURF for producing the maps for the figures reproduced in this paper. A full account of that project is available in a monograph by Stimson, *et al.*, (2004).

REFERENCES

Aldendefer, M. and Blashfield, R. (1984) *Cluster Analysis*, Sage Publications: Beverley Hills.

Baum, S., Stimson, R., O'Connor, K., Mullins, P. and Davis, R. (1999) *Community Opportunity and Vulnerability in Australia's Cities and Towns: Characteristics, Patterns and Implications*, University of Queensland Press, for the Australian Housing and Urban Research Institute:Brisbane.

Everitt, B.S. (1993) *Cluster Analysis*, 3rd edition, Halstead Press: New York.

Hair, J.F., Anderson, R.K. and Tatham, R.L. (1987) *Multivariate data analysis with readings*, Collier Macmillan: London.

Hill, E., Brennan, J. and Wolman, H. (1998) What is a central city in the United States: Applying a statistical technique for developing taxonomies, *Urban Studies*, 35(11), pp. 1935–1969.

O'Connor, K. and Stimson, R. (1995) *The Economic Role of Cities: Economic Change and City Development, Australia, 1971–1991*, Australian Government Publishing Service: Canberra.

O'Connor, K., Stimson, R. and Daly, M. (2001) *Australia's Changing Economic Geography: A Society Dividing*, Oxford University Press: Melbourne.

Stevens, J. (1996) *Applied Multivariate Statistics for the Social Sciences*, 3rd ed., Lawrence Erlbaum Associates: New Jersey.

Stimson, R. and Baum, S. (2001) Patterns of advantage and disadvantage across Australia's communities: a focus on education and human capital, *New Horizons in Education, Journal of World Education Fellowship*, No. 105, Nov. pp. 9–34.

Stimson, R., Baum, S., Mullins, P., and O'Connor, K. (2001) Australia's regional cities and towns: modelling community opportunity and vulnerability, *Australasian Journal of Regional Studies*, 7(1), pp. 23–61.

Stimson, R., Baum, S. and O'Connor, K. (2003) The social and economic performance of Australia's large regional cities and towns: implications for rural and regional policy, *Australian Geographical Studies*, 41(2), pp. 113–148.

Stimson, R., Baum, S., Mangan, J., van Gellecum, Y., Shyy, T-K. and Yigitcanlar, T. (2004) *Analysing Spatial Patterns in the Characteristics of Work, Employment and Skills in Australia's Capital Cities and Across its Regional Cities and Towns: Modelling Community Opportunity and Vulnerability*, Main Report, Prepared for The Australian National Training Authority (ANTA), CR-SURF/ANTA National Project, Centre for Research into Sustainable Urban and Regional Futures (CR-SURF), The University of Queensland: Brisbane, April, 387pages.