SUPPORT DOCUMENT

An enterprising approach to regional growth: Implications for policy and the role of VET: Support document

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Regional opportunities and impediments

Table 1 Opportunities and impediments by case study region

Region	Opportunity	Impediments
Orange	1. Further growth in vineyards and wine industry 2. Expand the region's mine maintenance expertise into other regions, including exporting this expertise 3. Build on the 'just-in-time' approach of Electrolux and its use of robotics 4. Increased focus on fresh rather than processed fruit 5. Local tourism	1. Market saturation leading to lower profit levels in some areas of agriculture (e.g. wine) impacts on new opportunity expansion 2. Impact of metal prices on mining activity and the enthusiasm for pursuing new opportunities in this sector
North Adelaide	1. Wealth *creation* industry development (e.g. automotive industries linked to defence industries, food processing with emphasis on value adding, electronics with focus on applied research and systems research) 2. Wealth *distribution* industries (e.g. health and allied care, building, transport logistics and retailing)	1. Need for more knowledge transfer mechanisms from existing high technology leading industry to those seeking to become high technology oriented 2. Better skills matching to opportunities, better linking of education to meet the opportunities
Mt Isa	1. Continue with current mining activity 2. More local decision making rather than decision making from Brisbane, enabling many small local opportunities to grow (e.g. retail, tourism, aquaculture, alternative energy, native food) 3. Greater encouragement for Indigenous people to take up opportunities	1. A limited life for the mine but no planning for this 2. Too much Brisbane control of what goes on in Mt Isa 3. High workforce turnover and isolation means shortage of skilled trades 4. Need for increased diversification and improved coordination between decision making agencies 5. More culturally appropriate Aboriginal involvement needed
Wide Bay	1. Engineering cluster among local manufacturers 2. Timber industry value adding and diversity 3. Sugar value adding 4. Aged care industry 5. Upgrading Hervey Bay airport 6. Increased numbers of older tourists	1. Rapid population growth outstripping rate of new jobs growth 2. No residential skill base with an outflow of young people 3. New industry developments tend to import their own skilled personnel from elsewhere on a contract basis. 4. A culture for learning still evolving 5. Relatively 'thin' training market, particularly in skilled areas where regional business is mostly small.
Wollongong	1. Multi-cultural education 2. Population growth from Sydney spill-over and 'lifestyle seeking' people retiring to area 3. Human services for children and aged 4. Technology park 5. Tourism 6. Floraculture 7. Port Kembla	1. No comprehensive regional development strategy in place

Horsham	1. Greater use of new water supply via Wimmera pipeline 2. Business support for new business start-ups 3. Agriculture niche markets (e.g. lentils, chickpeas, faba beans) 4. Aged health 5. Tertiary and secondary education locally to keep youth in town 6. Lifestyle opportunities	1. Community attitudes; e.g., traditional view of VET, risk averse, training seen as a cost, weak coordination of providers 2. Few role models 3. Isolation issues 4. Traditional VET funding models a problem
Penrith/western Sydney	1. Better align schools with industry needs 2. Pre-vocational courses designed around skill shortages 3. Changed perceptions towards VET by teachers, parents and students	1. Collaboration at a regional level missing 2. Local economy still based on small and medium enterprises, retail sector—missing knowledge economy opportunities 3. Need improved engagement to bring diverse connections together in a mutually reinforcing way 4. No one group planning whole of the education, training and employment issues that involve employers, training providers and educators 5. Weak links with economic development strategy for the region, so danger of piecemeal approach
Shepparton	1. Increased food production 2. Increased food processing 3. Transport hub 4. Skilled migration to the area 5. Career centre	1. Water limitations 2. Lack of local skills 3. Not utilising skills of Aboriginal community with culturally appropriate methods 4. Funding mechanisms restrictive 5. Complacent community
Burnie	1. Mining on west coast 2. Tourism and associated service industries, such as restaurants 3. Specialised agriculture (e.g. carrots) 4. Forestry products 5. Aged services 6. Lifestyle 7. IT	1. Increases in house prices 2. Influx of 'lifestylers' has had a mixed impact 3. Knowledge workers are often contracted in but hard to keep as families not easily assimilated into the local community 4. No knowledge audit 5. Skills shortage 6. Domestic market size 7. Professionals moving to other places
Port Hedland/Pilbara	1. Any growth in mining exports means increased demand for skilled labour 2. School to work pathway initiatives 3. Increased town amenity (theatre, libraries, coffee shops) and associated social capital and community building to attract local business development 4. Indigenous education; e.g. cultural issues, how to run an organisation such as a pastoral company, issues of governance, managing finance, etc. with Indigenous employment	1. Existing industry is dependent on international markets, which are cyclic by nature 2. Historically, labour comprises 'fly-in, fly-out' or people looking for high wages who only stay until children complete primary school and then move back to Perth 3. Indigenous people needed to run culturally appropriate courses; large distances need to be covered which can be expensive 4. Disparate sources of funding need to be brought together to redress present systemic limitations

Alice Springs	1. Desert knowledge precinct 2. Specific enterprises in remote areas in the fields of conservation and land management, and in maintaining the operational activities of tourism infrastructure and ecotourism activities	1. Lack of 'major projects' aimed at job creation and population increase 2. No clearly articulated 'regional development policy' for new commercial enterprises 3. Central Australian Railway project has had no significant lasting effects 4. Fly-in, fly-out mining and mineral exploration activities don't contribute 5. US base doesn't make a contribution other than through social networks and direct employee expenditure

Regional growth values for all regions

Table 2 Regional growth values for all regions

No	Region	UER84	UER84W	UER02	UER02W	ChgUER	ChgUERW
1	Central and Inner Western Sydney	0.104884	0.07579	0.034286	0.042206	-1.11813	-0.56222
2	Gosford	0.152692	0.088856	0.044268	0.053002	-1.23817	-0.50863
3	Northern Sydney	0.040689	0.118949	0.026001	0.044323	-0.44783	-0.98583
4	South Western Sydney	0.101774	0.097397	0.069299	0.060223	-0.38432	-0.46659
5	Southern Sydney	0.08741	0.111781	0.0462	0.054883	-0.63763	-0.73357
6	Western Sydney	0.099271	0.09706	0.054416	0.051513	-0.60119	-0.62236
7	Inner Melbourne	0.123297	0.07005	0.075265	0.061854	-0.49359	-0.18332
8	Inner-east Melbourne	0.060586	0.081485	0.046198	0.060393	-0.27113	-0.31326
9	Mornington Peninsula	0.095561	0.057805	0.070835	0.053754	-0.2994	-0.11269
10	North East Melbourne	0.076152	0.079588	0.082861	0.065329	0.084427	-0.18946
11	Outer-eastern Melbourne	0.058302	0.069264	0.047302	0.063715	-0.20909	-0.09786
12	Southern Melbourne	0.068188	0.084437	0.036143	0.0599	-0.63478	-0.3183
13	Western Melbourne	0.075274	0.089557	0.082214	0.079054	0.088192	-0.10462
14	Nowra	0.112816	0.096733	0.083325	0.060739	-0.303	-0.42712
15	Wagga Wagga	0.08715	0.07505	0.06617	0.06281	-0.2754	-0.19515
16	Balance Brisbane	0.10481	0.111072	0.056847	0.092258	-0.61179	-0.18988
17	Inner Brisbane	0.089366	0.074805	0.072244	0.061835	-0.21269	-0.19042
18	Outer Brisbane	0.074805	0.097088	0.061835	0.064546	-0.19042	-0.41224
19	Townsville	0.082051	0.087329	0.079936	0.078303	-0.02611	-0.0623
20	Eastern Adelaide	0.086237	0.086554	0.052582	0.085639	-0.49473	0.009874
21	Southern Adelaide	0.064379	0.085829	0.076909	0.069789	0.177842	-0.23823
22	Western, Para & N E Adelaide	0.109862	0.081796	0.093012	0.08162	-0.1665	-0.04007
23	Central Perth	0.099584	0.100757	0.061846	0.061595	-0.47636	-0.49554
24	East Perth	0.083766	0.091848	0.05677	0.055652	-0.38901	-0.45493
25	North Perth	0.101543	0.079181	0.056071	0.06218	-0.59385	-0.22736
26	South East Perth	0.116881	0.078078	0.055852	0.061947	-0.73845	-0.2159
27	South West Perth	0.10084	0.105702	0.077687	0.070982	-0.26084	-0.42111
28	Hobart	0.065636	0.105702	0.094018	0.089554	-0.07501	-0.17263
29	Canberra	0.070334	0.085352	0.058211	0.075189	-0.12006	-0.12963
30	Albury - Wodonga	0.079857	0.070339	0.065839	0.067295	-0.06604	-0.06518
31	Bathurst	0.080492	0.080956	0.050644	0.058019	-0.45541	-0.32746
32	Dubbo	0.07833	0.083456	0.057975	0.056884	-0.32815	-0.38769
33	Goulburn	0.101341	0.087334	0.053918	0.063138	-0.37346	-0.31801
34	Grafton	0.094219	0.114065	0.101339	0.101197	0.072852	-0.14588
35	Lismore	0.123744	0.09503	0.117486	0.076728	-0.05189	-0.21183
36	Orange	0.098745	0.079995	0.052365	0.055579	-0.63429	-0.36856
37	Tamworth	0.081851	0.087688	0.063887	0.063801	-0.24778	-0.30628
38	Ballarat	0.113574	0.072352	0.08095	0.065607	-0.33862	-0.11471
39	Bendigo	0.076133	0.084303	0.075262	0.071901	-0.0115	-0.16496

40	Shepparton	0.080481	0.073167	0.075667	0.063487	-0.06169	-0.14781
41	Wangaratta	0.056951	0.06555	0.056482	0.068859	-0.00827	0.031988
42	Warrnambool	0.083506	0.082958	0.072742	0.067946	-0.13799	-0.17726
43	Maryborough	0.090473	0.137266	0.098367	0.117786	0.083654	-0.14498
44	Rockhampton	0.070987	0.08044	0.08203	0.075916	0.14459	-0.04914
45	Burnie	0.119232	0.096757	0.105003	0.084062	-0.12708	-0.14659
46	Launceston	0.092172	0.110287	0.074105	0.099511	-0.21817	-0.10104
47	Newcastle	0.126609	0.103785	0.078589	0.0639	-0.47687	-0.47017
48	Wollongong	0.141194	0.100666	0.061529	0.066275	-0.83063	-0.44165
49	Lithgow	0.065363	0.094615	0.061951	0.061792	-0.05361	-0.42317
50	Geelong	0.082646	0.082286	0.082827	0.074079	0.002188	-0.0912
51	Traralgon	0.053708	0.053554	0.095214	0.105905	0.572561	0.658132
52	Port Augusta	0.083768	0.084366	0.098125	0.084673	0.158194	0.002836
53	Port Pirie	0.073731	0.093017	0.105282	0.092711	0.356229	0.003325
54	Whyalla	0.116751	0.077746	0.123524	0.09668	0.056393	0.220852
55	Armidale	0.091127	0.110063	0.065311	0.092302	-0.33309	-0.18274
56	Hamilton	0.071139	0.079245	0.064999	0.064551	-0.09027	-0.20136
57	Sale	0.063111	0.061619	0.097342	0.080327	0.433338	0.234836
58	Northern Territory	0.084001	0.070776	0.081058	0.065322	-0.03566	-0.1194
59	Alice Springs	0.086007	0.084001	0.04676	0.081058	-0.60939	-0.03566
60	Broken Hill	0.106927	0.077849	0.082914	0.072791	-0.25435	-0.07605
61	Darwin	0.066001	0.084001	0.039941	0.081058	-0.50226	-0.03566
62	Moe	0.046924	0.063043	0.077816	0.084955	0.50581	0.254063
63	Morwell	0.050627	0.054581	0.142556	0.090124	1.035246	0.503903
64	Mount Isa	0.058191	0.09354	0.069244	0.084168	0.173901	-0.08562
65	Kalgoorlie	0.060067	0.069757	0.053673	0.069356	-0.11256	-0.02159
66	Port Hedland	0.070621	0.076019	0.08419	0.071998	0.175742	-0.0604
67	Coffs Harbour	0.127324	0.099004	0.120792	0.087022	-0.05267	-0.14268
68	Port Macquarie	0.111667	0.116953	0.094417	0.093224	-0.1678	-0.24432
69	Caloundra	0.130511	0.119134	0.110145	0.085957	-0.16967	-0.38003
70	Gladstone	0.071484	0.09012	0.086976	0.083839	0.196156	-0.06185
71	Maroochydore	0.133459	0.118619	0.115068	0.094944	-0.14827	-0.26802
72	Mandurah	0.099982	0.081017	0.095247	0.055374	-0.04851	-0.33511
73	Griffith	0.074145	0.084565	0.049187	0.066175	-0.4104	-0.23897
74	Moree	0.082681	0.088049	0.068334	0.072726	-0.19059	-0.2071
75	Taree	0.132409	0.109801	0.093568	0.079439	-0.3472	-0.32592
76	Colac	0.064162	0.093242	0.057889	0.07884	-0.10288	-0.15814
77	Horsham	0.056527	0.084308	0.039921	0.071125	-0.34781	-0.15068
78	Mildura	0.097319	0.081073	0.069826	0.071436	-0.33199	-0.15042
79	Bundaberg	0.124254	0.089402	0.106472	0.091549	-0.15445	0.020377
80	Cairns	0.133506	0.070121	0.080945	0.07459	-0.50039	0.073896
81	Gympie	0.120535	0.105623	0.117841	0.087953	-0.0226	-0.20131
82	Mackay	0.086631	0.076519	0.080993	0.080983	-0.0673	0.059241
83	Toowoomba	0.075118	0.103813	0.063014	0.090204	-0.1757	-0.1404
84	Port Lincoln	0.071725	0.10026	0.095235	0.110825	0.283509	0.107294
85	Albany	0.081626	0.055471	0.060726	0.04721	-0.29577	-0.15123
86	Geraldton	0.083989	0.070404	0.081264	0.060694	-0.03298	-0.13544
87	Gold Coast	0.132006	0.101224	0.085644	0.079116	-0.43264	-0.2798
88	Hervey Bay	0.167008	0.090473	0.129045	0.098367	-0.25788	0.083654
89	Bunbury	0.071434	0.072173	0.05667	0.062421	-0.23153	-0.1513

90	Narrogin	0.034913	0.079896	0.031288	0.061835	-0.10961	-0.23965
91	Northam	0.049385	0.080193	0.048841	0.05582	-0.01108	-0.32941
92	Mount Gambier	0.063375	0.075654	0.064589	0.067724	0.018967	-0.1363
93	Renmark	0.089528	0.082471	0.078978	0.079884	-0.12538	-0.03414
94	Murray Bridge	0.085421	0.081554	0.086997	0.081354	0.018282	-0.01077

UER84. Unemployment rate1984

UER84W. Spatially lagged unemployment rate1984

UER02. Unemployment rate 2002

UER02W. Spatially lagged unemployment rate 2002

CgUER. Change in unemployment rate 1984 - 2002

CgUERW. Spatially lagged change in unemployment rate 1984 - 2002

Regional growth driver values for all regions

Table 3 Regional growth driver values for all regions

No	Region	HITECH	PROT	NODEG	SPEC
1	Central and Inner Western Sydney	1.163408	6.375	38.5	0.16
2	Gosford	0.57878	2.818	50.5	0.06
3	Northern Sydney	2.58287	2.766	25.1	0.19
4	South Western Sydney	2.732042	7.149	37.9	0.02
5	Southern Sydney	2.344185	8.134	35.7	0.08
6	Western Sydney	1.346171	8.992	36.2	0.07
7	Inner Melbourne	1.336439	11.719	45	0.13
8	Inner-east Melbourne	1.596158	6.607	28.5	0.1
9	Mornington Peninsula	0.802623	13.543	38.5	0.1
10	North East Melbourne	1.190845	15.475	37	0.07
11	Outer-eastern Melbourne	2.257431	7.94	31.2	0.08
12	Southern Melbourne	2.22901	14.003	35.5	0.1
13	Western Melbourne	2.210907	12.523	38.4	0.08
14	Nowra	0.267749	1.94	52.3	0.08
15	Wagga Wagga	0.251105	1.127	48.9	0.26
16	Balance Brisbane	0.701883	5.517	41.3	0.08
17	Inner Brisbane	0.485765	3.141	39.8	0.09
18	Outer Brisbane	0.539019	6.986	34.8	0.07
19	Townsville	0.402314	1.402	43.4	0.04
20	Eastern Adelaide	0.510959	1.906	34.9	0.11
21	Southern Adelaide	0.628872	14.81	38.3	0.04
22	Western, Para & N E Adelaide	1.952348	12.567	42.9	0.05
23	Central Perth	0.427818	1.61	38.3	0.14
24	East Perth	0.546143	5.2	38.7	0.05
25	North Perth	0.667412	3.528	36.7	0.11
26	South East Perth	0.999213	4.658	38.4	0.06
27	South West Perth	0.292118	3.39	40.3	0.08
28	Hobart	0.315674	2.928	40.1	0.03
29	Canberra	0.804715	0.914	30.1	0.03
30	Albury - Wodonga	0.462752	3.87	41.5	0.29
31	Bathurst	0.133283	1.884	44.9	0.33
32	Dubbo	0.375197	1.013	54	0.3
33	Goulburn	0.02035	6.181	43.7	0.38
34	Grafton	0.152417	1.906	56	0.29
35	Lismore	0.214655	2.362	57.4	0.26
36	Orange	2.396075	3.035	51.6	0.28
37	Tamworth	0.806288	1.002	48.9	0.28
38	Ballarat	0.100743	9.119	49.3	0.16
39	Bendigo	0.110139	8.241	49.4	0.26
40	Shepparton	0.230358	4.637	49.3	0.29

41	Wangaratta	0.474575	10.09	47.1	0.27
42	Warrnambool	0.130339	3.469	46.9	0.26
43	Maryborough	0.385393	2.389	53.3	0.2
44	Rockhampton	0.370329	0.66	45.7	0.16
45	Burnie	0.043064	4.785	46.6	0.19
46	Launceston	0.207105	4.387	45.8	0.12
47	Newcastle	0.328645	3.916	41.4	0.02
48	Wollongong	0.281346	6.703	41.3	0.1
49	Lithgow	0.007774	8.347	41	0.32
50	Geelong	0.582086	18.422	42.4	0.03
51	Traralgon	0.046064	5.848	35.8	0.16
52	Port Augusta	0.012779	0.9	42.5	0.04
53	Port Pirie	0.013181	0.904	54.7	0.29
54	Whyalla	0.01526	2.587	47.7	0.06
55	Armidale	1.276306	0.516	48.9	0.33
56	Hamilton	0.411649	3.222	46.5	0.37
57	Sale	0.111641	1.779	47.5	0.27
58	Northern Territory	0.063555	0.13	52.9	0.19
59	Alice Springs	0.736935	0.316	31.4	0.06
60	Broken Hill	0.079815	-0.864	49.8	0.03
61	Darwin	0.289769	0.799	31.4	0.07
62	Moe	0.458032	7.64	41	0.26
63	Morwell	0.535125	6.21	38.8	0.15
64	Mount Isa	0.120974	0.657	40.8	0.06
65	Kalgoorlie	0.079931	-0.452	41.6	0.04
66	Port Hedland	0.161757	-0.832	35.7	0.06
67	Coffs Harbour	0.289061	1.882	58.8	0.18
68	Port Macquarie	0.069709	2.056	59.8	0.16
69	Caloundra	0.468489	2.38	56.4	0.06
70	Gladstone	0.068361	-0.348	42.8	0.17
71	Maroochydore	0.394465	1.185	57.9	0.06
72	Mandurah	0.028392	-1.439	53.6	0.13
73	Griffith	0.568503	1.525	53.6	0.33
74	Moree	0.25053	0.637	55.3	0.33
75	Taree	0.049704	3.943	59.2	0.26
76	Colac	0.061544	1.818	53.1	0.39
77	Horsham	0.301009	3.762	52.9	0.35
78	Mildura	0.247513	1.42	52.9	0.32
79	Bundaberg	0.296806	1.75	56.1	0.23
80	Cairns	0.360063	1.377	52.8	0.12
81	Gympie	0.248142	2.147	58.8	0.26
82	Mackay	0.253016	0.535	44.5	0.16
83	Toowoomba	0.329457	3.03	50.8	0.33
84	Port Lincoln	0.027049	0.551	55.3	0.28
85	Albany	0.133931	1.82	53.3	0.35
86	Geraldton	0.135991	1.16	48.2	0.2
87	Gold Coast	0.1632	2.621	49.8	0.07
88	Hervey Bay	0.128014	0.859	66.1	0.07
89	Bunbury	0.137216	1.462	48.2	0.23
90	Narrogin	0.05593	1.183	49.9	0.4

91	Northam	0.246643	0.774	51.3	0.34
92	Mount Gambier	0.069096	4.586	45.8	0.34
93	Renmark	0.012643	4.44	52.1	0.4
94	Murray Bridge	0.174774	2.31	48.4	0.4

HITECH. Technological leadership at the enterprise level

PROT. Infrastructure support and institutional thickness

NODEG. Local human resource base

SPEC. Local sectoral specialisation

Theories and concepts

This support document discusses the key concepts flowing from the major regional development theories of institutional embeddedness that have emerged over the last few decades that are discussed in the Literature and Concepts section of the main report *An enterprising approach to regional growth: Implications for policy and the role of VET*.

Structural agglomeration

The concept of structural agglomeration relates to the way regionally based business enterprises, institutions and other organisations form partnerships and strategic alliances to share knowledge and reduce transaction costs.

There are generally three models of endogenous regional networking: those based around a broad range of intrinsic structural economic characteristics of the region itself (Porter 1998, 2000; Porter & Ketels 2003); those based around an existing globally competitive business enterprise (Reich 1991; Kanter 1995); and those based around a system of innovation (Lundvall & Johnson 1994).

The first structural agglomeration approach, following Porter's competitive advantage model, suggests there are four structural variables in the regional environment, which help to support the competitiveness (measured as productivity improvement) of local firms focused on niche markets. These are the:

- factor endowment of the region
- size of the home market demand
- connections made in the region with complementary and supporting industries
- organisational structure of the firms themselves and their capacity to implement strategy and be competitive.

It is very much an eclectic model but with particular emphasis on the business enterprise and managerial decision making. Competitive success and local growth in this model hinges on processes that combine to enhance business firm productivity with 'location…[affecting]…competitive advantage through its influence on productivity and especially on productivity growth' (Porter 1998, p. 209).

According to Porter (1990, pp. 19, 149 & 157):

> …competitive advantage is created and sustained through a highly localised process.
>
> …a nation's successful industries are usually linked through vertical (buyer/supplier) or horizontal (common customers, technology, channels, etc.) relationships
>
> …the process of clustering, and the interchange among industries in the cluster, also works best when the industries involved are geographically concentrated.

The Porter approach is manifested in local industrial clusters of firms that are able to achieve external economies through their participation in the network cluster. This might include access to a larger pool of skilled workers, information sharing, joint marketing, buyer–seller agreements, and so on.

According to Porter (1998, p. 227), other elements of the institutional embeddedness model are linked to his business firm model of regional growth: '…cluster theory also provides a way to

connect theories of networks, social capital, civic engagements more tightly to business competition and economic prosperity—and to extend them.'

Porter draws quite explicitly, though superficially, on concepts from the flexibility and learning regions models, and from work on agglomeration in economic geography.

Factor conditions are seen more broadly than just physical resources; they are also seen as human resources (quantity, skills and cost), knowledge resources (technical, scientific and market knowledge), capital resources (types, access, deployment), and infrastructure (physical and social). What is important about these factors of production is that they can be created. So, it is not the stock of existing factors that is important in understanding differential regional growth, but the rate at which they are created. The *nature of home demand* is likewise interpreted as endowing places with dynamic advantage. Domestic buyer needs and sophistication can sensitise local producers and instil confidence. Dynamic home markets can allow firms to anticipate international demands, and the size of local demand can act as a reinforcing advantage.

Complementing ideas on flexible production, innovative milieus and learning regions, the competitive advantage afforded by related and supporting industries recognises the external economies generated by agglomeration and the less tangible benefits of 'locational integration' in terms of knowledge, learning, technology and innovation. However, by recognising that firm strategy, structure and rivalry can create regional competitive advantage, Porter reinforces the nature of the business enterprise and its internal workings (managerial attitudes, motivation and commitment) as a source of differential regional growth.

From Porter's most recent analyses of clustering (see Porter & Ketels 2003), productivity in a place can be enhanced, according to the competitive advantage model, by:

- ***local specialisation***, which affords reduced transaction costs in firms in assembling inputs and ***human resources***
- the strength of ***local demand***, which brings advantages in *interregional trade*
- greater ***access to information*** for firms
- complementarities between firms that result from ***local or locational integration***
- ***institutional support***, both public and private, turning costly inputs into public and quasi-public goods
- ***technological leadership*** built on the ease with which opportunities can be identified locally.

The most significant element of the Porter approach for regional growth and competitiveness is not the manifestation of practical clustering per se, but the localised learning processes underpinning it, which are supposed to promote firm-based innovation and growth.

The second regional networking model is based around an existing globally competitive business enterprise (Kanter 1995). The network is seen as a way of increasing the skills and ideas of local people through transfers from the key enterprise, enabling the region to develop globally competitive enterprises.

According to Kanter, it is not enough to simply build a local industry cluster in the Porter sense; there need to be global links, through so-called foundation organisations with core capabilities or 'magnets', that reinforce local skill levels and attract others, and there needs to be the infrastructure, the quality of life or the 'glue' to hold it all together. In her words (1995, pp.354 & 363):

> Cities will thrive as international centres to the extent that the businesses and the people in them can learn more and develop better by being there, in communication with each other, rather than somewhere else.

> The infrastructure for collaboration consists of the pathways by which people and organisations come together to exchange ideas, solve problems or forge partnerships.

The third approach to building regional networks is based around R&D and innovation systems (Lundvall & Johnson 1994). While still related to business firm productivity, the approach of Lundvall and Johnson is different from that of Kanter and Porter in that it seeks to foster local learning from the ground up and on a wide front, rather than have it imported via a globally connected company and therefore available only to those firms closely networked in a cluster. In the Lundvall and Johnson approach, education systems and their link to business are important.

Lundvall (1994) stresses the importance of interactive learning as the basis for innovation and change in modern developed economies. He defines the learning economy as one where success reflects the capability to learn (and forget old practices); where change is rapid, old skills become obsolete and new skills are in demand; where learning includes skills and the building of competencies, not just increased access to information; where learning is going on in all parts of society, not just the high-tech sectors; and where net job creation is in knowledge-intensive sectors.

The regional innovation system

Regional innovation systems (Braczyk, Cooke & Heidenreich 1998; Cooke & Morgan 1994) are seen as a combination of regional characteristics that lead to greater take-up of technology (e.g. R&D, ICT, e-commerce, etc) by firms at the regional scale, giving rise to enhanced regional economic development outcomes. They are arguments based around proximity and embeddedness. Silicon Valley, Boston's Route 128, Cambridge Research Park, the North Carolina Research Triangle and Baden Württemberg are generally put forward as examples where such systems are demonstrating success.

A regionally determined process of innovation is seen as having four elements. The first is the agglomeration of proximate business firms and other complementary activity in the region in the form of clusters (Porter 1998) and networks of social and professional relations between groups of firms (OECD 1999, 2000). It is argued that the regional competitive benefits of such agglomeration can be in the form of knowledge transfer between cluster members, learning and mentoring, supply and demand chain relationships, lower transaction costs through economies of scale, and so on.

The second element seen to be important in a localised innovation system is the activation of financial, physical (including ICT and other infrastructure) and human capital in the form of skills through the network.

The third element is regional governance. The trend to so-called 'bottom-up' regional development over the last two decades has led to a range of local organisation structures, generally under government auspices, that can provide business innovation support programs and facilitate technology links between enterprises.

The fourth element in a regional system of innovation comprises cultural norms and trust (Fukuyama 1999) in the community, particularly among business enterprises that enable the growth of reciprocity and cohesion among regional entities. These are discussed in the following sections.

Learning and knowledge

According to Drucker (1993), productivity in the economy is rapidly becoming dependent on the generation and application of new knowledge by knowledge workers rather than on changes in

work practices in the labour market or changes to organisational design, as has been the requirement in the past. Increasingly sophisticated electronic processing for storing and manipulating information has accelerated the demand-side intensity in the trade for knowledge.

Knowledge and learning have always been seen as vital for innovation, regional growth and competitive advantage (Schumpeter 1961; Arrow 1962). Now, however, knowledge creation and transfer have become the most important ingredients for regional competitiveness in the modern global economy. According to Maskell et al. (1998, p. 21):

> This adds a new entry to the list of currently important location factors influencing the geographical pattern of industry: the knowledge assets and learning abilities of particular local, regional or national milieus.

What is important for this study is how knowledge generation and transfer can contribute to economic development outcomes in a regional environment. What is the process by which knowledge and learning are converted into outcomes? It is simplistic to say it is merely absorbed into the decision-making process of the business firm, as Porter might argue. It has to be linked to innovation, opportunity recognition, skill development and a business venture. More than that, there needs to be a milieu in the region that facilitates these processes.

There are two factors that influence regional specificity in this regard: the nature of the knowledge creation and transfer process itself and the attributes of the spatial milieu in which the knowledge is being applied, including the relationships between the various actors and agencies.

Knowledge is not a homogeneous commodity, and there have been various attempts to classify it based on its properties and usefulness. Polanyi (1958) made the distinction between codified and tacit knowledge. The former is thought to be generated through formal, strategic and original scientific inquiry, and built up through formal education processes and the involvement of large corporations with big-budget R&D programs. The latter relates to a more pervasive set of everyday and informal social constructs with 'fuzzy' boundaries built up through experience and dialogue. Others, such as Blackler (1995), Fleck (1997), and Johnston and Blumentritt (1998), have elaborated on this classification by introducing concepts that could more easily be delineated in society and made relevant to the management of knowledge operations in organisations.

To better relate the contribution of knowledge to economic activity outcomes, Lundvall and Johnson (1994, pp. 27–28) identified four types of economically relevant knowledge:

> Know-what refers to the knowledge about 'facts'…close to what is normally called information… Know-why refers to scientific knowledge of principles and laws of motion in nature, in the human mind and in society… Know-who refers to specific and selective social relations…to know who knows what and can do what… Know-how refers to skills; that is, the capability to do different kinds of things on a practical level.

According to Lundvall and Johnson, 'know-what' and 'know-why' can be marketable commodities, while 'know-who' and 'know-how' generally cannot be removed from their social and human context—except where parts of it can be codified and transacted via patents, etc. The working of the learning economy combines all the categories of knowledge in the innovation process (p. 38).

Gibbons et al (1994) argued that as aspects of knowledge have increasingly become market-based, Mode 1 knowledge, which is scientific and cognitive based and embodied in patents, agreements, producer accreditation, quality control standards, etc., has become more tightly controlled and managed by large corporate entities. As a result, Mode 1 knowledge is more problem-specific and less widely useful in a social context. Mode 2 knowledge, on the other hand, is characterised more by the context of its application and has a wide range of stakeholder interests. There is, therefore, greater use of Mode 2 knowledge. It is also characterised by

transient cross-disciplinary research teams who are prepared to relinquish control of the knowledge to stakeholders for the greater public good.

Malmberg, Solvell and Zander (1996), and Malmberg and Solvell (1997) have described the process whereby three important regional characteristics help build knowledge accumulation locally:

- ✧ Lower costs and time are associated with knowledge transfer in a local context, as well as a socialising process which tends to reinforce the local innovation process.
- ✧ Knowledge leakage from a regional milieu will be sluggish, whereas knowledge embedded in physical and human capital outside of a regional framework can move quickly across large distances in a global economy. The social capital embedded in the regionalised innovation process tends to remain historically tied to a particular 'place' through local circumstances.
- ✧ The region attracts knowledge through the social capital of local actors and agents interacting with particular segments of the external environment.

Maskell et al. (1998, p. 181) say:

> Some geographical environments are endowed with a structure as well as a culture which seem to be well suited for dynamic and economically sound development of knowledge, while other environments can function as a barrier to entrepreneurship and change.

The concept of the 'learning region' has been used to capture the socialisation process inherent in knowledge creation and transfer locally. According to the 'learning region' model, all of a region's elements (institutions, business firms and individuals) are constantly in a collaborative learning mode to build their competencies and skills in a way that relates to 'place' objectives (Lundvall & Johnson 1994; Keane & Alison 2001).

In this regard, Florida (1995, p. 532) says:

> In effect, regions are increasingly defined by the same criteria and elements which comprise a knowledge intensive firm: continuous improvement; new ideas; knowledge creation and organisational learning. Regions must adopt the principles of knowledge creation and continuous learning; they must in effect become **learning regions**.

At the heart of the regional learning process is the concept of social capital. As Putnam(1993) observed:

> By analogy with notions of physical capital and human capital—tools and training that enhance individual productivity—social capital refers to features of social organisation, such as networks, norms and trust, that facilitate co-ordination and co-operation for mutual benefit. Social capital enhances the benefits of investment in physical and human capital and is coming to be seen as a vital ingredient in economic development around the world.

Asheim (1997) argues that the regional milieu provides an ideal context for the necessary fusion of the economy with society, and that the 'learning region' can transcend the usual contradictions between functional (or sectoral) priorities and territorial (or spatial) priorities by integrating industry, global and regional knowledge and innovation.

According to Storper (1997, p. 300), knowledge embeddedness in a learning region needs to '…therefore be built simultaneously and synergetically, from the bottom up'. Otherwise the learning region success stories become '…mere islands floating in a sea of lean management and rapid entry and exit'; in other words, a new type of regional marginalisation predicated on the equity of access to knowledge.

Vulnerable regions in a knowledge world are not only those that make themselves unattractive to new knowledge accumulation, but those that do not make the effort to mobilise existing endogenous knowledge and learning resources. While all regional communities have creative

'ideas people' of one kind or another, resilient regions will be those that extract the full extent of this knowledge and promote learning around it to meet their regional priorities. They will be places where innovative people come together and pool their ideas to generate non-linear solutions that will help their local communities become better places. Coalitions within the regional community, rather than between firms, become the organising framework for creative people. According to Florida (2002, p. 7):

> Place has become the central organising unit of our time, taking on many of the functions that used to be played by firms and other organisations… Today, corporations are far less committed to their employees and people change jobs frequently. In this environment, it is geographic place rather than the corporation that provides the organisational matrix for matching people with jobs…it determines where companies will choose to locate and grow, and this in turn changes the ways cities must compete.

Learning and the mobilisation of knowledge are seen in the model as the wellspring of innovation that transforms 'learning regions' into regional innovation systems (Braczyk et al. 1998). Innovation, in turn, leads to the creation of new businesses and the constant revitalisation of existing businesses, allowing them to remain internationally competitive. According to Malmberg and Solvell (1997), such an innovative milieu is a place with common behavioural practices and a technical culture within which knowledge can be developed, stored and disseminated. These milieus are argued to have four basic characteristics:

- a group of actors (firms and institutions) that is relatively autonomous in decision making and strategy formulation
- a specific set of material, immaterial and institutional elements combining firms, infrastructure, knowledge, know-how, authorities and legal frameworks
- interaction between actors based on cooperation
- a self-regulating dynamic that leads to learning.

Localities and communities are in these terms environments that facilitate the evolution of institutions, common language, social bonds, norms and values, which all add to the process of accumulated learning (Morgan 1996). They are localities of sectoral specialisation in low-tech as much as high-tech activities (Maskell & Malmberg 1999). Pivotal to the success of such specialised milieus are long-term producer and buyer relationships—horizontal and oblique quasi-integration, to use the terminology of Leborgne and Litietz (1992). In essence, this approach to understanding spatially uneven economic growth proposes the social bonding of firms to create new competitive enterprise through processes of innovation and learning.

Institutional thickness

Institutional agencies, along with business enterprises, generally represent a large and influential group of players in the region. They include government service delivery or regulatory agencies, business support agencies, trade unions, infrastructure managers, institutional investors, environmental groups and education institutions.

The role of institutions in a region's economic development prospects arises from the influence their culture of decision making has on the social dynamic of the region. According to Hodgson (1988, p. 244 & 1998, p. 180):

> Institutions are regarded not merely as rigidities or constraints, but as structures and routinized activities which affect the dispersal and cognition of data and mould individual preferences and actions in many other ways.
>
> Institutions are regarded as imposing form and social coherence upon human activity partly through the continuing production and reproduction of habits of thought and action.

There are potentially three issues for regional economic development that relate to the presence of institutions in the region. First there is the issue of how to overcome the hiatus, conflict and potential loss of opportunity that can occur because of the differing objectives of vertically aligned institutions. Second, there is the issue of how best to use vertical power relationships and networks of an institution to connect with external decision-makers that are important to the region's future growth prospects. Third, there is the question of how to engage important institutional leaders in the aspirations of the regional community.

The concept of 'institutional thickness' has been coined to refer to the region that is able to embed the strengths of the institution, allow for its insular and self-perpetuating habits and behaviours, overcome disparities in the development objectives and processes of 'place' and institution, and add to the social capital of the region (Amin & Thrift 1994; Curran & Blackburn 1994; Amin & Housner 1997). Importantly, the concept of institutional thickness raises the argument that successful regional development requires regions to build their external connections and capacities through higher level decision making connections. As Amin (1999, p. 375) concluded:

> …the critical factor for economic success is not the presence of local relations of association and institutional advancement but the ability of places to anticipate and respond to changing external circumstances. Thus it is the management of the region's wider connectivity that is of prime importance rather than its intrinsic supply-side qualities.

For Amin and Thrift (1994a, p. 16), the economic success of a locality is heavily dependent on its 'proven institutional capacity'. That capacity or 'thickness' is said to derive from: a numerous and diverse mix of institutions (local firms, public initiatives, private institutions and so on); their frequent interaction to promote collaboration and knowledge transfer; structures of coalition to control behaviour; and a common agenda among those local institutions. These factors are reckoned to create institutional persistence and flexibility, heightening trust, reciprocity and local inclusiveness.

Appealing as this specification appears, it does not stand the test of empirical scrutiny. A growing number of studies suggest that institutional thickness may not always bring economic success to an area or endow it with resilience.

MacLeod (1997, p. 302), working in the lowlands of Scotland, has described the area as having '…a strong institutional presence, a commitment towards partnership, governance, sociability and the sense of a common enterprise'. But this had not been sufficient to bring economic success to the region. The region had developed as a low-wage manufacturing region, and jobs created by inward investment had been associated more with quantity than quality. The subsequent drive by localist and central state institutions to increase the innovative capacity of the area was at odds with these existing institutional arrangements and led to 'institutional overkill' (MacLeod 1997).

In Turkey (Eraydin 2002), the institutions of government and civil society appeared to create institutional thickness, along with local enterprise networks, learning and information exchange. But recession and the almost immediate retreat of firms to long-established cost-cutting strategies showed that this 'supportive tissue' in fact provided no economic resilience to these changes.

Wølneberg (2002) has shown, in the context of the Argentinean tanning industry, that not only can local institutions be ineffective in generating self-sustaining local growth, but that the actions of international institutions (in this case the World Bank and the EU) can erode what little local benefit they might have created. MacLeod (2001) has identified this same scalar conflict in the actions of institutions in his study of lowland Scotland. And Raco (1998) has identified a similar situation in Cardiff, not least because in this case '…localist and central state institutions may

promote very different objectives' (p. 989). Indeed, the failure to consider the impact of state decisions was viewed by MacLeod as a major flaw in the institutional thickness concept.

There is also evidence that in some cases institutional thickness can marginalise and exclude groups within local economies. This has been shown in Sheffield by Raco (1998) and in Fiji by Taylor (2002). Indeed, institutional thickness can ossify local social, economic and political relations and divisions, stifling mutual cooperation and halting progress (see Raco 1998).

Further undermining the concept of institutional thickness is the question of whether it post-dates economic growth rather than pre-dating it, as is usually assumed. Henry & Pinch (2001) raised this complication following their research on Motor Sport Valley. Growth in this specialised engineering cluster was based on institutional *thinness* rather than thickness. Success came from a process of churning staff, firms and linkages. Economic success in the absence of thick institutional structures has similarly been identified in Cambridgeshire's hi-tech cluster (Keeble et al. 1999), Bristol's natural history film industry (Bassett et al. 2002) and the British high fidelity industry in south-east England (May et al. 2001).

Compounding the awkward issue of whether institutional thickness is a cause or a consequence of local economic success is the additional complication that the motivation and goals of an institution may change dramatically over time. This situation has been spelled out in detail in Leonard's (2002) examination of training provision in London, and it serves to underline the complexities of time inherent in the 'institutional thickness' concept.

At the core of the institutional thickness concept is the problem of defining institutions. Are they simply organisations by another name, as Jessop (1990) has complained, or are they something more subtle and as yet imperfectly understood? The next section considers the role of the organisation in regional development.

Organisation power and control, and enterprise segmentation

Important among the behavioural influences on regional growth outcomes are the internal machinations of organisations, particularly those with head offices located elsewhere.

In contrast to the notions of trust, cooperation and reciprocity that underpin the flexible-production and learning-region models, the enterprise-segmentation model, first proposed by Taylor & Thrift (1982 and 1983), offers a different interpretation of business enterprise inter-relationships and their impact on regional dynamics. This approach begins with the proposition that relationships between business enterprises are normally asymmetric. They display elements of dominance and subordination. Power is ascribed to the control of resources (Pfeffer 1981), with the most powerful firms acting as centres of control and strategic decision making. This serves to draw other enterprises into functional networks (Cowling & Sugden 1987; Taylor 1995). As it was put in Dicken & Thrift (1992, p. 287):

> Production is organised primarily by business enterprises operating within extremely complex, dynamic networks of internalised and externalised transactional relationships of power and influence…co-ordinated and effectively controlled by 'centres of strategic decision-making'… Business organizations, therefore, organise production systems…but are themselves produced through complex historical processes of embedding.

Taylor and Thrift (1983) elaborate a typology of business enterprises and the nature of the positions they might occupy within a generalised network structure. They suggest that position within power networks endows enterprises (and thus the places within which they are embedded) with distinctive operational characteristics and growth potentials. Taylor (1986) suggests that network peripherality, for example, is associated with:

- local market exploitation and not export-oriented growth
- the provision of unskilled, ephemeral jobs and little labour training
- the slow or late acquisition of new technologies, coupled with the loss of local inventions
- a tendency towards geographical centralisation.

Those same characteristics and potentials, in turn, affect local society, its local mode of social regulation, and its ability locally to generate and attract further enterprise, investment and employment. As such, there is a dialectical relationship between enterprise and place based on inequality and differential power which affects the dynamic of change in both business enterprises and localities. The spatial placement of an organisation's research and development, production and distribution elements, for example, follows this pattern.

Local growth in the segmentation model therefore arises from three principal drivers. First, there is local control of technology, endowing particular places with competitive advantage. Second, there is the impact of large corporations, diminishing growth in localities from which they extract surplus value while enhancing growth in those from which they exercise control. Third, there are the growth benefits that derive from the locational integration of smaller firms created by historical processes of embedding.

Social capital and regional organisation

The concepts of social capital and regional organisation refer to the more intangible but distinctive qualities of 'place', which make it worthwhile for those in the community to invest their money, time, energy and knowledge in collaborative ways to enhance the efficiency and quality of local and regional society. They seek to underpin a region's development with trust, shared understandings and coordinated actions (Bolton 1992; Putnam 1993, 2000; Etzioni 1994; Theobald 1997; OECD 2001).

In her book *World class: Thriving locally in the global economy* (pp. 362–63), Rosabeth Moss Kanter says:

> …communities must offer more than their connective physical infrastructure of roads, bridges, subways, airports, seaports, electric power lines, and telecommunication networks. They must also have a social infrastructure that helps forge linkages relevant to global success… I call this the infrastructure for collaboration.
>
> The infrastructure for collaboration consists of the pathways by which people and organisations come together to exchange ideas, solve problems or form partnerships…to recognise, value, and leverage their area's assets for mutual gain.

Handy (1998, p. 170) reports that some corporations and institutions have begun to recognise social capital at the local community level. Calling it the 'new assets', or corporate citizenship, of organisations, he says community residents feel more empathy towards a corporation's products and services if there is a reciprocal commitment by the corporation to the community. For organisations, this means that principles of community citizenship need to permeate the way they do business.

Many communities now go beyond being simply dissatisfied with the remote institutional and corporate decision making that affects the economic viability of their areas. Because they put a value on the 'sense of place' of their local and regional communities, they are beginning to create their own initiatives to generate regional outcomes consistent with their local objectives and potential. Some very heartening examples of communities working together to make a difference in Australia for the sustainable development of their local and regional areas are case studied in the book by Dore and Woodhill (1999).

Social capital relates essentially to networked social and business relationships based on trust, reciprocity and loyalty. It has been defined by Putnam (2000, p. 19) as the 'connections among individuals—social networks and the norms of reciprocity and trustworthiness that arise from them'. According to the World Bank (2002), 'Social capital refers to the institutions, relations and norms that shape the quantity and quality of a society's social interactions.' For Bowles and Gintis (2002, p. 1), 'Social capital generally refers to trust, concerns for one's associates, a willingness to live by the norms of one's community and to punish those who do not.' Putnam (1993, p. 167) observes:

> Voluntary cooperation is easier in a community that has inherited a substantial stock of social capital, in the form of norms of reciprocity and networks of civic engagement. Social capital here refers to features of social organisation, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions.

These quotes, however, only serve to reinforce Durlauf's (2002) contention that social capital is a confused and chaotic concept that mixes causal and functional elements. The functional element is evident in the set of norms and values facilitating cooperation and efficiency, which social capital is said to provide. The causal element of social capital emerges because the cooperative behaviour of others makes the cooperative behaviour of individuals a rational choice.

Woolcock (1998) has expressed this same concern in different terms. While on the one hand social capital can be understood as the ties and norms that bind individuals in and across groups, it can, on the other hand, act as a form of moral coercion to define different status groups and further segment the region into a different suite of elite groups. Defined so widely, it is difficult to identify whether social capital is the infrastructure or the content of social relations—it becomes impossible to separate what it is from what it does.

Even in a causal context the concept of social capital has been challenged. While rational choice theorists regard it as an interaction between rational agents resulting in mutual benefit (Glaeser et al. 2002), network theorists see social capital as social ties that can be non-rational (Woolcock 1998). And here a further element of confusion appears because it is unclear whether that choice is made because of altruism and fairness in a community, or because of fear of retaliation. Just to add more shades of complexity and confusion, there is no reason why social capital should only be positive and not negative (or 'perverse')—as with the activities of the Mafia or other organised crime, or the restrictive social structures of some societies and immigrant groups (Portes and Sensenbrenner 1993). Indeed, there is a bias in the social capital literature that highlights only its positive impacts while neglecting or ignoring the destructive 'free-rider' and opportunist potential of network relationships.

It is hardly surprising that the impacts of social capital are difficult to measure, although there have been attempts at it (World Bank 2002; Fukuyama 1999; Putnam 2000). It is theoretically vague and has the potential to both enhance and destroy human and physical capital. It is difficult to know whether it is a causal or a functional concept and whether its apparent impact on regional outcomes results from the infrastructure or the content of the social relations that make it up. Is it the product of rational choice or enforced and irrational decision making? Indeed, it can be argued that the meaning of 'social capital' is so vague that it is, in fact, meaningless.

Method

Introduction

Our objective for this project was to identify the patterns and causes of growth among different regions of Australia, to identify the issues related to them, and to explore ways to enhance the role of VET in improving regional development.

A problem in regional growth and viability will only be considered worthy of an investment of time and other resources if the reasons for the problem are properly investigated and the benefits of intervention identified. Unfortunately, such investigation is not always undertaken prior to implementing policy and practice. Popular hearsay is substituted for both intensive and extensive analysis, so that there is no scope for meaningful assessment and fine tuning when expected outcomes do not eventuate. This underlies much of our concern with frequent policy reference to and regional practice take-up of institutional concepts which are discussed in the main report and in this support document.

Although a distinction between quantitative and qualitative research is useful in clarifying differences in methodological norms and practices, recent debate suggest that such dualism is not sustainable in applied research (Downward & Mearman 2002; Downward et al. 2002). Typically, debates in both economics and economic geography assume the legitimacy of the critical realism perspective through the use of qualitative methodologies, and ask the question: what role do quantitative methodologies play? In contrast, in this project we have constructed empirical knowledge of the social world from the other side of the coin by assuming an economic modelling perspective and then ask how 'intensive' case studies expand the knowledge we've gained from the quantitative work (cf. Martin 2004).

We see the connection between quantitative and qualitative method occurring at three levels. First, intensive case studies can, and do, form part of our prior knowledge about the processes driving local economic growth. This *a priori* knowledge can be used to specify and select an empirical model. Second, 'intensive' case studies can be useful *a posteriori* in so far as they provide detailed information about the processes that have been identified through the empirical modelling. This can include case studies in regions that have been identified, through the qualitative work, as 'outlying' or exceptional. Third, 'intensive' case studies in regions that are considered to be exemplars of different types of regions across the Australian regional economy can be useful for building on the empirical knowledge that has been derived from the empirical modelling process.

Fundamentally, in this project we were interested in using relevant data in conjunction with institutionalist theories of local economic growth to understand the processes driving such growth in Australia. This raised key methodological questions about how the data were generated, the role of theory in constructing and validating our explanation, and how much inference was appropriate in measuring data against theory. In contrast with the conventional interpretations of empirical modelling in economic geography, we were not searching for map patterns of local economic growth or the potential drivers of it; rather, we were using map patterns generated using theoretically informed empirical measurements to: (a) describe the nature and degree of uneven regional economic development across Australia, (b) test the empirical plausibility of competing theories of local economic growth, and (c) assess the potential impact of policy intervention on the drivers of local economic growth.

The quantitative approach enabled the *breadth* of regional growth, and its determinants, to be assessed across 94 Australian regions, such that the growth potential in each region could be seen in the context of its competitive relationship with other regions, rather than in isolation. Too often, regional analysis is undertaken as a single-region case study, leading to the conclusion that other regions have no influence on the outcomes of the targeted region. In a globally competitive environment this is a significant weakness in analysis that can lead to unrealistic policy and practice, and can hide, on a spatial basis, where the best return on policy intervention can occur.

However, analysis needs to be *deep* as well as broad in order to capture the underlying and unrealised regional capacity that may not be apparent from the quantitative work. The contingency of location, and its influence on the growth transmission and translation process, was explored *in-depth* in this project through 11 detailed regional case studies representing different spatial circumstances. In our analysis we argue that 'place' is important, and that each region has a set of qualitative characteristics (historical, cultural, economic, social, natural, etc) that not only make it distinct from other regions, but influence its capacity to grow and be competitive (i.e. the growth transmission process), either helping or hindering its efforts. The 11 case study workshops enabled the inclusion of local views, fostered region-wide dialogue and knowledge exchange, confirmed the quantitative analysis, and identified new mechanisms to build a momentum for change. The qualitative investigation further informed the conclusions about regional growth and their determinants arrived at through the quantitative work.

Quantitative method

For this analysis we have defined 94 nodal regions across Australia. As opposed to functional regions which emphasise uniformity of attributes within a region and are generally used by organisations for administrative purposes, nodal regions emphasise spatial hierarchy and the diversity within a regional boundary. It is therefore more appropriate to use nodal regionalisation in studies of regional development.

The original classification of Australia based on nodal regions for comparative economic analysis was carried out by Taylor and Garlick in 1989 (see Taylor & Garlick 1989). It notionally comprised contiguous polygons with an urban centre of 10 000 people and a hinterland, and used the ABS statistical local area (SLA) as the base building block. In isolated locations, urban centres of 5000 people were used. We have used this method of regionalisation in this project as it offered a regionalisation definition at the approximate midpoint of the temporal analysis undertaken in this project.

Regional growth measures

Relative regional growth over the study period 1984–2002 has been ascertained using changes in unemployment rate relativities (Plummer & Taylor 2001a & 2001b). Despite limitations in the availability of regional data, this measure, as an outcome of regional demand and supply, enables a comparative perspective across all regions both at a point in time and through time. Regional unemployment relativity is defined here as the region's unemployment rate relative to the weighted average unemployment rate across all 94 regions being analysed. Labour force size in each region has been used as the weight. Changes in unemployment relativity between 1984 and 2002 are measured as the degree of change between the relative unemployment rates of each year; in other words:

$R_{it} = U_{it}/U_t$, where U_{it} is unemployment in region i and time t, and U_t the average unemployment at time t.

Using a conventional gap-convergence (Barro regression) econometric model (Plummer & Taylor 2001b), regional growth is decomposed into three elements:

- ✧ transition dynamics: the speed at which a region's growth rate returns to a long-run equilibrium after a shock; that is, mean reversion
- ✧ 'structural' characteristics: the extent of growth differences between neighbouring regions
- ✧ random shocks: the unanticipated and unpredictable factors that can impact on the regional growth rate; sometimes referred to as 'white noise' (Martin & Sunley 1998).

We hypothesise that in a situation of competitive regional growth, unemployment rates in all regions will converge towards a general common rate over time. If this convergence does not occur and each region moves towards its own long-term unemployment rate over time, there are particular factors, or drivers, at work that reflect the local capacities of each region rather than simply reflecting national competitive trends. The nature of this long-term growth in each region is determined by the relative impact of each of the factors or drivers (Baddeley et al. 1998).

Regional growth is defined as the difference between relative unemployment at the end of the period (2002) and that at the beginning (1984). It can be measured using the following equation (1):

$$\ln(R_{it}) = \beta_0 + \beta_1 \ln(R_{it-T}) + \sum_j \beta_j X_{ij,t-T} + \varepsilon_{i,t,t-T}$$

Where β, j=1,…,K are unknown parameters, Xij,t-T is the jth covariate associated with region i at time t-T, and ε_{it} ,t-T defines a set of random and serially uncorrelated shocks to a region's unemployment relativity. In the context of this model, β1 defines the speed of convergence in regional unemployment relativities. In the absence of regionally specific steady state disparities between regions (β2,…., βk=0), if 0< β1 <1 then regional unemployment relativities will converge to a common mean, whereas $|\beta_1| > 1$ implies divergence of regional unemployment rates, and β1=1 implies stable unemployment relativities. Accordingly, $\sum_j \beta_j X_{ij,t-T}$ represent the set of regionally specific effects, reflecting the set of local capacities in each region. By construction ε_{it} is interpreted as a 'white noise' process containing all of the non-systematic determinants of local unemployment relativities. That is, ε is assumed to be a normally distributed process with an expected value of zero, errors independent of the set of explanatory variables, uniform variance, uncorrelated, and with fixed regressors in repeated samples.

This type of ordinary least squares (OLS) regression equation enables the use of a range of testing procedures to evaluate the robustness of the model. Using either the asymptotically consistent Jacque-Bera test for normality or the Jacque-Bera test for normality employing a small sample correction factor indicates that there is no evidence in the sample to suggest abnormal overall regional growth rates in either 1984 or 2002.

Three statistical approaches have been used to explain the patterns of regional growth in Australia over the period 1984–2002 that were identified through the model.

The significance of the overall spatial association among all regions is assessed using Moran's *I* (Anselin 1996). Specifically, global measures of spatial autocorrelation, such as Moran's *I*, are a measure of spatial clustering that indicates the degree of linear association between regional growth rates and the values of regional growth at 'neighbouring' sites in the context of a map of all values. For simplicity, in this analysis we assume first order contiguity relationships between regional labour markets in defining neighbouring sites. It is possible, however, to experiment with alternative definitions of spatial structure to assess how sensitive our results are (Ertur & Le Gallo 2003).

While Moran's *I* is a global measure of spatial association across a whole map, it cannot detect or assess peculiar local or regional occurrences of spatial association that may be masked by the overall degree of spatial association. Specifically, we also need to know which regions contribute the most to the global measure, and the extent to which the global evaluation masks atypical localisations. Currently, we have three quantitative tools available to detect local spatial association.

Moran scatterplots (Anselin 1996) can be employed to visually portray local spatial instability over time and spatial outliers, and detect those sites (regions) which exert a strong influence on the global measure of spatial association. A Moran scatterplot is essentially a visual representation of the Moran's *I* statistic. Each plot is the value of the unemployment rate (UER) variable against the weighted average of the UER values of the neighbouring regions (defined in this project as first order contiguous regions). The slope of the scatterplot is a regression against the two sets of values, with a positive slope indicating a positive spatial autocorrelation and hence overall spatial clustering across all regions. In addition, the plot diagram is divided into quadrants representing the values above and below the average on each axis. For example, the plots in the NE corner of the diagram can be interpreted as those regions which have poor growth in 2002 (that is, high unemployment rates) and whose neighbours also have poor growth values. The reverse holds true for plots in the SW quadrant, where regions with good growth (low unemployment rates) have neighbours also with good growth. Those plots on the off-diagonal (that is, NW and SE) portray circumstances where there is negative autocorrelation between regional growth rates and that for contiguous regions, therefore showing hotspot locations of isolated growth or decline surrounded by neighbours with very different regional growth circumstances.

A Getis-Ord statistic can be computed to assesses *the significance of local spatial clusters around individual locations*. A positive value indicates a spatial cluster of high growth. Conversely, a negative value indicates a spatial cluster of low growth.

The LISA (local indicator of spatial association) (Anselin 1996) is computed for each observation to give an indication of the *significance* of spatial clustering of similar values around that observation based upon spatial covariance rather than spatial accumulation (that is, Getis-Ord). High values indicate significant local spatial clusters or 'hot spots'.

Growth drivers

Our objective, using the gap-convergence model, has been to select a valid subset of theoretically derived variables that are hypothesised to capture the processes for driving local economic growth, conditional on the validity of the hypothesis that random 'shocks' are an evenly distributed 'white noise' process. We employ a modelling methodology that uses both theory and data and yet avoids the potential pitfalls of purely theory-driven and data-driven model selection strategies (Plummer & Taylor 2001a, 2001b). While it is by no means the only model selection strategy, this general-to-specific strategy, previously employed by Hendry and his colleagues, has been widely recognised as a state of the art methodology in dynamic econometrics (Hendry & Krolzig 2002) and this is what we have employed in this project.

The essential feature of a general-to-specific model selection is to begin with an over-parameterised model that contains all of the information derived from the 'institutional' theories we have used. This general specification is subjected to a battery of mis-specification tests on the random 'shocks' component of the gap-convergence model. Once these assumptions have been satisfied, the resulting specification is simplified by eliminating non-significant variables, using mis-specification testing at each stage in the model reduction process. Multiple reduction paths are used to prevent the selection process from becoming stuck in a path in which a significant variable has been removed. Model reduction continues until we have obtained a parsimonious undominated empirical model that is congruent with the evidence. If multiple congruent models are retained, then encompassing tests can be used to eliminate dominated congruent models.

Finally, the sample is split into overlapping sub-samples to help identify spurious significant regressors. (For a detailed exposition of this model selection strategy see Hendry & Krolzig 2001).

From six 'institutionalist' regional development theories we have drawn eight hypothesised drivers of regional growth (Plummer & Taylor 2001a). The six theories and the eight variables they connote are detailed in Appendix B of the main report and they have been discussed in detail in this support document. The method of selection of the eight particular variables has been reviewed by referees in the international academic literature and the publication (Plummer & Taylor 2001a and 2001b) awarded the prestigious Ashby prize by the journal Environment and Planning A. The data used to test the variables are summarised in Appendix C of the main report. Table 4 summarises the eight variables and their significance as growth drivers in the modelling analysis. They can be nested within the following over-parameterised model (equation 2):

$$\ln(R_{it}) = \beta_0 + \beta_1 \ln(R_{it-T}) + \beta_2 HITECH + \beta_3 INFOACC + \beta_4 MOLCN +$$

$$\beta_5 PROT + \beta_6 DEGREE + \beta_7 TOTPOP + \beta_8 MKTACC + \beta_9 SPEC + \varepsilon_{i,t,t-T}$$

Table 5 provides a summary of statistical test results for each of the drivers of local economic growth across the data base of 94 regions. The mean (central tendency), standard deviation (dispersion around the mean), skew, and Kurtosis (peakedness of the distribution) are the first four statistical measures shown for each variable. The minimum and maximum refer to the highest and lowest data values in the distribution. The Asy is the Jacque-Bera test for normality at the one per cent level (**). Moran's *I*, as explained earlier, is a test of autocorrelation between contiguous regions as an indicator of clustering at the one per cent level significance (**).

Table 4 Growth drivers

Theoretical dimension	Variable name	Description of variable*	Significance
Technological leadership at the enterprise level	HITECH	An index of the presence of high technology industries	Positive significant
Knowledge creation and access to information	INFOACC	An index of access to information	Positive insignificant
Locational integration of small firms	MLOCN	Percentage of establishments in multi-locational enterprises	Indeterminate
Infrastructure and institutional support	PROT	Industry assistance	Negative significant
Human resources	NODEG	Percentage of working population without a degree	Negative significant
Power of large corporations affecting structure and strategy	TOTPOP	Index of corporate control	Positive insignificant
Local demand and interregional trade	MKTACC	Index of intermediate trade goods market access	Negative insignificant
Local sectoral specialisation	SPEC	Index of specialisation	Positive significant

*See Appendix C in the main report, *An enterprising approach to regional growth: Implications for policy and the role of VET,* for details on growth driver variables.

The data show that each variable other than NODEG is positively skewed and this, together with both tests for normality, enables the hypothesis that the data for each variable (except NODEG) is normally distributed to be rejected.

Table 5 Statistical test results for growth drivers

Variable	Mean	Std dev.	Skew	Kurtosis	Min	Max	Asy. test	Normality	Moran *I*
HITECH	0.531	0.645	1.95	2.99	0.0078	2.732	94.8**	168.32**	4.50**
INFOACC	0.375	1.293	0.552	-0.356	-2.11	3.051	5.265	9.678**	9.54**
MLOCN	14.083	4.239	1.233	2.283	7.9	32.4	44.23**	22.279**	8.76**
PROT	3.988	4.014	1.464	1.798	-1.439	18.422	46.251**	62.595**	6.62**
NODEG	45.632	8.116	-0.106	-0.497	25.1	66.1	1.146	0.779	4.52**
TOTPOP	0.416	1.71	6.203	43.164	0	14.144	7900**	1430**	0.65
MKTACC	0.459	1.455	1.34	0.547	-1.109	3.753	29.312**	99.32**	11.39**
SPEC	0.1777	0.115	0.355	-1.248	0.02	0.4	8.07*	20.936**	3.77**

*significant at five per cent level
**significant at one per cent level

Final model specification

Employing a general-to-specific model reduction strategy on the gap convergence model specified in equation 2, MLOCN, INFOACC, TOTPOP and MKTACC were eliminated as explanatory variables. Thus, the final or specific model is a theory-inspired, congruent, parsimonious, empirical model encompassing all rival model specifications that are consistent with equation 1.

The suite of mis-specification tests suggests that there in no evidence in the sample to indicate deviations from normality, linearity, or homoscedasticity in the distribution of residuals. Also, the Chow tests suggest that there is no evidence of parameter instability across sub-samples of the Australian dataset. Further, Lagrangian multiplier tests for omitted variables indicate that there is no evidence in the sample to suggest that MKTACC, TOTPOP, MLOCN, or INFOACC should be included either individually or jointly in the final model specification.

Based upon this final model specification and the lack of mis-specification errors for exploring regional growth in the Australian situation between 1984 and 2002, the statistically significant conditioning variables are HITECH, PROT, NODEG and SPEC. Specifically, increasing HITECH and SPEC enhances local economic performance, while PROT and NODEG retard local economic performance. Furthermore, HITECH, NODEG and SPEC are significant when tested in two overlapping sub-samples as well as the full set of regions, suggesting that these variables are reliable measures of regional economic performance. PROT, however, is not a totally reliable measure of regional economic performance, with the test statistic indicating that this variable is not significant in either of the two overlapping sub-samples, although it is significant in the full set of observations.

In relation to the direction of causality of each driver on growth, it is important to keep in mind with our regression modelling that the drivers are measured from a base year of 1984. Therefore any argument that growth over the period 1984 to 2002 causes, for example, the level of institutional support in 1984 is counterintuitive. An alternative approach for research in the future is to build a system of simultaneous equations in which we allow local economic growth to, for example, depend on institutional support and vice versa and then test to see which coefficients are significant. This approach would require data for at least two time periods for all the variables that we choose to include in the model. This type of modelling, which can be quite difficult in practice, is currently being explored.

In addition to the theory-inspired drivers of local economic growth representing the impact of HITECH, PROT, NODEG and SPEC, the final model specification includes a series of dummy variables intended to capture the impact of significant 'individual' outlying or unknown values on

local economic growth ('white noise') in a very small number of specific regions. These individual effects are significant and unexplained, and warrant further investigation.

In the final model specification, the set of drivers and significant individual local effects accounts for 63 per cent of the variability in growth relativities in 2002. Using an F-test, this indicates that overall the model accounts for a significant amount of variability in regional unemployment relativities in 2002. The test for conditional convergence over the period 1984–2002 indicates that there is evidence in the sample to suggest that Australian regions are converging to a distribution of equilibrium unemployment relativities, not a single set as might be ordinarily assumed in a national growth situation. Finally, the tests for excluding subsets of variables indicate that, jointly, the set of conditioning variables and the case dummies are significant determinants of regional economic performance, hence increasing unemployment relativity (reducing growth) in a local economy by 1.013. Similarly, increasing the proportion of a local population without a degree qualification (NODEG) by one percentage point increases unemployment relativity (reducing growth) in a local economy by 1.025. Increasing the index of high-tech industries (HITECH) by one unit decreases unemployment relativity (increasing growth) by 1.16 in a local economy. Finally, decreasing the index of specialisation (SPEC) by one unit decreases unemployment relativity (increasing growth) in a local economy by 3.16).

However, since the drivers of local economic growth are measures on different scales, it is not possible to directly compare the relative importance of each determinant on local economic performance. For comparability, it is possible to use a standardised beta coefficient for each driver of local economic growth. A standardised coefficient is computed by transforming each individual variable into standardised Z-scores. For the drivers of local economic growth in the final model specification the standardised coefficients are as follows:

NODEG = 0.640
SPEC = -0.406
HITECH = -0.307
PROT = 0.164

Thus, in terms of standardised marginal effects, NODEG is the most important determinant of local economic performance, followed by SPEC, HITECH and PROT.

Alternatively, we can evaluate the contribution of each variable by computing the product of its median value and the corresponding coefficient. This provides a reference point for a typical degree of importance. Then we can consider what would happen if, instead of the median value, the variable took the most favourable and least favourable values in the dataset. These extremes are reported in Table 6 as the increments (marginal effects) above or below the median, so they indicate how much better or worse a region would perform if it were to adopt the best or worst value actually experienced by any region.

Table 6 Final model specification—the importance of determinants of regional economic performance

Variable	Characteristics of the data				Effect on dep. var. evaluated at		
	Min	Median	Max	COEFF	Median	Min	Max
LnRU84	-0.93	-0.05	0.64	0.04	-0.002	-0.0352	0.0276
HITECH	0.008	0.29	2.73	-0.15	-0.0435	0.0423	-0.366
PROT	-1.44	2.6	18.42	0.013	0.0338	-0.05252	0.20566
NODEG	25.1	46.15	66.1	0.025	1.15375	-0.52625	0.49875
SPEC	0.02	0.16	0.4	-1.14	-0.1824	0.1596	-0.2736

Again, the rank order of importance in terms of determining local economic growth performance is: NODEG, SPEC, HITECH and PROT.

Qualitative method

In the previous section we outlined, through a closed modelling approach across 94 regions, the regional growth patterns and the drivers of these growth patterns in Australia between 1984 and 2002. Consistent with the multiple methods approach and principles of critical realism (Yeung 1997) adopted in this analysis, 11 case study regions were looked at in more detail to get closer to the way regional growth transmission occurs. The mere presence of a positive growth driver such as human capital (1-NODEG), access to high technology (HITECH) or industry specialisation (SPEC) is no automatic guarantee of growth outcomes, as the growth transmission and translation process in many Australian regions is being impeded by a number of factors. Also, the workshops assisted in the process of triangulation to support or revise the modelling results.

Four-hour facilitated workshops were held in each case study region to:

- gain on-the-ground feedback on the quantitative modelling results
- gain an appreciation of what the regional development process in each region had been, including its drivers and impediments over the past two decades
- identify some of the emerging opportunities in each region and the role for VET, and more particularly TAFE, in realising these and in the regional development process generally
- come to some conclusions about policy to enhance the regional development process and the VET contribution to regional development.

The facilitated workshop setting was chosen as a form of action research so as to promote regional community dialogue and information collection. Results from each workshop were written up as extensive transcripts and sent to participants for confirmation and further contribution. Copies of the transcripts were also sent to any stakeholders who could not be present on the workshop day, with a request for additional input. The transcripts are summarised for this project report.

Each workshop had between 12 and 30 participants across a broad spectrum of interests, including TAFE, other VET providers, local government, state government, business, schools, universities, regional development organisations and social development bodies. Workshops were chosen as the information gathering medium because they enabled a learned response and a consensus view. The case study regions (detailed in Table 7) were selected to fit with the following criteria: a mix of growth rates, a mix of growth driver impacts, a spread across states and territories, and a mix of urban and rural lifestyles.

Table 7 Case study regions

Region (state)	Growth characteristics
Orange (NSW)	Rural city, high growth, high-tech access, relatively low human capital, relatively low sector specialisation, relatively low institutional support
Western Sydney/Penrith (NSW)	Peri-urban metropolitan, high growth, high tech, high market access, high human capital, high sector specialisation, medium level of institutional intervention
Wollongong (NSW)	Provincial, stationary growth, low- to medium-level human capital and access to high technology, medium to high levels of institutional intervention and sector specialisation, high market access
Mt Isa (Qld)	Remote mining, low growth, relatively high human capital, high sector specialisation, low institutional intervention and low access to high technology
Wide Bay Burnett (Qld)	Rural cities, low and declining growth, low human capital, low technology access, sector specialisation varies considerably between centres, institutional intervention is low
Shepparton (Vic.)	Rural city, close to zero growth level, low access to high technology, medium to low human capital, low sector specialisation, relatively high institutional intervention

Horsham (Vic.)	Rural city, stationary but relatively high level of growth, relatively low human capital, low specialisation, relatively low technology access, medium level of institutional intervention. Additional factor: high out-migration
Burnie (Tas.)	Rural city, declining growth, low technology access, relatively low human capital, middle level institutional intervention and sector specialisation
Northern Adelaide (SA)	Peri-urban metropolitan, low growth, high access to high tech, high institutionalism, low human capital, high sector specialisation
Pilbara/Port Hedland (WA)	Remote mining, rapidly declining growth, low access to high technology, relatively high human capital, high sector specialisation, low institutional intervention
Alice Springs (NT)	Remote city, recent relatively high growth, very high human capital, high sector specialisation, low institutional intervention, relatively high access to high technology

Confirming quantitative analysis

Generally, the workshops confirmed that the quantitative analysis reflected the general situation of growth over the last two decades, although in a number of cases where performance had been poor there was a view locally that this performance had recently improved. The evidence for this, however, was generally thin, ad hoc and transitory in nature. In each case, real stories filled out the detail on points that the multi-regional modelling had identified. There were insights into labour flows, industry restructuring, key industry sectors where growth was occurring, changes in demographics, changes in housing markets, reliance on subsidies, evidence of innovation diffusion, issues to do with local leadership, balance between urban and rural economies, industry networking, existing product markets, supply of knowledge workers, migrant content of workforce, infrastructure issues, telecommunications, government intervention, education culture, service provision and so on.

Impact of growth drivers

High technology access

Through the workshops, regions either said that they did not have the industry base (e.g. retail, rural, business and personal services) to generate high technology business access, or that the high technology industries in their region did not enable a wider diffusion to other enterprises locally. The motor vehicle industry in the northern Adelaide region was provided as an example of this.

Many existing companies in non-metropolitan regions are slow to upgrade their technology, and the required knowledge workers in regions where there are pockets of specific-purpose high technology tend to either commute daily to the region from adjacent metropolitan regions (e.g. northern Adelaide), work locally on fixed-term contracts and then leave (e.g. Wide Bay), or are fly-in, fly-out (Mt Isa in Queensland and Pilbara/Port Hedland in Western Australia).

As a result, high technology access appears to contribute to regional growth only in key metropolitan regions, such as the case study region of western Sydney. Outside the large metropolitan regions, the index of high technology access is only high where there are large public sector R&D facilities, such as in Orange, New South Wales, or where there are particular local initiatives, such as in Alice Springs, to enable wider diffusion of technology to new enterprises.

Human capital

A common feature of most non-metropolitan regions was the tendency of tertiary-educated people to leave the region permanently for larger centres, the argument being that in non-metropolitan regions there were not enough jobs locally for graduates. In peri-urban centres (e.g. western Sydney) there was also a concern at the loss of those knowledge workers who commuted daily to more central metropolitan centres. As a result of this general outflow, the momentum for

generating new enterprising outcomes from within had slowed, and there were doubts about the ability of the education system to address this apparent lack of regional capacity. This occurred in all the non-metropolitan case study regions except Alice Springs. In Alice Springs, there has been a significant relative regional presence of high human capital and high regional growth. The only other non-metropolitan regions with a relatively high human capital presence were Pilbara/Port Hedland and Mt Isa; however, regional growth has not improved in these places. It is likely there are special circumstances in these remote mining centres to do with the fly-in, fly-out labour skills and the loss of local income from these activities.

Institutional support

Government agencies generally have a large role in the provision of services and support to most regions. The intervention depends on the particular mix of the industry base, the degree of structural change that has occurred over time, and the extent of the structural issues that exist at any one time. Remote mining and farming centres appeared to have the lowest level of institutional support among the regions studied, while older industrial regions (e.g. northern Adelaide, Wollongong in New South Wales and Shepparton in Victoria) have the highest. Smaller rural and remote regions (e.g. Mt Isa in Queensland) have a large number of government agencies, but program determination is not generally decentralised.

Sector specialisation

Regional growth has not followed sector specialisation in the remote mining regions of Pilbara/Port Hedland and Mt Isa, and the industrial regions of northern Adelaide, Wollongong and Shepparton, which suggests either that the specialisation has not translated to outcomes, or that other driver variables have had an impact. On the other hand, there does appear to be a relationship between high sector specialisation and strong regional growth in Alice Springs.

Patterns of regional growth

Quantitative analysis

Moran's *I* and scatterplots

Our analysis shows that growth across the 94 Australian regions studied has become increasingly divergent and entrenched. The computed values of Moran's *I* provide evidence that there is positive spatial autocorrelation between regional unemployment rates in 1984 and 2002, with the standardised Moran's *I* indicating that the degree of spatial clustering has increased between the two time periods. In other words, pockets of consistently high or low regional growth across Australia are becoming more defined or entrenched, as the values for unemployment rates in 2002 (UER02) and 1984 (UER84) in Table 8 show.

Similarly, the computed values for Moran's *I* indicate evidence of positive spatial association, and hence spatial clustering, of regional economic performance across the map of regions, as measured by the percentage change in regional unemployment rates (ChgUER) between 1984 and 2002, as Table 8 also shows. In other words, areas of decline seem to be clustered together as are areas of growth.

Table 8 Moran's *I* values

Variable	Moran's *I*	Z Moran	P value
UER02	0.416	5.78*	0
UER84	0.213	3.035*	0.001
ChgUER	0.455	6.39*	0.0053

*statistically significant at the one per cent significance level

In this table, Moran's *I* is the computed Moran's *I*, where the expected Moran's *I* is -0.0108 with a variance of 0.0055. In this case, Moran's *I* is computed under the null hypothesis of no spatial autocorrelation and the sampling distribution is constructed using the randomisation hypothesis. Z Moran is the computed standardised value for Moran's *I*, and P values indicate the probability of the null hypothesis of no spatial autocorrelations.

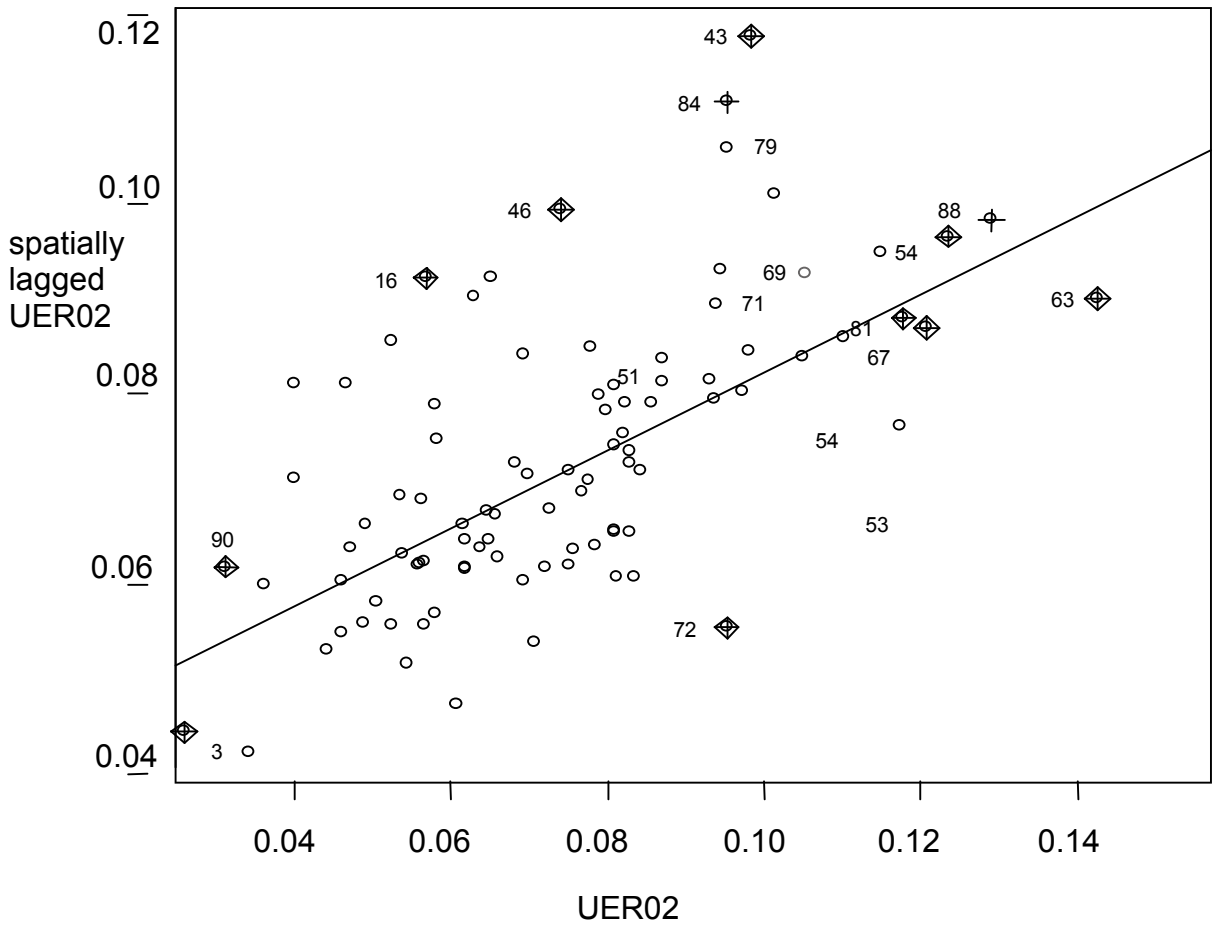
Moran scatterplots provide a visual tool to detect where these spatial clusters of growth and decline are located. The slope coefficient of the linear regression measures the linear association between a region and its neighbours. This corresponds to the computed Moran's *I* statistic. From the scatterplot figures it is possible to detect outliers and sites that exert a strong influence on the global measure of spatial association using standard regression diagnostics.

The Moran plots for unemployment rates in 1984 and 2002, and percentage change in unemployment rates between 1984 and 2002 (shown in Figures 1, 2 and 3) indicate the presence of a number of possible spatial clusters. The figures show the relativity and degree of change (i.e. growth) for each region (horizontal axis) compared to that of its contiguous neighbours (vertical axis). Table 2 lists the scores for 1984, 2002 and the change for 1984 to 2002 for all 94 regions examined in the study.

The Moran plot for 2002 (Figure 1) indicates the presence of potential 'local' spatial clusters around Maryborough (43), Gympie (81), Hervey Bay (88) and Bundaberg (79) in the Wide Bay Burnett area of Queensland, as well as around Morwell (63) and Traralgon (51) in the central Gippsland area of Victoria, around Maroochydore (71) and Caloundra (69) on the Queensland

Sunshine Coast, and around Whyalla (54), Port Pirie (53) and Port Augusta (52) in South Australia. All cases had high unemployment and were surrounded by neighbours that also had high (i.e. above average) unemployment rates. In other words, in 2002 there were three key areas of significant clustered regional decline. These were regions in Wide Bay and the Sunshine Coast in Queensland, regions in the Gippsland area of eastern Victoria, and the Upper Spencer Gulf regions in South Australia.

Figure 1: Moran scatterplots of regional unemployment 2002



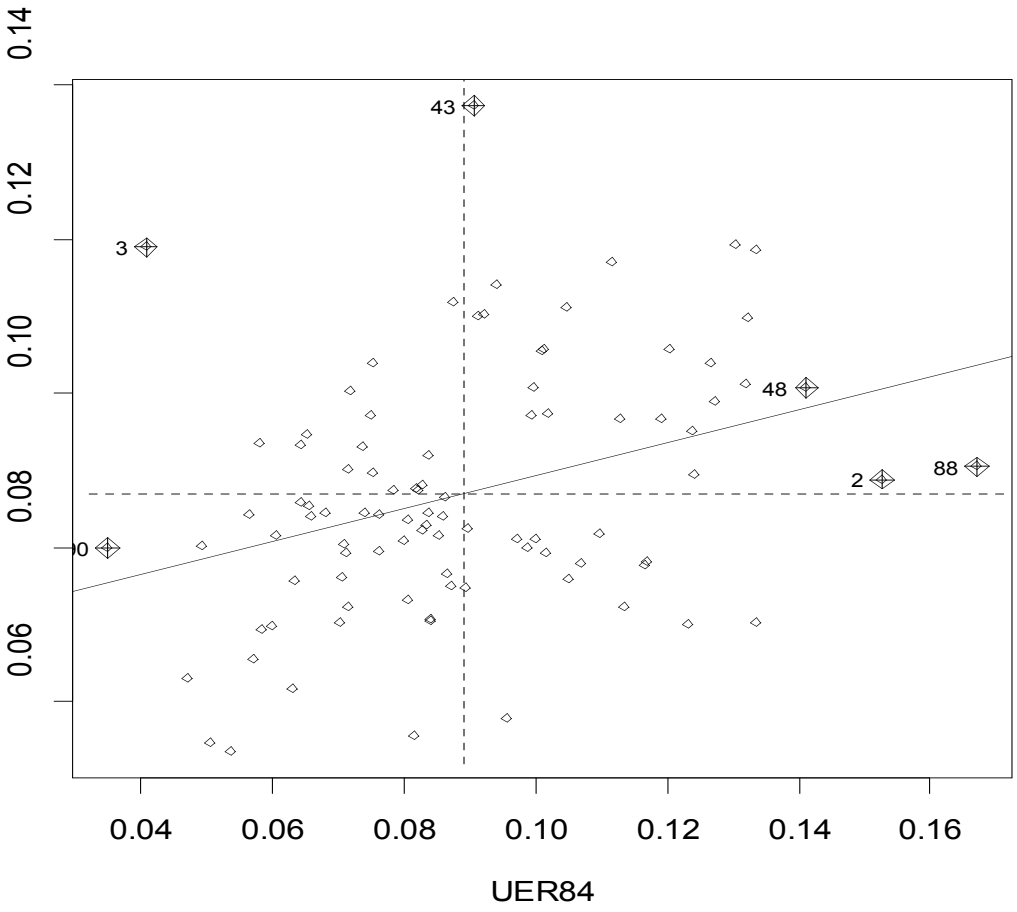
Conversely, in the south-west part of the scatterplot diagram, northern Sydney (3) and Narrogin (90) had low relative unemployment rates and yet were surrounded by regions with low unemployment rates in 2002. In the case of northern Sydney, there were other Sydney regions with similar high growth rates (e.g. inner and central Sydney, southern Sydney, western Sydney), while in Narrogin, surrounding regions like Northam also had relatively good growth rates.

Those regions on the north-west and south-east parts of the scatterplot diagram show situations (pockets) where there are islands of relatively low unemployment rates in 2002—for example, Brisbane Balance (16) and Launceston (46)—surrounded by a sea of high unemployment rate regions, or islands of high unemployment rates surrounded by low unemployment regions; for example, Mandurah (72).

The Moran plot for 1984 (Figure 2) suggests Maryborough (43), Bundaberg (79), Gympie (81) and Hervey Bay (88) are local labour markets with relatively high unemployment rates, with neighbours that also have relatively high unemployment rates (NE quadrant). This includes, for example, the regions of Maroochydore and Caloundra. Similarly, Gosford (2) and Wollongong (48) are high unemployment regions surrounded by other regions with relatively high unemployment. Conversely, in the 1984 scatterplots northern Sydney (3) is a local labour market

with a relatively low unemployment but with neighbouring labour markets that have relatively high unemployment (e.g. south-western Sydney, central and inner western Sydney). On the other hand, Narrogin (90) is a region with relatively low unemployment surrounded by similar regions (e.g. Northam), while Cairns (80) has high unemployment but is surrounded by regions with relatively low unemployment. (e.g. Townsville).

Figure 2: Moran scatterplots of regional unemployment 1984

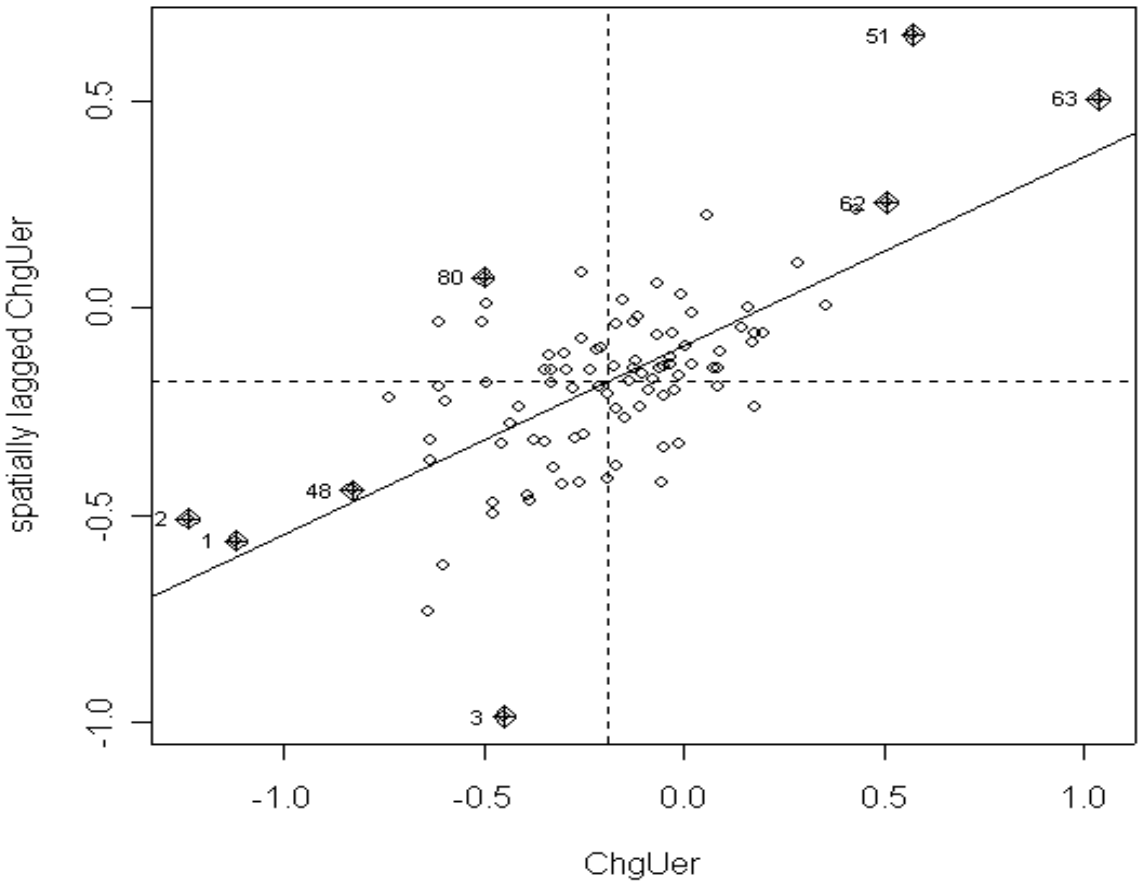


Therefore, a comparison of the scatterplot results for 2002 and 1984 suggests that there has been entrenched low economic growth in the Wide Bay region of Queensland (Maryborough, Bundaberg, Gympie and Hervey Bay) as well as parts of the Sunshine Coast (Maroochydore and Caloundra), and an emergence of new areas of clustered regional decline in the Gippsland region (Traralgon, Morwell, Sale and Moe) and in the Upper Spencer Gulf (Whyalla, Port Pirie and Port Augusta). Over the same period, the metropolitan region of clustered growth in Sydney has expanded beyond northern Sydney to include all other Sydney metropolitan regions. As well as this, by 2002 the contiguous regions of Gosford and Wollongong had moved out of the low-growth group into the high growth group, expanding the Sydney metropolitan high growth conurbation.

Finally, the Moran plot for percentage change in unemployment rates between 1984 and 2002 (Figure 3) detects positive local spatial growth clusters around central and inner western Sydney (1), Gosford (2), and northern Sydney (3), while Traralgon (51), Moe (62), Sale (57) and Morwell (63) experienced negative growth. Cairns (80) stands out as a region with increasing growth (i.e. reduced unemployment) surrounded by regions with falling performance (i.e. increasing unemployment).Those regions that have exhibited poor growth throughout the 18-year period

(e.g. Maryborough, Bundaberg, Hervey Bay, Caloundra and Maroochydore), as might be expected, do not show up in this particular scatterplot diagram.

Figure 3: Moran scatterplots of regional growth 1984–2002



Getis-Ord G statistic and LISA (local indicator of spatial association)

While Moran's *I* measures the overall degree of spatial clustering for a given variable across the total map of regions, Getis-Ord G and LISA measure the existence of local spatial clusters *within* an overall map pattern.

For a sample size of n = 94, a computed value of approximately G = 3.3 indicates the presence of a significant local spatial cluster (at one per cent level of significance). Based upon the computed G statistics for unemployment rates, the only significant 'local' spatial cluster is around Maryborough (43), which has a G statistic of 3.3 in 2002 and 3.3 in 1984. This is a positive value, indicating a spatial cluster of high and persistent values of low growth for this regional area.

The computed G statistic for percentage change in unemployment rates between 1984 and 2002 indicates the presence of 'local' negative value spatial clusters around northern Sydney (G = -4.2, 3), southern Sydney (G = -3.4, 5), western Sydney (G = -3.7, 6) and, to a lesser extent, south-western Sydney (G= -2.1, 4). These are regional labour markets with spatial clusters of low values, and therefore exhibit high regional growth.

Conversely, there are potentially significant 'local' positive spatial clusters around Traralgon (G = 4.7, 51), Sale (G = 3.6, 57), Moe (G = 3.5, 62) and Morwell (G = 4.0, 63). This is a significant cluster of declining regional growth performance.

The computed G statistics for the case study regions selected for the project are as follows:

Table 9 G statistics of the case study regions

Case	Region name	Uer 84	Uer 02	% change	G 84	G02	G change
6	Western Sydney	0.10	0.05	-0.60	0.86	2.72	-3.66
22	Northern Adelaide	0.11	0.09	-0.17	-0.47	0.57	0.79
36	Orange	0.10	0.05	-0.63	0.79	1.87	-1.29
40	Shepparton	0.08	0.08	-0.06	-1.55	-1.17	0.32
43	Maryborough*	0.09	0.10	0.08	3.27	3.31	0.25
45	Burnie	0.12	0.11	-0.13	0.45	0.62	0.18
48	Wollongong	0.14	0.06	-0.83	0.85	0.62	-1.40
59	Alice Springs	0.09	0.05	-0.61	-0.19	0.28	0.45
64	Mt Isa	0.06	0.07	0.17	0.41	1.06	0.82
66	Port Hedland/Pilbara	0.07	0.08	0.49	0.89	1.10	0.25
77	Horsham	0.06	0.04	-0.35	-0.45	-0.04	0.25
79	Bundaberg*	0.12	0.11	-0.15	0.06	1.55	1.29
88	Hervey Bay	0.17	0.13	-0.26	0.09	1.09	0.82

* Maryborough and Bundaberg are in the Wide Bay Burnett region

Using the LISA for 1984, the most significant hot spot regions were northern Sydney (3) on the low relative unemployment side, while on the high relative unemployment side they included: Traralgon (51), Sale (57), Moe (62), Morwell (63) and Maroochydore (71). In 2002, the most significant hot spot areas were central and inner Sydney (1), and northern Sydney (3) on the low relative unemployment side, while on the high relative unemployment side they included: Maryborough (43), and Morwell (63).

The positive growth hot spots between 1984 and 2002 were: central and inner western Sydney (1), Gosford (2), northern Sydney (3), southern Sydney (5) and western Sydney (6). On the negative side the standout hot spot areas were Traralgon (51), Sale (57), Moe (62) and Morwell (63). Table 10 shows the computed LISA figures for the case study regions, with western Sydney being the only significant growth hot spot.

Table 10 Computed LISA for the case study regions

Case	Region name	Uer 84	Uer 02	% change	Z84	Z02	Z change
6	Western Sydney	0.10	0.05	-0.60	0.37	2.37	4.65
22	Northern Adelaide	0.11	0.09	-0.17	-0.38	0.47	0.07
36	Orange	0.10	0.05	-0.63	-0.28	1.80	1.76
40	Shepparton	0.08	0.08	-0.06	0.55	-0.04	0.15
43	Maryborough*	0.09	0.10	0.08	0.21	3.48	0.22
45	Burnie	0.12	0.11	-0.13	0.52	0.82	0.05
48	Wollongong	0.14	0.06	-0.83	1.64	0.36	2.71
59	Alice Springs	0.09	0.05	-0.61	0.03	-0.34	-0.60
64	Mt Isa	0.06	0.07	0.17	-0.51	-0.21	0.91
67	Port Hedland/Pilbara	0.07	0.08	0.49	0.65	-0.06	0.79
77	Horsham	0.06	0.04	-0.35	0.56	0.49	-0.11

79	Bundaberg*	0.12	0.11	-0.15	0.0	2.15	0.16
88	Hervey Bay	0.17	0.13	-0.26	0.19	2.49	-0.17

* Maryborough and Bundaberg are in the Wide Bay Burnett region

The results of this analysis show that there have been three key regional areas for negative growth over the period 1984–2002. These were Wide Bay Burnett in Queensland (comprising the Maryborough, Hervey Bay, Bundaberg and Gympie regions) with some spillover to the Sunshine Coast to the south (Caloundra and Maroochydore in particular), Gippsland in Victoria (comprising Morwell, Moe, Traralgon and Sale), and the Upper Spencer Gulf area of South Australia (comprising Whyalla, Port Pirie and Port Augusta). Of these, the Wide Bay regions have had continuing poor growth over the entire period, whereas the situation in the Gippsland and Upper Spencer Gulf regions has become markedly worse over the period. On the positive growth side, the stand out area is Sydney metropolitan (in particular the regions of northern Sydney, central and inner western Sydney, Gosford, southern Sydney and western Sydney). Over the period the cluster of high growth around metropolitan Sydney has widened to include peripheral areas (e.g. western Sydney, Wollongong and Gosford) to produce a larger growth conurbation.

Relative impact of significant drivers on regional growth

Aggregate driver impact

Having derived an adequate empirical model specification, it is possible to use it to explore different policy scenarios.

As the drivers of regional growth have been measured on different scales (refer Table 3, for the scores for all 94 regions for the significant drivers), their relative significance needs to be standardised in order for them to be properly compared. To enable this, the values are converted to Z scores, as shown in Table 11. It can be seen immediately that the human capital driver NODEG is considerably more important in determining regional growth than is SPEC, followed by HITECH and then PROT.

Using the coefficient for each of the four significant variables (ignoring the other non-significant coefficients and controlling for gap convergence), we can ascertain the change in unemployment that occurs with a change in each driver to a specified level (holding the other three constant). Table 11 shows the impact on relative unemployment (i.e. regional growth) of four different scenarios:

- ✧ a one per cent change
- ✧ a change to the median across all 94 regions
- ✧ a change to the minimum value
- ✧ a change to the maximum value amongst the 94 regions.

Table 11 The importance of determinants of economic performance

			Impact on relative unemployment			
Variable	Z score	Coefficient	1 % increase	Median value	Min value	Max value
HITECH	-0.307	-0.15	-1.16	-0.0435	0.0423	-0.366
PROT	0.164	0.013	1.013	0.0338	-0.05252	0.20566
NODEG	0.640	0.025	1.026	1.15375	-0.52625	0.49875
SPEC	-0.406	-1.14	-3.16	-0.1824	0.1596	-0.2736

In other words, a one per cent increase in the HITECH coefficient will reduce relative unemployment (and increase average regional growth) by 1.16 per cent. A one per cent increase in those with NODEG will lead to an increase in relative unemployment (reduced regional growth) by 1.026 per cent.

One tentative conclusion from the modelling of drivers is that when positive human capital (1-NODEG) and sector specialisation (SPEC) are linked with some degree of technology leadership (HITECH), a regional 'enterprising' culture results. Alice Springs, Wollongong and western Sydney are places where this may already be evident and where we can learn from closer investigation. On the other hand, in Hervey Bay, Bundaberg, Mt Isa, Maryborough, Burnie, Shepparton and Northern Adelaide there is a need for significant initiatives to boost regional growth competitiveness. These regions need to be examined closely to find out what is currently impeding it.

We have been able to unpack 'enterprising' human capital from the more chaotic concept of human capital (Sayer 1992) through the modelling, a critical analysis of the literature, the information obtained through the 11 case study workshops, and by exploring the role of 'education' as opposed to 'training' in generating productivity gain.

Table 12 highlights those regions with the highest and lowest driver presence. Those clusters of regions with low growth (e.g. Maryborough, Hervey Bay, Bundaberg, Maroochydore, Caloundra, Traralgon, Moe, Morwell, Sale, Port Pirie, Port Augusta and Whyalla) have consistently low access to high technology and human capital, and relatively high levels of government support. Similarly, the clusters of high-growth regions (e.g. the Sydney metropolitan area) appear to do well with human capital and high technology access.

Table 12 Regional growth driver presence

Variable	Highest 10 ranking	Lowest 10 ranking
HITECH	Northern Sydney, southern Sydney, south-western Sydney, Orange, outer east Melbourne, southern Melbourne, western Melbourne, northern Adelaide, inner eastern Melbourne, inner Melbourne	Lithgow, Renmark, Port Augusta, Port Pirie, Mandurah, Port Lincoln, Taree, Whyalla, Goulburn, Traralgon
NODEG	Hervey Bay, Gympie, Port Macquarie, Coffs Harbour, Maroochydore, Caloundra, Taree, Port Pirie, Moree, Mandurah	Northern Sydney, inner eastern Melbourne, Canberra, Darwin, outer east Melbourne, east Adelaide, Traralgon, northern Perth
MKTACC	Central and inner western Sydney, northern Sydney, Gosford, south-western Sydney, southern Sydney, western Sydney, inner Melbourne, inner east Melbourne, north-east Melbourne, Mornington Peninsula	Northern Territory, Alice Springs, Darwin, Cairns, Geraldton, Mt Isa, Kalgoorlie, Port Hedland, Townsville, Rockhampton
SPEC	Renmark, Murray Bridge, Narrogin, Colac, Goulburn, Hamilton, Horsham, Albany, Armidale, Bathurst	South-western Sydney, Canberra, Hobart, Geelong, Broken Hill, Kalgoorlie, southern Adelaide, northern Adelaide, Port Augusta, east Perth
PROT	Geelong, north-east Melbourne, southern Melbourne, Mornington Peninsula, western Melbourne, inner Melbourne, Wangaratta, western Sydney, Bendigo, southern Sydney	Mandurah, Port Hedland, Kalgoorlie, Broken Hill, Gladstone, Northern Territory, Moree, Armidale, Port Augusta, Rockhampton

Regional variability in driver impact on growth

Different regions will have a different mix of drivers in determining their respective growth paths. To demonstrate this through the modelling we assume regions increase their growth to the

average of that across all regions (parity). Table 13 shows how much each driver would need to change in order to achieve parity relative unemployment for the case study regions listed. For example, some regions (northern Adelaide, Shepparton, Maryborough, Burnie, Mt Isa, Bundaberg and Hervey Bay) need to increase the presence of their high technology and human capital drivers for economic growth to reach parity levels, while others (e.g. western Sydney, Orange, Horsham and Wollongong) can afford to reduce theirs.

Table 13 Required change in driver contribution to achieve parity growth in case regions

Region	HITECH		PROT		NODEG		SPEC	
	Actual	Parity	Actual	Parity	Actual	Parity	Actual	Parity
Western Sydney	1.35	0.25	8.99	21.8	36.2	42.82	0.07	-0.08
Northern Adelaide	1.95	4.32	12.57	-15.05	42.9	28.62	0.05	-0.37
Orange	2.40	1.05	3.04	18.74	51.6	59.72	0.28	0.10
Shepparton	0.23	1.26	4.64	-7.42	49.30	43.07	0.29	0.43
Maryborough*	0.39	3.11	2.39	-29.45	53.30	36.83	0.20	0.57
Burnie	0.04	3.19	4.79	-31.98	46.60	27.59	0.19	0.62
Wollongong	0.28	-0.02	6.70	10.25	41.30	43.13	0.10	0.06
Alice Springs	0.74	-1.34	0.32	24.50	31.40	43.94	0.08	-0.22
Mount Isa	0.12	0.58	0.66	-4.71	40.80	38.02	0.06	0.12
Horsham	0.30	-2.79	3.76	39.93	52.90	71.60	0.35	-0.07
Bundaberg*	0.30	3.53	1.75	-36.06	56.10	36.54	0.23	0.67
Hervey Bay	0.13	4.60	0.86	-51.45	66.10	39.05	0.07	0.67

* Maryborough and Bundaberg are in the Wide Bay Burnett region

The conclusions that can be tentatively drawn from this modelling process, therefore, are that regional growth theories, and the policies and practices that rely on them, including openness to interregional trade (MKTACC), the encouragement of connections between enterprise-based firms (MLOCN) and access to information (INFOACC) do not have as large a regional impact on growth as might be expected and may need to be re-thought.

At the same time, a combination of low NODEG, high HITECH, low SPEC and low PROT appear to have the potential to generate better growth outcomes if they can be harnessed effectively. The human capital element (NODEG) is the most significant determinant of regional economic growth. Together these results suggest there is a case for region-specific attention to correct particular imbalances. For this reason, each region needs to be explored in more detail to see what measures could be put in place to enhance growth through human capital. This is what we did through the 11 case studies.

Regional growth 1984–2002: maps and diagrams

The statistical results outlined in the preceding sections are confirmed for all regions by the following series of spatial maps and diagrams, which deal with patterns of growth for 1984 and 2002, and the change in growth between these two years. The maps have been drawn in Arcview and use natural breaks as a classification scheme. The units of measurement are dependent on the variable (refer Appendix C in the main report, *An enterprising approach to regional growth: Implications for policy and the role of VET The role of VET*). These variables are either percentages or dimensionless indices. Essentially, there are three types of variables: location quotients, accessibility indices and percentages. The location quotients and indices are the dimensionless measures.

The spatial pattern of unemployment rates for 1984, shown in Figure 4, indicates high levels of unemployment in western Tasmania; the Hunter, and the North and Central coasts of New

South Wales; and the Sunshine Coast, Wide Bay and Far North areas of Queensland. The best performing regions were parts of metropolitan Sydney and Melbourne, as well as rural areas east of Perth and in western Queensland.

Figure 4: Regional unemployment rates 1984

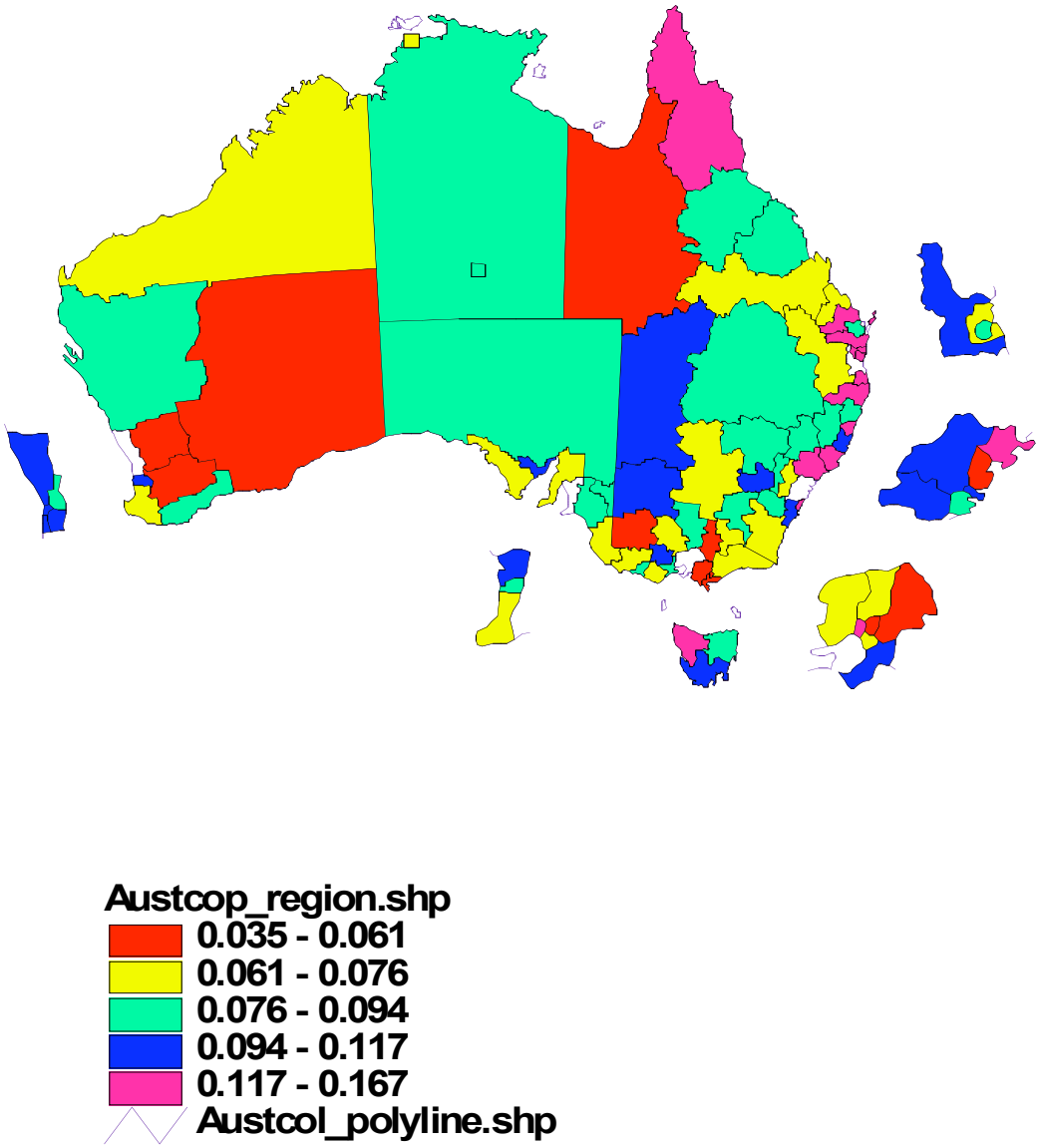


Figure 5 shows the patterns of regional unemployment for 2002. The data show that the highest rates were in South Australia, the New South Wales North Coast, Gippsland in Victoria, western Tasmania, and again the Sunshine Coast and Wide Bay areas of Queensland. Regions with the lowest rates of unemployment in 2002 remained the metropolitan areas of Sydney and Melbourne and rural areas to the east of Perth, Horsham in Victoria and central New South Wales.

Figure 5: Regional unemployment rates 2002

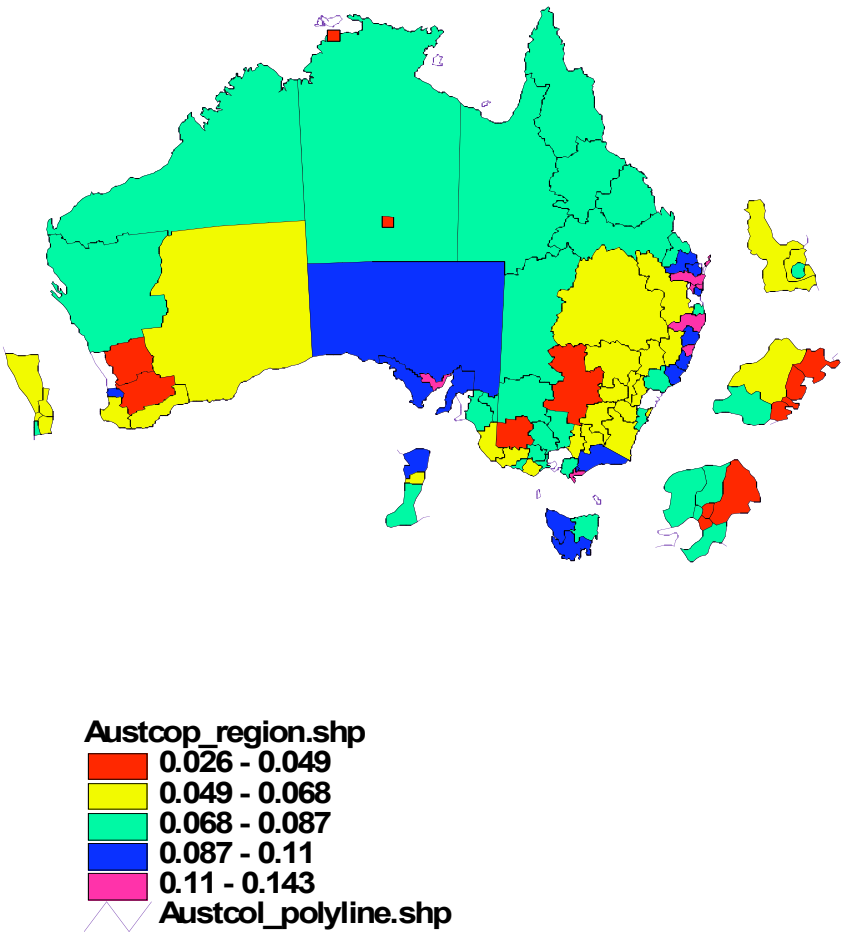
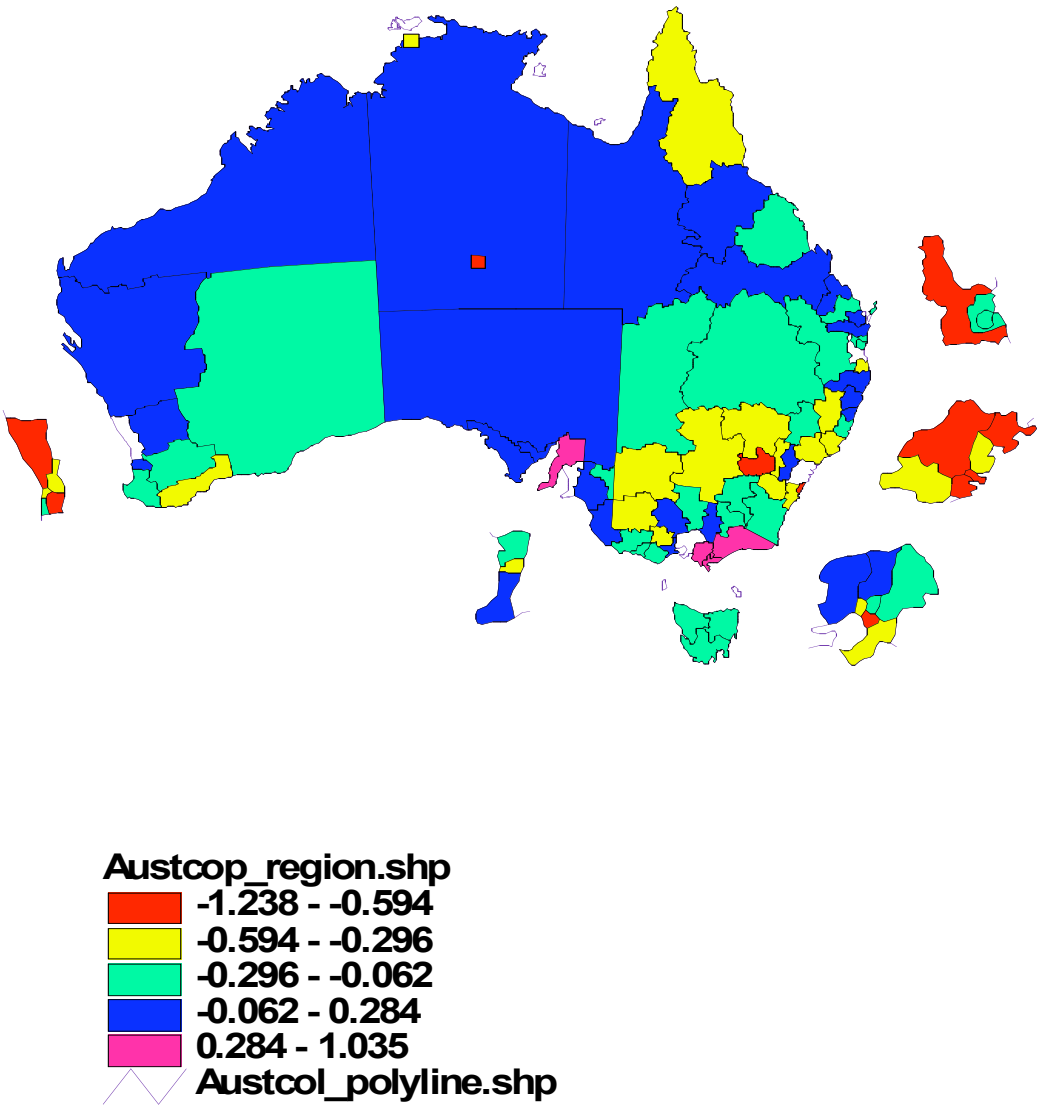


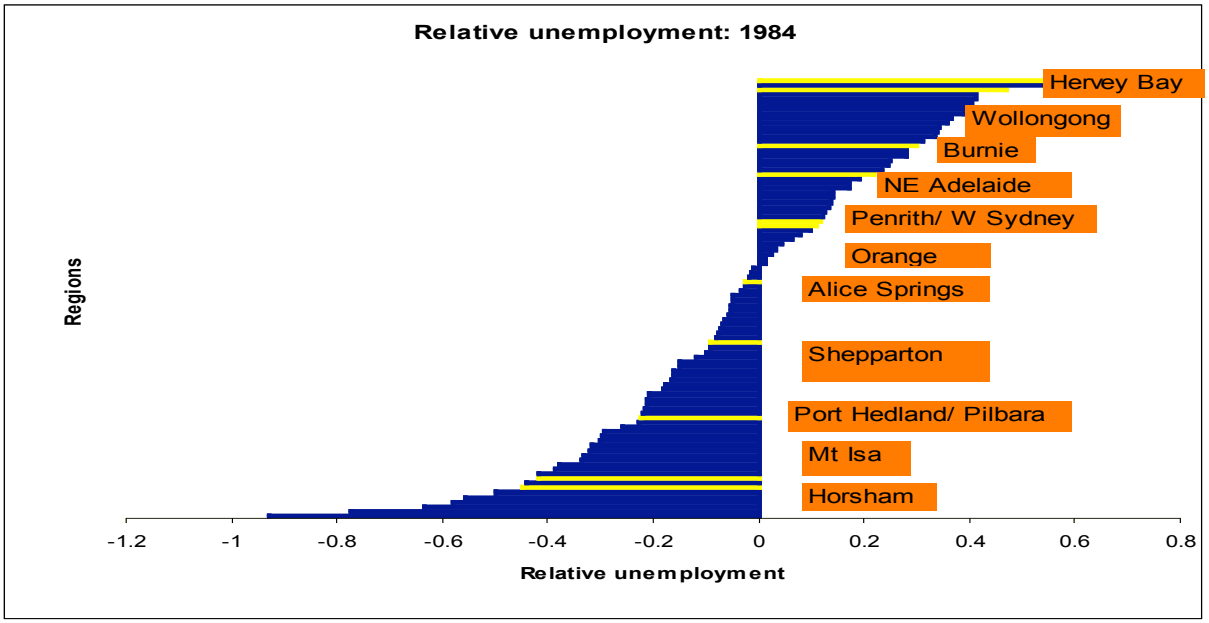
Figure 6 shows the degree of change in relative unemployment over the period 1984–2002. The data show that the decline in growth has been greatest in Gippsland, Victoria; the Spencer Gulf regions of South Australia (Whyalla, Port Pirie and Port Augusta); the North Coast of New South Wales; the Sunshine Coast and Wide Bay regions of Queensland; and most rural areas of Australia. The metropolitan regions of Sydney and Melbourne appear to have performed best over this period.

Figure 6: Percentage change in regional economic performance



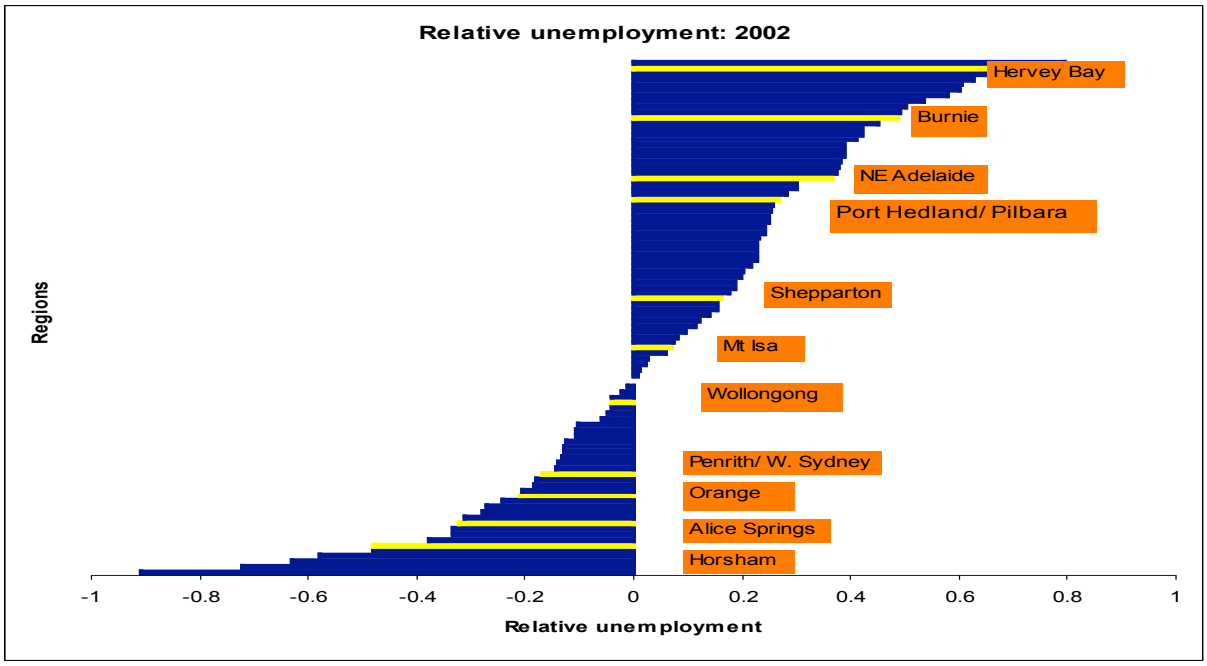
Figures 7, 8 and 9 show the 94 regions in diagrammatic form and highlight the 11 case study regions for comparative purposes.

Figure 7: Relative unemployment 1984



In 1984, the best performing case study regions in terms of relative unemployment (Figure 7) included mining areas (e.g. Mt Isa and Port Hedland/Pilbara) and rural areas (e.g. Horsham), with the worst performers being the older industrial regions (e.g. Wollongong, Burnie, north-east Adelaide, western Sydney). Hervey Bay was the worst performed in relative unemployment terms of all the case study regions.

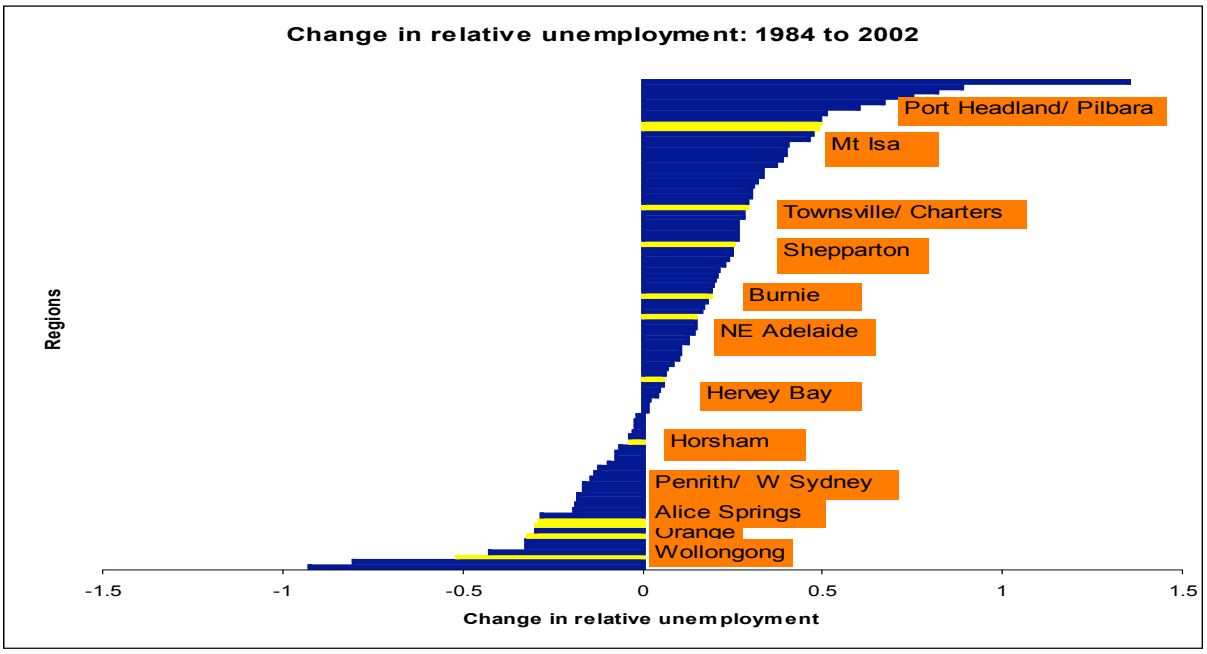
Figure 8: Relative unemployment 2002



In 2002, the best performing regions in terms of relative unemployment (Figure 8) included Alice Springs, Orange, western Sydney, and rural areas such as Horsham, with the worst performers again being Burnie, northern Adelaide and Maryborough. Hervey Bay was again the worst performed in relative unemployment terms.

The best performing regions in terms of growth (Figure 9) were Orange, Wollongong, Alice Springs and western Sydney, while those performing worst over the 1984–2002 period were the mining centres and the older industrial regions of Maryborough, Burnie and northern Adelaide.

Figure 9: Change in relative unemployment 1984–2002



Regional growth drivers: mapping

In this section the following growth-determining variables are mapped to highlight their spatial configuration:

- ✧ technological leadership at the enterprise level
- ✧ infrastructure support and institutional thickness
- ✧ the local human resource base
- ✧ local sectoral specialisation.

As Figure 10 shows, the main concentration of high technology in Australia on a spatial basis is in the metropolitan regions of Sydney and Melbourne. High technology is a positive driver of regional growth. Northern Adelaide, with its motor vehicle industry, shows up as having a relatively high concentration of high technology, as does Orange in New South Wales. Most of the remaining non-metropolitan regions have a relatively low concentration of the high technology driver.

Figure 10: Technological leadership at the enterprise level

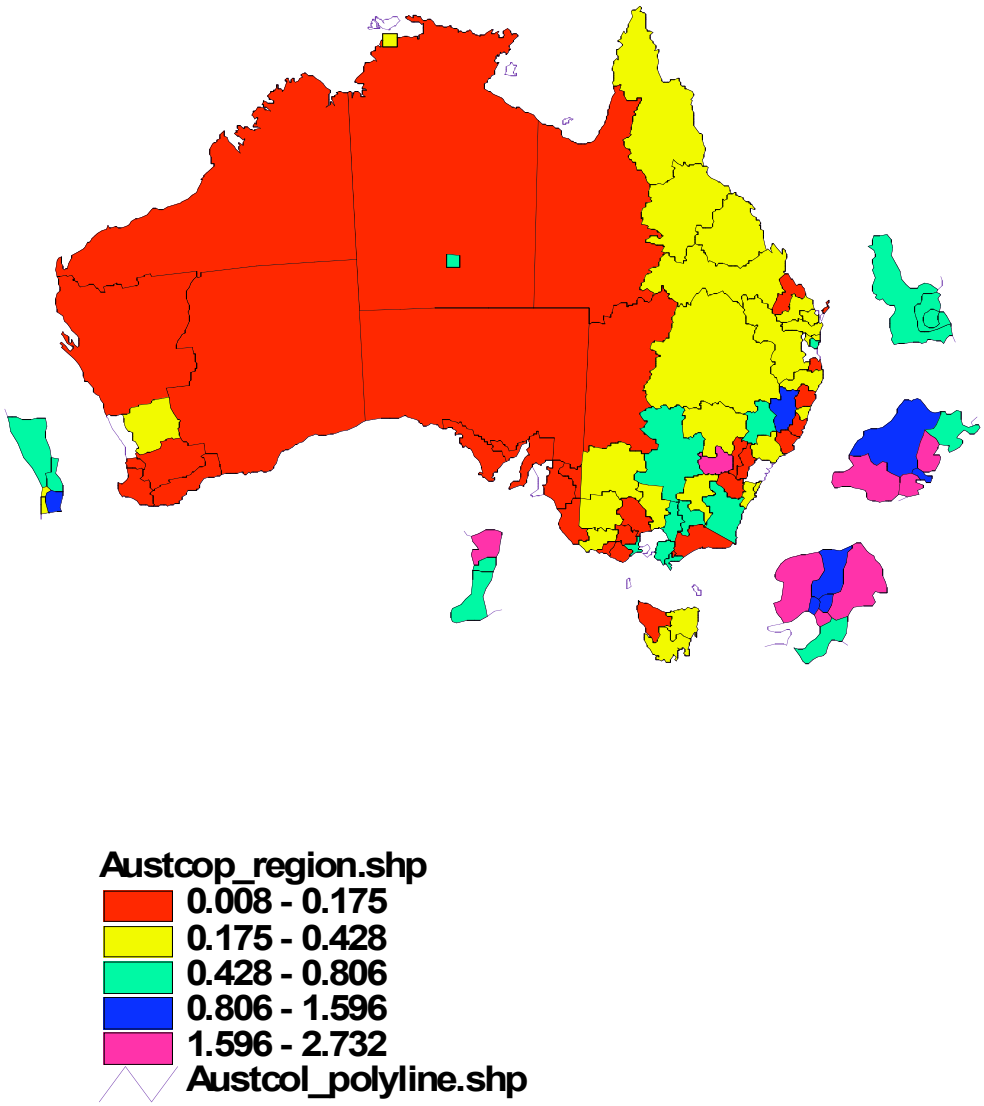


Figure 11 shows those regions where government financial intervention in industry has been greatest. This includes most of Melbourne—particularly the north, south and west—northern and southern Adelaide, and western and south-western Sydney. High concentrations of institutional intervention show up in the analysis as having a negative impact on regional growth.

Figure 11: Institutional support

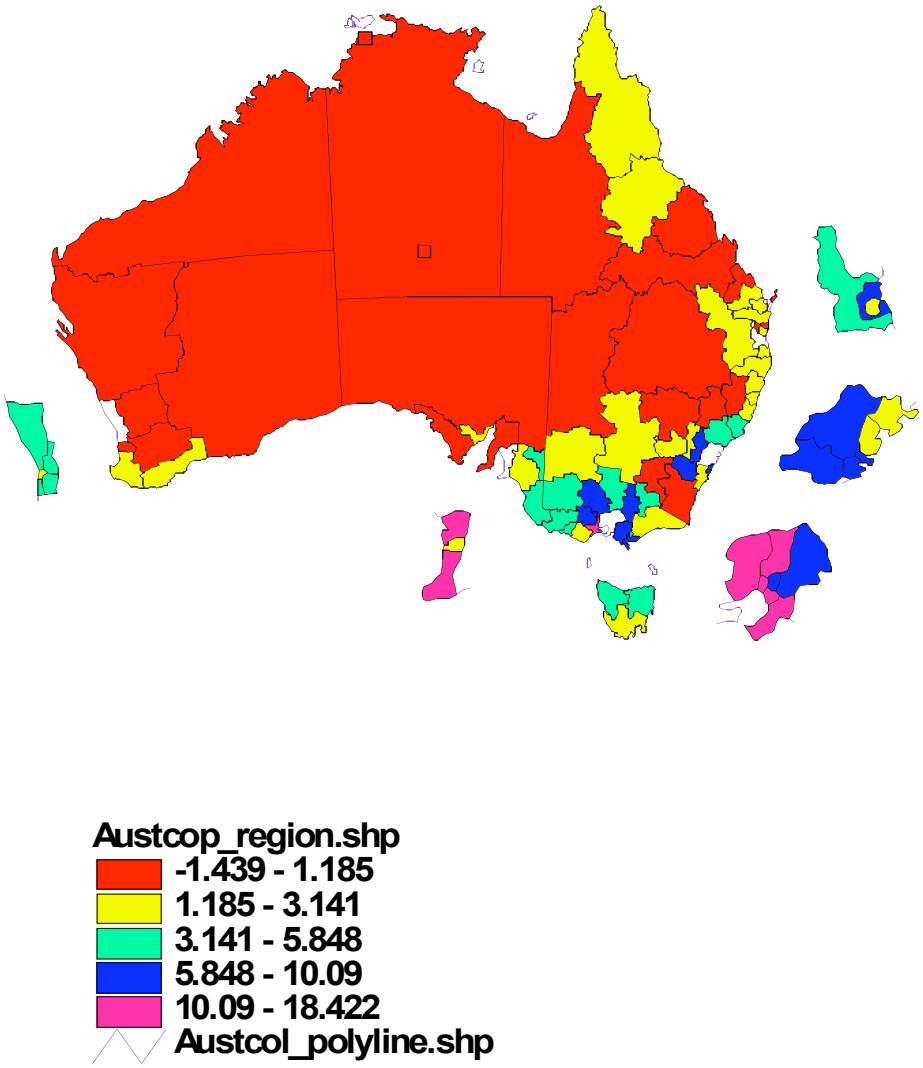


Figure 12 shows the spatial distribution of the human resources driver for regional growth. Regions with the poorest concentration of human resources perform worst. These include North Coast of New South Wales and the Sunshine Coast and Wide Bay regions of Queensland. Metropolitan regions have the highest relative concentration of the human resources growth driver.

Figure 12: Local human resource base

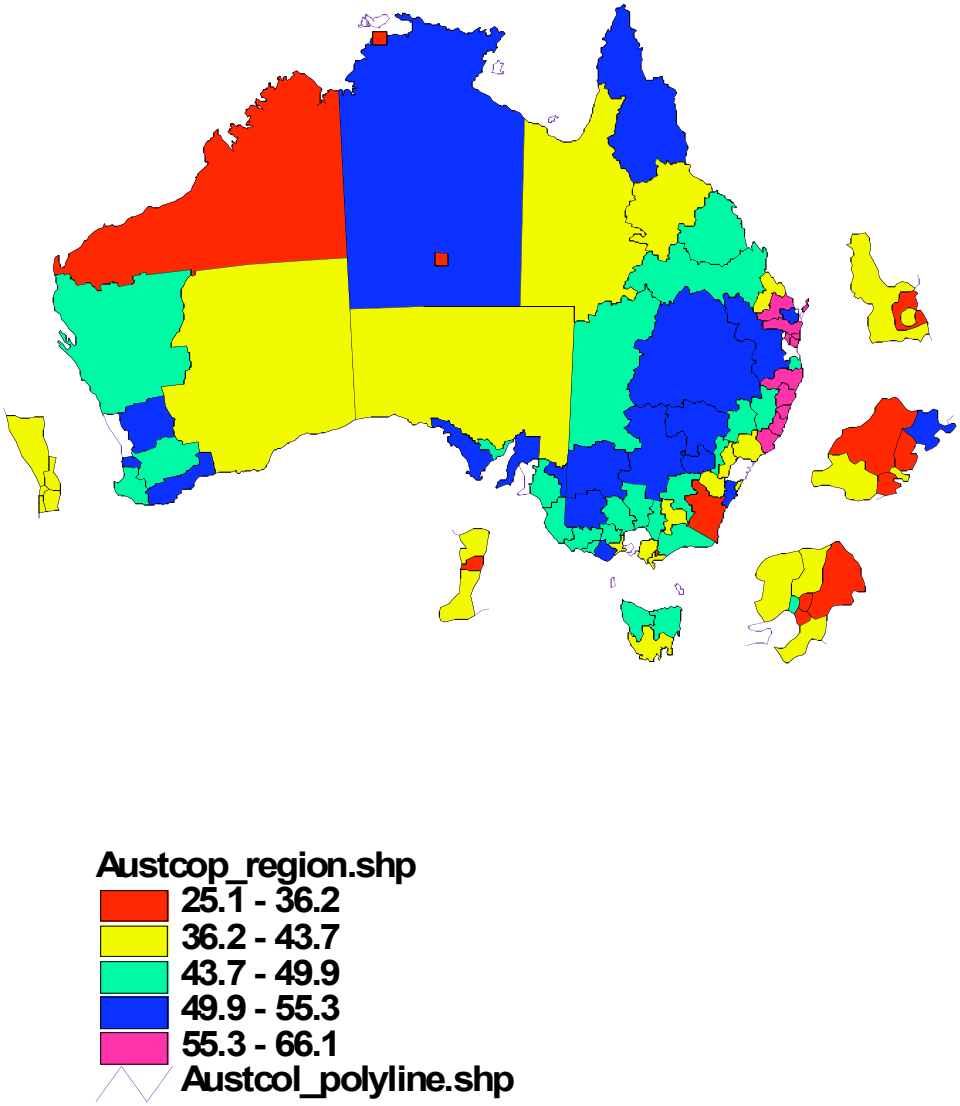
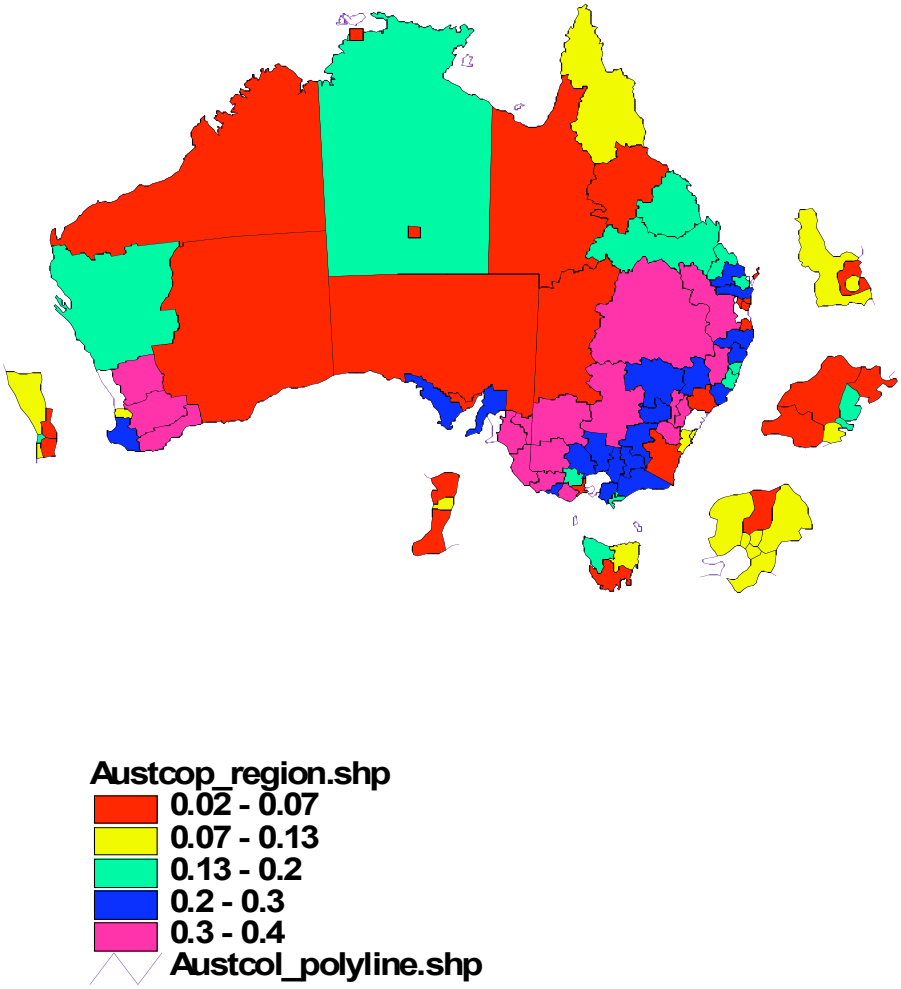


Figure 13 shows the distribution of the local industry specialisation driver for regional growth. It shows an uneven pattern, with key areas of concentrated specialisation in the metropolitan regions and remote rural regions. Regions with the least amount of specialisation are in rural Victoria, New South Wales and Western Australia.

Figure 13: Local sectoral specialisation



The following four diagrams (Figures 14 to 17) show how the case study regions compare to the other regions in terms of the relative presence of the four key economic growth drivers. Those regions faring the best for the human capital driver include Alice Springs and western Sydney/Penrith, while those with the lowest concentration of human capital include Hervey Bay and Maryborough in the Wide Bay area of Queensland, and Horsham in rural western Victoria. The older industrial regions of northern Adelaide, Wollongong and Burnie fall about midway.

Figure 14: Local human resource base

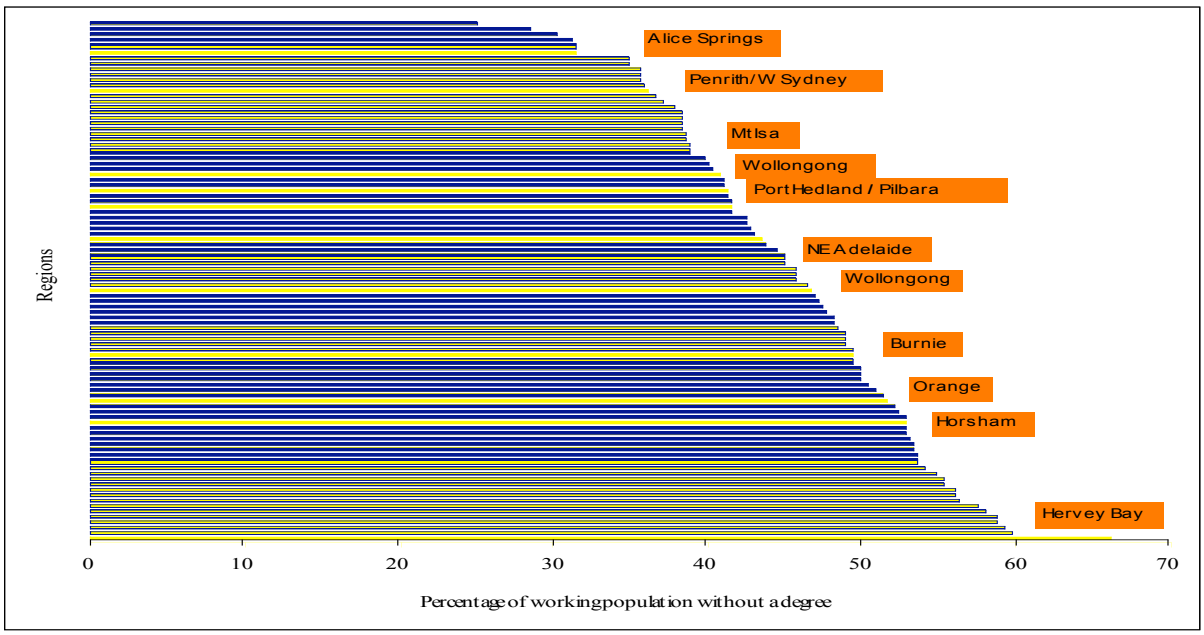


Figure 15 compares the case study regions in terms of access to the high technology driver of regional growth. Orange, northern Adelaide, western Sydney/Penrith and Alice Springs stand out as having the highest concentration of this driver, while those areas where it is under-represented include Burnie, Hervey Bay, Port Hedland/Pilbara, Mt Isa, Shepparton, Wollongong, Horsham and Maryborough.

Figure 15: Technological leadership

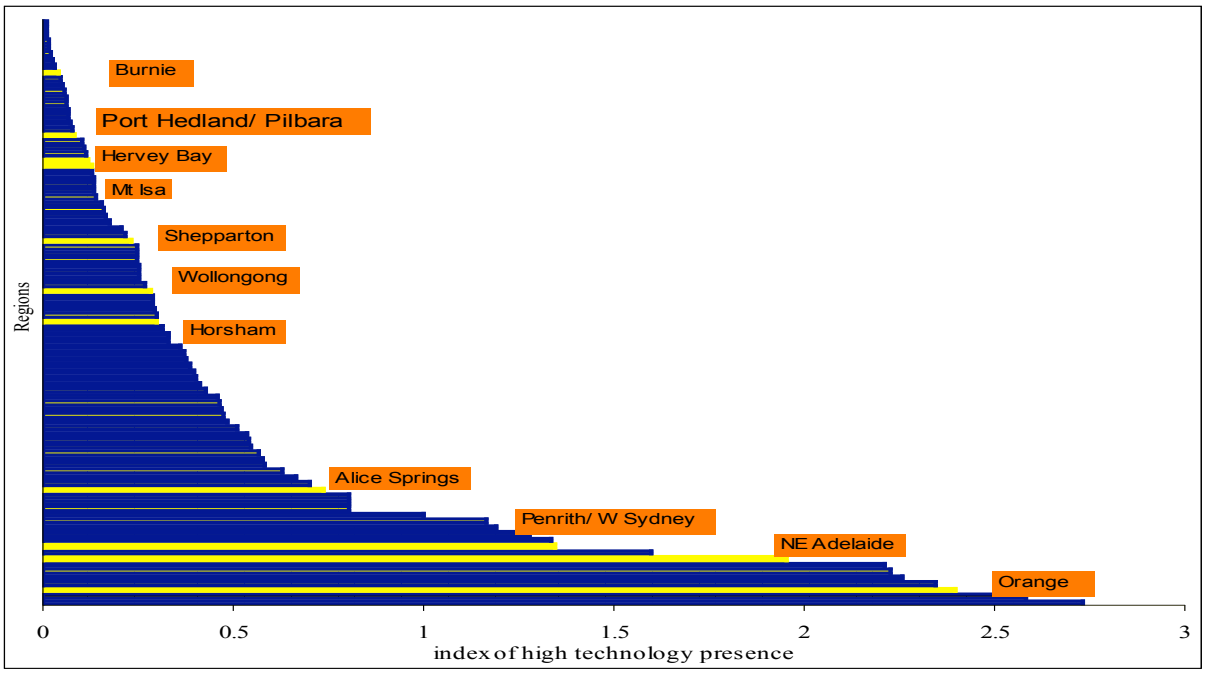


Figure 16 shows the relative position of the case study regions against all 94 regions in the project in relation to the degree of institutional financial intervention. The case study regions with the greatest institutional support include northern Adelaide, western Sydney/Penrith, Wollongong and Burnie, while those with the least include Alice Springs, Hervey Bay, Mt Isa and Port Hedland/Pilbara.

Figure 16: Institutional support

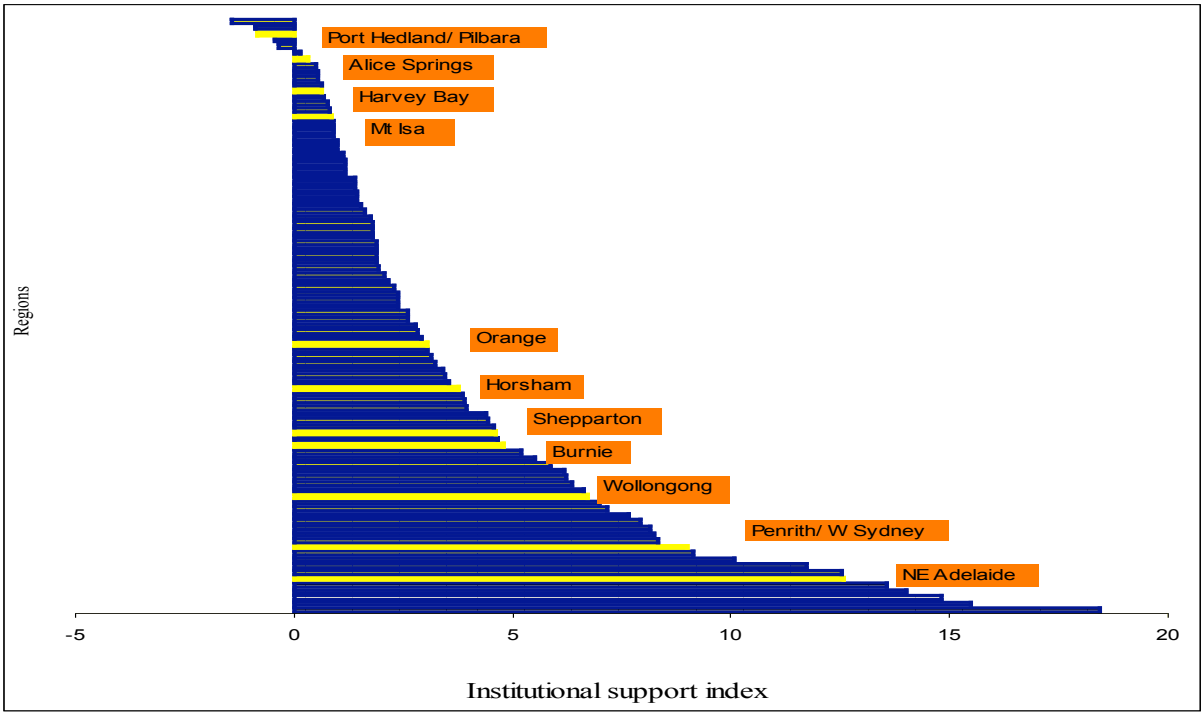


Figure 17 shows how the case study regions compare with other Australian regions in relation to the degree of industry specialisation. Remote rural regions such as Port Hedland/Pilbara, Mt Isa and Alice Springs, as well as single-industry regions like northern Adelaide, appear to be the most specialised in their economic base, whereas rural regions like Orange, Horsham and Shepparton are more diverse.

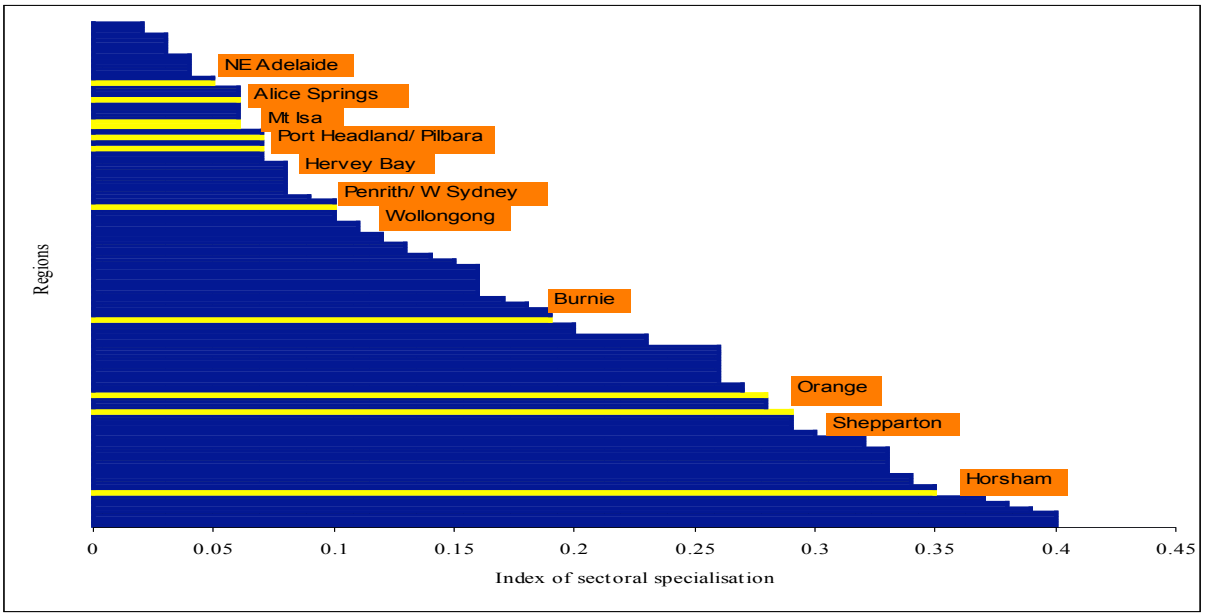



Figure: 17: Local sectoral specialisation