Prometheus, Vol. 22, No. 4, December 2004

Carfax Publishing
Taylor & Francis Group

Innovation–Export Linkages within Different Cluster Models: A Case Study from the Australian Wine Industry

DAVID AYLWARD

ABSTRACT *This paper examines innovation and export linkages within different levels of cluster development. The aim of the paper, using empirical data from the Australian wine industry, is to demonstrate that the association between innovation and export activity intensifies as the cluster develops. Dividing wine clusters into 'innovative' (highly developed) and 'organised' (less developed) models, the paper uses selected core indicators of innovation and export activity to explore levels of integration within each model. This integration is examined in the context of Porter's theory of 'competitive advantage', showing how these lessons can be translated to industry clusters in general.*

Keywords: innovation; exporting; industry clusters; wine industry; linkages

Background

In recent years the potential for industrial clusters to create 'competitive advantage' has become an issue of growing discussion. As a consequence, the body of research literature has developed to an extent where 'cluster analysis' is now a recognised component of innovation theory. The 'analysis' has also expanded to include studies on regional knowledge clusters, industry-specific clusters, competition and cooperation within industry concentrations, systems of innovation and, of course, the competitive advantage of industry clusters.

As Michael Porter once described them, clusters are:

> … networks of companies, suppliers, service firms, academic institutions and organizations in related industries that, together, bring new products or services to market.[1]

It is the interaction between these public and private sector 'actors' that can be so effective in generating an environment of concentrated innovation. As the environment becomes more interactive, more actors tend to be attracted from an increasing range of related industry sectors. As a result, the level of value-adding continues

Prometheus ISSN 0810-9028 print/ISSN 1470-1030 online © 2004 Taylor & Francis Ltd
http://www.tandf.co.uk/journals
DOI: 10.1080/0810902041233131650

to grow, both competition and cooperation within the cluster are further elevated, and the cluster tends to create self-sustaining momentum.[2] In terms of innovation system theory, as Mytelka points out, the intense interaction within such a cluster becomes itself a measure of innovation. Firms learn their innovative behaviour from their environment. The more intense and robust the cluster, the more innovative the firm.[3]

A number of researchers, including Redman and Rosenfeld, cite the 'geographic concentration' of actors as a core criterion of clusters, where product and supply chains are pronounced and the associated education, research and regulatory bodies dramatically influence the cluster's competitiveness.[4] Others have since taken the definition further, arguing that a geographic proximity of actors may not be required for the development of clusters.[5] Mytelka and Farinelli point out, however, that the industry sector usually determines whether or not geographic proximity is a core criterion.[6] They argue that specific cluster 'types' are suited to specific industry 'types' and to more or less developed economies.

Cluster Types

Within modern cluster theory, the range of cluster types, or more appropriately, sub-types, continues to expand as researchers identify the myriad of contributing factors, environments and indicators involved. Included in more recent literature are such variations as knowledge-driven clusters, trade-driven clusters, low- and high-tech clusters, and geographic and non-geographic clusters. Johnstone succinctly captures this variation when he states that:

> What emerges clearly is that there is no single, standard, 'one fits all' model of clusters. Every country and region has a different set of clusters, shaped by historic background, national characteristics, the strength of the knowledge base, size, connectedness, R&D intensity and share of innovative products.[7]

Beyond the above-mentioned sub-types, therefore, Mytelka draws two main distinctions when discussing cluster types. These are:

1. spontaneous groupings of firms, suppliers and public sector bodies around a growth industry; and
2. constructed clusters such as industrial parks and incubators, originating through policy mechanisms with specific objectives in mind.

For the purposes of this paper, the focus will be on the first type—spontaneous clusters. Mytelka divides spontaneous clusters into three useful categories: Informal, Organised and Innovative. Based on a matrix of innovation measures, she rates each cluster type, with 'informal clusters' representing what Porter would classify as the least 'evolved' through to 'innovative clusters' as representative of the highest level of development.[8]

In Australia, 'informal clusters' are generally evident in some of the older metal manufacturing industries, where the firm size is small to medium, skill levels tend to be low, innovation levels are usually low, exports are non-existent or sporadic, but competition between firms is high.[9] In 'organised clusters', which in Australia may be found in niche industry sectors such as marine manufacturing and equipment or the micro electronic industry, as well as in a number

of wine regions, innovation measures tend to be higher. Firms are almost exclusively small and medium enterprises (SMEs), with a growing level of innovative activity, new but growing levels of skill development, some links to public sector bodies and research facilities, and relatively high levels of exports with developed markets.[10]

'Innovative clusters' are seen as the most advanced type of cluster formation. While clusters are referred to loosely in a number of industries, and each industry sector can boast some type of cluster formation, truly innovative clusters remain a rare phenomenon. In Australia, the motor industry in South Australia and Victoria partially fit the characteristics of an 'innovative cluster'. Firm size is large, skill levels range across low, medium and high, linkages are medium to high level, product exports are high, but another core criterion—cooperation—is relatively poor. One of the clearest examples of an 'innovative cluster', however, can be found in the Australian wine industry. As this paper will demonstrate, the South Australian wine industry fits neatly into Mytelka's model, fulfilling all major indicators, as well as the most important indicator from the author's perspective, demonstration of leading-edge linkages between its innovation and export capacity.

Wine Industry Clusters

While wine is one of the world's oldest commodities, the systemic organisation, infrastructure, packaging and marketing of this commodity is more recent. It has been referred to as an 'industry' only within the past 20 years. Now, however, particularly with the emergence of high-growth New World wine industries, the sector is attracting intense interest. Importantly, New World wine industries are also attracting interest because of their natural tendency towards cluster formations, or what Porter refers to as 'pre-existing local circumstances'.[11]

The desire to export has been a key factor in the evolution of these clusters. While, historically, wine firms have always emerged and grouped around existing and new wine-growing regions, it was the desire to export, to expand markets, that triggered systemic organisation. In catering to international markets, New World firms quickly realised that the most effective way to compete with their Old World counterparts was to produce and market a consistently high-quality product, at reasonable price points, to the world. This required a coordinated approach to research and development (R&D), a well-developed supply chain, sustainable alliances between growers and producers, significant public and private sector infrastructure and a unified marketing strategy. To a very large extent, the strategy has worked, and, clusters have evolved.

These clusters have, without exception, followed the model of geographic proximity emphasised by Redman and, to some extent, that of Rosenfeld. Unlike IT, communications or the electronics industry, the wine sector is a natural resource-based industry that, as Mytelka and Goertzen state, is focused around 'site-specific characteristics'. Wine clusters will vary in development, intensity, connectedness and therefore effectiveness. The least developed will include a loosely knit group of firms with some associated suppliers, perhaps local industry associations, some related agricultural firms, technical education providers and growers. Contrasting sharply with this model is the highly evolved, intense cluster, which displays a significantly different business and organisational culture. There is a cohesive integration of suppliers, wine makers, growers, marketers, numerous related industries, and the national research, funding, regulatory, education and infrastructure bodies

that help provide the framework within which these firms compete and cooperate so effectively.[12]

Porter and Bond have devoted considerable attention to what they refer to as the California wine cluster. In other studies, Mytelka and Goertzen have focused on the Niagara wine cluster and Visser and Langen have selected the Chilean wine cluster for examination. These clusters are at substantially different stages of evolution. California is far more developed than either of its newer rivals, Niagara or Chile. It has the associated fertiliser, grape harvesting, irrigation, barrel, cork, bottle and wine-making equipment firms. It has strong linkages with state government agencies, regulatory bodies, marketing agencies and research institutes, and it has the associated tourism and food clusters.[13] As with wine clusters in South Africa, New Zealand (with the exception of Malborough) and Argentina, Chile and Niagara are far less evolved and could only be classified as 'informal' or 'organised'.

Aims of the Study

This paper aims to build on the current knowledge of clusters by:

- embedding it within an Australian context;
- relating the cluster models summarised above to the Australian wine industry;
- demonstrating, through empirical research, the effectiveness of innovation and export linkages within an 'innovative' wine cluster; and
- contrasting these linkages with those evident in less developed wine clusters within Australia's major wine regions.

Research Methods

This paper is based on empirical data, with a survey designed around selected innovation and export measures. The study did not attempt to include a comprehensive set of measures but rather focused on what an extensive literature search found to be a number of 'core' measures.

In terms of export activity, respondents were asked a series of questions relating to length of time in the export market, methods of entering the export market, their firm's export intensity (exports as a percentage of sales), absolute changes in export sales, number of export markets (time series analysis), and whether they believed exporting had made their firm more innovative.

In terms of innovation activity, respondents were asked about their use of the industry's research and analytical services, new product development and production processes, extension of product range, sources of competitive advantage, collaboration with other firms, relative marketing costs, and employee training.

The survey was conducted in the form of individual phone interviews. One hundred interviews were conducted in total. A stratified, randomised method was used. The survey included 50 respondents from an 'innovative' cluster (the South Australian wine industry), and a further 50 respondents equally divided between two significantly less developed clusters still situated within major wine regions (New South Wales and Victoria). Respondents were also chosen to provide relatively equal representation across category of firm size within the micro/SME band. Only micro firms and SMEs were surveyed, as large firms within the Australian wine industry account for a significantly disproportionate share of resources, innovation

and export activity. Size of firm in the wine industry is usually determined by tonnes crushed and this was the measure used for this study.

The Australian Context

Like most wine industries of the New World, the Australian wine industry had rather inauspicious beginnings. Wine grapes were introduced to the new colony under Governor Phillip in the 1790s, with first plantations in western Sydney, New South Wales. By 1795 the first vineyard had produced 410 litres of wine.[14] For the next half-century plantings were sporadic and short-lived, until a new immigrant, James Busby, undertook serious plantings in the Hunter Valley. Plantings in Victoria, South Australia and Western Australia soon followed and the Australian wine landscape began its slow and often troubled evolution. In the latter half of the nineteenth century the industry was beset by a number of major problems, the main one being the lack of any real domestic market. Compounding this was an apparent inability to access international markets due to Australia's reputation as a 'backwater colony' and the lack of recognition accorded to our wines.[15] It was not until federation in 1901 that Australian wine makers looked forward with any degree of optimism. With this federation came the removal of the debilitating trade barriers between states. Wine, at last, appeared to be a viable commodity. Until the early 1980s, however, Australia was still seen by much of the world as a bulk wine supplier, with little sophistication and only bland products to offer. The proliferation of vineyards in the 1980s and 1990s and the renewed focus on international markets with the requisite demand for quality at last brought fundamental changes to the way wine was grown, made and marketed.[16]

Today, the Australian wine industry is at the forefront of a changing international wine landscape. It is one of the 'upstart' New World participants that have sacrificed tradition for innovation and growth. As a result, it has transformed itself from a cottage industry to a leading exporter, ranked fourth internationally in 2003/04, with sales of $2.39 billion.[17] The industry has approximately 1,800 wineries, with 157,000 hectares under vine, and crushes 1.86 million tonnes a year.[18] The growth has indeed been impressive.

These figures, however, tend to mask the uneven distribution of resources, research infrastructure and wine output throughout the industry. Of those 1,800 wineries, the 12 largest account for over 90% of production, with the top four

Table 1. Number of wine producers by tonnes crushed, by state

Tonnes	NSW/ACT	VIC	QLD	SA	WA	TAS	Total
<20	101	204	46	112	66	53	582
20–99	157	195	42	143	114	21	667
100–449	79	76	11	88	57	6	317
500–999	17	11	0	29	14	1	72
1,000–2,499	9	9	1	12	12	2	42
2,500–4,999	10	12	0	14	4	0	40
5,000–9,999	5	5	0	14	0	0	22
>10,000	14	9	0	19	1	0	43
Unknown	4	0	1	1	1	0	7
Total	**392**	**521**	**101**	**432**	**269**	**83**	**1,798**

accounting for 66%. Almost 70% of wineries crush less than 100 tonnes annually. In terms of exports, the top 20 exporters account for approximately 94% (see Table 1).[19]

Of the 14 national industry associations, including regulators, national supplier groups, export councils, federations and research bodies, all are in the South Australian wine cluster. Funding and intermediary agencies are also located there, as are the national training and education bodies. While South Australia is home to only 24% of the country's wineries, it accounts for 49% of production and 60% of the nation's exports.[20] More than this, however, the South Australian cluster epitomises the innovative model. It has successfully integrated the core ingredients of

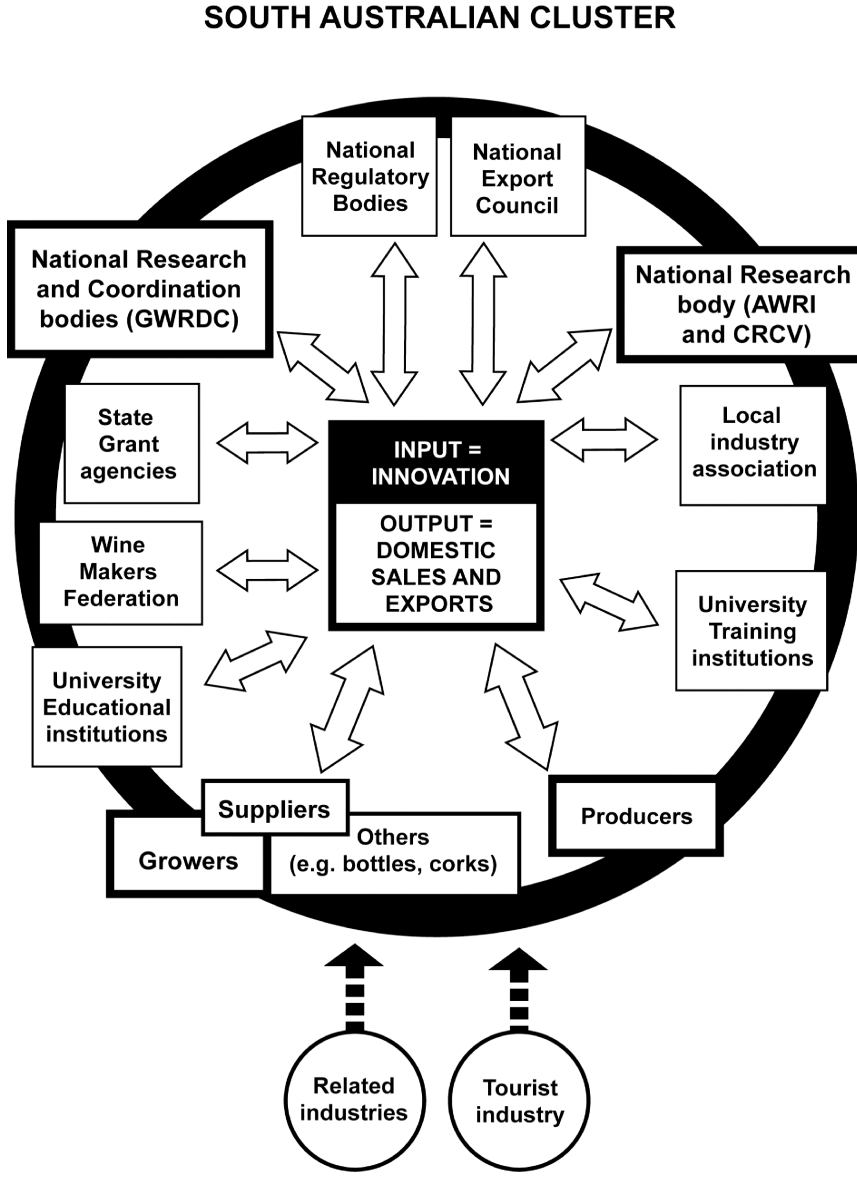

Figure 1. The South Australian 'innovative' wine cluster.

viticulture, oenology and the organisational and marketing requirements into a highly evolved mix of innovation and export activity. This is what sets it apart. The apparent two-way articulation between innovation and export is refined to a degree that one appears to a large extent to feed into the other.[21]

The situation is captured perfectly by Saimee, Walters and DuBois, who draw attention to the intimate relationship between innovation and export activity among leading-edge firms.[22] They argue that this relationship is so interdependent that firm-initiated exporting must be viewed as a core innovative measure.

This paper's findings will demonstrate a clear disparity between the innovative cluster of South Australia and the substantially less developed clusters of Victoria

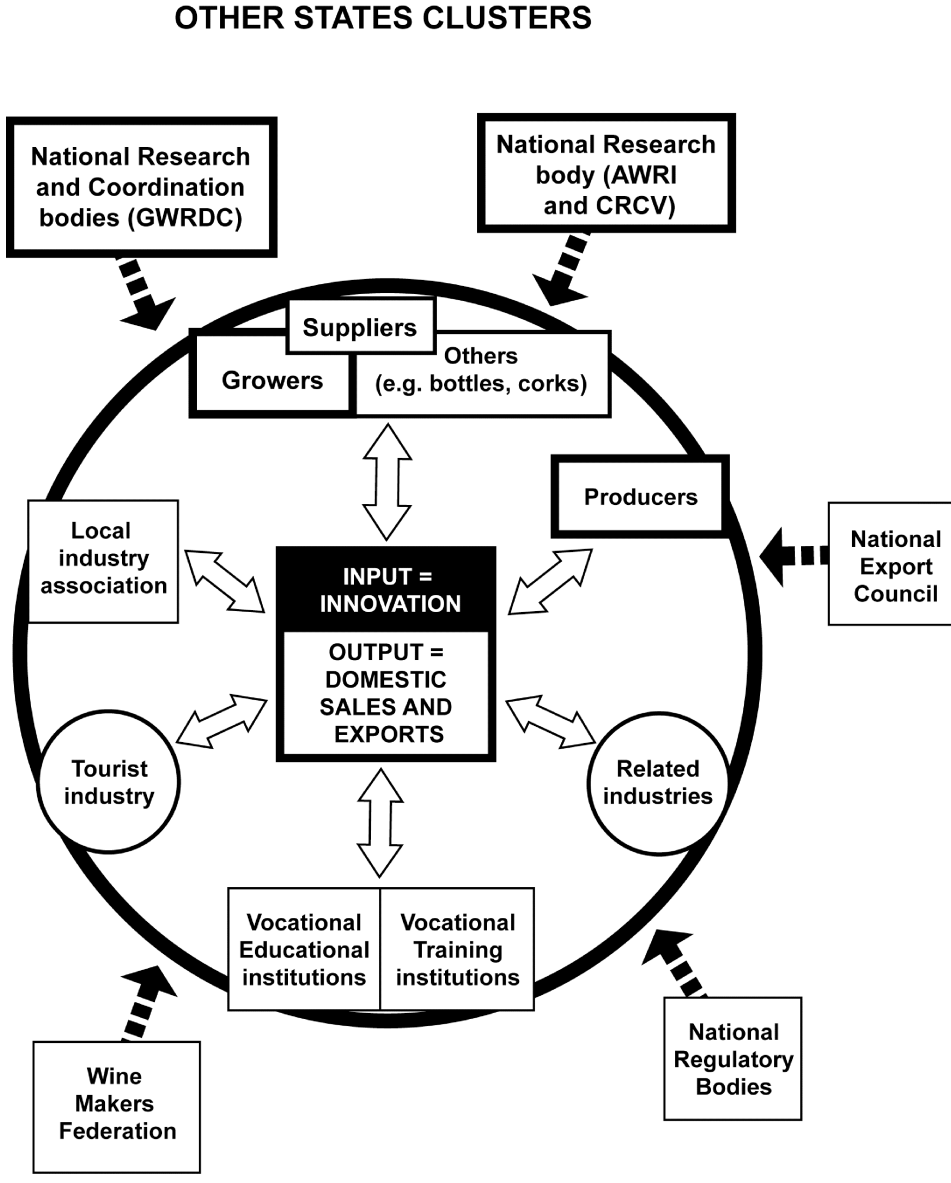

Figure 2. The 'organised' wine clusters of Victoria and NSW.

and New South Wales by assessing and comparing core export and innovation indicators.

The diagrams below represent the author's impression of these two different cluster models. Figure 1 represents the South Australian 'innovative' cluster, which, as the diagram shows, is highly inclusive, has numerous actors at a national and state level, has a high degree of integration and draws heavily upon the industry's research bodies. As a result, both inputs and outputs are closely interdependent and occur at high levels.

Figure 2 represents the less developed 'organised' clusters of Victoria and New South Wales. While the diagram illustrates the same type of activity occurring, it is less intense, less integrated, involves fewer actors and is not as inclusive. A number of the industry bodies have only external influence on the cluster and thus, their impact is significantly reduced. In addition to the reduced intensity of interaction, the core education and training providers are vocational in nature, rather than operating within the higher education sector. As a result of the above factors, inputs and outputs are occurring at a lower level.

Findings

In the Australian wine industry in the year 2003/04, approximately 50% of wine firms exported. Furthermore, in the period 1993/4 to 2003/04 there was a 402% increase in the number of firms exporting. This compared with an increase of only 143% in the actual number of firms established.[23] These figures place the wine industry substantially ahead of any other Australian industry sector in terms of export activity.[24] As stated above, however, the activity is by no means evenly distributed. If we look at the percentage of firms exporting by state over a 10-year period (Table 2), we see a rather different picture.

Export Activity

There is also a marked difference within the study's three sample states—South Australia, Victoria and New South Wales. While Victoria and New South Wales show approximately the same levels of export activity, with 40.3% and 45.3% of firms exporting, the innovative South Australian cluster has 77.3% of firms involved in exporting. The differences are reinforced when assessing *export intensity* (exports as percentage of sales), which is often cited as the core criterion of an entrenched export culture.[25] Respondents in Victoria and New South Wales claimed that export sales averaged 27% of total sales for 2003 while in South Australia respondents' export sales averaged 41% of total sales.

Table 2. Percentage of each state's firms that export 1993/4–2003/04

Year	ACT	NSW	VIC	QLD	SA	WA	TAS
1993	0%	20.2%	21.5%	4.7%	36.5%	22.8%	26.4%
1998	20%	31.3%	27.8%	13.1%	57.0%	31.2%	12.5%
2004	0%	40.3%	45.3%	11.9%	77.3%	56.1%	33.7%

Note: ACT's figures are based on very small numbers and so are not statistically relevant.
Source: Wintetiles, Directory 2004 and Aylward.

While all industry sectors, including the wine industry, suffer from sporadic export activity, primarily among their micro and SME firms, this phenomenon is less prevalent within the study's innovative cluster. Of those firms surveyed, an average 50% of Victorian and New South Wales firms claimed that exports had increased as a percentage of total sales over the past three years. This compared with more than 66% of respondents within the South Australian cluster. Only 32% of Victorian/New South Wales firms claimed that absolute exports had risen in this period, compared to 78% of South Australian firms. Even more significantly, of the firms whose exports did increase, Victorian/New South Wales firms claimed their exports had risen over the three years by an average of 44%. For the innovative cluster respondents, this figure was 96.4%, or more than double the growth of those in the non-innovative clusters. Such figures help to demonstrate the apparent ability of firms within both innovative and non-innovative clusters to increase exports over time. They also highlight the higher levels of export sustainability within the innovative cluster.

Growth and sustainability of exports within an innovative wine cluster are certainly not confined to larger firms. The survey was conducted only among micro and SME firms. Additional data from the *Australian and New Zealand Wine Industry Directory* also highlights the fact that the highest growth (646%) in firm establishment within South Australia over the past decade was within the micro firm category.[26] This is traditionally the least export-intensive sector, yet in South Australia it is not the case. As data from the author's previous research shows, the national average (excluding South Australia) of exporters within the micro firm category is 12%. Yet in South Australia's innovative cluster it is 42%, or 3.5 times the average.[27]

Another key indicator of export drive and sustainability is the extensiveness of a firm's export markets. Respondents were asked about the number of international markets they exported to in 2003. Again those firms in the less developed clusters of Victoria/New South Wales trailed those in South Australia, with an average of 5.5 markets per firm compared to 7.96 markets per firm. Wine industry directory data reinforce this trend. Looking at all wine firms in the decade from 1993/4 to 2003/04, South Australian firms increased their number of export markets by 132%, from an average of 3.3 markets per firm in 1993 to an average of 7.66 by 2004. By contrast, Victoria/New South Wales increased their export markets by 68.5%, from a combined average of 3.05 markets to 5.15 markets in 2003/04 (see Table 3).[28]

Table 4 provides a brief summary of the export indicators surveyed for each cluster type.

Associating Export and Innovation

The above data clearly show that firms within South Australia's innovative cluster demonstrate a substantial lead over their Victorian and New South Wales counterparts in each of the export indicators. The firms export more, have more

Table 3. Growth in the average number of export markets per firm, by state

Year	ACT	NSW	VIC	QLD	SA	WA	TAS
1993	0	3.2	2.9	1	3.3	3	1.3
2004	0	5.44	4.86	2.25	7.66	5.93	1.43
% Growth	0%	70%	67%	125%	132%	97%	10%

Table 4. Summary of export indicators for the two cluster types

Cluster type	% firms that export	Exports as % of sales	Firms with increase in exports	No. with increase in absolute exports	Average % by which exports have risen	Average number export markets	% increase in number of export markets
SA	77.3	41	66	78	96.4	7.96	132
VIC/NSW	42.8	27	50	32	44	5.5	68.5

markets to which they export, are increasing their exports at a faster rate and are more export intensive. In the words of Tim Harcourt, Chief Economist at the Australian Trade Commission, 'exports and innovation are linked … innovation creates exports, which in turn assists innovation'.[29] Or, as Roper and Love state, 'Product innovation, however measured, has a strong effect on the probability and propensity to export … being innovative is positively linked to export probability'.[30]

These statements appear to be substantiated by the study's survey respondents. An average of 41.6% of Victorian/New South Wales respondents believe that exporting has made their firm more innovative. This compared with 66% of South Australian firms. The reasons behind these responses were just as interesting and included:

- marketing exposure;
- packaging;
- production flexibility;
- product quality;
- branding;
- labelling;
- varietal experimentation and development;
- market specific designs;
- efficiency documentation;
- collaboration;
- quality testing.

Indicators of Innovation

This issue was followed by questions focused on a selected number of core innovation indicators, which may be correlated with those for export. Firstly, respondents were asked about their use of the wine industry's research and analytical services. Specifically, this included the Australian Wine Research Institute (AWRI), the Cooperative Research Centre for Viticulture (CRCV) and, to some extent, the Grape and Wine Research and Development Corporation (GWRDC) for more generic information. The AWRI carries out the vast majority of research within the industry. It also provides specialist contract services to all firms across the range of oenological, viticulture and knowledge transfer requirements. Within the wine industry, use of the industry's research services is strongly encouraged, made readily available and considered a central indicator of innovative activity.

Research Services

Responses on the use of research services proved interesting. Indicatively, more than twice as many South Australian firms use the industry's research services than do those from Victoria and New South Wales (68% versus 32%). These results served to substantiate the reputation of innovative clusters in general and the South Australian wine cluster in particular. Given that the Australian Wine Research Institute, the CRCV and the GWRDC are all located within the South Australian cluster, it is understandable that firms in this cluster have much higher levels of research opportunity and participation than their Victorian and New South Wales counterparts. As the author has argued previously, these three research bodies, together with their attendant education and training bodies, have created a research 'epicentre'. Although having a mandate to disseminate knowledge industry-wide, inevitably the vast majority of firms serviced by these institutions are co-located.[31] Firms operating outside the South Australian cluster, and particularly SMEs, can only access the industry's research base through limited and sometimes sporadic regional extension programmes.

Collaborative Activity

Reinforcing this 'cultural divide' between clusters were responses to another core indicator of innovation. When respondents were questioned about their collaboration with other wine firms for the purposes of marketing, research or other 'innovative activities', 44% of Victorian/New South Wales firms responded that they had been involved in such collaboration over the past three years. This compared with 64% from within South Australia's innovative cluster. Apparently, firms within the innovative cluster not only utilise the industry's research services more, but also more often partner other firms in the use of that research. This, of course, is part of a highly evolved cluster's self-sustaining momentum. Borrowing from Dobkins, such 'spill-over' between co-located firms involved in collaborative activities also leads to improved export performance. It appears that the more concentrated the co-location and innovation 'spill-over', the higher the export activity and intensity.[32]

Other Indicators

The study also used a grouping of complimentary innovation measures, comprising 'new product development', 'improvement to production processes', 'education levels' and 'training methods'. 'New product development' related primarily to a new bottled product, new variety or blend but also included clone development. 'Improvement to production processes' is a broad indicator and drew varied responses from those interviewed. These ranged from soft-equipment improvements, to temperature controls, testing mechanisms, climate controls, harvesting, packaging, vertical integration, canopy management, irrigation and rootstock development. An interesting example of this indicator was the 'virgin wine' procedure of a South Australian firm, where no pressing was involved. The 'pressing' process simply relied on the grapes' own weight, involving large quantities of grape for low quantity, but high quality juice.

The education indicators differentiated between 'no education', 'technical institution education' and 'tertiary (university) education'. On the issue of training,

respondents were asked a series of questions relating to 'in-house training', 'external provision of training' and 'employment of skilled workers'. Again South Australian firms recorded higher ratings in all these indicators, although the degree of leadership varied. Disparity between South Australian and Victorian/New South Wales firms ranged between only 4% (negligible) on 'new product development' through to approximately 20% on some of the training indicators, including in-house training and the contracting of skilled employees.

It is difficult to assess this variation at face value, as a number of the indicators are multi-faceted and involve innovation at different levels and stages and in different ways. For example, 'production process improvements' were interpreted by the majority of South Australian firms as improvements to the actual wine-making process, which involved new machinery, upgraded temperature and hygiene controls, crushers, destemers and maceration procedures. In a large proportion of Victorian/New South Wales firms, however, the indicator was interpreted more broadly. For example, many included testing procedures, replacement of barrels and vineyard software management. Such indicators may be considered peripheral to those cited by South Australian firms.

Competitive Advantage

Finally, respondents were asked to cite what they believed were their firm's key sources of 'competitive advantage' outside export. As shown in Table 5, 'product differentiation' was the most highly cited factor and was equally cited by both the innovative cluster firms (South Australian) and those in the Victorian/New South Wales clusters. 'Branding' was the next key indicator cited. Some 40% of innovative cluster firms believed 'branding' provided a critical edge to their competitive advantage, as opposed to an average 32% from Victoria and New South Wales. 'Marketing innovation' provided a significant disparity, with 34% of South Australian firms believing it increased their competitiveness compared with just 18% of Victorian/New South Wales firms. Probably the most critical indicator cited was that of 'technical innovation'. Only 8% of Victorian/New South Wales firms believed this was key to their 'competitive advantage'. This compared to 22% of firms within the innovative South Australian cluster.

Cluster Performance

Although imprecise, as a 'package' of innovation indicators, those measures grouped under the headings of 'other indicators' and 'competitive advantage' in the previous sections serve to confirm the clear leadership shown by South

Table 5. Responses to competitiveness indicators

Indicator	SA firms	VIC/NSW firms
Technical innovation	22%	8%
Product differentiation	54%	54%
Marketing innovation	34%	18%
Price Competitiveness	32%	32%
Branding	40%	32%

Australian firms in terms of collaboration and participation in industry research services. They also help to confirm the 'gap' in levels of innovative activity between firms within the innovative cluster and those within less developed clusters. In fact, the cluster influence becomes very apparent.

When respondents were asked about their products' domestic market share over the past two years, 76% of South Australian firms stated that it had increased. This compared with 58% of Victorian/New South Wales respondents citing an increase. Reasons provided for this increase also varied between cluster types. In the South Australian cluster, primary reasons included marketing, new initiatives, labelling and packaging, targeting specific markets, upgrading product quality and increasing varieties. Most of these link in with the core indicators selected for the survey and have a focus on product and process quality. In the Victorian/New South Wales clusters, although firms also focused on marketing and branding in order to increase market share, the majority attributed their success to new distribution channels and tourism-oriented activities. These are indeed innovative mechanisms, but not the core innovations preferred within the South Australian cluster. Again, the measurements are not precise, but they *are* strongly indicative of the 'cultures' within the different clusters.

From the range of innovative and export measures cited, it appears that growth within South Australia's innovative cluster is not confined to either export or domestic markets. One is not being sacrificed in favour of the other, but rather, growth is occurring within both these markets simultaneously and at a more rapid rate than within the less developed clusters. Historical data suggest that it is also a more sustainable growth. This is probably one of the more important findings, as it helps to illustrate tangible outcomes from the collection of indicators surveyed. In addition, it helps to demonstrate that firm growth and development is a key aspect of wine clusters and the more developed a cluster is, the more sustainable growth becomes. Innovation and export activities appear to be not only more closely aligned within developed wine clusters, but also underpin market advancement on the domestic front.

Siamee *et al.* point out that exporting *is* an innovative behaviour. So it appears, however, is operating within highly developed wine clusters. Porter states that clusters tend to 'drive the direction and pace of innovation'. As clusters mature and develop, this pace increases.[33] The innovative climate within the cluster becomes increasingly entrenched and translates more effectively into retailing in general, exporting in particular and, above all, 'competitive advantage'.

Concluding Remarks

As if to confirm the above argument, recent news from Britain highlights the fact that in a list of the top 100 Australian wines compiled by leading European wine writer, Matthew Jukes, South Australian brands account for half.[34] This was further reinforced by another news item from the same paper, detailing the intended transfer of production facilities of one of the world's larger wine firms—Foster's—from Victoria to the Barossa Valley in South Australia, once again demonstrating the innovative cluster's ability to attract and concentrate resources.[35]

However, by no means should the Victorian and New South Wales wine clusters be undervalued. In terms of the Australian wine industry, clusters within Victoria and New South Wales, as well as Western Australia, must be regarded as significant and to be on growth trajectories. Each of these clusters has demonstrated

substantial growth and concentration over the past two decades. Furthermore, and particularly in the case of Western Australia, each cluster appears to be progressing towards higher levels of public and private sector integration. Industry programmes and local industry associations are complementing growers, producers, suppliers, and marketers in the value-adding process. Education and training are also commanding greater attention and occupying a more central role within each cluster. Export intensity is increasing, as is regional recognition. The GWRDC has played a critical role in this development and each of these clusters now has the potential to evolve into the highly innovative model. Yet currently, according to Mytelka's model, they could only be described as the less developed 'organised' cluster.

An aim of the paper was to compare the two-way articulation between export and innovation within this cluster type and that of the South Australian innovative cluster. Indicative results highlighted throughout the paper indeed reflect the apparent advantages of co-location. The more intense that co-location and the more highly evolved the integration of supply chains, advisory and regulatory bodies, education, training and research bodies and the growers and wine-makers themselves, the more visible the advantages.

Since the GWRDC was established in 1991, one of its critical roles has been to ensure that research and development underpin a viable and growth-oriented export market.[36] South Australia's innovative cluster is their template and the industry's benchmark. Other wine clusters have yet to fully embrace this template, but as the Australian wine industry continues to target international markets, demand will require higher levels of integration within these clusters.

Finally, the paper has attempted to demonstrate two major themes. It has embedded distinct cluster examples from the Australian wine industry within Mytelka's model of 'innovative' and 'organised' (less innovative) clusters. It has shown, through empirical data, that this model also has practical applications, particularly so with regard to clusters of geographic proximity or intense 'co-location' of actors.

In addition, the paper has attempted to demonstrate Porter's theory of 'competitive advantage'. By drawing on these distinct wine cluster types, the author was able to underline differences in cluster activity, productivity and integration, showing the association between cluster intensity and export/innovation performance.

Notes and References

1. M. Porter, C. H. M. Ketels, K. Miller and R. Bryden, *Competitiveness in Rural US Regions: Learning and Research Agenda*, Harvard Business School, MA, 2004, pp. 4, 44.
2. *Ibid*, pp. 4, 44.
3. L. Mytelka and H. Goertzen, 'Innovation and identity: the emergence of a wine cluster in the Niagara Peninsula', *Innovation Systems Research Network Conference*, National Research Council, Canada, 2003, pp. 1, 2, 3, 6.
4. J. M. Redman, *Understanding State Economies Through Industry Studies*, Council of Governors' Policy Advisors, Washington, DC, 1994; S. Rosenfeld, *Industrial Strength Strategies: Regional Business Clusters and Public Policy*, Aspen Institute, Washington, DC, 1995; L. H. Dobkins, 'Location, innovation and trade: the role of localization and nation-based externalities', *Regional Science and Urban Economics*, 26, 1996, pp. 591–612.
5. E. J. Feser and E. M. Bergman, 'National industry cluster templates: a framework for applied regional cluster analysis', *Regional Studies*, 34, 1, 2000, pp. 4–6.

6. L. Mytelka and F. Farinelli, 'Local clusters, innovation systems and sustained competitiveness', *Discussion Paper Series*, The United Nations University, Institute for New Technologies, 2000, pp. 11, 12–4.
7. R. Johnstone, *Clusters: A Review*, Department of Education, Science and Technology (DEST), Canberra, March 2003, p. 9.
8. Mytelka and Farinelli, *op. cit.*, pp. 12–4; Porter *et al.*, *op. cit.*, p. 44.
9. A. Hodgkinson, R. Iredale, P. McPhee, P. Vipraio and D. Aylward, *Internationalisation, Information Flows and Networking in Rural and Regional Firms: Final Report to the Australian Research Council*, Human Resource Centre, Wollongong, 2003, pp. 70–87.
10. Hodgkinson *et al.*, *op. cit.*; Mytelka and Farinelli, *op. cit.*
11. Porter *et al.*, *op. cit.*, pp. 4, 44, 45.
12. M. Porter, 'Clusters and the new economics of competition', *Harvard Business Review*, 76, 6, 1998, pp. 77–90.
13. Porter *et al.*, *op. cit.*
14. J. Beeston, *A Concise History of Australian Wine*, Allen & Unwin, London, 1994, pp. 4, 135, 233.
15. G. Walsh, 'The wine industry of Australia 1788–1979', *Wine Talk*, ANU Canberra, 1979, pp. 1–10.
16. Beeston, *op. cit.*, pp. 135, 136, 232–5.
17. Winetitles, *The Australian and New Zealand Wine Industry Directory*, Winetitles, Adelaide, 2004, pp. 1–17.
18. *Ibid.*, pp. 5, 6, 8; Winemakers Federation of Australia, website, http://www.winetitles.com.au/awol/, 2004.
19. Winetitles, *op. cit.*, pp. 13, 14, 17.
20. *Ibid*, pp. 13, 14, 17; South Australia bizfacts, website, http://www.cibm.sa.gov.au/tools/bizfact.shtml, 2004.
21. D. Aylward, 'Diffusion of R&D within the Australian wine industry', *Prometheus*, 20, 4, 2002, pp. 351–66; D. Aylward, 'Mapping Australia's wine exports', *Wine Industry Journal*, 18, 6, 2003, pp. 68–72; T. Harcourt, Speech, Australian Trade Commission, Sydney, 2003, p. 1.
22. S. Saimee, P. G. P. Walters and F. L. DuBois, 'Exporting as an innovative behaviour: an empirical investigation', *International Marketing Review*, 10, 3, 1993, pp. 1–5.
23. D. Aylward, 'Wine clusters equal export success', *The Australian and New Zealand Grapegrower and Winemaker*, August 2004, pp. 105–7; Winetitles, *op. cit.*
24. Australian Bureau of Statistics, *A Portrait of Australian Exporters*, Canberra, 2000, p. 5.
25. Hodgkinson *et al.*, *op. cit.*, pp. 70–87.
26. Aylward, 2004, *op. cit.*, pp. 106–7.
27. Aylward, 2003, *op. cit.*, pp. 70–2.
28. Winetitles, *op. cit.*, p. 95; Aylward, 2004, *op. cit.*, pp. 81–7.
29. Harcourt, *op. cit.*, p. 1.
30. S. Roper and J. Love, 'Innovation and export performance: evidence from the UK and German manufacturing plants', *Research Policy*, 31, 2002, p. 1087.
31. D. Aylward and T. Turpin, 'New wine in old bottles: a case study of innovation territories in "New World" wine production', *International Journal of Innovation Management*, 7, 4, 2003, pp. 501–25; Aylward, 2002, *op. cit.*, pp. 360–66.
32. Aylward, 2002, *op. cit.*; Aylward and Turpin, *op. cit.*, pp. 520–5.
33. Porter, *op. cit.*, pp. 85–90.
34. 'Top tipples to lift our British sales', *The Advertiser* (South Australian newspaper), 31 May 2004.
35. *Ibid.*
36. Grape and Wine Research and Development Corporation, *Five Year Research and Development Plan 2002–2007*, Adelaide, 2002, http://www.gwrdc.com.au/.