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SME innovation within the Australian wine industry: A cluster analysis

David Aylward

University of Wollongong, daylward@uow.edu.au

John Glynn

University of Wollongong, jglynn@uow.edu.au

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Abstract

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Keywords

SMEs, clusters, innovation, regional, wine industry

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SME Innovation within the Australian Wine Industry:

A Cluster Analysis

David Aylward, University of Wollongong, NSW, Australia

John Glynn, University of Wollongong, NSW, Australia

ABSTRACT

This paper assesses core innovation activity among SMEs within different levels of cluster development. The aim of the paper, using empirical data from the Australian wine industry, is to demonstrate that innovation levels and activity intensify as an industry cluster develops.

By dividing wine clusters into 'innovative' (highly developed) and 'organised' (less developed) models, the paper uses selected core indicators of innovation activity to explore levels of integration within each model. This integration is examined in the context of Porter's theory of 'competitive advantage', with implications for SMEs in particular, and lessons for industry clusters in general.

INTRODUCTION

The potential for industrial clusters to create 'competitive advantage' has become an issue of growing discussion over recent years. As a result 'cluster analysis' is now a reputable area of investigation within modern innovation theory. Such 'analysis' includes studies on natural, resource-driven clusters, designed, government-sponsored clusters, regional knowledge clusters, competition and cooperation within industry concentrations, and the 'competitive advantage' of industry clusters.

Porter et al. (2004, pp.4, 44) describe clusters as:

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

What is often so effective in generating an innovative environment is the interaction between these public and private sector 'actors'. As the environment becomes more interactive, it tends to attract more actors from an increasing range of related industry sectors. The level of value-adding continues to grow, both competition and cooperation within the cluster are further elevated, and the cluster tends to create self-sustaining momentum (Porter et al., 2004, pp.4, 44). In terms of innovation system theory, Mytelka and Goertzen (2003, pp.1-3, 6) point out that the intense interaction within such clusters 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.

Redman (1994), Rosenfeld (1995) and Dobkins (1996), among others, 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. Others have since taken the definition further, arguing that a geographic proximity of actors is not necessarily a factor in the development of clusters (see, for example, Feser and Bergman, 2000). Mytelka and Farinelli (2000, pp.11-14) point out, however, that the industry sector usually determines whether or not geographic proximity is a core criterion. They argue that specific cluster 'types' are suited to specific industry 'types' as well as specific economies.

CLUSTER MODELS

The range of cluster types and sub-types within modern cluster theory 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 (2002, p.9) 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.

Moving beyond these sub-types, Mytelka and Farinelli (2000, pp.12-14) draw 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.

In its assessment of implications for SMEs, this paper will focus on the first type – spontaneous clusters. Mytelka and Farinelli (2000) divide spontaneous clusters into three useful categories: Informal, Organized and Innovative. Based on a matrix of innovation measures, each cluster type is rated, with ‘informal clusters’ representing what Porter et al. (2004, p.44) would classify as the least ‘evolved’ through to ‘innovative clusters’ as representative of the highest level of development.

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 traditionally low, exports are non-existent or sporadic, but competition between firms is high (Hodgkinson et al., 2003). In ‘organized clusters’, which in Australia may be found in niche industry sectors, including marine manufacturing and equipment and the micro electronic industry, as well as a number of regional wine industries, innovation measures tend to be higher. Firms are predominantly small and medium enterprises (SMEs), with a growing level of innovative activity, some links to public sector bodies and research facilities, and relatively high levels of exports with developed markets (Hodgkinson et al, 2003; Mytelka and Farinelli, 2000).

The most advanced type of cluster formation is represented by ‘innovative clusters’. While 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, linkage levels are medium to high, exports are high, but another core criterion – cooperation -- is poor. One of the clearest examples of ‘innovative clusters’, however, can be found in the Australian wine industry. As this paper will demonstrate, the South Australian wine industry neatly represents Mytelka and Farinelli’s model in fulfilling all major indicators.

Wine Industry Clusters

Wine is one of the world's oldest commodities. However, the systemic organization, infrastructure, packaging and marketing of this commodity are far more recent. Wine has been referred to as an 'industry' only within the past 20 years. Yet now, 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 et al. (2004, pp.4, 44-5) refers to as 'pre-existing local circumstances'.

A desire to export has been critical to 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 organization. In servicing international markets, New World firms quickly realized 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.

Without exception these clusters have followed the model of geographic proximity emphasized by Redman and, to some extent, that of Rosenfeld. Unlike the electronics industry, communications or IT, the wine sector is a natural resource-based industry that is focused around what Mytelka and Goertzen (2003) refer to as 'site-specific characteristics'. Wine clusters will vary in development, intensity, connectedness and therefore effectiveness. The least developed will include a loosely knit group of largely SME firms with some associated suppliers, perhaps local industry associations, some related agricultural firms, technical education providers and the growers themselves. Contrasting sharply with this model is the highly evolved cluster, which displays a significantly different business and organizational culture. There is a high degree of vertical integration with suppliers, wine makers, growers, marketers, numerous related industries, and the national research, funding, regulatory, education and infrastructure bodies helping to provide the framework within which these firms compete and cooperate so effectively (Porter 1998).

The Californian wine cluster has attracted considerable attention from Porter and Bond. In other studies, Mytelka and Goertzen (2003) have focused on the Niagara wine cluster, and Visser and Langen (2003)

have selected the Chilean wine cluster for analysis. These clusters are at very different stages of evolution. California is highly developed. It has the associated fertilizer, grape harvesting, irrigation, barrel, cork, bottle and wine-making equipment firms. There are strong linkages with state government agencies, regulatory bodies, marketing agencies and research institutes, and it has the associated tourism and food clusters (Porter et al., 2004). As with wine clusters in South Africa, New Zealand (with the exception of Marlborough) and Argentina, Chile and Niagara are far less evolved and could only be classified as 'informal' or 'organized'.

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 summarized above to SMEs in the Australian wine industry; and
- Demonstrating, with empirical data, the link between cluster development and innovative activity.

RESEARCH METHODS

This paper is empirically based, with a survey designed around selected innovation 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.

SME respondents were asked a series of questions related to 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, employee training and exports.

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

THE AUSTRALIAN WINE INDUSTRY

The Australian wine industry, like most of the New World wine industries, had rather inauspicious beginnings. Wine grapes were introduced to the new colony under Governor Phillip in the 1790s, with the first plantations in western Sydney, New South Wales. By 1795 the first vineyard had produced 410 litres of wine (Beeston 1994, pp.4, 135, 233). For the next half-century plantings were sporadic 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 19th century the young 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 (Walsh, 1979). It was not until federation in 1901 that Australian wine-makers looked forward with any degree of optimism. With 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 (Beeston, 1994).

The Australian wine industry today is at the forefront of a changing international wine landscape having sacrificed tradition for innovation and growth. As a result, it has transformed itself from a cottage industry to a leading exporter, ranked 4th internationally in 2003/04, with sales of \$2.39 billion (Winetitles, 2004, pp.1-17). The industry now has 1800 wineries, with 157,000 hectares under vine, and crushes 1.86 million tonnes a year (Winetitles, 2004, pp.5, 6, 8; Winemakers Federation, 2004). The growth has indeed been impressive.

Masked within these figures, however, is an uneven distribution of resources, research infrastructure and wine output throughout the industry. Of those 1800 wineries, the twelve largest account for over 90% of production, with the top four 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% (Winetitles, 2004, pp.13, 14, 17).

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
1000-2499	9	9	1	12	12	2	42
2500-4999	10	12	0	14	4	0	40
5000-9999	5	5	0	14	0	0	22
>10000	14	9	0	19	1	0	43
Unknown	4	0	1	1	1	0	7
TOTAL	392	521	101	432	269	83	1798

Wine Cluster Disparity

The Australian wine industry has 14 national industry associations, including regulators, supplier groups, export councils, federations and research bodies. All of these 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 (Winetitles, 2004, pp.13, 14, 17; South Australian Bizfacts, 2004). More than this, however, the South Australian cluster epitomizes the innovative model. It has successfully integrated the core ingredients of viticulture, oenology and the organizational and marketing requirements into a highly evolved mix of innovation activity.

This paper's findings will demonstrate a clear disparity between the innovative cluster of South Australia and the substantially less developed clusters of Victoria and New South Wales by assessing and comparing core innovation indicators among SMEs.

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 1: The South Australian 'innovative' wine cluster

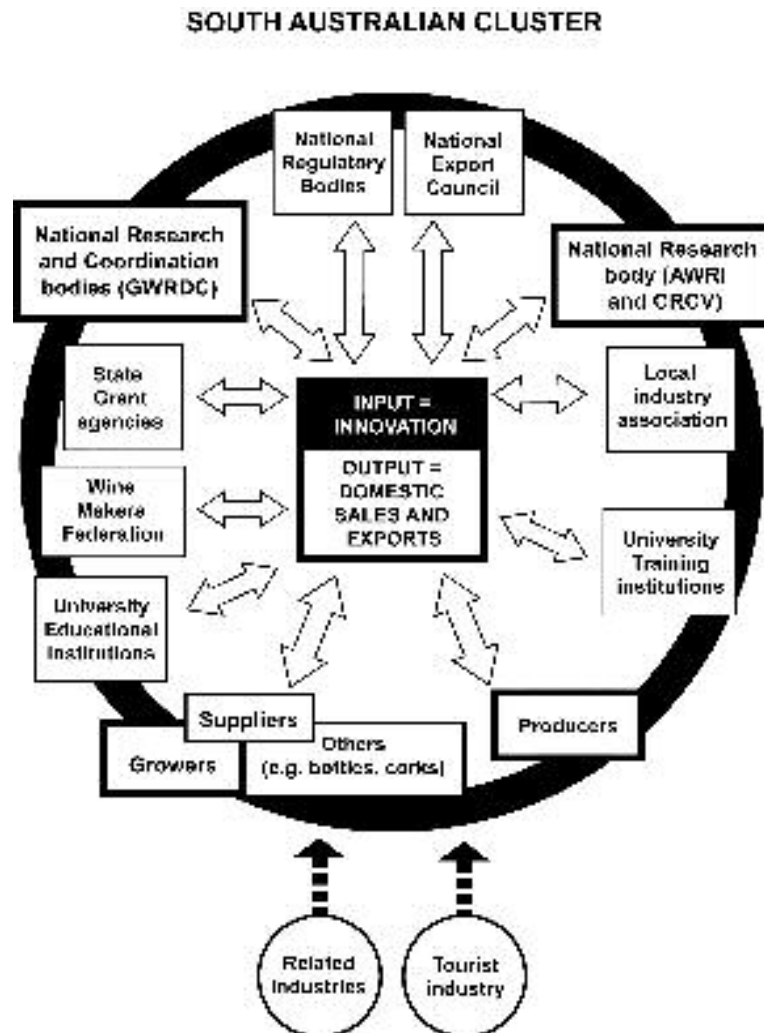
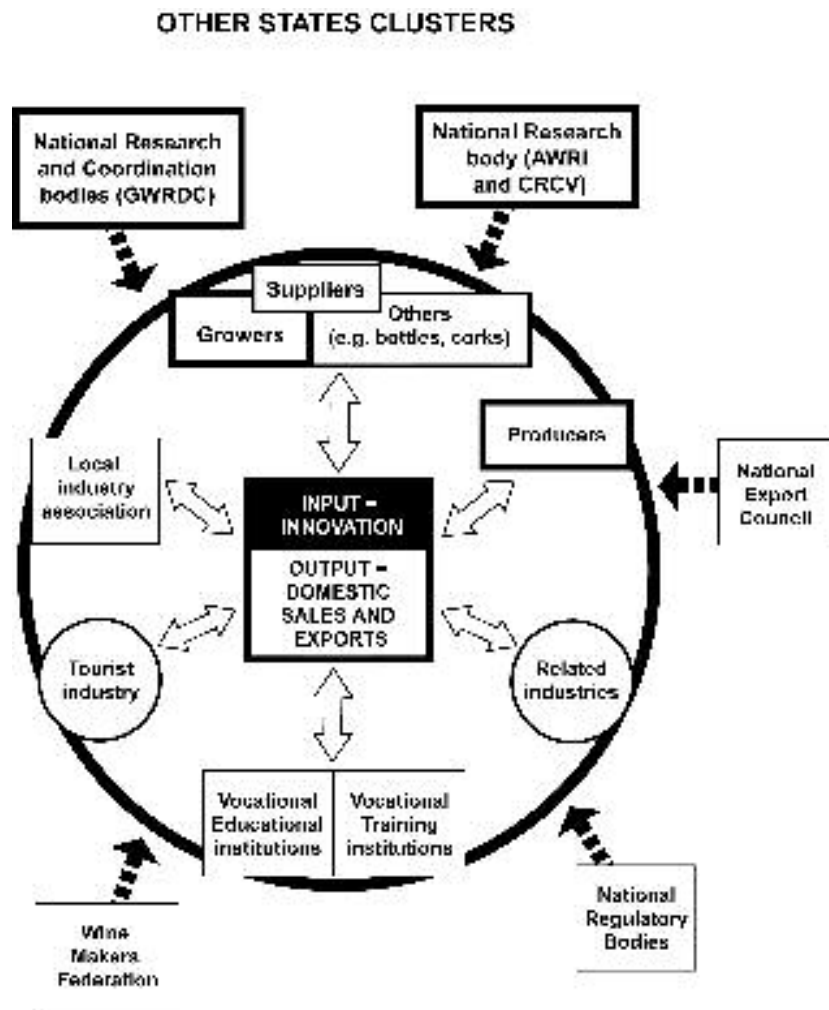


Figure 2 represents the less developed 'organized' clusters of Victoria and New South Wales. While the diagram illustrates the same type of activity occurring, it is less intense, involves fewer actors and is not as inclusive. A number of the industry bodies have only external influence on the cluster 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.

Figure 2: The ‘organized’ wine clusters of Victoria and NSW



FINDINGS

INDICATORS OF INNOVATION

Respondents were asked a series of questions focused on selected core innovation indicators. Firstly, they 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 (for a fee) and considered a central indicator of innovative activity.

Research Services

The use of research services drew interesting responses. Indicatively, more than twice as many South Australian SMEs use the industry's research services than do those from Victoria and New South Wales (68% versus 32%). 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 stated previously, these three research bodies, together with their associated education and training bodies, have created an R&D 'epicentre'. Although mandated to disseminate knowledge industry-wide, inevitably the vast majority of SMEs serviced by these institutions are co-located (Aylward and Turpin, 2003; Aylward, 2002). Firms operating outside the South Australian cluster, and particularly SMEs, are restricted to accessing the industry's research base through limited regional extension programs.

Firm Collaboration

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 SMEs 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, SMEs 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.

ASSOCIATED CORE INDICATORS

Also included in the study was a 'package' of associated core 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 SME, 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’.

South Australian SMEs again recorded higher ratings in all of the above indicators, although the degree of leadership varied. For example, South Australia’s leadership was less prominent for ‘new product development’ than was the case for the training indicators, including in-house training and the contracting of skilled employees. In terms of ‘production process improvement’, however, South Australian SMEs were clearly more innovative.

It should also be noted that 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 SMEs as improvements to the actual wine-making process, which involved new machinery, upgraded temperature and hygiene controls, crushers, destemmers and maceration procedures. In a large proportion of Victorian/New South Wales SMEs, 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 SMEs.

Competitive Advantage

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 SMEs (South Australian) and those in the Victorian/New South Wales clusters. ‘Branding’ was the next key indicator cited. 40% of innovative cluster SMEs 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 SMEs believing it increased their competitiveness compared with just 18% of Victorian/New South Wales SMEs. Perhaps the most critical indicator cited was that of ‘technical innovation’. Only 8% of Victorian/New South

Wales SMEs believed this was key to their 'competitive advantage'. This compared to 22% of SMEs within the innovative South Australian cluster.

Exports

The study's final core indicator of innovation is firm export activity. According to numerous innovation analysts, including Saimee, Walters and DuBois (1993), exporting is an innovative behaviour. Firms that export, and particularly those whose decision to export is internally initiated, demonstrate consistently higher levels of innovative activity. Further, there is demonstration of an intense two-way articulation between innovation and export activities within these firms (Saimee, Walters, DuBois, 1993, pp.1-4). As Tim Harcourt (2003, p.1) explains, 'exports and innovation are linked...innovation creates exports, which in turn assists innovation'. Because of the marketing, logistic, distribution, supply chain, branding and product requirements of the internationalization process, it is argued that exporting should be seen as a core innovative measure.

Therefore, respondents were asked a limited number of questions about their exporting activities, including export intensity (export sales as a percentage of total sales), number of export markets and absolute changes in export sales. These data were then reinforced with data from the Australian and New Zealand Wine Industry Directory 1994-2004.

Wine industry data suggest that while the South Australian cluster hosts only 24% of the nation's wineries and accounts for 49% of production, it exports 60% of the nation's wine. In addition, approximately 43% of firms in New South Wales and Victoria export, compared to over 77% of South Australian firms (Wine Industry Directory, 1994-2004). With regard to the extensiveness and sustainability of export markets within each cluster, Directory data suggests that firms in the South Australian cluster clearly outperform their New South Wales and Victorian counterparts. In the decade 1994 to 2004, South Australian firms increased their number of export markets by 132%, from an average of 3.3 markets per firm to 7.66 markets per firm. In the same period, New South Wales and Victorian firms on average, increased their number of markets by 68.5% from 3.05 markets per firm to 5.15 markets (Wine Industry Directory, 1994-2004).

A critical measure of performance used within more recent export literature, is that of export intensity. The study's respondents reinforced the above figures for the different cluster models. Victorian and New South Wales respondents claimed exports accounted for an average 27% of total sales for the year 2003. This

compared with South Australian respondents' claim of 41%. Approximately 50% of the New South Wales and Victorian SMEs claimed that this intensity had increased over the past three years, compared with more than 66% for South Australian SMEs. The viability of these figures is further substantiated by responses to movement in absolute exports for the surveyed firms. For the New South Wales and Victorian respondents, 32% claimed that absolute exports had also risen in this period, compared with 78% for the South Australian respondents. It is clear that exporting as an innovative activity is a feature of Australia's wine clusters. However, it appears to be one of the more critical elements of South Australia's innovative cluster.

Table 2: 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%

Cluster Culture

The above indicators help to confirm the 'gap' in levels of innovative activity between SMEs within the innovative cluster and those within less developed clusters. In fact, the cluster influence becomes very apparent.

This was reinforced when respondents were asked about their products' domestic market share over the past two years. Of the South Australian respondents surveyed, 76% stated that market share had increased. This compared with 58% of Victorian/New South Wales respondents citing an increase. Reasons provided for the 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. The measurements are not precise, but they *are* strongly indicative of the 'cultures' within the different cluster types.

From the range of innovative 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 (Wine Industry Directory, 1994-2004). 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.

Porter (1998) states that clusters tend to 'drive the direction and pace of innovation'. As clusters mature and develop, this pace increases. 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' (Porter 1998, pp.85-90).

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 (The Advertiser, 2004). 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 half (The Advertiser, 2004).

By no means, however, 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 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 programs 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 and Farinelli's (2000) model, they could only be described as the less developed 'organized' cluster.

The paper has attempted to demonstrate two major themes. It has embedded distinct cluster examples from the Australian wine industry within Mytelka and Farinelli's model of 'innovative' and 'organized' (less innovative) clusters. It has shown, through empirical data, that this model also has practical applications, particularly so with regard to SMEs.

In addition, the paper has attempted to demonstrate Porter's (1998) theory of 'competitive advantage'. By drawing on these distinct wine cluster types, the author was able to underline differences in cluster activity and integration, showing the association between cluster intensity and SMEs innovation performance.

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