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Abstract

This article applies the concept of 'innovation territories' to explain the recent export success of the Australian Wine Industry. Recent data collected from four 'New World' wine producing countries are contrasted in order to investigate 'innovation territories' that in the Australian context transcend geographic and policy boundaries. The international comparison shows that these territories can be mapped and their interaction compared. A major finding from the study is that one of the major contributors to Australia's success in gaining comparative advantage in this industry is the way local and national investments in R&D have transcended geographic and policy boundaries. Coordination driven by strong national policies is required to make this happen. This suggests that 'knowledge intensive clusters' driven by national policies can be turned to advantage for regional development. The present study serves to sketch out how the idea of innovation territories might be operationalised for the purpose of future industry policy research.

Keywords

Innovation territories, innovation policy, wine-industry, industry clusters

Disciplines

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**NEW WINE IN OLD BOTTLES: A CASE-STUDY OF
INNOVATION TERRITORIES IN 'NEW WORLD' WINE
PRODUCTION**

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Revised Version

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NEW WINE IN OLD BOTTLES: A CASE-STUDY OF INNOVATION TERRITORIES IN 'NEW WORLD' WINE PRODUCTION

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This article applies the concept of 'innovation territories' to explain the recent export success of the Australian Wine Industry. Recent data collected from four 'New World' wine producing countries are contrasted in order to investigate 'innovation territories' that in the Australian context transcend geographic and policy boundaries. The international comparison shows that these territories can be mapped and their interaction compared. A major finding from the study is that one of the major contributors to Australia's success in gaining comparative advantage in this industry is the way local and national investments in R&D have transcended geographic and policy boundaries. Coordination driven by strong national policies is required to make this happen. This suggests that 'knowledge intensive clusters' driven by national policies can be turned to advantage for regional development. The present study serves to sketch out how the idea of innovation territories might be operationalised for the purpose of future industry policy research.

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Introduction

The national systems of innovation (NSI) concept has been influential in steering the focus of national innovation policies through the 1990s. Much recent research into NSI has been directed toward refining the concept and defining the main features and their dynamics in comparative regions (Galli and Teubal, 1997). This has led to a focus on institutions and the mechanisms through which they collectively contribute to a national system of innovation. Edquist and Johnson (1997) have pushed this approach further by seeking to identify those institutions that are most important for innovation (Edquist and Johnson, 1997, p. 50). An important aspect of these refinements is the distinction between organisations that support the innovation process and institutions as forces that govern rules and behaviour through the process. While these conceptual refinements help to sharpen comparative system analyses they also lead to complications. For example, as Edquist and Johnson have observed there is a '...complicated two-way relationship of mutual embeddedness between institutions and firms' (Edquist and Johnson, 1997, p.60). This suggests a research agenda that should focus less on concerns about how institutions, as organisations, interact in the innovation system

and concentrates more on institutions in the broader sociological sense and the way they define rules and patterns of behaviour.

'Not much empirical knowledge exists on this ... Are institutions, in the sense of "things that pattern behavior", really that important for innovation? What do we know and what would we want to know about this? (Edquist and Johnson 1997, p. 60-61).

This article takes the NSI approach and these questions as a starting point but develops the concept of innovation 'territories' through which both organisations and rule governing institutions influence the flow of information, knowledge and ideas. Innovation is a social process that can be stimulated or inhibited by a wide array of industry practices and government policies. Our interest is in understanding how these practices and policies intersect to influence innovation in industry clusters that are widely dispersed across geographic space. The concept of innovation 'territories' offers an analytical approach that can draw out the policy management implications by comparing patterns of interaction between firms, industries, institutions, regulatory mechanisms, skills and technologies most of which are influenced by different policy domains and interventions. The innovation territories approach differs, but is complementary to cluster analyses. The latter seeks to reveal linkages, complementarities and interactions across firms, industries and institutions (Porter, 1998). The emphasis is thus primarily on product and information flows between firms and industries in a geographically defined 'space' (Gordon and McCann, 2000). Innovation territories, in contrast, focus analytical attention on the various policy domains that intersect and influence the product and information flows and linkages. This approach seeks to reveal the enabling or disabling features of government policy, across 'economic space' within which clusters are located. Innovation territories in this sense provide an analytical approach for comparing patterns of interaction in different economic spaces and in different countries.

The article is divided into two parts. The first part explains our use of this analytical approach. This section follows recent work carried out at the Australian Expert Group in Industry Studies (AEGIS) (see Marceau and Basri, 2001; Marceau, 2001; Turpin *et al* 2002; and Marceau and Martinez-Fernandez, 2003). In the second section we apply the 'analytical territories' approach to some international comparative data and seek to explain one of Australia's recent and most successful innovation, production and export stories: the Australian wine industry. In doing so we contrast the experiences and perceptions of a sample of wine-producers in four major 'new world' wine producing countries: Australia, New Zealand, South Africa and the United States.¹ The results of the study suggest that in the Australia wine industry important institutions (in the broad sense) are interacting effectively at *both* local and national levels. In the wine industry 'location' is particularly important. However, it appears that successful communication between suppliers, producers, industry organisations, R&D institutions and government agencies supporting the sector *and* interaction *between* locations have been major contributors to successful innovation. As Marsh and Shaw (2000) have pointed out, clustering in the Australian Wine Industry and a sharing of industry concerns through the development of a 'knowledge-driven cluster' has enabled the industry to undergo a major transformation (Marsh and Shaw, 2000, p.3). How this is occurring across diverse regional boundaries in Australia can be observed through the 'analytical territories' approach tentatively sketched out in this article.

¹ Although South Africa is of the old-world, archaeologically speaking, in viticultural terms it is generally referred to as a new-world country in terms of the production and global marketing of wine.

An 'Analytical Territories' Approach to Analysing Innovation Systems

The concept of 'national systems of innovation' (NSI) has emerged as one of the more influential concepts in explaining innovation processes and managing industrial innovation policies (Lundvall, 1999). One of the revealing insights of the approach is that it seeks to capture the fluid and increasingly interactive relationship between R&D institutions and an industry's production system. However, with raised demands for knowledge intensity and the increasingly global nature of knowledge production and transmission the NSI approach has failed to fully account for the complex ways that different aspects of knowledge intensive activity intersect across particular localities, regions or nations. Arocena and Sutz, for example, have pointed out that NSI is an 'ex-post' concept and therefore limited in its capacity to inform situations where a system is only embryonic in nature. Moreover, while the NSI approach does allow for comparisons between countries comparisons between an existing system and a potential 'optimal system' is not possible (Arocena and Sutz, 2001, p.58). Others have noted that when adopted by policy makers, the concept tends to underplay the complexity and significance of social action at the interface between global and local knowledge systems (Marceau, 1995; Marceau and Basri, 2001). Moreover, the increasing complexity of product systems that deliver both products and services to the market call for more precise analytical tools for informing policy options. For example, a framework is required to investigate the wide range of institutions, actors and activities that comprise the innovation processes in the context of the various policy domains and geography over which different policy makers wield some influence.

The analytical concept of 'industrial districts' has been influential in industrial studies throughout the twentieth century. The emphasis in this approach has been on spatial forms of agglomeration and the cooperation, mutual dependence and trust between specialised and innovative firms. This has given rise more recently to analyses of industrial clusters (Porter, 1998; Marsh and Shaw, 2000; Mohannak and Turpin, 2002). The results of cluster studies have been attractive for policy makers because they suggest options for supporting collective efficiency and lower transaction costs through joint action. An advantage of using the cluster concept is that it can reveal the evolution and current structure of an industry without establishing artificial sectoral boundaries. Similarly, research into regional innovation systems has emphasised the ways in which firms and other organisations can become engaged in interactive learning through systemic linkages between the sources of knowledge, such as firms, research institutes and universities, and intermediaries, such as governments and innovation services (see for example Cooke and Morgan, 1998; and Cooke *et al.*, 1998). The idea of networks and clusters, regional innovation systems and 'innovative milieu' (see Camagni, 1991) all imply the importance of geographic space. Consequently, governments and their policies have often been influenced by, and endeavoured to replicate, the success experienced by innovating regional economies (such as those in Germany and Italy).

However, there is growing evidence that many so called clusters are not bound so much by geographic space but by 'economic space' shaped by key elements that inhabit them. For example, Marceau and Basri have drawn attention to complex social product systems the constituent elements of which can be 'disorganised' yet remain '...highly productive and very often innovative – rather than an organised part of the national innovation system' (2001, 305-6). Porter has drawn attention to industry cluster evident in the California Wine

Industry. This reflects a cluster organised not simply around geographic spatial connections but economic space occupied by policy makers, markets, regulations, capital, technology and information (Porter, 1998). In the Australian context Marsh and Shaw have drawn attention to elaborate cluster arrangements in the Australian wine industry and the salient influence of market competition, collaboration and negotiation (Marsh and Shaw, 2000, p. 44-45) all of which takes place within economic rather than geographic space.

This carries important implications for the management of innovation policy. While locality remains important it is the elements that shape the economic space in which industries and firms collaborate and compete that are most formative in determining the flows of knowledge, information, products or services.

Government interventions designed to improve links between firms and R&D have been a major feature of innovation policies in many countries for some time. However, there is growing evidence that some organisations or institutions are performing multiple roles at this interface. Simply focusing on institutional linkages or what Etzkovitz and Leydesdorff call the 'triple-helix' (Etzkovitz and Leydesdorff, 1997) captures only part of the process. For example, in China, Liu and Guo (2002) have documented how local, national and foreign firms have jointly exploited local natural resources through quite complex organisational structures: part public; part private; part local, part national and part international. Similar observations of industrial districts in Italy has led Paniccia to observe that innovation:

...will not come about through reliance on traditional local resources; instead, it will derive from 'contamination' or 'hybridisation' with new actors: processes that generate new practices and rationalities that may enrich local patterns of learning (Paniccia, 2002, p. 194).

From this perspective, the transformation of institutions and organisations, the flow of information that passes through them and the regulations and practices that bind them, should take precedence over industry sector and locality. In other words, institutions previously described simply as intermediaries are becoming increasingly complex or 'hybridised'. The implication for policy is that interventions should not simply focus on locality, nor target industry sector, but on the elements that shape the social or economic 'spaces' within which innovation occurs across different industries and localities. However, while a cluster analysis is valuable for identifying areas where cooperative links between firms, organisations, industries and institutions might be enhanced to promote innovation a more specific framework is required in order to reveal the policy implications for enabling this to occur.

Efforts toward the development of a framework for underpinning this perspective have been outlined by Marceau and Martinez-Fernandez (2003). From their perspective, the economy in which industries are operating is conceptualised as a 'space' in which many activities compete for scarce resources. In any such space there are likely to be many different manufacturing and service or resource-based activities taking place at the same time. There is also likely to be different players interacting as clients and suppliers and many different institutions providing services and information as well as regulating the 'rules of the game'. These rules of the game have local, national and international dimensions. In Australia there are usually local administrative rules, state and federal rules and there is a large number of quasi-public bodies that administer them. As Marceau and Martinez-Fernandez have noted, 'It is not hard to see how easy it is for the 'law givers' in different spaces to provide a web of inconsistent rules regulating many actions' (Marceau and Martinez-Fernandez 2003, p. 3).

Because organisations and institutions and their activities are distributed across various economic spaces in different ways and at different times, their interactions will rarely be the same. Public policies for supporting innovation should therefore be devised to fit the particular dynamics in the area toward which they are targeted (Marceau and Martinez-Fernandez, 2002, p. 7). This requires a sharp analytical focus on the major activities or 'elements' that inhabit the economic spaces. Marceau and Martinez-Fernandez refer to these elements as *territories* '... the building blocks of any given national and regional economy' (Marceau and Martinez-Fernandez 2003, p. 7). Their analytical framework includes eight such territories:

- technological and industrial spread;
- knowledge, production, transmission and transfer;
- financial and business services;
- production and consumption;
- institutional;
- human capital;
- infrastructure; and
- cities as knowledge-hubs.

An important feature of this approach is that each of these territories has a spatial as well as a symbolic or more abstract presence in different regions where they come together in different ways. The approach thus focuses on the interaction in given spaces *between these different territories*. It is not just the geographic distribution of these territories that is important but how local configurations interact in specific spaces.

This analytical territories approach stands in contrast to the NSI approach because it takes into account the fluidity of action across local, regional and national boundaries. Activities, institutions and organisations, within any defined 'economic space' become the target of analysis rather than those political spaces over which policy makers administer their often limited options (Marceau and Martinez-Fernandez 2003, p. 8). It is complementary to the industry clusters analytical approach because it offers a different lens through which the impact of policy interventions can be understood.

In the following sections an analytical territories perspective is used to explain the international success of one of Australia's most dynamic industry sectors – the wine industry. The research approach was exploratory and sought to document the different experiences and perspectives of R&D and innovation processes among wine producers in the US, South Africa, Australia and New Zealand. We assumed that the territories identified above would intersect in different ways in each country and lead to differing innovation outcomes. Although many different grape-growing regions contribute to the winemaking industry in each country we adopted a national perspective for the industry comparison. This was partly because of the exploratory nature of the study and partly because the major wine-producers in each country are national players. As such they provide a conduit between the localised growers and producers through which knowledge and ideas are transmitted. The results of the study suggest that in Australia the territories identified above are interacting more effectively than they are in the comparative countries. This conclusion is supported by the views expressed by wine producers across the four sample groups. The majority of all respondents perceived Australia to be leading innovation among new-world wine producers. The

analytical territories approach allowed for a more detailed analysis as to how this was being achieved.

New World Wine Production: An International Perspective

The wine industry has been undergoing global restructuring. No longer do 'old world' producers such as Italy, France, Spain and Germany dominate the industry to the extent they once did. No longer are 'new world' producers such as Australia, New Zealand, South Africa the US or Chile regarded simply as new-comers with medium quality output. A combination of changing patterns of consumption, new varieties, new technologies and business systems have led to a significant transfer of wine production and marketing to new world producers (ABS, 2002; Anderson, 2000).

Although new world producers have gained considerable ground in the international production of wine it is still primarily an old world product. In absolute terms, Europe's 1987 share of exports was approximately 88%. In 2001, it was closer to 68% (Winetitles 2002). This *transfer* in wine production was reinforced by declines in production in France, Italy and a number of other old world producers and significant production increases in countries such as Australia, New Zealand, the US and Chile (Wine Institute, 2002). In the period 1989-2002, Australia's wine exports rose by around 1,132% from 40 million litres to 453 million litres (Winetitles, 2002). The increase was even greater in value of exports, rising from around \$25 million to \$2 billion over the same period. In New Zealand wine exports have quadrupled over the past decade; the export market now accounts for 34% of all New Zealand wine sales (Winetitles, 2002). Most industry predictions suggest these export trends will continue over the next ten years. Changing consumption patterns in the lucrative markets of the UK, USA, Canada, Germany and Japan will continue to play an important role in maintaining these trends.

Production and consumption patterns have been driven by the introduction of a range of innovative processes and products. New varieties of grapes, new types of wine with new flavours and new methods of propagation and production have been developed and transferred. This has underpinned much of the growth in new world wine production and sales in international markets.

The preparedness and ability of many new world producers to trial the latest oenological techniques and equipment and combine such technologies with the best soil, vine and disease management practices is providing them with significant advantage over their less adventurous old world' competitors. This is in spite of the fact that knowledge generated in these fields is generally available to major wine producers world-wide. However, the innovation process is broader than simply R&D. It involves innovative approaches to markets, branding and business systems as well as the development of human resource capability. It involves learning and requires a supportive regulatory environment. As Anderson has pointed out,

...while dramatic export-led expansion by industries is possible, it is not without substantial hard work and large synergistic investments of time, effort and money in all three stages of the production process (primary production, processing, and marketing/distribution) (Anderson, 2000, p.viii).

From a policy point of view it is difficult to investigate how knowledge and effort in these different stages are brought together across diverse policy domains (for example state, federal and local government and different sectoral portfolios). As we argue below, an ‘analytical territories’ approach to innovation provides a framework for understanding innovation processes across diverse regional boundaries.

Strong and sustained investments in R&D have played a major part in such innovation. Research in the wine industry is financed through a combination of private sector investments, compulsory levies and government allocations. In 1996/7 the private sector invested \$4.3 million in R&D. This was complemented by \$16.6 through government grants to the Grape and Wine Research and Development Corporation (GWRDC) and other research institutions. Total research expenditure in the industry represented 0.9 per cent of turnover, considerably more than for the food and beverage sector as a whole (0.5 per cent) (see Marsh and Shaw, 2000, p. 53-4). Further, new technology uptake among winegrape growers has been impressive. A 1998 innovation survey of winegrape growers suggests that 68 per cent of growers had adopted at least one innovation through the one-year period (reported in Marsh and Shaw, 2000, p. 54).

However, for the more successful national producers it is not simply the spread and uptake of new technologies or technological processes that have produced comparative advantage but a combination of industrial building-blocks or ‘territories’. Technological advances in viticulture such as new techniques for soil and vine analysis, disease and pest control, are clearly important building blocks for increasing production and quality but many other territories also interact in the same space. Extension services and training for local firms contribute to the transmission of knowledge and the development of human capital. Successful new products, branding and marketing are also a consequence of financial and business service territories and the availability of effective infrastructure and institutional support.

New world producers are creating new production spaces that draw on local, national and regional innovation territories. They are not locked into the viticultural and oenological traditions to which for many European producers remain highly localised. Wine making produces a highly localised product in a geographic sense. This is not only in practice but also in presentation. Where a wine, or more specifically the grapes, originate from is important. Yet the innovation process extends well beyond each locality. As new knowledge is produced in firms, farms and institutions it is diffused and available to varying extent and time to both old and new world wine producers. The extent to which such knowledge is compounded through interaction with other territories is where comparative advantage lies. How to achieve the compound advantage is what should interest industry policy analysts and practitioners more generally.

Experiences and Perceptions of Innovation Among Wine Producers in South Africa, California, Australia and New Zealand

The present study investigated R&D processes, infrastructure, information, training and institutional support in four new-world wine producing regions: Australia, New Zealand, California and South Africa. Data were collected by survey from wine-producers in each country on three general areas:

1. experiences and perceptions of level of innovation and coordination of R&D outcomes;
2. experiences and perceptions of how well firms were serviced by their respective industry bodies in terms of technology transfer, infrastructure and information; and
3. experiences and perceptions about how well these different activities contribute to international competitiveness or 'leadership' in the global environment.

The survey instrument was based on an earlier study of R&D diffusion in the Australian Wine Industry (Aylward, 2002). The survey was distributed to 244 firms; 61 in each country. Responses were received from 120 producers: 48 from Australia 30 from New Zealand; 17 from South Africa; and 25 from California.

Respondents represented sole proprietors, incorporated companies, subsidiaries and publicly listed companies and ranged in size from single-family boutique firms, to small, medium and large firms. Respondents also represented a mix of geographic regions in each country. Although the number of respondents in each country was not large they were considered sufficient to explore the potential for applying an analytical territories approach to innovation systems.

Regional Overviews

South Africa

The establishment of a victualling station in South Africa by the Dutch East India Company in 1652 led to what is today a major export product. The first Governor of the Cape, Jan van Riebeeck planted vineyards in 1655 and by 1659, Cape wine was being produced. Since then the South African wine industry has grown into the eighth largest producer in the world. It still has the largest single cellar in the world (Winenet, 2002).

Today, there are roughly 105,000 hectares under vine with about 950 million litres produced annually. The production is handled largely by 82 estates and 70 cooperative cellars, pressing roughly 85 per cent of the total wine harvest. Recent estimates suggest that about 208,000 people are employed both directly and indirectly in the industry ² and the contribution to the total horticultural income for South Africa is 30 per cent (Winenet, 2002).

At the heart of the South African wine industry, is a state research body, the Nietvoobij Institute for Viticulture and Oenology, which employs approximately 230 people. The Institute is linked to the departments of viniculture and viticulture at the University of Stellenbosch, as well as the Elsenburg Agricultural College and has a 12 person advisory team from KWV, the largest wine-producer in the country (Winenet, 2002). The South African Wine Industry Trust (SAWIT), which represents the interests of wine producers and government has a mandate to promote wines abroad and develop research and technology for the advancement of the wine industry (SAWIT, 2002). Other bodies conducting research and providing extension are the South African Wine Institute, and the South African Wine Industry Information and Systems body (SAWIS, 2002).

² In terms of employment patterns transformation of the wine industry in South Africa has its own unique characteristics associated with the role of Black labour during the apartheid years and the labour reforms that are still taking place.

California

The Californian wine industry first took root in 1769, when Fr. Junipero Serra brought vines from Baja to the Californian coast. For the next 70 years the young industry developed slowly and sporadically, with gradual settlements at Sonoma and Napa, but no systematic plantings (Mojave Internet, 2002). California now represents the heart of wine production in the US, accounting for over 90 per cent of the nation's total output and 96 per cent of its exports (Wine Institute, 2001)

By the late twentieth century Californian wine was outclassing many of its European competitors in terms of market penetration. Much of this success has been attributed to California's 'scientific approach' to what had previously been a 'lifestyle' industry (Wine Institute, 2002). Today, research and development in the Californian wine industry is supported by institutions such as the Californian Association of Wine-grape Growers, the American Vineyard Foundation, the American Vintners Association and universities such as the University of California – Davis.

These institutions provide services, information and general infrastructure support for around 850 wineries and wine-grape growers utilising 905,000 acres of vineyard. Annual wine output is over 533 million gallons and the sector provides approximately 145,000 equivalent full time jobs. The export market has been estimated to be worth US\$500 million (Wine Institute, 2001).

Australia

The Australian wine industry can be traced back to the 1790s and the efforts of Governor Phillip at Rose Hill, NSW. The first vintage report was that 'the grape thrives remarkably well' (Beeston, 1994). By 1795 the first vineyard had produced 410 litres of wine and it was predicted that within two years there would be 'no need for importation' (Beeston, 1994).

However, vine plantings around the western area of Sydney were sporadic and of mixed success for the next 40 years, until the cause was taken up seriously by a new immigrant – James Busby. The firm, originally established by Busby remains a leading producer and exporter, now the fourth largest in Australia with growth rates outstripping most of its rivals.

Wine production through the 1990s continued to grow rapidly. Between 1999 and 2000 in Australia:

- the number of wineries increased 10% to 1318;
- the area under vine increased by 19% to 146,177 hectares;
- the tonnes crushed increased 2% to 1,147,000;
- beverage production increased 1.6% to 806.4 million litres; and
- exports increased over 20% to 310.5 million litres and in value, 24.5% to Aust. \$1,487,400 (Winetitles 2002, 5).

Research and Development (R&D) in the Australian Wine Industry is promoted and coordinated through the Grape and Wine Research Development Corporation (GWRDC, 2002). This is a national body with a mandate to identify and sponsor industry-wide research. R&D supported by the GWRDC is carried out by researchers attached to organisations such as the Australian Wine Research Institute (AWRI), the Commonwealth Scientific and Industrial Research Organisation (CSIRO), State departments of agriculture and universities.

The GWRDC also consults extensively with other providers such as the Australian Wine and Brandy Corporation and the Cooperative Research Centre for Viticulture (GWRDC, 2002).

GWRDC Research program priorities articulated in their five-year plan are intended to reflect industry needs and are funded through an industry levy on tonnes of grapes crushed and litres of wine produced. All wine producers are subject to this levy.

New Zealand

The basis for the New Zealand Wine Industry was laid down in 1819 when vines were first planted. The first winery was established in Hawke's Bay in 1851. The relatively short history can be largely attributed to a Temperance Society and very conservative licensing laws in existence until the middle of the 19th century (Network Wine Agency, 2002).

The industry has undergone rapid growth through the past two decades. For example, between 1984 and 2001 the number of wineries increased from 97 to 382 (Network Wine Agency, 2002). Exports have quadrupled in the last decade alone, with their value increasing eight-fold. In 2003, it is expected that there will be approximately 13,630 hectares under vine (Network Wine Agency, 2002).

Research and Development in the New Zealand Wine Industry was until recently, coordinated and promoted by two industry bodies, sponsored jointly by industry and the government. These were the Wine Institute of New Zealand and the New Zealand Grape Growers Council, which together represented the interests of New Zealand's wine operators in terms of research, information dissemination, operator representation, export support and industry standards (Network Wine Agency, 2002).

In March, 2002 these two bodies merged to form a new organisation – the New Zealand Winegrowers. This body will carry on the same responsibilities of the previous two, but will also review research, information and promotion needs for future strategies.

Wine production in each of these four countries is located in what we have defined as an economic space. In each space different territories provide infrastructure, information and knowledge with the potential to underpin innovation. The extent to which these territories effectively intersect and cohere in the economic space is likely to determine the level of innovation that occurs. In the following section we report on this process as it has been experienced by wine-producers in the four case-study countries.

Knowledge Production and Transmission Territories

Research and development

The first territory examined concerns the production of knowledge through research and development. Survey respondents were asked to comment on and rank the overall level of R&D in the wine industry in their country in terms of whether they believed it was 'low', 'average' or 'high'. Of the total 114 who responded, 30 stated that it could only be ranked as 'low'. Another 48 ranked R&D investments as 'average', while 36 claimed that it was 'excellent' or 'high'. It should be noted here that we are not comparing actual levels of R&D for the industry but perceptions of investment, and more specifically, what is experienced as

‘adequate’. Australian respondents recorded a significantly higher perception of ‘adequate’ R&D investment than their counterparts in the other countries.

Table 1: Wine Producer Perceptions of Overall R&D in their Own Industry

Country	Low	Average	High
Australia (n=47)	19.1%	23.4%	57.4%
New Zealand (n=29)	37.9%	51.7%	10.3%
South Africa (n=16)	12.5%	62.5%	25.0%
U.S. (California) (n=22)	36.3%	54.5%	9.0%

Source: New World Wine Producer Survey, (2002).

Infrastructure and Institutional Territories Supporting Technology Transfer

Coordination of R&D

A second territorial issue concerns the role of underlying institutions and structures for coordinating R&D. Such institutions perform a key supporting role in the transfer of new knowledge and technologies. Their effectiveness in this role is likely to lead to optimal circulation of information and knowledge and in particular between users and producers (Marceau and Basri, 2001, p. 292). In the case of the wine-industry an important user-producer relationship is that between wine-grape growers and wine-makers. While overall R&D levels within a specific industry sector and space may be high, its effectiveness depends on the adequacy of mechanisms and structures for its coordination and diffusion across the space more generally (Turpin *et al.*, 2002). Respondents were therefore asked to express their experience of how well R&D was coordinated.

Table 2: How Effectively is R&D Coordinated within each of the New World Industries?

Country	Poorly	Moderately	Very Well
Australia (n=47)	2.1%	65.9%	31.9%
New Zealand (n=27)	42.4%	57.6%	0.0%
South Africa (n=16)	25%	68.8%	6.2%
U.S. (California) (n=20)	40%	50.0%	10%

Source: New World Wine Producer Survey, (2002).

Of all respondents who answered this question 24 expressed the view that R&D was coordinated ‘poorly’ within their industry. A further 67 thought it was coordinated

‘moderately’. Only 18 thought there was a high degree of coordination. Australian respondents offered more positive responses than their overseas competitors (see Table Two). Thus Australian respondents reported higher levels of technological development (R&D investment) but also considered these investments to be better coordinated for the benefit of their industry. In contrast, New Zealand respondents expressed the most negative views about R&D coordination.

Industry Information Concerning Developments in R&D: Relevance and Availability

Investments and coordination of R&D are important factors in the institutional technology spread and knowledge production territories. However, a second layer of knowledge transfer concerns the flow of information between industry bodies, grape-growers and wine producers. It might be expected that the more centralised the structure and mechanisms of R&D diffusion within an industry sector, the more regular and effective the information flow. Certainly the Australian Wine Industry is one of the more centralised of the new world wine industries in terms of research priority setting, research funding and mechanisms of diffusion.

The table below reflects an association between information flows within each country and the level of R&D coordination. Australia again ranked highest in terms of experiences of consistency and relevance of information flows ‘relevant to their needs’. This is not the case for operators within the other three regions who reported with a high degree of consensus that their information was largely ‘Irregular’ (see Table Three).

While the New Zealand Wine Industry is also relatively centralised, it ranks fairly poorly in terms of R&D coordination and information flows. Conversely, R&D in the Californian Wine Industry is one of the more decentralised, with a large number of stakeholders contributing in varied ways. Yet Californian respondents ranked coordination of R&D in a similar way to their New Zealand and South African counterparts.

Table Three: Information Flows: Consistency and Relevance

Country	Non-existent	Irregular	Regular & Relevant
Australia (n=47)	2.1%	23.4%	74.5%
New Zealand (n=28)	3.6%	53.6%	42.6%
South Africa (n=16)	0.0%	62.5%	37.5%
U.S. (California) (n =20)	5.0%	55.0%	40.0%

Source: New World Wine Producer Survey, (2002).

Institutional, Infrastructure and Business Service Territories

Producer Perceptions of their Respective Industry Bodies

The information flows discussed above when aligned with a strong R&D environment can produce a dynamic innovation environment. Further, effective knowledge transfer in most economic spaces depends to a large extent on the way institutional territories intersect with the industrial space and provide a range of services. Services relevant to innovation and development include business services as well as technological services such as testing. The Australian Wine Industry, is serviced by a large number of organisations, but two organisations devoted to the provision of knowledge intensive services to the sector stand out. These are:

The Grape and Wine Research and Development Corporation (GWRDC); and
The Australian Wine Research Institute.³

We sought to investigate the mediating influence of these organisations by asking the Australian respondents to comment on the extent to which these organisations fulfilled their needs in the development and marketing of their product. Experiences reported here suggest that these organisations are formative in practice and are generally held in high regard by Australian wine producers. Of the 47 producers who commented on the services of the Grape and Wine Research & Development Corporation, 29 claimed that they serviced their needs either 'well' or 'very well'. With regard to the influence of the Australian Wine Research Institute, 31 of the 45 respondents claimed they were serviced either 'well' or 'very well'.

Table Four: Australian Wine Producer Perceptions of Service Provided by Industry Bodies

Industry Body	Not at All	Not Well	Average	Well	Very Well	Total
Grape & Wine R&D Corporation	1	2	15	24	5	47
Australian Wine Research Institute	2	4	8	17	14	45

Source: New World Wine Producer Survey, (2002).

New Zealand

The same issue was explored with wine producers in the comparative countries. Until very recently, there have been two main research bodies in the New Zealand Wine Industry; one representing producers and the other representing suppliers. These were:

The Wine Institute of New Zealand; and
The New Zealand Grape Growers Council

In March 2002 the Wine Institute of New Zealand and the New Zealand Grape Growers Council merged, to form a new organisation – New Zealand Winegrowers. This new industry body is intended to promote, represent and research the interests of grape growers and

³ The Cooperative Research Centre for Viticulture, which is a funded partner of the GWRDC carries out R&D services and training. It is not however, a subject of this study, as it usually does not interact directly with operators. Producer perceptions therefore are not likely to be based in practical experience.

winemakers, both domestically and internationally” (New Zealand Wine, 2002). The present study collected responses in relation to the two separate organisations, as they existed prior to March 2002.

Table Five presents the responses of New Zealand wine producers to the activities of these organisations. The experiences reported here suggest that for New Zealand wine producers these organisations had a mixed influence on their development and production. Generally, their experiences suggest the influence was less than for similar organisation in the Australian context. Among New Zealand respondents 17 of the 30 respondents claimed that the Wine Institute of New Zealand services them ‘well’ or ‘very well’. Another eight claimed that it does not service them well or even at all.

For the New Zealand Grapegrowers Council the responses were less positive. Twelve of the 30 respondents claimed their needs were serviced ‘well’ or ‘very well’, while another 13 claimed that service was poor. As the wine producers were respondents to this question, rather than grapegrowers this suggests a potential weakness between research directed to grape growing and that devoted more directly to the wine production process.⁴

Table Five: NZ Wine Producer’s Perceptions of Service Provided by Industry Bodies

Industry Body	Not at All	Not Well	Average	Well	Very Well	Total
Wine Institute Of NZ	5	3	5	10	7	30
NZ Grapegrowers Council	9	4	5	8	4	30

Source: New World Wine Producer Survey, (2002).

South Africa

There are two main organisations that support wine research and innovation in South Africa:

The Nietvoorbij Institute for Viticulture and Oenology; and
 The South African Wine Industry Information and Systems (SAWIS).

South African respondents were asked to comment on their experiences with both of these agencies. Experiences with Nietvoorbij Institute for Viticulture and Oenology were mixed (see Table Six). In terms of servicing their needs as producers, the majority reported the Institute’s activities to be performing either ‘average’ or ‘not well’. This suggests the influence of the institute on innovation is not particularly strong. Only three respondents noted that it serviced their needs well. On the other hand, SAWIS, the organisation devoted

⁴ While the larger wine-producers are supplied with grapes from many growers they are also often the owners of vineyards. In this study we recognise that the business practice of owning or financing grapegrowers is an important mechanisms for the diffusion of knowledge, information and ideas between growers and wine-makers.

more to the dissemination of information was experienced more positively. In this case more than half South African respondents reported that SAWIS serviced their needs ‘well’ or ‘very well’, while no operator thought it failed to service their needs. The more negative response to the Nietvoorbij Institute could suggest that research outcomes are disseminated more indirectly to producers through SAWIS. The point is that while the outcome, in terms of innovation, might be the same the pattern of interaction in the system is different because of the intermediary role of SAWIS.

Table Six: South African Operator Perceptions of Services Provided by Industry Bodies

Industry Body	Not at All	Not Well	Average	Well	Very Well	Total
Nietvoorbij Institute	1	6	6	3		16
SA Wine Industry Information & Systems			6	9	1	16

Source: New World Wine Producer Survey, (2002).

California

Three organisations provide research, information and advice to wine producers in California: The California Association of Winegrape Growers; The American Vineyard Foundation; and The American Vintners Association.

Californian respondents generally reported ‘average’ level of satisfaction with the services provided by these industry bodies. However, responses were quite mixed (see Table Seven). Less than a quarter of respondents noted that the California Association of Wine-grape Growers serviced their research needs well. For the American Vineyard Foundation, the responses were somewhat better, with a small number of respondents claiming that their needs were very well serviced. In the case of the American Vintners Association only four respondents recorded that their needs were serviced well or very well. This suggests that the institutional influence of these organisations, in terms of industry representation, research funding and business behaviour generally is also mixed

Table Seven: Californian Wine Producer Perceptions of Services Provided by Industry Bodies

Industry Body	Not at All	Not Well	Average	Well	Very Well	Total
California Association of Winegrape Growers	1	6	10	5		22
American Vineyard Foundation	1	4	8	5	3	21
American Vintners Association	1	4	12	4		21

Source: New World Wine Producer Survey, (2002).

Comparative Territory Perspectives

R&D Infrastructure and Support – Winemakers’ Rankings

The data presented above begin to show some different features to the pattern in which different innovation territories intersect and influence innovation in the wine industry sector in each country. Three features stand out from this preliminary analysis. First, from the experiences of the wine producers surveyed in Australia, there appears to be more coherence or symmetry in the way and extent to which new knowledge is produced and transmitted in the Australian context when compared to experiences in the other countries. Secondly, there seems a greater appreciation of the coordination of institutional infrastructure and industry information among Australian respondents. Thirdly, the potential impact or influence of industry norms and mores, transmitted through industry bodies in Australia appears stronger in the Australian case.

The question of whether this pattern in Australia is associated with a more dynamic innovation environment, was explored by asking all respondents to rank the level of R&D infrastructure and research and development support services operating in their country against the other countries included in the study. Responses to this question are shown in Table Eight.⁵

⁵ Although industry respondents would be more familiar with the environment in their own country we were interested with *perceptions of leadership* in terms of international competitiveness. Further, wine production is now becoming a global industry with many of the larger producers holding investments in wine production and vineyards in other countries. In many case *perceptions of leadership* are therefore informed by international business practice and experiences.

Table Eight: Wine producer Rankings of R&D Infrastructure Support in each Country

Country	Ranked 1st	Ranked 2nd	Ranked 3rd	Ranked 4th	Total Ranked
Australia	20	13	7	0	40
New Zealand	0	0	12	11	23
South Africa	0	0	10	5	15
U.S. (California)	0	5	13	2	20

Source: New World Wine Producer Survey, (2002).

Australian producers were the only ones to rank their industry as first among the four regions. Twenty producers noted that R&D infrastructure in the Australian Wine Industry was the best of the four selected industries. Another 13 ranked it as second and no operator ranked it last. Australian producers thus had a strong positive image of the innovation environment in their country.

On the other hand, New Zealand producers reflected a reverse pattern of perception. No New Zealand winemakers ranked their industry status as first or second, twelve ranked it third and half ranked it as last. The responses from South African respondents were similar. California fared slightly better with the majority of their respondents ranking their innovation infrastructure capacity as third among the four regions..

Finally, all respondents were asked to nominate which of the four countries they believed led the field in terms of overall R&D and innovation. Responses to this question showed that the Australian wine production was perceived to be closer to the leading-edge. Respondents in all countries generally shared the perception of Australia's leading position. Respondents ranking Australia as the R&D leader included 31 per cent of the Australian sample, 37 per cent of the New Zealand sample, 56 per cent of the Californian sample and 76 per cent of the South African sample. Thus while Australian wine-export figures suggest a growing comparative advantage Australia is also *perceived* to be a leader among this sample of new world producers (see Table Nine).

Table Nine: Perceptions as to Who leads the New World Industries in terms of R&D and Innovation.

Country	Respondents
Australia	64
New Zealand	3
South Africa	2
U.S. (California)	31
Total	100

Source: New World Wine Producer Survey, (2002).

Conclusion: an ‘Analytical Territories Perspective for Regional Innovation and Development Policy

We have attempted to unpack here the innovation process in the Australian wine industry by comparing some of the key elements or territories across four new-world wine producing countries. Until recently industry policy analyses have either tended to focus on industry clusters in a geographic sense or on the ways that innovation support organisations are linked to firms and their activities at the national level. While some work has focused on mapping the national spread of what we have defined as territories in this study, such as mapping R&D investments by sector and technology spread, they have done this separately. The NSI approach has had the effect of steering many studies in this direction. Our argument is that it is not sufficient simply to know the geographic spread of each of these territories. For a regionally dispersed industry such as wine production we need to know how local configurations of the territories *interact in the economic spaces* for which various policy makers are *independently* responsible.

Industry cluster approaches have proved valuable for identifying interdependencies between producers, firms, and institutions in the wine industry.. Marsh and Shaw have successfully used this approach in order to identify how government policies might stimulate collaboration to enhance the economic power of clustering activities. However, as they also point out ‘...public policy approaches are based on theories that were developed when national boundaries were significant barriers, and when technological change was periodic or episodic rather than primary and continuous’ (Marsh and Shaw, 2000, p. 71). There is no single policy domain through which innovation can be influenced. Rather, there is, as we have argued, an economic space where policy influences ebb and flow. We have argued that a range of innovation territories inhabit this space and the impact of the policy flow and ebb needs to be understood in order to ensure a positive impact from policy interventions.

The wine industry offers an interesting case to explore the role of innovation territories in underpinning innovation practice because it is highly localised in terms of where the grape is grown and how the wine is produced and marketed. Yet, at the same time, at least in the Australian context, wine and wine-grape production is embedded in an innovation environment that is supported and coordinated at a national level. It presents a knowledge intensive cluster that transcends geographic and policy boundaries. The convergence of innovation territories in this environment appears to generate strong links between grape producers and grape users and some coherence to the ways that business, marketing and technological information is distributed to both producers and users. In the Australian context and from an innovation territories perspective it appears that while new wine is being poured into Australian wine-bottles it is taking place in an innovative environment that is comparatively more integrated than is experienced among competitors located overseas.

Levels of research infrastructure and coordination of product and process innovation appear to vary between the four new world producers covered in this study. Producers in the New Zealand wine industry for example, noted in response to the present study that levels of R&D are at best average, and that coordination and transfer of results was poor. Australia on the other hand, from the experiences of producers, has high levels of R&D and an effective information and coordination infrastructure. Research and development in the Australian wine industry is comparatively centralised. The R&D levy on Australian producers is among the highest in the world and the funds raised are channelled through a single industry body,

the GWRDC, before they are distributed to various research organisations and groups around the country. However, the innovation process requires more than simply R&D investments. New knowledge must not only be produced but it must be transferred and transmitted through training and industry advice. Innovation also requires other innovative elements such as the underlying infrastructure support, input from a variety of institutions to provide all manner of services, training and marketing insights, technological spread or dispersal and the role of cities in providing a knowledge-hub for development. In short, there appears to be some coherence in the ways these different territories in Australia are aligned.

The present study on the wine-industry serves to sketch out how these territories might be operationalised for the purpose of future industry policy research. The comparison between four new-world wine-producing regions shows that these territories can be mapped and their interaction compared. An interesting outcome from the study is that Australia's success in gaining comparative advantage in this industry might well be explained by the way local and national investments in R&D have transcended local boundaries. But coordination driven by strong national policies have been required to make this happen. This is not an argument for centralisation, rather, it is an argument for the need to understand how territories driven by national policies can be turned to advantage for regional development. Considerable further work will be required to refine the analytical territories approach but we believe this offers some scope to deliver greater policy insight than is generally available through the NSI approach.

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