

**University involvement in wine region development: A comparative case study between Universidad de Talca (Chile) and Universidad de Cuyo (Argentina)**

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**ABSTRACT:**

Australia is considered to have the highest level of investment in R&D in the wine industry. Chile and Argentina has entered the New World of wine recently (Foster and Valdes, 2004). However, the organization of their systems of innovation is still under developed when compared with Australia. In nascent innovation systems in developing countries, it is more important to learn how to assimilate and improve acquired technologies in order to generate new ones since technological activities are often only new to the firm (Schiller, 2006). In this situation, the universities are usually the main actors in emerging regional innovation systems because they are the main regional knowledge source (Schiller, 2006). In this role, universities provide for a qualified workforce, locally adapted research, appropriate services and technologies for their regional stakeholders (Schiller, 2006). Two universities located in the heart of Argentinean and Chilean wine regions were reviewed. The results suggest that wine regions may have two (albeit relatively implicit) policies: one is to used exogenous sources, such as foreign consultants, foreign suppliers or foreign wineries (the Chilean case); or another policy is to try to develop the institutions to provide new knowledge from endogenous sources (the Argentinean case). In the first case the university has to grow in importance in the region, but in the second the university is a key actor in the evolution of the wine region.

## Introduction

Today, the competitive environment for most firms, irrespective of size, is very difficult. Two factors account for this situation. First, over the past two decades, production has become more knowledge intensive. Second, competition has both globalized and become more innovation-based. Increasingly, the position of firms and regions in a globalized economy reflects their capacity to learn (Mytelka 2000). The linkages firms establish with research centers, clients, suppliers and even competitors at home and abroad can be critical in this respect. The accelerated pace of technological change, moreover, requires a larger volume and set of resources than many firms have in-house or can easily access. These resources are both knowledge and finance based (Mytelka, 2000). Firms in the wine industry are no exception, especially in the New World.

Since 1980s the concept of “national system of innovation” has emerged to study the linkages between firms, institutions and knowledge creation institutions (Lundvall, 2002). The conception of the innovation system is based on several assumptions. One assumption considers that key elements of the knowledge base are highly localized. Another assumption is the interactive nature of the innovation process means that it is socially embedded. As a consequence of both the localized nature of the knowledge base and the socially embedded context of the interactive learning process, systems of innovation differ significantly in terms of their capacity for capitalizing on new sources of knowledge and their productive capabilities (Feldman, Gertler and Wolfe, 2006). Cooke (2001) coined the term “regional system of innovation” to describe the systems of innovation localized in a region which is a level set between the national and local levels that might have cultural or historical homogeneity and where localized economic development can be identified, particularly innovation<sup>1</sup>. However, while these theories can be applied successfully to a number of traditional industry sectors, it falls short when attempting to understand the complexity of innovative relationships in emerging and high growth wine industries (Aylward, 2003).

Aylward (2003) suggests that the increasingly interactive relationship between wine R&D institutions and the industry’s production system may be better understood conceptually by the ‘innovation territories’ approach, which allows for broader patterns of interaction for different levels and types of innovation across different economic ‘spaces’, regions and countries. This approach looks beyond the simple geographical distribution of innovation, which is the wine producing region, to look the fluid interaction between wineries, suppliers and R&D centers in all of its forms – an approach more adequate for New World wine development (Australia, USA, South Africa and New Zealand).

Aylward (2003) found that Australia is considered to have the highest level of investment in R&D in the wine industry. In contrast, New Zealand and Californian operators view R&D levels as below the average. Interestingly many of the respondents who claimed they had either not been serviced at all or had not been serviced well, were boutique or small operators in regional areas. Aylward (2003)

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<sup>1</sup> A regional system of innovation relates to the boundaries of a territorially bounded, administrative region while a cluster primarily refers to functionally interrelated industries.

suggests that one factor accounting for this situation is the R&D geographical and cultural concentration of the industry's R&D providers, users and other stakeholders and the second is the inertia in small operators to enter the innovation circle.

Chile and Argentina has entered the New World of wine recently (Anderson, XXX check for the book). However, the organization of their systems of innovation is still underdeveloped compared with Australia, USA, New Zealand and South Africa. Many reasons may account for this situation, for example infrastructure issues like private and public finance support for research institutes or superstructural issues like co-operative culture or importance of interactive innovation (Cooke, 2001). In nascent innovation systems in developing countries, it is more important to learn how to assimilate and improve acquired technologies in order to generate new ones since technological activities are often only new to the firm (Schiller, 2006). Foreign companies and their direct investments play a prominent role since the majority of new knowledge and technologies is acquired from extra-regional sources via direct investments or technology licensing (Schiller, 2006). The innovation systems in developing countries are characterized by a fragmentation of actors and their linkages because some actors are incapable of contributing to innovation activities, and embeddedness and trust among these actors are not yet sufficient to support the evolution of strong linkages oriented to cooperative R&D (Schiller, 2006).

In this situation, the universities are usually the main actors in emerging regional innovation systems because they are the main regional knowledge source (Schiller, 2006). In this role, universities provide for a qualified workforce, locally adapted research, appropriate services and technologies for their regional stakeholders (Schiller, 2006). By doing this, universities are at the same time enhancing the absorptive capacity of the regional system of innovation and directly supporting technological change and development for less resourceful small to medium firms, which do not have any technological capabilities (Schiller, 2006). Since universities are the only endogenous knowledge source in some regional innovation systems in developing countries, they have an important role in the economic development of the area (Schiller, 2006).

This paper reviews the role that two universities are playing in the development of a nascent innovation system in the largest wine producing regions in Argentina and Chile. In the case of Argentina, the paper reviews the role of Universidad de Cuyo located in the heart of Mendoza, the largest wine-producing region. In the case of Chile, the paper reviews the role of Universidad de Talca located in the Maule Valley, one of the largest wine-producing regions in Chile. The universities were chosen because they are regional universities embedded in the wine region and far from the capital cities of both countries, where there is usually the largest concentration of resources. The paper is structured as follows. First, there is a characterization of the type of knowledge stocks and flows existing in wine region. Second, a review of the role of universities is explored. Third, the case studies are presented. Finally, some conclusions and recommendations are provided.

## Characteristics of Knowledge Stocks and Flows in Wine Regions

Agro-food industry knowledge originates from agriculture practices. Traditionally, the agricultural industry has largely drawn upon an empirical, experimental up-scaling of artisan processes and substitution strategies to replace specific raw materials by means of chemical or biological synthesis (Coenen, Moodysson, Ryan, Asheim and Phillips, 2006). Synthetic knowledge is related to 'engineering science'. It refers to the knowledge required for activities involved in the design of something that works as a solution to a practical problem. Thus, innovation refers to the application or novel combination of existing knowledge to solve practical problems during growing or food-processing process (Coenen *et al*, 2006). There are two approaches to R&D processes in agriculture: the process that occurs inside large multinational corporations is conducted in a research facility anchored in an agricultural area; and the other approach is based in research institutes with close ties to industry that are also established in such regions. Therefore, spatial concentration should be a characteristic feature. However, knowledge does not flow freely from R&D centers to the firms that should use it (Giuliani, 2003).

In this respect, there are two main issues related to the flow of knowledge from generators to users. One is the capacity of the user to understand the new knowledge and the second is the connection between the generators of knowledge with users of this knowledge. Therefore, the existence of learning patterns within a region depends on the knowledge accumulated by firms and on their different contributions to the enhancement of the local knowledge base (Giuliani, 2003). Since firms are heterogeneous in their absorptive capacities, they are able to absorb differently intra and extra-cluster knowledge flows (Giuliani, 2003). Here we are interested in what are the relevant actors in knowledge generation, transference and application in a wine region

In wine industry the degree of specialization and productive division of labor is relative limited since the process is divided only into two main parts: grape growing and wine producing (Giuliani, 2003). While small grape producers are mainly specialized in grape growing, backwards-integrated wine producers that have direct control on their viticulture and grape growing can integrate grape-growing knowledge with the knowledge in wine producing. Oenologists and agronomists can be the most appropriate knowledge workers to conduct knowledge generation, transference and application on all the phases of the productive chain in wineries<sup>2</sup> (Giuliani, 2003). However, there also other persons who can transfer knowledge like researchers from public research institutes, people who have worked in other firms with similar technologies, or consultants (Brenner, 2007). Therefore, the capacity of a winery to absorb and generate knowledge is mainly determined by the employment of these two workers. However, there is no assurance that having an oenologist or/and

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<sup>2</sup> While agronomists and oenologists are important actors in knowledge processes for wine firms, they are usually containers of component knowledge. Component knowledge is related to identifiable parts of an organizational system rather than a whole and it is normally tied to the technology of the industry, which makes it easier to be shared between firms in a region/cluster (Tallman, Jenkins, Henry and Pinch, 2004). On the other hand, architectural knowledge relates to organizations as entire systems and the structures and routines for coordinating and integrating its components (Tallman *et al*, 2004). This type of knowledge usually resides in managerial positions (Tallman *et al*, 2004). Since architectural knowledge evolves endogenously as an inseparable part of an organization and its managers, it is very difficult to find two organizations that have identical architectural knowledge (Tallman *et al*, 2004).

an agronomist will generate or apply new knowledge since it is necessary that they engage into processes of knowledge exchange with peers in the region through communities/networks of professionals.

Communities of practice are means for knowledge transmission between professionals (Coenen *et al.*, 2006; Malmberg and Power, 2005; Hakanson, 2005). Communities of practice are defined by the communal (shared) practice of its members, who undertake or engage in a job or profession while communicating regularly with one another about their respective activities (Coenen *et al.*, 2006; Malmberg and Power, 2005; Hakanson, 2005; Brenner, 2007). They are able to produce and internalize shared understandings through collaborative problem-solving enabling interactive learning in embedded inter-organizational cluster relations (Malmberg and Power, 2005; Hakanson, 2005; Coenen *et al.*, 2006). Another way for firms to obtain those knowledge workers is through local mobility of these professionals (Malmberg and Power, 2005; Hakanson, 2005).

In conclusion, the main actors in a wine region are connected professionals who possess the capability to understand R&D advances and transform it into applied knowledge to solve problems in grape growing and wine producing. Therefore, one critical actor in the development and connection of those professionals should be the regional university. In the following section, a review of the role of universities is presented.

### **The Role of Universities in Regional Systems of Innovation**

In recent years, the traditional research and teaching missions of universities have been extended to direct interactions with regional stakeholders (Etzkowitz, 2001). Universities and public research organizations became important knowledge sources in regional innovation systems and partners in industrial innovation processes. (Schiller, 2006). There are two models of university involvement in regional development. First, the generative role serves regional needs directly by providing boundary-spanning activities like incubators and science parks (Schiller, 2006). Second, a developmental role consists of adjusting research and teaching activities to regional needs (Lundvall, 2002; Etzkowitz, 2001). However, university-industry linkages varies in their degree of institutionalization, which may range from the informal hiring of professors and ad-hoc services, to long-term partnerships and joint research centers (Schiller, 2006). Among the many benefits that universities can provide to regional systems of innovation are to provide a link to international academic networks, and to adjust external knowledge (from outside the region) for the local environment (Schiller, 2006). A summary of the factors and the dynamics of the role of universities in their regions is presented in figure 1.

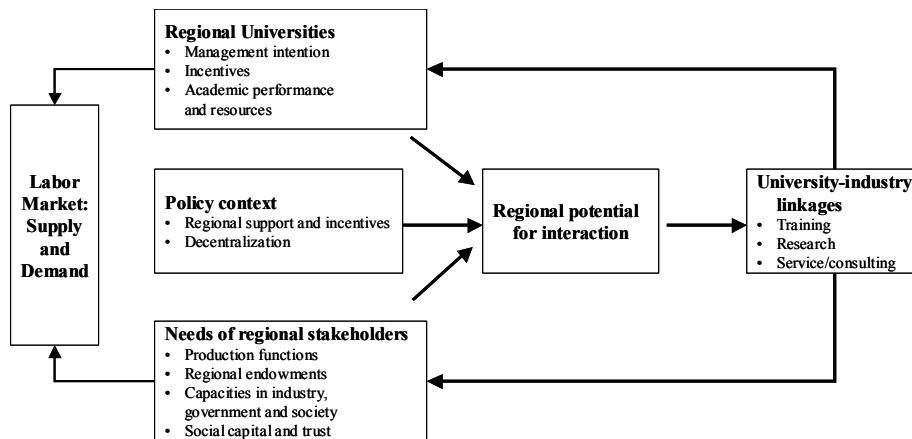


Figure 1. The role of universities in regions (based on Schiller, 2006 and Kunc and Tiffin, 2008)

Since innovation actors are mainly located in or around the capital nation, universities can be the most important knowledge provider in peripheral regions (Boucher, Conway and Van Der Meer, 2003). Schiller (2006) found that innovation actors such as regional offices of government agencies or affiliates of large local or multinational companies are mainly centrally controlled. Thus, universities are taking over a broader developmental role at the regional level since the academic or even administrative autonomy of universities should allow them to respond the regional needs more efficiently (Schiller, 2006; Boucher *et al*, 2003). While university involvement in regional development can be mostly based on informal personal contacts, which may be important to serve as an efficient mode for knowledge transfers, the lack of long-term relationships limits the potential spillovers to more actors. Another important limitation to university involvement is the mismatch between knowledge production and needs. For example, excellent departments at regional universities may not find peers at the regional level either at the firm or governmental level so they need to look for and establish links with external partners. On the opposite side, technologically advanced companies may not find capable university partners within a particular country. Therefore, knowledge transfers with large local or foreign-owned companies can occur from companies to universities, whereas local SMEs or cooperatives are lacking basic absorptive capacities for any kind of linkage with a university (Schiller, 2006). Policies that result in conscious university-linkages strategies, rather than isolated individual approaches, are needed on a broader scale (Schiller, 2006; Gunasekara, 2006) as well as programs aimed at increased graduate retention is particularly important in peripheral regions due to the problem of matching the supply of graduates to the demand of the regional labor market (Boucher *et al*, 2003).

### **The Role of Universidad de Talca (Chile)**

#### *Chilean wine industry*

Wine production is concentrated in thirteen valleys in Chile: Elqui Valley, Limari Valley, Aconcagua Valley, Casablanca Valley, San Antonio Valley, Maipo Valley, Cachapoal Valley, Colchagua Valley, Curico Valley, Maule Valley and the south region comprising Itata Valley, Bio Bio Valley and Malleco Valley (Wines of Chile,

2007; Knowles and Sharples, 2002). However, the majority of Chile's premium wines are made in the wine regions of Maule, Maipo, Aconcagua, Cachapoal and Colchagua (Sharples, 2002). Regional clustering is thus relevant in the industry. However, marketing, administrative, strategic decision-making, and representative functions of the larger wine producers are concentrated in the capital city of Chile, Santiago (Visser and de Langen, 2006). This city also accommodates the national wine business associations, two of the three specialized university R&D institutes, public agencies involved in the development of the wine industry, as well as specialized information brokers (Visser and de Langen, 2006). Santiago is the strategic center of the wine industry, which is a regionally clustered in its production functions covering about one-third of Chile.

With respect to industry structure, the Chilean wine industry is more concentrated than in continental Europe, but less so than in other New World wine producers. In 2005, the four largest wineries in Chile accounted for 42 percent of wine export value: Concha y Toro (22%), San Pedro (7%), Santa Rita (6.8%) and Cono Sur (6.0%) (Chilevid, 2006). Foreign firms have played an important part in the recent development of the Chilean wine industry. They have made substantial investments in this industry, attracted as they were by the unique climate and soil characteristics, the availability and relatively low cost of land and labor, a low disease burden, and a stable macroeconomic environment. More important perhaps are the "example effects" of foreign investors. Since the Chilean wine industry seems to have benefited from the arrival of foreign investors in wine making through their technical and marketing expertise, market knowledge, brand names, and economies of scale (Visser and de Langen, 2006) as well as foreign suppliers

Giuliani and Bell (2005) found three type of actors in a typical wine region in Chile: local firms, foreign firms and national subsidiaries. Interestingly, firms are rather independent in their knowledge acquisition processes, especially on an international level, the link of firms with networks of knowledge is represented by the so called 'flying winemakers': the consultant oenologists that advise firms and keep them informed on the latest techniques. Most of the successful firms have a foreign consultant who comes from South Africa, Australia and France. They normally visit firms from 12 times a year (for Chilean advisors) to less than 4 times a year (for foreign advisors) (Giuliani, 2003). However, such consultants are usually overbooked flying from one firm to the other in the country or worldwide, and therefore have a distant participation in the daily working life of the farm. Local professionals intervene in the work daily and contribute to winery's incremental enhancement (Giuliani, 2003). Foreign owned wineries tend to be strongly related with their parent firm but very poorly interconnected locally. They tend to interconnect with extra-cluster knowledge sources (their parent firms and consultant oenologist) but very poorly with the local knowledge system (Giuliani, 2003; Giuliani and Bell., 2005). Finally, subsidiaries of national big firms in different valleys are poorly interconnected with local firms for two major reasons. First, the local subsidiary, which in most of the cases is a sole vineyard, has limited local skilled knowledge-workers, as it is normally the corporate oenologist that visits the farm periodically to give technical advice and solve problems. Second, the subsidiary operates in strong connection with the parent firm and tends to work in isolation with respect to the local area since it is just a source of natural endowments (Giuliani, 2003).



In a study in Colchagua Valley, Giuliani (2003) found that wineries are well interconnected with national research institutions and other organizations. Most of firms have received technical support, training or other sorts of technical knowledge inflows from different institutes and organisations. What it emerged from her study is both the CEVIUC from Universidad Catolica (Santiago) and the Centro de la Vid y Vino from Universidad de Talca (Talca) are highly interconnected with the firms sampled: more than 50% of them have received technical assistance from them. Other universities such as Universidad de Chile (School of Agronomy) seemed to play a more limited role. However, in terms of joint research projects, only 19% of the firms have made experiments with CEVIUC, 12% with Universidad de Chile and even lower for Universidad de Talca. Colchagua valley also has two local branches of national agricultural technology transfer and research institutions (Giuliani, 2003). While knowledge flows originate mostly from private suppliers, firms also receive quite often technical assistance, training and up-to-date courses (average participation in training of the technical professional happens 3 times a year in Chile and 1 time or less abroad) (Giuliani, 2003). The connection is made by professional themselves or by the intermediation of the consultant oenologists (Giuliani, 2003).

Before 1980, there were less than 200 oenologists who had graduated from Chilean universities in the country, but over 300 students graduated during the 1990s. By 2004, the Chilean Association of Oenologists had 620 members (Hojman, 2005). Hojman (2005) found a high rate of migration from winery to winery caused by firms' (or some firms') unwillingness to accept active participation by their experts in knowledge networks such as the one existing in Colchagua valley found by Giuliani and Bell (2005). As part of their professional development, winemaking experts must work with different soils, local microclimates and grape varieties. But in an ideal world they should be able to do this without having to change jobs (Hojman, 2005). Some of the large wineries chose to provide an internal environment where scope economies associated to diversity (of everything, from natural conditions to technological packages to experts' personalities) can be fully exploited. This is equivalent to trying to internalize the positive externalities generated by their experts' network (Hojman, 2005).

### *Universidad de Talca*<sup>3</sup>

The universities involved with the wine industry are Universidad de Talca, Universidad de Chile, Pontificia Universidad Catolica de Chile and Universidad Catolica del Maule. The University Catolica del Maule, which is located in the same area as Universidad de Talca, has a very small involvement (a wine testing lab) which makes it not relevant to our study. The Universidad de Talca has a much more developed connection with the wine industry.

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<sup>3</sup> Data for the U Talca case study are found in more detail in papers being prepared by Tiffin: *Measuring the Roles Universities Can Undertake to Link with Clusters*, for submission to *International J of Technology Management*; *Comparing University Involvement with Natural Resource Clusters in Canada and Chile*, for submission to *World Development*.

While the Universidad de Talca is immersed in a wine area, its strategies relate only vaguely to industry, to “link technological management with the productive environment” (p. 30). In executing the strategies, there is a specific intent to “decentralize operational decisions to particular specialized centers” (p. 36). This is the approach taken with regard to wine industry when it created the CTVV (Centro Tecnológico de la Vid y Vino). The mission of CTVV consists of undertaking applied research in viticulture and oenology, offering technological services, offering continued education programs to operators, technicians and professionals in the wine industry, and becoming the contact point among researchers, technicians and businesspeople in the Chilean wine industry, to allow a full interchange of ideas and experiences about the emerging problems of the national wine industry.” A second centre, the CITRA (Centro de Investigación y Transferencia en Riego y Agroclimatología) is not oriented specifically to the wine industry, but most of its customers are in this business. Since they work with services and research to optimize the irrigation practices using high technology, such as automatic climate stations. Both centers are self-supporting.

Most of revenues related to wine industry come from research contracts with public support (e.g., CORFO funding schemes) and laboratory service contracts or technological services and less in consulting. Most of their research, services, consulting and lab contracts come from the core wine industry not only located in Maule valley but also in Colchagua valley. The areas related to wine industry have three types of funding: (1) payment to the faculties and some research assistants comes from the payroll of the College of Agriculture or directly from the University (research assistants); (2) part of the income comes from innovative projects (mixture of industry and government) or scientific-technologic project funded by CONICYT – a governmental agency for scientific research. However, both centers receive subsidies from governmental agencies. Comisión Nacional de Riego – a governmental agency in charged of water management – supports financially CITRA, and CORFO subsidizes the CTVV center. Another part of the funding comes from consulting, lab service contracts and other services such as appellation control, supplying healthy wines clones free of virus (CTVV), and services of irrigation programming using modern meteorological stations (CITRA). All their research, consulting and lab contracts come from the core wine industry. The number of faculty involved in research is 5 FTE (full time equivalent).

Universidad de Talca, which was founded in 1981, is located in a city of 190,000 habitants. Universidad de Talca is a public university. The School of Agriculture is highly rated in Chile. Other schools are Business, Forestry, Health, Law, Engineering, Music, Architecture and Dentistry. The total number of students is approximately 6,100 undergraduates and 1,100 postgraduates.

In Universidad de Talca, there are no specialized degrees in wine. Undergraduate students obtain a generalist title of “Ingeniero Agronomo” (Agricultural Engineering) and a degree of “Licenciado en Ciencias Agrarias” (Licenciate in Agricultural Sciences); and postgraduates can obtain Master’s degrees (one is in horticulture and the other is in a dual degree in International Agribusiness with Goettingen University in Germany). The school also has a PhD and Postdoctoral programs. While wine is part of final undergraduate year; wine is not specifically a part of the graduate programs. In general undergraduate courses are around 20-30 students.

CITRA offers a 4-month course in irrigation, in which a third of students are from the wine industry and a diploma course in Good Agricultural Practices with 20% of the people coming from the wine industry. A policy of the university is to focus on educating individuals through diplomas since it is felt the local market for companies is limited. CTVV does a series of seminars for various clients, involving an average of 40 students each. Most active people in diploma or other courses are outside Maule valley, mostly from Colchagua valley. Problems in diffusion and people inside cluster that do not see the value sometimes can be the issues for this low level of development in continuing corporate and public education.

There are no scholarships and internships in the wine industry generated by the university or the school. The percentage of students in agriculture degrees getting term jobs in the wine region is 30% who works in something related directly to the wine industry (vines and vineyards, cellars) and 20% works in something indirectly associated (irrigation, selling inputs from distributors, fertilizers companies, etc). There is a strong cluster of apples, kiwis, corn seeds, rice, etc in this region that competes for students' attention. Some people move to other regions for their practicum.

There are three formal research units. One is the Centro Tecnológico de la Vid y el Vino (CTVV) set up in 1996; the other is Technovid, a consortium with Universidad de Chile, Universidad Técnica Federico Santa María, Chilevid, Corporación Chilena del Vino and Tonelería Nacional, established in 2006; and the third is CITRA (Centro de Investigación y Transferencia en Riego y Agroclimatología). There is also a Center for Soils and Crops but the connection with the wine industry is not clear

Universidad de Talca has no endowments but it receives significant research grants. For example, CTVV receives US\$ 300,000 per year coming 70% from public sources and 30% from industry. The total value of grants from public sources is US\$ 500,000 in the last three years. One foreign wine company provides with US\$ 30,000 per year.

While consulting is not institutionalized, academics obtain 3 to 5 private contracts for consulting, on the average, per year.

About 25% of the 60 students graduated in agriculture each year finds employment in the wine industry.

In conclusion, Universidad de Talca shows rapid, entrepreneurial development and a commitment to be involved in the agricultural and wine sectors, despite a strong, formalized mission to do so, and lacking some key infrastructure such as an incubator or entrepreneurship courses. Several centers have been created with significant funding from industry to provide laboratory services; they have grown, diversified and are largely self-supporting. However, the centers are not able to support academic research. Part of the reason is the necessity to generate operational funding, part is the lack of interest by industry in supporting research and part the lack of support from the university to free the faculty involved from teaching obligations. There is not enough time to do all activities and academic research is the one left out. More staff would be required to carry out a broader range of activities, and more research

funding. The low level of academic research from the centers is understandable from their resource inputs, but contrasts with the general intent and performance of the university to be a research leader in Chile.

Our review did not find any significant involvement in wine industry by other faculties (except for some efforts in wine tourism at the business faculty and a general course on wine industry by a faculty member now departed) nor managed a more comprehensive involvement through other offices. Given that the wine industry does have significant capital to invest and is modern and competes globally, there is obviously far more potential for more involvement with knowledge activities, especially when there is already significant financial contribution from this industry. Recently a wine industry donor funded a major technical school for wine in Colchagua valley; with a more rounded strategic offering, the university could doubtless increase its involvement in wine industry in these other dimensions.

### **The Role of Universidad de Cuyo (Argentina)**

#### *Argentinean wine industry*

Argentina is historically one of the largest volume producers and per capita consumers of wine in the world, but production focused on low-quality wine and grapes for the domestic market for many years, and the industry operated in a “wine manufacturing” mode. Through the 1980s, the industry suffered under hyperinflation, negative growth, and heavy regulations, such as price controls and output quotas. By the end of the 1990s, the industry had undergone a profound transformation. Wine exports grew from a few million dollars in 1990 to over 3% of the world market or over \$380 million in 2006 (INV, 2007). These gains came not simply from comparative costs, but especially from consistent advancements in product quality and innovation mostly motivated by the arrival of foreign firms such as French and Chilean wineries. The process consisted of gradually improvement of the quality of grapes, as varieties of high enological value increased their shares of vine surface area, without losing its variety like Malbec and Torrontes varietals or other regions of the world (e.g., Tempranillo, Bonarda). Wine quality improved to obtain premium wines sold in competitive markets like the US, EU, and Japan highly ranked by top wine magazines. Average exports prices per bottle increased albeit from a low base compared with Chile (McDermott, Corredoira and Kruse, 2007).

Mendoza accounts for a highly disproportional share of Argentina’s wine exports (McDermott, Corredoira and Kruse, 2007). The surface planted with vineyards represents 141.081 ha and the vineyards in production reach 139.508 ha (UNC, 2006). Most of the production is concentrated in a belt around Mendoza city. Mendoza has 1221 wineries that produce roughly 10 million hl of wine per year (UNC, 2006).

However, production is not easy in Mendoza since there are over 100 micro-climates that can support at least 12 red and white varietals of medium to high value. (McDermott, Corredoira and Kruse, 2007). While microclimates give advantages in allowing more varieties and seasons, the difficulty is in developing standarization and scale in grape growing. Despite some consolidation in the 1990s, grape production in both provinces takes place in thousands of relatively small vineyards, with ownership concentration very low and subcontracting reaching 70% of a winery’s needs

(McDermott, Corredoira and Kruse, 2007). As of 2004, there were about 300 firms that exported wine, with the top five firms accounting for about 40% of total wine export sales and the top 20 for about 70%.

The Mendoza provincial government collaborated with a variety of associations to create gradually new institutions that provided firms with new resources, such as small firm financing for environmental hazards and data bases on micro-climate mapping and international production standards, as well key services, such as agricultural extension programs, R&D, and export promotion (McDermott, Corredoira and Kruse, 2007). During the 1990s, Mendoza created over 75 new services and programs related to the wine and grape sectors, all of which were run by new were jointly developed and run by partnerships between the government and over 50 non-government organizations. There is a rich set of interactions between local actors such as Mendoza Economy Ministry, ISCAMEN – the regional food safety institute, INTA Mza – the local branch of the national agricultural institute, and Fondo Viti – the national fund set up by industry.

The intertwined boards of the federation of vineyards and other institutions provided the foundations for the creation of R&D and extension service alliances with INTA, and the School of Agriculture of the Universidad Nacional de Cuyo (McDermott et al, 2007). The overlapping ties and participatory governance process in one institutional or policy domain led to collective action solutions that gave rise to institutional changes in other domains (McDermott et al, 2007). For example, by the late 1990s, the two major universities in Mendoza, Universidad Nacional de Cuyo (UNC) and Universidad Maza, had new or vastly expanded degree programs in oenology and viticulture; UNC was also for the first time undertaking applied research with firms (McDermott et al, 2007). According to data from these two universities, the number of students and graduates in agronomy and enology degree programs increased by 50 percent between 1996 and 2001 (McDermott et al, 2007).

These changes in part grew out of responding to specific demands and market information revealed via the universities' participation in and joint research projects with INTA and IDR (McDermott et al, 2007). ISCAMEN, the Mendoza government's food safety regulator, also sits on the boards of INTA and IDR. It created new crop protection and pest prevention systems from joint data collection and field testing projects with INTA and IDR (McDermott et al, 2007).

These rich set of public-private networks lead to a high consideration of Universidad Nacional de Cuyo among firms in the wine region (McDermott et al, 2007).

#### *Universidad Nacional de Cuyo*

The School of Agricultural Sciences is located at 18 km from the city of Mendoza, in the outskirts. Mendoza and the greater urban region has an combined population of 445,000. In this area are 94 wineries, like Chandon, Norton, and Lagarde, which are very famous and specialized in premium varietals and sparkling wines. The wines originated from this area obtain a DOC (Denomination Controlled of Origin).

Universidad Nacional de Cuyo, which was founded in 1939, initially covered three provinces: Mendoza, San Juan and San Luis. In 1973, Universidad Nacional de Cuyo

(UNC) was limited to Mendoza since the government created independent national universities in San Juan and San Luis. UNC offers undergraduate and postgraduate degrees as well as some Ph.D. programs. While it has almost 32,000 undergraduate students, only 2,000 are graduated every year. On average, the whole university has 1,600 postgraduate students. In the School of Agricultural Sciences, only 100 students graduate from a total of 1,300. The School of Agricultural Sciences has 103 ha of occupied land with a farm, an experimental winery, experimental factory of olive oil and preserves.

Each academic subject is organized in Departments. In each department, the structure comprises a director, which is usually a senior professor, and set of associated, assistant professors and auxiliary teachers. The main departments in the School of Agricultural Sciences are: bio-mathematics, physics and chemistry; biological sciences; economic, judicial and social sciences; agricultural engineering; agricultural production; oenology and agrofoods sciences. There are a number of institutes in the school: Institute of Animal Biology; Institute of Soil and Irrigation, Institute of Vine and Wine; and Institute of Food Science. Some labs are related to toxic residuals management; molecular biology; and pathological analysis of seeds. There are 230 academics with 120 full time.

There are two specific programs aimed at the wine industry in the School of Agricultural Sciences. One is a technician in oenology and viticulture. The second program is a master of science in viticulture and oenology, where students can obtain a double diploma with Ecole National Superieure Agronomique de Montpellier (AGRO-Montpellier) and INRA-Montpellier (Institut National de la Recherche Agronomique). Wine is part of common undergraduate courses such as Agricultural engineering and Licenciata in Food Safety.

The school offers 10 to 15 corporate education programs per year. Our interviewee suggested that there is a strong market for in-company programs related to different aspects of viticulture and grape growing, as well as technical support.

On average, there are 5 scholarships from industry so as their employees can take the Master of Science in viticulture and oenology. It is mandatory in all the programs run by the School to take an internship in a firm in the region. Some students found internships in wineries, other students in grape growers and another group provide support to governmental programs to small producers. On average, 60 to 70 students are employed in the region in different firms but most of them related to wine.

Research is formally undertaken at the level of department. Thus, there are 40 units (departments) more or less actively doing research in different aspects of agricultural science with involves 120 full time faculties. However, only 15% of them have Ph.D. degrees and 35% has a Master of Science as the highest degree. The fields of research include ecological physiology, viticulture mechanization, weather forecasting, and water management.

Universidad Nacional de Cuyo has no endowments but it receives research grants. The School of Agricultural Sciences has received US\$ 300,000 in the last three years from the Argentinean National Agency of Scientific Research (CONICET). The school also has an agreement with one foreign wine company.

Consulting is partly institutionalized through a co-operative established and run by faculty, academics obtain at least one contracts for consulting per year. There is an intensive exchange of academics with industry since an important proportion also had positions in the industry before joining the School.

Almost all students graduated in agriculture each year go to the wine industry since most of them entered university from wine companies or are related to existing wineries or grape growers.

In conclusion, Universidad Nacional de Cuyo has long been committed to the wine sector. Several centers have been created to provide laboratory services; they have grown, diversified and are largely self-supporting. The rich set of relationships between the actors in the wine region determined a good embeddedness of the university inside the industry as academics and practitioners exchange their positions in and out of the university. The tradition of the university implies a good institutionalization of academic research but the review could not confirm the relevance of the research to the actors in the region as well as the academic community. The review did not find any involvement in wine industry by other schools (engineering or business) nor management of a more comprehensive involvement through other offices at a university-wide level.

### Comparative Analysis of universities

In this section, we will present few statistics showing the differences between Universidad de Talca and Universidad de Cuyo in terms of training, research and consulting services.

#### *Training People for the Cluster*

Activity	Indicators (during present year)	Indicators (during present year)	
		Talca	Cuyo
Degree Programs and Courses	specialized degrees	0	2
	students currently enrolled in the specialized degrees		30
	courses outside the specialized degrees	5	0
	students taking these courses outside the specialized degrees	100	0
Post Degree Diploma Courses	Courses	1	3
	Students	20	25
Continuing Corporate Education	courses relating to the cluster	5	10/15
Industry Scholarships	scholarships paid by industry	0	5/6
Management of Continuing Corporate Education	executive education staff	1	1

The training role is where the Universidad de Cuyo put their greatest attention. Training that is related to the cluster is dispersed among many departments in the School of Agribusiness because its involvement with the wine industry since the beginning of the School.

*Research: Developing Scientific Knowledge Related to the Cluster*

Activity	Indicators (total past 3 years)		
		Talca	Cuyo
Research in Formal Units	research units	3	40
	research faculty involved	5	120
	% research faculty with PhD	66	15
Research by Other Faculty	other FTE faculty involved with research in cluster topic area	5	na
	% with PhD	60	
Research Outputs	peer reviewed publications relating to sector	38	na
	scholarly books relating to sector	0	0
Formal Research Diffusion Mechanism	research diffusion mechanisms	4	+4
Technology Transfer	licenses negotiated	1	3
Funding	Total value of endowments to research units from private sources	0	0
	Total value of grants to research units from public sources	2,017	300
	Total value of grants to research units from private sources	30	0
	Total value of research grants to individual professors from public sources	88	5
	Total value of research grants to individual professor from private sources	na	Na
	Number of non-research centre endowments	0	0
	\$ value of non-research centre endowments	0	0
Management	management staff in the individual research units	1	0
	research management office staff	2	8
	staff in the technology transfer office	0	0
Fundraising	Staff	0	0

Universidad de Cuyo is larger than Universidad de Talca in terms of faculty but the funds are relative scarce compared with Talca. Both universities do not have implemented a good information system to track the intellectual contribution of their faculty. However, Universidad de Cuyo has implemented by national law a faculty performance review every 4 and 7 years in areas like number of agreements with firms, grants obtained, impact on graduates and intellectual contributions.

*Solving Technical Issues for Cluster Organizations through Consulting and Other Services*

Activity	Indicators (total past 3 years)		
		Talca	Cuyo
R&D Extension Office	Number of instances	1	na
	Number of research contracts oriented to cluster	na <sup>2</sup>	25
Consulting Corporation	Number of instances	2	Na
	Number of consulting contracts	20	>10
Individual faculty consulting	Number of professors who consult	7	100
	Total number of contracts	33	100
Laboratory Services	Number of lab contracts	1000	60
Management	lab staff, excluding technicians and non-office operational people	7	50
	consulting office staff	0	15
	staff in the research and development extension office	0	5 <sup>3</sup>



Universidad de Cuyo has set up a co-operative by the faculty which runs all the consulting contracts since faculty cannot be hired directly by firms. The co-operative manages the relationship with the industry and the money that is paid to the faculty. Universidad de Cuyo has 6 laboratories for diverse subjects: molecular biology; soil; nematology; viticulture, oenology; cold; waste management

Finally and the most important function of the universities given the characteristics of the stocks and flows of knowledge is the links created between the university and the cluster. The following table summarizes this information.

*Creating Student and Faculty Links between University and Cluster*

Activity	Indicators (during present year)		
		Talca	Cuyo
Practicum	students getting term jobs in the cluster	24	60
Graduate Placement	% students in the main teaching department involved with the cluster who get permanent jobs in the cluster	50	100
	students from all other faculties who get permanent jobs in the cluster.	na	na
Alumni	university alumni in cluster organizations	49	500 <sup>1</sup>
Agreements with Technical Schools	formal links	1	1
Faculty Cluster Placements	full time faculty on industrial placements	0	10
Faculty Employment	full time professors who have left the university to take up cluster jobs, over the past 3 years.	1	5
	full time professors who have held full time employment in cluster organization before	0	4
	full time faculty with product companies	0	0
Cluster Professionals Teaching	cluster professionals teaching full courses	0	all
Research Collaboration	outputs coauthored by people from the cluster	1	Na
Cluster Internships	scholarships for students to spend time in a mature cluster	0	5
Management of Cluster Development	public awareness infrastructure or activity staff	4	na
	media staff		Na
Management of Students in the Workplace	practicum staff	2	8
	graduate placement staff	0	0
	alumni staff	1	0

All students in Universidad de Cuyo should have a practicum in small, medium and large wineries. Most of the students come from existing wine companies or are related to existing local wineries/farms. Universidad de Cuyo also runs a College of Agriculture (degree in Agricultural technician).

*Summary*

From the two case studies, we can observe that both Chilean and Argentinean wine regions have infrastructure issues like lack of private and public finance support for research as well as superstructural issues like the low levels of interactive innovation. Although most of the extra-regional knowledge is acquired directly by the wineries through their relationships with their foreign owners or through foreign consultants, both universities are strongly working in bringing extra-regional knowledge through their alliances with foreign universities in certain programs (especially at postgraduate level). It is encouraging to see the efforts that both universities are investing in

developing a qualified workforce and appropriate services and technologies for regional firms, especially those firms which do not have the resources to hire or bring foreign consultants.

In terms of knowledge stocks applied to innovation, our review showed that they are actively engaged in combining existing knowledge to solve practical problems like adaptation and calibration of weather and irrigation systems to local characteristics. Unfortunately, both universities are not doing enough formally in terms of knowledge flows through the mobility of professionals since they have not developed alumni departments to link experienced and recent graduates with opportunities generated by the local firms.

Informal comments from our interviewees suggested the intention to develop science parks or even incubators but these ideas are still in design phase. Thus, most of the university involvement in regional development is through the adjustment of research and teaching activities to regional needs.

The role of academics as consultants seems to be well developed and formalized in both universities but there is not evidence of long-term relationships with firms that can improve the potential spillovers of basic research. Perhaps more involvement of global wineries or even suppliers to the wine industries with these local universities may help to develop this aspect.

## **Conclusion**

The most developed countries of the New World of wine are clearly basing their business models in R&D findings to obtain better quality for their wines. While Australia is the leader in this aspect, countries like Chile and Argentina are lagging behind not only Australia but also other countries. Interestingly, Chile and Argentina are following two different paths in this respect. While Chilean wine industry seems to focus more on exogenous knowledge sources, such as flying wine consultants and centrally located universities like Pontificia Universidad Católica de Chile, for their wine regions, Argentina wine industry seems to be more endogenously driven (albeit the recent establishment of foreign firms generated a similar effect to local wineries as it happened in the 1980s in Chile) because the important role of local government, the local branch of the national agriculture institute and Universidad de Cuyo in a rich network.

While the knowledge diffusion literature cautioned against the impact of publicly supported institutions since more sophisticated knowledge transfer often needs many direct interactions, which are more likely to happen between firms than via relatively large institutions, publicly supported institutions usually focus on aiding backward firms, especially grape growers in a developing country as they are resource constrained SMEs (McDermott et al, 2007). In this aspect, the Argentinean University seems to be more attuned to this concept.

The variety of resources and knowledge appears to play an important role in innovation in wine industry. In this aspect, wine regions may have two policies: one

is to use exogenous sources, such as foreign consultants, foreign suppliers or foreign wineries; or another policy is to try to develop the institutions to provide new knowledge from endogenous sources. One might view policies such as those in Mendoza as enabling endogenous innovation through a strong role of the university as coordinator of a network since firms tapped in a great variety of other actors' knowledge facilitated by the university from which they could gain different types of knowledge and resources (McDermott et al, 2007). However, more recent research has emphasized the limits to this diversity. The returns to performance at some point may become inversely related to the diversity of one's network and search breadth, because the costs overwhelm capacity and the knowledge being accessed is either highly codified or too tacit (McDermott et al, 2007). The other approach followed by the Chilean wine industry, which focused on exogenous sources of knowledge, leaves regional universities with a more limited role and fighting hard to establish a reputation in the region.

## References

- Aylward D.K. (2003) A Documentary of Innovation Support Among New World Wine Industries, *Working Paper, Faculty of Commerce, University of Wollongong*
- Boucher G., Conway C. and Van Der Meer E. (2003) Tiers of Engagement by Universities in their Region's Development, *Regional Studies*, Vol 37, No. 9, pp. 887-897
- Chilevid (2006) Bottled wine exports – Ranking of exporting firms.
- Coenen L., Moodysson J., Ryan C., Asheim B. and Phillips P. (2006) Comparing a Pharmaceutical and an Agro-food Bioregion: On the Importance of Knowledge Bases for Socio-spatial Patterns of Innovation, *Industry and Innovation*, Vol 13, No. 4, pp. 393-414
- Cooke P. (2001) Regional Innovation Systems, Clusters and the Knowledge Economy, *Industrial and Corporate Change*, Vol. 10, No. 4, pp. 945-974
- Etzkowitz H. (2001) The second academic revolution and the rise of entrepreneurial science, *IEEE Technology and Society Magazine*, Vol 20, No. 2, pp. 18-29
- Feldman M., Gertler M. and Wolfe D. (2006) University Technology Transfer and National Systems of Innovation, *Industry and Innovation*, Vol. 13, No. 4, pp. 359-370
- Giuliani E. (2003) How clusters learn: Evidence from a Chilean wine cluster, *Paper presented at EADI Workshop Clusters and Global Value Chains in the North and the Third World.*
- Giuliani, E. and Bell M. (2005) The micro-determinants of meso-level learning and innovation: evidence from a Chilean wine cluster, *Research Policy*, Vol 34, pp. 47-68.
- Gunasekara C. (2006) Dilemmas in Regional University – Industry Research Collaboration, *Local Economy*, Vol 21, No. 2, p.166-179
- Hakanson L. (2005) Epistemic Communities and Cluster Dynamics: On the Role of Knowledge in Industrial Districts, *Industry and Innovation*, Vol 12, No. 4, pp. 433-463
- Hojman, D. E. (2005) Network Learning, Principal-Agent Conflict and Award-Winning Wine-Making in Chile's Colchagua Valley, *The University of Liverpool – Management School*, Research Paper Series No. 2005/12.
- INV (2006). Instituto Nacional de Vitivinicultura – Exportaciones Argentinas
- Knowles, T. and Sharples, L. (2002) "The History and Development of Chilean Wines", *International Journal of Wine Marketing*, Vol 14 No 2, pp. 7-16.
- Kunc, M. and Tiffin, S. (2008) Background Report on Business Management PhD Programs in Latin America. Tampa: AACSB.
- Lundvall B.-A. (2002) The University in the Learning Economy, *DRUID Working Paper*, No. 02-06. Aalborg
- Malmberg A. and Power D. (2005) (How) Do (Firms in) Clusters Create Knowledge? *Industry and Innovation*, Vol 12, No. 4, pp. 409-431

- McDermott G., Corredoira R. and Kruse G. (2007) Public-Private Networks as Sources of Knowledge and Upgrading Capabilities: A Parametric Stroll through Argentine Vineyards, *Working Paper Wharton School, University of Pennsylvania*
- McDermott G. (2007) Recombining the Vines That Bind in Argentina The Politics of Institutional Renovation and Economic Upgrading, *Politics & Society*, Vol 35, pp. 103
- Mytelka L. (2000) Local Systems of Innovation in a Globalized World Economy, *Industry and Innovation*, Vol. 7, No. 1, pp. 15-32
- Schiller D. (2006) Nascent Innovation Systems in Developing Countries: University Responses to Regional Needs in Thailand, *Industry and Innovation*, Vol 13, No. 4, pp. 481-504
- Tallman S., Jenkins M., Henry N. and Pinch S. (2004) Knowledge, Clusters and Competitive Advantage, *Academy of Management Review*, Vol 29, No. 2, pp.258-271
- Visser E-J. and de Langen P. (2006) The importance and quality of governance in the Chilean wine industry, *GeoJournal*, Vol 65, pp. 177–197
- Wines of Chile (2007) <http://www.winesofchile.org>
- UNC (2006). Universidad de Cuyo – Report of Activity 2006.