



Catching up and Sectoral Systems of Innovation: A Comparative Study on the Wine Sector in Chile, Italy and South Africa

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Keywords: Sectoral systems of innovation, Catching up, Wine sector, Emerging economies

Abstract

The wine industry represents an interesting case of catching up of latecomers in traditional agro-food industry. In this paper we argue that the literature on the sectoral systems of innovation (SSI) provides a useful analytical framework for interpreting the industry trajectory of co-evolution along different dimensions and the catching up experiences across the New World. The paper adopts a comparative empirical perspective to investigate the key dimensions of the emergent wine SSI, identifying the main factors that lead new producers to catch up and, in some cases, to forge ahead. The study is based on the analysis of recent global trends and particularly on novel empirical evidence collected on research organizations and wine cellars located in Italy and in two emerging countries: Chile and South Africa.

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Introduction

The last decades of technological evolution and global competition in the wine industry provide a distinct tale of catching up and leap frogging, whose interpretation may prove useful for advancing knowledge on catching up opportunities and strategies in the agro-food industry, an extremely important sector in the least developed countries (LDCs).

The wine industry has been recently characterised by relevant discontinuities and a spectacular competitive performance by latecomers, whose emergence can be hardly explained in terms of acceleration along the technological and market path opened up by forerunners, as commonly envisaged by the early literature on catching up. Indeed, the process of technological modernisation and pervasive organisational change has been spurred by consistent investments and research efforts in new producer countries, the so-called New World, including both affluent nations, relatively new to the industry, such as USA and Australia, and emerging economies, such as Chile, Argentina and South Africa. The renovation promoted in the New World has been meeting with slow response by traditional wine areas in Europe, the so-called Old World, whose long established competitive positions in international markets have been, as a consequence, significantly challenged.

Moreover, the supply side technological renovation and the country-level strategies addressed at building specialised research institutions in support of the catching up effort account only for part of the story. The institutional innovations in the scientific and technological system supporting the agro-food industry have been consistent with - and supportive of - the trend of exogenous changes in the consumption habits. That is, the demand side has been playing a central role in the industry evolutionary trajectory. New World players have been particularly effective in favouring and responding to the changes in wine consumption habits along the world, aligning the emerging scientific approach and institutional building efforts to branding and marketing strategies.

The wine industry catching up tale is therefore one of co-evolution in interrelated dimensions at both the supply and the demand sides, whose analysis calls for a broad systemic perspective. In this paper we argue that the literature on the sectoral systems of innovation (SSI) provides a useful analytical framework for interpreting the industry trajectory of co-evolution along different dimensions and the catching up experiences across the New World. The sectoral system approach offers a conceptual device that helps to disentangle the complex web of interactions between markets, firms, research organisations and government bodies, providing a guidance to identify key factors and feedback mechanisms underlying the process of catching up.

Furthermore, the wine industry provides an interesting case of opening up of "windows of opportunities" in traditional agro-food sectors, defining a comparative case for further studies. The paper argues that such windows of opportunity arise at times of significant transformations in the SSI, triggered by technological progress and radical changes in the institutional set up of innovative activities. We maintain that the ability of emerging countries to take advantage from these opportunities is strongly influenced by institutional variables, which shape the interactions among actors in the innovation system. These same institutional variables, that is, the framework in which innovative activities are organised, at the national and at the local level, may explain lock-in or falling behind of long-established players, which have been building their competitive advantage upon strategies and interactive patterns that prove to be less functional under the new sectoral system "regime".

The paper adopts a comparative empirical perspective to investigate the key dimensions of the emergent wine SSI, identifying the main factors that lead new producers to catch up and, in some cases, to forge ahead. The study is based on the analysis of recent global trends and particularly on novel empirical evidence collected on research organizations and wine cellars located in Italy and in two emerging countries: Chile and South Africa. The paper is organised as follows. Section 2 reviews the literature debate on catching up and Sectoral Systems of Innovation (SSI). Section 3 presents the methodology and the data. Section 4 discusses the findings of the field studies undertaken in Italy, Chile and South Africa. Section 5 concludes.

2. Catching up and sectoral systems of innovation

The emphasis on "dynamic sectors" as the target of catching up efforts by backward countries goes back to the pioneering work by Gerschenkron (1962), who advocated the building up of appropriate institutional instruments for improving capacity to invest in advanced technology and take advantage of the forerunners' experience. Following Gerschenkron, the neo-Schumpeterian literature on SSI has emphasized the role of dynamic sectors in catching up, and, most interestingly, the differences across industries in the factors at the base of catch up (Malerba, 2006; Malerba and Nelson, 2007). Such a perspective implies a conceptualisation of technology diffusion and innovation in LDCs which strongly differs from that of the early literature on catching up.

According to the mainstream development thinking in the 1950s and 1960s, catching up could mainly take place through technology transfer, that is, import and adaptation of technology and organisational models developed in advanced countries, whose benefits were assumed to trickle down and diffuse to the economy at large (Mytelka, 2004). Latecomers were mostly represented as users, rather than producers, of technology. Investments in production capacity and institutional changes favouring the adoption of imported technology and consistent business models were considered key variables in their catching up trajectory. Along these lines, catching up is thus basically a question of relative speed in a race along a fixed track, in which latecomers can take advantage from mature technologies, forerunners' experiences and reduced market uncertainty.

The later evidence about catching up and leapfrogging in Asian Newly Industrializing Countries (NICs) has contributed to a significant shift in this perspective. In fact, engineering excellence in manufacturing and quick entry into new market segments appear as common elements across the successful experiences of Asian newcomers (Hobday, 1995; Kim, 1997; Lee *et al.*, 2005). Inspired by this evidence, over the 1980s and 1990s, a different conceptualisation of the catching up process has come up, stressing the key role of learning to produce efficiently quality products (Nelson, 1998). More recently, this approach has underlined the importance in the catching process of conscious systemic efforts aimed at fostering indigenous innovative ability and wide learning capabilities, mainly through large investments in higher education and R&D infrastructure (Fagerberg and Godinho, 2005; Mazzoleni and Nelson, 2007; Mytelka, 2004; Niosi, 2008).

According to Perez and Soete (1988), windows of opportunity for latecomers open particularly at time of shifts in the techno-economic paradigm - the set of interrelated technical and organisational innovations that gradually come together as a best-practice model - when forerunners carry a heavier burden of structural adjustment. Catching up is however by no means guaranteed, depending on the extent to which countries are equipped with relevant capabilities

(Abramovitz, 1986; Justman and Teubal, 1991; Niosi and Reid, 2008). Policies can play a key role in periods of transition, but the capacity to monitor, interpret, react, or even drive these changes depends on the cumulative efforts to promote learning capacity across the economy. According to this perspective, only those countries that are able to create technological capabilities and complementary assets to ride the new technological systems can grab this opportunity (Lall, 1992; Lee and Park, 2006). The analysis of national or regional settings is thus to be complemented with the investigation of sector-specific dynamics and knowledge structures. As key technologies of different eras require different sets of supporting institutions, successful countries are those that have the basis of these institutions in place when they are needed or manage to build rapidly and effectively appropriate new institutions (Perez and Soete, 1988; Nelson, 2008).

To analyse the wine industry evolutionary trajectory, we adopt the broad perspective of the SSIs, which focuses on sector-specific patterns of evolution, on their commonalities across countries and regions, and on the interplay between general sectoral dynamics and idiosyncratic factors, which account for differentiated performances and evolutionary paths.

Following Malerba (2004), a sectoral system of innovation and production is intended as the set of new and established products for specific use, and the set of heterogeneous actors who carry out interactions for the creation, production and sale of those “sectoral products”. Knowledge, learning processes and technologies, actors and networks, institutions represent the building blocks of a SSI, the basic dimensions of analysis for understanding the learning and innovation processes specific to a sector, as well as the factors that are at the base of differential performance and catching up strategies of firms and countries in a sector.

Sectors differ primarily in terms of knowledge domains, that is, in terms of scientific and technological fields that are at the base of innovative activities and in terms of applications and types of users involved (Dosi, 1988; Nelson and Rosenberg, 1993). In a sectoral system, features and sources of knowledge affect the organisation of production and innovation, the exploration paths and learning dynamics, the sequences of variety generation and selection, the role and interactive attitudes of the main actors.

Identification of key actors and understanding of the relationships among them represent a critical dimension in the characterisation of SSI. Firms (producers, suppliers, users) are the main object of investigation in the innovation literature, but, typically, they are not the only relevant organisations in the dynamics of sectoral-level technological change. Relevant non-firms organisations include industry and technical associations, trade unions, financial institutions, government agencies, training institutions and universities (Malerba, 2005). In particular Public Research Organisations (PRO) have been acknowledged as key players in building indigenous technological capabilities, especially in applied fields like agriculture, and they are likely to grow in importance in the near future as international property right regimes become tighter (Mazzoleni and Nelson, 2007). National factors generally affect the main actors’ functions, organisation and networks of relationships, inter-playing, however, with sectoral specificities, related with the features of the knowledge base and the primary technologies, that generate some common traits across countries.

Demand also plays a key role in the evolution of SSI; it can represent a source of important stimuli to change, or even spur SSI emergence, but it can also turn into a major constraint on evolution. Demand influences not only the scale of activities, but also cognitive boundaries, the nature of problems that firms have to solve, and the incentives driving their innovation behaviour. Changes in demand represent a substantial modification of the context in which firms operate and

may favour the entry of new firms and/or the out positioning of established ones, which may find it difficult to adapt or recognise new markets when they open up (Christensen and Rosenbloom, 1995).

A final relevant dimension of analysis of SSI, which cuts across the former, is the institutional framework, that is, laws and standards, norms, routines, established practices, which shape agents' cognition and behaviour and affect their interaction (Coriat and Weinstein, 2002; Malerba, 2004). The institutional level is certainly one of strong interplay between sectoral specificities and national or regional factors. On the one hand, national institutions, such as the system of property rights, the education system, the norms ruling university research and its interaction with industry, antitrust regulation or labour market regulation, largely explain different development paths and innovative dynamics within the same sector across countries (Lundvall et al., 2002). On the other hand, however, they may also produce different effects across industries, as a consequence of different coupling with the other defining dimensions of sectoral systems.

As Malerba (2006) indicates, the long run dynamic interaction between national factors and sectoral systems is one of the open research questions in need of more solid comparative analysis. Investigating trajectories and timing of catch up experiences through the lenses of the SSI approach may shed new light on the conditions that favour the opening up of windows of opportunities for latecomers. Furthermore, there is a need to extend knowledge across sectors, as the empirical literature is mostly dedicated to high tech or large scale manufacturing. Considering their relevance in the developing world, traditional sectors and agro-food industries represent, in this respect, a highly valuable research target (Arocena and Sutz, 2000).

The present contribution tackles this open agenda, as the wine industry appears an interesting case in point of significant transformations in the SSI and opening up of catch up opportunities, which have been caught at different degrees by newcomers in developing areas. In what follows, before analysing the wine sectoral system, some methodological details on our sources of data and information are provided.

3. Methodology and data

In order to understand how and to what extent New World wine producers have been able to catch up and, in some cases, to forge ahead traditional producers, we explore the different dimensions of the wine sectoral system, namely: the market and demand structure; the knowledge and technology content; the main actors of the system and their interrelations; the institutional framework. For the purpose of assessing catch up, we refer to relevant performance indicators from secondary sources. Moreover, in the in-depth analysis on Piedmont (Italy), Chile and South Africa we combine secondary sources with original survey data.

The reason for choosing our case studies are the following: Piedmont is an Italian region well representing an Old World area of production of high quality traditional wines; Chile and South Africa are two emerging countries, representatives of different tiers of the New World competitors. Chile is among the catch-up frontrunners and South Africa is a new player in the world scene which has been lately entering the international growth trajectory.⁴

⁴ It may be observed that the comparison is among two countries and one region but in terms of industry size they are comparable: in 2006 the value of the wine exports in Piedmont is 700 millions US\$, placing the region between Chile (900 million US\$) and South Africa (530 mln. US\$).

The survey was carried out in the period between October 2005 and October 2006 through personal interviews to two different categories of actors involved in the wine sectoral systems:

- a) The *researchers*, working at Universities or research centres, whose research agenda is focused on wine-related issues, spanning across different disciplines (e.g. viticulture, oenology, agronomy, agriculture, microbiology, genetics, chemistry, engineering). Through the help of key informants, we have identified a population of 40 researchers in Chile, 42 in South Africa and 53 in Piedmont (Italy), who have been interviewed about their professional and educational background and about their personal collaborations with other researchers and with people in the industry. Relational data on collaborations among researchers and with industry have been gathered in a specific section of the questionnaire in a format suitable for using social network analysis, through the so called *free recall* method (Wasserman and Faust, 1994);⁵
- b) A selection of high innovative *wine firms*, as indicated by key informants from local research centres, universities, extension agencies and business associations. The design of the empirical investigation was aimed at getting insights into the activities and strategies of dynamic players, which are supposedly leading innovation trends, rather than providing a representative picture of the overall wine sector in the selected areas. Across countries, these firms (37 in Piedmont, 27 in Chile and 20 in South Africa) exhibit differences that are consistent with the diversified features of the key industry actors in these areas, as it will be analysed in more details in Section 4.3. Whereas Piedmont producers are relatively small in terms of employees and hectares (though less so in terms of sales), reflecting the typical fragmentation of traditional wine areas, the Chilean sample is composed of rather large firms, many of them are part of groups which in some cases are international ones, thus being inserted in the dynamics of concentration and rationalisation which is characterising most of the New World regions. The smaller South African firms are, on the other hand, representatives of a New World industry which has still not entered this sustained concentration path and is mostly related to domestic capital. Concerning export activity, Chilean firms are those addressing international markets to a largest degree, while the majority of Piedmont and South African producers find important market also within their own country (Table 1).

Besides these two surveys, we have also conducted a number of in-depth interviews to key informants and privileged actors both in the industry and in the research institutions (see Table 7). Through these contacts, we have gathered in-depth qualitative information on the institutional and historical transformations occurred in the different national contexts and on the policy framework interesting the wine industry.

To complement the empirical evidence collected with the field studies, our analysis also draws on secondary sources. Particularly, in order to introduce some measures of the quality and performance of the researchers interviewed, we refer to international publications and citations in peer reviewed journals, as reported in the ISI Web of Knowledge (WoK).

4. Catching up in the wine sectoral system

⁵Two types of relational data have been collected: (i) on University-Industry linkages among researchers interviewed and professionals in the industry; and (ii) on academic linkages between the researcher interviewed and other researchers. For methodological details see Giuliani and Rabellotti (2007).

The wine industry has been undergoing radical changes over the last couple of decades, namely a seismic shift in production methods, research intensity and organisation, global competitiveness and producers ranking. Although, the so-called Old World countries, including Italy, France, Spain, Portugal and Germany, are still among the main producers, exporters and markets, they do not longer dominate the industry as they once did. Producers from the New World, such as USA, Australia, New Zealand, South Africa and Chile, have been rapidly gaining market shares, including in the medium-high quality segments, once the exclusive domain of traditional, long-established producers (Aylward, 2003; Aylward and Turpin, 2003).

Table 1 - Ownership and size of the firms interviewed

Country (# firms)	Ownership		Employees			Hectares			Sales	Export
	Part of a group (%)	% foreign shareholders (mean)	Average	Min	Max	Average	Min	Max	Average (mln Euro)	% Mean
Italy–Piedmont (37)	10.8	0	29.4	1	400	375.3	3	2051	17	45.8
Chile (27)	74.1	29	255.8	21	1000	1033.9	100	4000	21	84.1
South Africa (20)	15.0	5	38.7	2	181	186.7	25	780	1.7	44.6

Source: Authors' survey

Before the late 1970s, New World production was concentrated in bulk wine of variable quality, posing no real threat, neither in terms of volumes nor in terms of quality, to the European hegemony in international markets,. This position has been rapidly eroded by emerging areas, which managed to catch up and even, to some degree, to leap frog. In volume terms, the share of world trade of the 5 leading European exporters⁶ has declined from almost 80% in the late 1980s to 62% in 2007 while the 'Southern Hemisphere'⁷, which accounted only for 1.6% of world export in the 1980s, has reached a share of 28% (OIV, 2008).

Over the decade 1996-2006, the export volumes of the New World countries has increased dramatically, at the rate of 350% for South Africa, around 280% for Australia and Chile and 190% for the US (European Commission, 2007). The catching up trajectory of the New World countries is even more evident when considering the value of export, whose growth testifies their upgrading along the quality ladder and entry into the premium market segments that used to be contended by French and Italian wines. For instance, since of the early 1990s, premium exports⁸ have contributed to 97% of the growth in the value of Australia's wine exports, the frontrunner among the newcomers. Accordingly unit price for Australian wines went up from 1.22 US\$ per litre to 3.14 US\$, placing the country just after France and ahead of a historically quality producer such as Italy (Table 2). Chile and South Africa are still specialised in lower quality

⁶ In order of ranking in 2007: Italy, Spain, France, Germany and Portugal (OIV, 2008)

⁷ Argentina, Chile, Australia, New Zealand, South Africa and USA.

⁸Wines are commonly ranked on a six-point scale, from the best quality to the lowest one (i.e. icon, ultra premium, super premium, premium, popular premium and basic). Wines included in the premium segment are characterized by brand recognition and appellation of origin; their price ranges between 5 and 7euro (Rabobank, 2002).

segments, but the unit value of their exports has been gradually converging towards the world average, more than doubling, in absolute terms, since the early 1990s. As a consequence of quality upgrading and volume expansion, the value of exports has increased in Chile from 72 million US\$ in the first half of the 1990s to almost 900 million US\$ in 2004 and in South Africa from less than 200 million US\$ in the second half of the 1990s to more than 500 million US\$ in 2004.

All in all, these figures suggest that the upsurge of the New World producers is not a sporadic instance. Indeed, in some markets the New World producers have been able to overcome the Old World – for example Australia took over France as second largest exporter, after Italy, to US and it became the biggest exporter to the UK; similarly, Chile became the fifth largest exporter to the US and the first world table grape producer.⁹

The observed catching up trajectory can be hardly explained simply in terms of technology diffusion or imitation of established techniques. We argue the emergence of the New World producers has been favoured by significant discontinuities in both technologies and market demand, and has implied the co-evolution of physical and “social” technologies (Nelson and Sampat, 2001), that is of formal and informal institutions that support the adoption of knowledge oriented procedures and a novel division of labour between the main industry players. It was the rapid adoption of a scientific approach to a rather traditional industry and the co-ordination between research communities and wineries that spurred the performance of the New World. Following the SSI approach, in the next sections we analyse the sources and effects of these discontinuities in the interrelated dimensions of demand, knowledge content and technology, main actors and relations among them and institutional framework.

5. The main dimensions of the wine SSI

5.1. Demand

The demand side has been playing a central role in the industry evolutionary trajectory. New World producers have not only upgraded the quality of their wines, but they have also favoured and taken advantage from a change in consumers' tastes, ending what Aylward (2003) defines as the historical monopoly of Europe over wine culture. The New World expansion has been changing the way wine is valued in terms of flavour, variety and national origin (Cohen and Labys, 2006), forcing adaptation in the organisation of production, research and marketing strategies of Old World producers.

The changing habits in wine consumption are part of a wider transformation in consumers' attitudes that, since the 1980s, has been characterising the market in the European countries with a tradition as wine drinkers (e.g. Italy, France, Spain) as well as other affluent countries where wine culture was incipient (e.g. UK, Scandinavian countries, US). In the 1980s, a "gourmet culture" began to spread in rich countries, increasing the popularity of wine as a "beverage", with an emerging preference for cabernet, merlot and chardonnay varietal wines, typically produced in the New World (Cohen and Labys, 2006). These changes in tastes went along with a sharp decline in wine consumption, which has been common to almost all wine producing countries. Over the period 1985-2004 consumption fell sharply in France (-35%) and Italy (-20%), a decline

⁹ Since the beginning of its upsurge the growth of the Chilean wine industry has been export-driven, given the small size of the domestic market. While both the Italian and South African industries have traditionally sold a significant share of their production to the domestic market.

that was partly compensated by growing demand in the Northern European countries, the former Soviet Union and China (European Commission, 2007).

The strengthening of the New World producers was further favoured by concurrent changes on the side of demand. Among the affluent and educated consumers, wine drinking gradually turned into a "cultural experience", a sensorial approach to other cultures, where history, origins and varieties complement taste. This cultural change was first embraced and promoted by European producers, encouraging the diffusion of knowledge about "terroir" and quality varieties and the link between wine drinking and lifestyle. Then, this idea of drinking wine as a wider cultural experience became a stimulus among educated consumers for "tasting" other cultural products, hence for approaching New World wines.

Table 2 – Italy, Chile and South Africa in the global wine industry (1975-2004)

A. PRODUCTION AND EXPORT VOLUMES

		1975-79	1980-84	1985-89	1990-94	1995-99	2000	2001	2002	2003	2004
Volume of Wine Production ('000 hl)	France	66.614	67.453	66.088	56.309	57.925	60.109	55.383	56.388	47.500	58.500
	Italy	71.276	76.787	67.470	61.058	56.233	57.044	53.677	45.703	44.000	53.000
	Australia	3.535	3.992	4.391	4.693	6.790	8.592	10.765	12.204	10.860	14.712
	Chile	5.399	7.085	4.007	3.488	4.605	6.674	5.652	7.091	6.870	7.532
	South Africa	NA	NA	NA	NA	8.327	7.620	7.610	8.342	9.560	10.157
	World	319.335	340.626	302.867	270.274	282.708	307.257	288.556	293.601	286.451	316.892
Volume of Wine Exports ('000 hl)	France	7.196	9.662	12.905	12.569	15.628	16.620	17.179	16.345	15.934	14.724
	Italy	13.238	16.419	12.738	12.404	17.997	19.378	16.676	16.469	13.451	14.148
	Australia	55	78	266	968	1.785	3.107	3.750	4.710	5.242	6.426
	Chile	124	138	174	789	1.982	2.770	3.051	3.451	3.953	4.746
	South Africa	NA	NA	NA	NA	1.050	1.399	1.734	2.249	3.524	2.954
	World	41.939	48.045	44.773	47.203	65.262	68.730	69.018	70.848	75.346	79.392
Value of Wine Exports (millions US \$)	France	1.070	1.608	2.950	4.077	5.336	5.166	4.787	5.391	6.609	6.878
	Italy	553	787	954	1.488	2.396	2.356	2.339	2.608	3.030	3.542
	Australia	7	13	49	214	513	860	911	1.224	1.550	2.018
	Chile	10	13	16	72	382	585	641	599	730	896
	South Africa	NA	NA	NA	NA	189	242	241	307	414	535
	World	2.924	4.070	5.856	8.362	12.784	12.997	12.787	14.099	17.043	19.585
Share of World Wine Export Volume (%)	France	17,2	20,1	28,8	26,6	23,9	24,2	24,9	23,1	21,1	18,5
	Italy	31,6	34,2	28,5	26,3	27,7	28,2	24,2	23,2	17,9	17,8
	Australia	0,1	0,2	0,6	2,1	2,7	4,5	5,4	6,6	7,0	8,1
	Chile	0,3	0,3	0,4	1,7	3,0	4,0	4,4	4,9	5,2	6,0
	South Africa	NA	NA	NA	NA	1,6	2,0	2,5	3,2	4,7	3,7
	World	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

B. EXPORT VALUES

Value of Wine Exports (millions US \$)	France	1.070	1.608	2.950	4.077	5.336	5.166	4.787	5.391	6.609	6.878
	Italy	553	787	954	1.488	2.396	2.356	2.339	2.608	3.030	3.542
	Australia	7	13	49	214	513	860	911	1.224	1.550	2.018
	Chile	10	13	16	72	382	585	641	599	730	896
	South Africa	NA	NA	NA	NA	189	242	241	307	414	535
	World	2.924	4.070	5.856	8.362	12.784	12.997	12.787	14.099	17.043	19.585
Share of World Wine Export Value (%)	France	36,6	39,5	50,4	48,8	41,7	39,8	37,4	38,2	38,8	35,1
	Italy	18,9	19,3	16,3	17,8	18,8	18,1	18,3	18,5	17,8	18,1
	Australia	0,2	0,3	0,8	2,6	3,9	6,6	7,1	8,7	9,1	10,3
	Chile	0,3	0,3	0,3	0,9	2,9	4,5	5,0	4,2	4,3	4,6
	South Africa	NA	NA	NA	NA	1,5	1,9	1,9	2,2	2,4	2,7
	World	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Unit Value of Wine Exports (US\$/litre)	France	1,49	1,66	2,29	3,24	3,43	3,11	2,79	3,30	4,15	4,67
	Italy	0,42	0,48	0,75	1,2	1,34	1,22	1,40	1,58	2,25	2,50
	Australia	1,22	1,7	1,85	2,21	2,85	2,77	2,43	2,60	2,96	3,14
	Chile	0,79	0,95	0,95	0,91	1,87	2,11	2,10	1,73	1,85	1,89
	South Africa	NA	NA	NA	NA	1,85	1,73	1,39	1,36	1,17	1,81
	World	0,7	0,85	1,31	1,77	1,96	1,89	1,85	1,99	2,26	2,47
Relative Unit Value of Wine Exports (Relative to World)	France	2,13	1,95	1,75	1,83	1,76	1,64	1,50	1,66	1,83	1,89
	Italy	0,6	0,56	0,57	0,68	0,69	0,64	0,76	0,80	1,00	1,01
	Australia	1,74	2	1,41	1,25	1,46	1,46	1,31	1,31	1,31	1,27
	Chile	1,13	1,12	0,73	0,51	0,95	1,12	1,13	0,87	0,82	0,77
	South Africa	NA	NA	NA	NA	0,96	0,92	0,75	0,69	0,52	0,73
	World	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00

Source: Anderson and Norman (2006)

Most interestingly, such a pervasive change on the demand side has been substantially modifying the role of consumers in the industry. The definition of wine "quality" is no longer the exclusive domain of wine producers; beyond any intrinsic characteristics the ultimate criterion for quality is the value perceived by the market (Aylward and Zanko, 2006). Furthermore, the capacity to facilitate the identification of a wine and to build its reputation has become a major competitive

advantage in a market characterised by a large and increasing share of relatively inexperienced consumers, mainly buying wine in supermarkets.

The consolidation of distribution, at both the wholesaler and the retail level, has been strongly affecting the wine market competitive game. In the US, the 20 largest wholesalers control 70% of the market and supermarkets and mega-supermarkets account for more than 40% of retail wine sales, with a similar trend being observed across all the affluent countries (Castaldi *et al.*, 2006). Distributors' consolidation has made it increasingly difficult for smaller producers to get their product onto the shelves. Wholesalers and supermarkets prefer to distribute only the top selling brands, in lieu of small or new labels. This sale strategy is of course damaging wine industries, like the Italian one, characterised by small, often micro, wineries producing an incredibly rich variety of vines and wines sold with thousands of different labels.

These quantitative and qualitative changes in the market were embraced and somehow favoured by California, the first New World region that posed threat to Old World dominance. US wine experts had a major initial role in breaking the patterns of established perception and changing the reputation and media coverage of wine regions, traditionally associated to low quality segments and with very little recognition in international markets. The role of Californian wines was crucial in attracting interest and improving recognition for wine areas that were not part of the traditional establishment¹⁰.

Among New World producers, together with California, Australia was very rapid at recognising this evolution in the market, responding consistently with increased efforts in branding and marketing. In particular in order to send a clear and strong message to consumers, Australia has chosen to promote the “Brand Australia”, putting on the side all the differences among wines and regions, to target the “popular-premium” segment of the world market (Aylward, 2006).

Following the way opened by California and Australia, other New World producers have begun to change their position in the international market. Among these latecomers there are Chile and South Africa, where the surge of the wine industry began in the 1990s. Although they still lag behind Australia in terms of export quality, as commented above, both countries managed to lift dramatically the value of their export since the 1990s.

With regard to Old World producers, their first response to the aggressive marketing strategies of New World countries has been to strengthen the concept of *terroir*, maintaining a producer-driven approach. Both in the case of France and Italy, this response has been reinforced by the strengthening of the institutional setting in terms of regulations of wine appellations of origins and production disciplines (Pompelli and Pick, 1999; Aylward and Zanko, 2006). This left large room for the penetration of New World producers in the world changing market and more recently has forced substantial changes in Old World strategies (see Section 5.4).

Among Italian wine regions, Piedmont has fully embraced the strategy of strengthening the specificity of its “*terroir*”. The region produces 11 DOCG (*Denominazione di Origine Controllata e Garantita*) wines (over 38 in all Italy) and 45 DOC (*Denominazione di Origine Controllata*) (over 316 in all Italy), which account for almost 80% of overall regional production in Piedmont, and 15% of Italian production of appellation wines.¹¹

¹⁰ The first seismic shock in the wine world industry was in 1976, when at a blind test in Paris, the French wine experts chose as the best wine a Cabernet from California, also including among the best whites other four Californian wines (Aylward and Zanko, 2006).

¹¹ The attribution of these appellations depends on strict regulations that establish the production area, the grape varieties that can be used in a particular regional blend, the vine yield, the wine/grape yield, the alcoholic content, production and ageing methods together with a specification of which kind of information can be put on the wine

Piedmont wineries have therefore chosen to target fast growing market niches dominated by highly educated consumers, which demand 'experience goods', that is, unique wines linked to specific heritage and story. These consumers represent a small, but culturally relevant, market segment, reacting to the standardisation of tastes and dominance of supermarkets and international retail chains in the global wine market by drawing attention on small independent producers and local wines variety.¹²

5.2 *Technologies and knowledge base*

The wine industry has always been knowledge-driven, but over the last decades, and in parallel with demand changes, the characteristics of the knowledge base have changed and R&D strategies have become critical to the industry success.

The initiation of oenology as a scientific field dates back to the 19th century, first driven by research at universities in France and leading scientists such as Louis Pasteur. The application of microbiology and the understanding of the process of wine fermentation were major scientific advances (Giuliani, 2006). The scientific input was typically absorbed in traditional production methods, driven by the manual dexterity of farmers and idiosyncratic knowledge. Up to the 1970s, the wine industry was characterised by producer-driven research and innovation focused on responding to knowledge requirements in the traditional *terroirs*. This implied context specific learning processes and knowledge cumulativeness.

In the New World, the industry developed slowly as a consequence of colonial settlements and import of vines and remained very much confined to local markets and bulk wine, sustained by simple oenological culture and research. However, it is in the New World that the recent process of technological modernisation took off. This is broader than R&D and diffusion of oenological knowledge, as it involves innovative approaches to markets, branding and business systems as well as large investments in human resources (Aylward and Turpin, 2003).

In this respect, the pioneer has been California, bringing about the novelty of a full-fledged "scientific approach". In this revolution, the University of California at Davis has played a major role, conducting leading scientific research and training highly skilled oenologists and agronomists who eventually contributed to the introduction and widespread diffusion of technical changes at the firm level (Porter and Bond, 2002). Thus, rather than scientific breakthroughs, it is the consistent modernising research-based approach that has changed technologies and production methods.

In the New World, the research has been significantly oriented towards responding to (and further strengthening) the changes in demand (Kramer, 2003). The focus of research has been on the introduction of new grapes varieties and on the reduction of the variability of output in order to obtain wines with regular taste and quality notwithstanding the variability in climate conditions, soil characteristics as well as other local specificities.

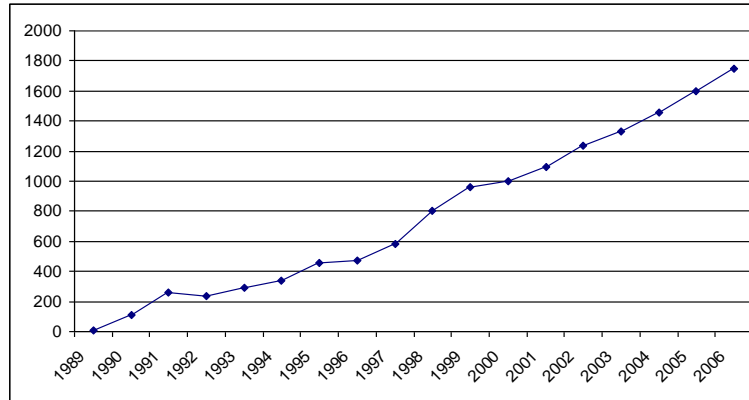
The scientific drive of newcomers has emerged in a global context of increased knowledge codification and formal investigation effort across a wide range of disciplines related to wine activities (Glänzel and Veugelers, 2006). Since the early 1990s to 2006, "wine publications", mostly under the subject of Food Science & Technology, but increasingly spanning into Biology

label (Odorici and Corrado, 2004). As discussed in section 5.4, this regulation is going to change in 2009 within the framework of the EU crop policy reform.

¹² A non-profit organization promoting this philosophy with a wide visibility in Italy and increasingly operating also in many other parts of the world is the Slow Food movement, founded in 1989 in Piedmont (www.slowfood.com).

and Biotechnology, recorded a growth rate five times larger than the average one across the spectrum of scientific disciplines (Figure 1)¹³.

Figure 1 Number of Wine Publications, 1989-2006

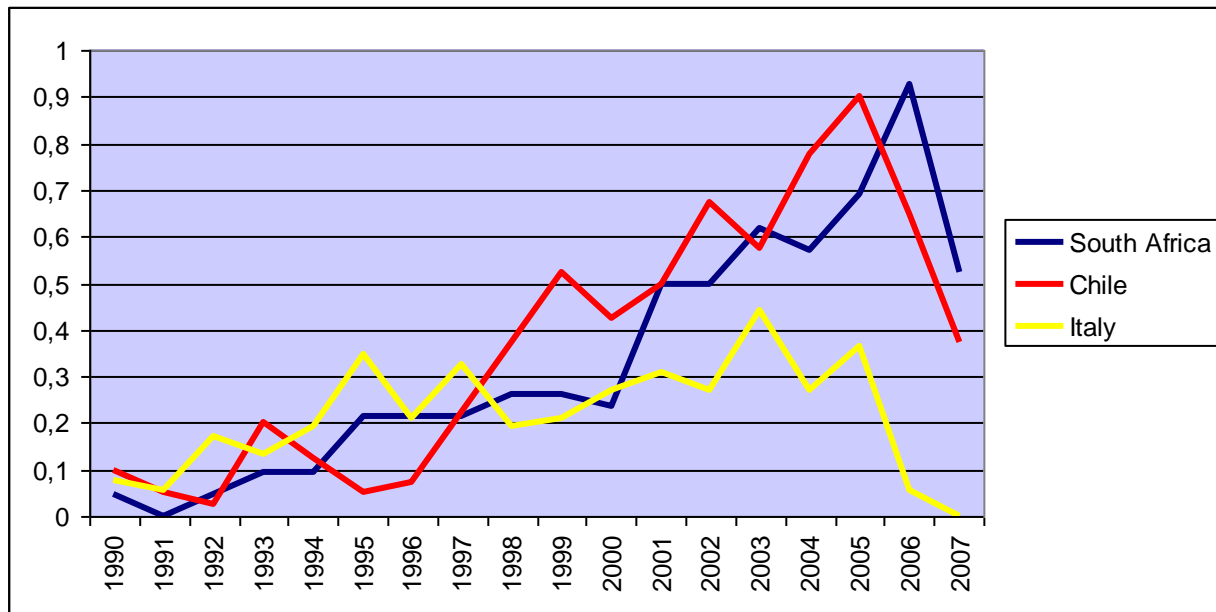


Source: Our elaboration based on Web of Science – ISI data

Figure 2 points at the New World dynamism in terms of scientific research output, depicting the trend of per-capita publications among the researchers interviewed in Piedmont, Chile and South Africa. In these latter, publication intensity boomed at the end of the 1990s, while the performance of Italian researchers has been constant or declining. Furthermore, the relational analysis, focused on collaborative projects among University and PRO researchers, depicts significant differences in the degree of openness of the research communities. Italian scholars appear to be more inward looking, that is, they mainly collaborate with other national researchers, than their Chilean and South African colleagues, who exhibit a higher propensity to establish linkages with foreign researchers. The evidence can be related in part to the different opportunities for domestic collaborations the researchers can access in the three countries. The national community of researchers involved in wine-related activities is much smaller in Chile and South Africa, where there is therefore greater need and incentive to link up with foreign researchers, than in Italy. Differences emerge also as far as the geographical span of collaborations is concerned. In fact, Italy, France, Spain and Germany are still perceived as important centers for the generation of scientific knowledge, to which linkages are directed from Old and New World producers, although the US and Australia have also recently emerged as important references in the field. New world countries such as Chile and South Africa have relatively small research systems that are however well connected with the leading countries. The increasing international character of research in wine is also evident when considering scientific co-publications of researchers (Cassi *et al.*, 2008). The number of countries connected through co-authorships in the field has increased from 7, in the period 1992-1997, to 36, in the period 2002-2006. New World researchers have been particularly active in setting international co-authorship linkages, both within the same emerging countries and with their colleagues in the Old World.

¹³ The publications are extracted from the Web of Science edition of the *Science Citation Index Expanded*TM (SCIE) of the *Institute for Scientific Information* (ISI, Philadelphia, PA, USA). For a detailed description of the selection criteria see Cassi *et al.* (2008).

Figure 2 - Number of ISI publications per researcher interviewed– 1990-2007



Source: Our elaboration based on Web of Science – ISI data

The increased importance of scientific research has implied a change in competence requirements on the side of producers. Techniques of production, that used to be driven by experienced farmers and their problem solving practical approach, have become highly codified and managed by highly skilled professionals. Hence, formalised training and access to external knowledge have become ever more important. The so-called "flying winemakers", consultants contracted worldwide by producers and sometimes by wine regions, have significantly contributed to the rapid transfer of scientific advances and technologies, emerging as key actors in the global wine system and symbolising, according to Aylward and Zanko (2006), the New World leading role in setting the trends of modernisation..

This is surely confirmed by our investigation on innovative firms. The New World firms interviewed, especially the Chilean ones, largely rely on international consultants, as agronomists or oenologists (Table 3). On the other hand, Piedmont firms tend to less frequently collaborate with external consultants, exhibiting, on average, a higher level of in-house technical competencies. Most interestingly, Piedmont producers rely exclusively on experts from the same region. This is consistent with the argument that the knowledge base relevant to Old World producers is much related with the local wine culture and the locally cumulated competencies (Aylward, 2003).

The information collected on experimental activities further points to a catching up process of New World firms, especially the Chilean ones, with respect to Old World producers. Experimentation consists not only in copying external technologies, it also involves creative adoption and selection along with mastery of best practices that are adapted to local and firm specific needs. In the fieldwork, we have identified four categories of experimental activities, which correspond to four innovation profiles: the lowest profiles (1 and 2) depict passive adopters of external technologies, which may conduct simple experiments closely supported by suppliers or extension technicians; the highest profiles (3 and 4) identify active innovators, which

conduct experiments on a permanent basis and build firm specific practices on them, often in close collaboration with extension agencies and universities.¹⁴

Table 3- Human capital in firms

	Italy (Piedmont)	Chile	South Africa
External consultants (%firms)			
• Viticulturist	32.4	92.6	50.0
• Oenologist	51.4	88.9	30.0
% of employees with a technical degree:			
- Secondary	15,2	9,8	3
- Tertiary	9,3	6,6	0,1

Source: Authors' survey

As shown in Table 4, Chilean (81.5 %) and Italian (70.2 %) producers are concentrated in the two upper experimental categories, although Italian wineries are further clustered in the top category, whereas the distribution of South African firms is skewed towards the lower categories. It is also interesting to notice that the most advanced experimenters are on average large firms, both in Chile and in Italy (respectively, 17 and 14 mln. Euro of sales on average). In particular in the Italian case, the high innovators are much larger than the average size in the sample considered.

Table 4 - Experimental activity over last five years (% firms per category), by country

Innovation profile	Italy	Chile	South Africa
None	0.0	0.0	25.0
1 (lowest)	2.7	0.0	20.0
2	27.0	18.5	25.0
3	43.2	66.7	20.0
4 (highest)	27.0	14.8	10.0
	<i>100</i>	<i>100</i>	<i>100</i>
% external collaboration	48%	85%	67%

Source: Authors' survey

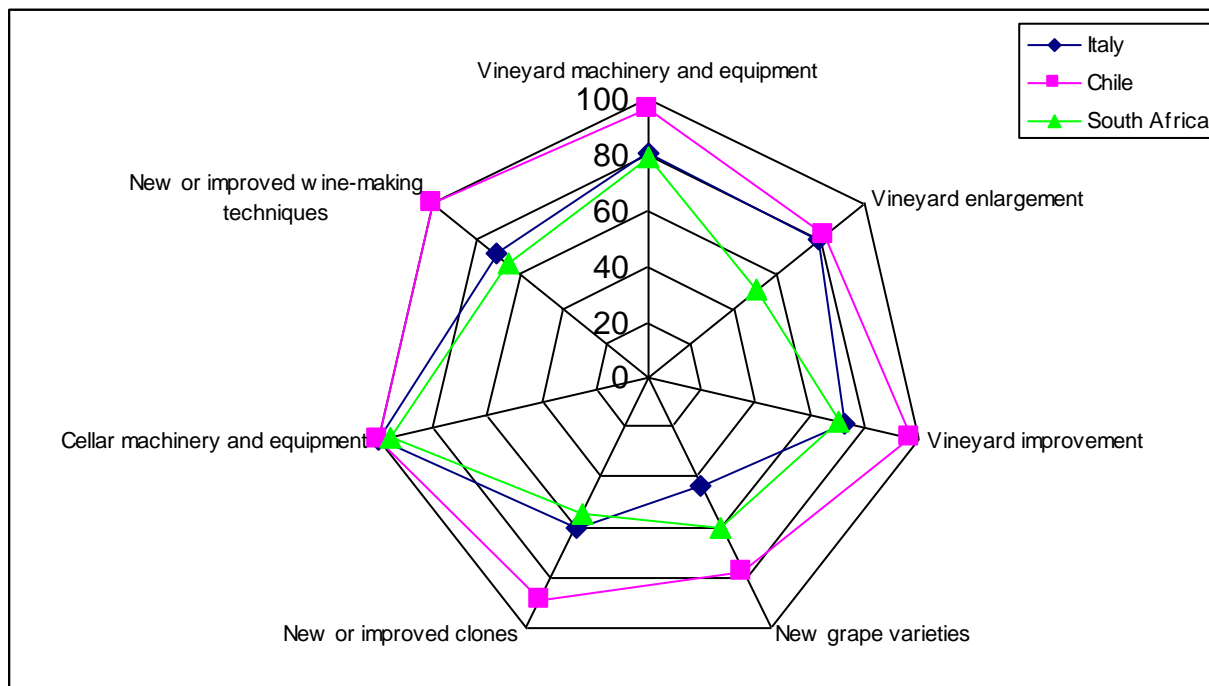
The typology of investments detected in our samples is consistent with the general picture of New World producers investing largely in machinery and equipment, in both the vineyards and the cellars, and orienting their technological efforts towards responding to the international taste. In fact, the Chilean and South African firms are significantly more concerned than the Piedmont producers by investments that target the intrinsic characteristics of their wine product, such as planting of new grape varieties, which change or broaden the type of product supplied to the market (Figure 3). It is worth noticing that Chilean firms, among which introduction of clones

¹⁴ The four different profiles have been defined with the assistance of technical experts in Italy and then checked with technical experts in Chile and South Africa.

and new grape varieties is most common, are those addressing international markets to a largest degree.

On the other hand, the innovative producers of a traditional Old World wine area refer importantly to established national markets (or even regional ones) and address international markets with long established and typical varieties (export intensity is indeed significantly and negatively correlated with the introduction of new grape varieties among these firms) and largely focus on process related investments, improving or acquiring machinery and equipment for the vineyards and the cellars.

Figure 3 - Typologies of investments (last three years, % firms), by countries



Source: authors' survey

5.3. *Actors and networks*

The new competitive scenario, based on technological modernisation, global marketing and access to international distribution channels and large-scale retailing, has affected the structure of the industry in a significant way. A remarkable consolidation process has taken place worldwide: since the late 1990s, mergers, acquisitions and strategic alliances have intensified at the national and transnational level. The branding and volume capabilities of the leading global wine firms, together with their ability to produce even quality products, satisfy the requirements of supermarket channels, which are themselves inclined to select a few large suppliers, in order to reduce procurements costs (Kaplan and Wood, 2004). However, international acquisitions appear to be also driven by quality concerns, brand diversification strategies and innovation-related motives. The opportunity to source grapes at competitive prices from multiple areas, the need to capture key brands and the most innovative oenological techniques are the driving forces behind

the recent consolidation process and the wave of alliances occurring in the wine industry worldwide (Anderson *et al.* , 2003).

The process of concentration and rationalisation concerns most of the New World regions, though with very different intensity, the three largest companies being from the U.S. (Table 5). *Constellation Wines* is the largest wine company in the world, belonging to the *Constellation Brands* group, a world leader in beverages, recently grown in size and scope with an aggressive strategy of takeovers. In Australia, with the take-over of the second largest wine maker *Southcorp*, *Foster's* became the fourth largest group in the world .

Among newcomers, the Chilean industry grew notably over the 1990s, so did the total number of wineries, the largest one being *Vina Concha y Toro*, which is the 9th largest in the world in terms of volume of production. Notwithstanding the industry is still dominated by few family based companies, with the four largest groups contributing to more than 45% of export value (Visser, 2004), there is an increasing participation of foreign capital in the sector (Moguillansky *et al.*, 2006).

Table 5 - World Top 10 Wine Producers (2006)

Rank	Company	Headquarters	Volume of sales (mln 9-lt cases)	World share (%)
1	Constellations Brands	USA	104.0	3.9
2	E&J Gallo Winery	USA	72.0	2.7
3	The Wine Group	USA	41.9	1.6
4	Foster's Wine Estate	AUSTRALIA	39.7	1.5
5	Pernod Ricard	FRANCE	37.5	1.4
6	Castel Freres	FRANCE	36.0	1.4
7	Bacardi	BERMUDA	25.7	1.0
8	Le Grand Chais de France	France	22.0	0.8
9	Vina Concha y Toro	CHILE	21.4	0.8
10	Distell Group	SOUTH AFRICA	20.5	0.8

Source: Impact, 2007, vol. 37, no.11-12

South Africa has been affected by the consolidation trend to a lower degree. This is partly due to the yet limited expansion of vineyards (due to lack of suitable land) (Ponte and Ewert, 2007) and to the small profit margin in the industry. International players, such as *Gallo* or *Pernod*, have played a minor role in the country, mainly signing marketing and branding agreements with local firms. It is worth to notice however that the fast growing South African brands in international markets, in particular in the UK, are marketed through UK Agents (Schmitt, 2006, as cited in Ponte and Ewert, 2007).

On the other hand, European firms have been very slow in the process of concentration. Thus, while New World wine companies integrated vertically, the long established wine making regions in Europe are in general still characterised by fragmented industry structures. However

significant differences also exist among the Old World wine countries. French companies have grown in size and expanded overseas. Some wineries have become part of large multidivisional groups, such as the wine branch of the luxury group *LVMH*, mainly specialised in champagne and *Castel Frères*, the largest European wine company, which is among the top ten wine producers in the world. With regard to foreign operations, the Paris based beverage group *Pernod Ricard* has become the third largest wine maker in Australia and the first wine producer in Spain, New Zealand and Argentina.

Conversely, Italian companies are still small in size and mainly family based. The two largest Italian wine companies are cooperatives - GIV and Caviro - with a turnover in 2007 of respectively €290 and 280 mln. (Mediobanca, 2008). The sum of the total sales of the top 5 Italian wine producers is only €1 bln, much less than world leaders as Constellation Brands which almost reached €4 bln, Foster's Group with €3 bln and the wine and spirits division of LMHV with almost €3 bln. of sales (Mediobanca, 2008).

Beside large firms, the technological renovation of the last decades has brought research institutions, technology transfer organisations and innovation-oriented alliances at the centre of the industry stage. The creation or strengthening of research institutions specialised in wine research and training has indeed represented a major driver of growth in the New World areas such as California and Australia. Industry-wide research institutions are also increasingly targeted as a primary policy objective in emergent producing areas such as New Zealand, South Africa and Chile. Dedicated funding bodies have been set up to promote and finance wine related research projects, often in partnerships with the main national research organisations and universities (see Section 5.4 and Table 6).

In order to give account of the effectiveness of the sectoral systems in diffusing knowledge we have mapped the linkages among researchers at universities and public research organisations and national and foreign professionals in the wine industry¹⁵ Joint research agreements are the most diffused type of collaboration in Italy and Chile, whereas in South Africa relationships are mostly based on informal contacts or research commissioned by the industry and undertaken by the university.

Overall, Italian universities and PROs are less involved in the formation of linkages with the industry (59.3%) compared to South African (81.4%) and Chilean ones (92.5%). Compared to their New World counterparts, Italian researchers are also less connected with foreign professionals (Giuliani and Rabellotti, 2007). Furthermore, Chilean and South African researchers at university and PRO are much more involved in consultancy work with respect to their Italian colleagues. A confirmation of the less intense relationships between university and industry in Italy also comes from the interviews with the sample of innovative firms, as they value the research centers as a much less important source of information for innovation than Chilean and South African firms.

As commented in greater detail in the next section, the different degree of contact and involvement of researchers in industry projects also depends on the different institutional frameworks and on the policy initiatives implemented in the cases under investigation.

5.4 Institutional framework

¹⁵ For more details see Giuliani *et al.* (2008).

Institutional changes have played a central role in the evolution and catch up trajectories of New World producers. The successful experience of Australia has represented a best practice for other latecomers, in particular for South Africa and more recently Chile. The Australian model is a rather top-down planning approach, in which there is a main sectoral organization (the Australian Wine and Brandy Corporation) and a main research body (The Australian Wine Research Institute) playing a pivotal role and strongly linked with government action (Aylward, 2004). The model proved successful at rationalising, coordinating, setting export-oriented priorities and targets, promoting and socialising a vision for the industry at large. In the case of South Africa, which has closely followed the Australian model, the development of industry associations occurred progressively, since the late 1990s and the early 2000s, under the stimulus of government initiatives, which promoted the establishment of the South African Wine and Brandy Corporation (SAWB) with the main goal of enhancing the industry competitiveness. R&D and marketing promotion are among its main areas of intervention along with training of human resources and social promotion. It is worth to highlight that SAWB set up a specific business unit (Wine Industry Network of Expertise and Technology - Winetech) in order to finance and promote applied research in the wine sector. Thus, the export orientation, which was the major concern of the early industry bodies, has now been integrated into a more comprehensive governance structure. Collaborative action and interactive learning across the industry and public bodies have constantly sustained the strategies of export orientation and R&D promotion. The South African industry has also found a single voice in the South Africa Wine Trust (SAWIT), which has been the catalyst of the visioning industry-wide exercise ("Strategy 2020") and more recently, contributed jointly with other representatives of the industry to set up the "The South African Wine Industry Strategy Plan (WIP)" (SAWB, 2003). This represents another step in building consensus among the industry stakeholders which led at the end of 2006 to the foundation of the South African Wine Industry Council, the new representative body of the industry.

The need for joining forces has also urged in the Chilean wine industry, although this process is only recently turning into a major institutional renewal. After years of internal divisions, the wine industry has in fact very recently announced the creation of a single representative body. Thus the two major winery associations of Chile, *Viñas de Chile* and *Chilevid*, will now merge to form *Vinos de Chile*. This will give a single voice to their interest and a more coherent strategy to the industry as whole. A process of joining forces has also been taking place in the field of research. In 2006 two consortia have been established by the two industry associations in partnership with the main research institutions and universities with the support of public funding by Innova Chile (promoted by CORFO - the Chilean Economic Development Agency). These bodies have the explicit aim of enhancing wine quality by investing in innovation and financing research in wine related areas. Moreover, the establishment of consortia including researchers and business associations are supposed to strengthen the linkages between university and industry. As commented in Section 5.3, these connections are already quite strong, being also stimulated by appropriate policy instruments (Moguillansky *et al.*, 2006).¹⁶

It is interesting to notice that, pressed by the need to adapt to the undergoing EU crop policy reform, France is also undertaking a profound restructuring of the institutional framework set up to support its wine industry. The reform is aimed at rationalising and simplifying with the

¹⁶ Among these instruments there are a number of initiatives promoted by CORFO such as the *Proyectos de Fomento* (Profos) and the *Consortios*.

establishment of a national bureau in charge of research and of the management of EU funds; this central institution will also be responsible of coordinating ten regional offices representing the different geographical areas of wine production.

In this respect the Italian institutional framework is still very fragmented and all the main areas of production do have their supporting institutions and research centres. Policy decisions are taken at many different levels, with high coordination costs and often misleading and contradictory objectives, and research activities, which are conducted in many different institutions, often overlap. In the case of Piedmont a number of research institutions participate to R&D projects mainly funded by the regional government in wine related fields. Besides PROs, research on wine is also and foremost conducted at Universities, which have nowadays a leading role in conducting research both in Piedmont and Italy along with some well established oenological colleges, such as the Oenology School of Alba.

Although the direct link between the industry and the research centres appears to be rather weak this is partly replaced by the presence of important quasi-public intermediate extension organisations, which play the role of hubs in disseminating knowledge to companies (Morrison and Rabellotti, 2007). A prominent example is *Vignaioli Piemontesi*, the largest association of wine and grape producers in Italy, with more than 8,000 members, whose main aim is to provide associates with technical and commercial assistance. *Vignaioli Piemontesi* participates directly in many of the research projects undergoing in Piedmont, acting mainly as a technical partner of the scientific institutions located in the region and making available technical information and knowledge to small firms and farmers. As a whole, the extension and R&D system in Piedmont appears close to local needs and well suited for dealing with growing market niches for differentiated and unique products. In this sense, there is a growing feeling that too centralised R&D policies, as those implemented by New World countries, would be inadequate to tackle the new emerging pattern of diversified demand (Aylward, 2006).

A further key institutional aspect, representing an important factor of differentiation between New and Old World, is the regulatory environment. The wine industry in Italy is embedded in a dual layer of regulation: at the national level, especially in the DOC and DOCG categories (see footnote 8) and at the European level within the framework of the Common Agricultural Policy (CAP) (Corsi *et al.*, 2004). As stressed by Anderson (2004), European producers have to satisfy to myriad restrictions on which grape varieties can be used in each appellation, on maximum yields and alcohol content, on vine density and on irrigation systems. The strict regulatory environment is considered to be a constraint to the ability of European, and particularly Italian, producers to react as flexibly as the New World producers to the rapidly changing international markets (Bell and Giuliani, 2007). To address this situation, EU countries are currently in a process of restructuring their wine regulatory framework, reforming the agriculture Common Market Organisation (CMO). The reform targets the competitiveness of EU wine producers through marketing and promotion, simplification of the wine-making practices and labelling policy, as well as reduction in direct subsidies to producers (European Commission, 2007).

6. Conclusions

The wine industry represents an interesting case of catching up of latecomers in traditional agro-food industry. In the early stage of this evolutionary trajectory, which can be traced back to the late 1970s, market-related discontinuities and the inertial response by traditional, long established producers favoured the entry in the world market of emerging wine regions, which have been

rapidly gaining market shares and, by leading a process of technological renovation, have been moving the competitive game on new playgrounds.

The wine market shift of the late 1970s-early 1980s is to be interpreted in the framework of a wider change in consumers' attitudes and tastes. The increasing popularity of wine as a "beverage" and the diffusion of wine drinking to relatively inexperienced consumer groups created favourable conditions for the easily identifiable and pleasant-tasting varietal wines, such as cabernet, merlot and chardonnay, which were typically produced in areas such as California and Australia. The planting of these grapes and the production of these wines exploded globally over the 1990s, following the entry of other New World areas, as an international, relatively standardised wine taste emerged, and it was indeed promoted through consistent marketing and distribution strategies by New World producers.

The quantitative and qualitative change in demand was favoured and strengthened by the increasing role of mass distribution channels, such as supermarket chains, leading wine experts and specialised magazines. The producers from California and Australia have been the most rapid at taking advantage of this window of opportunity, which set in motion a co-evolutionary trajectory of the sectoral system interrelated dimensions. The approach of "building up" wine products fitting international taste is in fact based on an innovative scientific approach to production. The timing and alignment of R&D strategies with market objectives is a key factor in the New World rapid catching up and it has gradually become a focal competitive strategy across Old and New World.

The market-driven scientific turn has been having enormous effect not only on the industry knowledge base, but also, and foremost, on the relevant industry actors. Universities and scientists have emerged as key players, as the ties between industry and research institutions have become ever more important. Across the New World, following the early successful Australian experience, a top-down planning approach has been diffusing, in which industry associations and research bodies are strongly linked with government action. Industry-level umbrella institutions are created with the aim of co-ordinating research efforts and export oriented strategies.

As far as industrial actors are concerned, a remarkable consolidation process has been taking place, triggered by technological modernisation, global marketing and need to access international distribution channels and large-scale retailing. The process of concentration and rationalisation largely concerns New World producers, but has lately extended to some of the traditional wine making countries, such as France. Nevertheless, the long established wine making regions in Europe, and certainly Italy, are in general still characterised by fragmented industry structures and regionally based research infrastructures.

In this respect, different institutional models and innovation strategies appear to coexist in the globalised wine industry, responding to differentiated industry needs. This is confirmed by our empirical analysis focused on Chile, South Africa and Piedmont in Italy. In spite of some common trends of mechanisation, application of scientific research to production, managerial upgrading and quality oriented market strategy, differences across New and Old World persist. First of all, the difference between the "first tier" and "second tier" of New World producers (as exemplified by Chile and South Africa) is still remarkable, in terms of internationalisation and technological efforts, although investment priorities and competitive drivers are increasingly similar. The structure of the industry in the traditional region considered, Piedmont, is, on the other hand, highly different, and has been little concerned by the recent international wave of consolidation. Firms are significantly smaller in size and financial resources than New World

frontrunners, but, it seems, no less intensive in innovation oriented investments and experimental activities.

The evidence presented is consistent with the argument that latecomers are catching up and, after the early inertia, the response of traditional regions to increasing competitive pressures by newcomers is increasingly one of diversification and experimentation in support of niche strategies. Old World regions have the opportunity to target high value niche production, as the trend toward standardisation appears to fade, or, at least, to concern primarily the lowest value added market segments. Demand seems in fact to evolve towards the "rediscovery" of specific *terroir*, wine drinking as part of a richer cultural experience, giving value to variety and unique wines linked to specific heritage. In this perspective, the traditional regions' endowment of wine culture, labour market and dense institutional infrastructure represents a valuable asset. Indeed, it appears that Old World producers are in fact strongly relying on localised linkages and resources, and much less concerned, in relation to their New World counterparts, by international knowledge networks. If local resources and relationships represent an asset, there is however a risk for Old World incumbents to be locked into traditional viticultural and oenological practices. If opportunities for sectoral-driven catching up arise at times of significant industry transformations, it seems the evolutionary trajectory is now providing a new opportunity to strike back for traditional wine areas. For the purpose, however, a major challenge appears to be finding a balance between localised learning processes and practices and openness to international knowledge networks and marketing strategies.

Acknowledgments

The authors would like to thank: Massimo Pernicone and Gabriela Cares for their collaboration in the collection of data. Moreover, we are grateful to Eric Wood for his assistance in organising the field work in South Africa and for his comments on the questionnaires. In South Africa we also thank Nick Vink. In Chile, thanks go to Mario Castillo, Jimena Gonzalez Alvarado, Pablo Ugarte Cruz Coke from CORFO and to José Miguel Benavente and Graciela Moguillansky for their support in the field research. Financial support from Progetto Alfieri – Fondazione CRT is gratefully acknowledged.

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