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CLUSTERS OF GRAPES AND WINE

by

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1 INTRODUCTION

1.1 Clusters

Michael Porter is the champion of the new economics of competition and for him the entity that determines competitiveness is the cluster. Cluster, the noun, has several connotations. For one, a cluster is a collection of things of the same kind, originally of grapes, but also of fruits or flowers, growing closely together. The relevant connotation here is, however, "A number of persons, animals, or things gathered or situated close together; an assemblage, group, swarm, crowd" (Oxford English Dictionary on the web).

Of course, Porter uses a more precise definition of clusters. He defines clusters as "geographic concentrations of interconnected companies and institutions in a particular field" (Porter, 1998) and he emphasizes two characteristics that set clusters apart from industries or supply chains. First, the firms and organizations that are part of a cluster usually belong to different industries that are related to each other, and second, clusters may embrace downstream sales channels, suppliers of various complementary products and services, as well as government agencies and non-profit organizations that are useful for the core firms of the cluster.

1.2 Diffusion of the cluster concept

Porter's (1998) theory of clusters is an idea that has infected the minds of many economists, regional planners, and politicians of all levels. One way to measure the spread of an idea in an area of research is to count journal papers that make use of the idea. When we searched the library catalog of the Institute of World Economics for journal articles concerned with clusters (excluding cluster analysis) and that appeared after 1998, the year when Porter published his idea, more than seven hundred articles were listed. This count is fairly comprehensive because the library we used is the largest economics research library in Germany and it catalogs individual articles from all major economics journals. In addition to article counts, another indication of the success of Porter's idea is the envy with which Porter has met in some quarters of economic geography (e.g. Martin and Sunley, 2003).

Curiously, the concept has not spread very far in agricultural economics. When we constrained our search for articles concerned with clusters to include the terms "agriculture", "agribusiness", "food", or "wine", the number of hits dropped precipitously from more than seven hundred to eleven. Agriculture is roughly 1.5 percent of GDP in rich countries, so the share for agricultural clusters research articles is roughly in line with this ratio. Whatever the accuracy of such bibliometric evidence may be, our article counts do not suggest that clusters have become a standard concept in our discipline.

Perhaps because Porter had chosen the California wine industry as an example illustrating the application and use of his cluster approach, the idea appears to have been better received by analysts of wine industries than by agricultural economists in general. A brief synopsis of that literature has only recently been provided by Ditter (2005), who studied the wine industry of Burgundy from a cluster-perspective. He reviews cluster-studies of the wine industries of Australia (Marsh and Shaw, 2000; Aylward, 2004), Chile (Visser, 2004; Giuliani and Bell, 2004), Canada (Mytelka and Goertzen, 2004), and that of California by Porter (1998) which may be considered to be the "mother" of all wine cluster studies. However, not all of the wine

cluster studies carry Porter's memes and Visser (2004) as well as Mytelka and Goertzen (2004) make no reference to Porter. Other agricultural economists concerned with wine also shun the concept. For example, in Anderson's (2004) collection of surveys of 14 regional wine economies in the world none of the papers includes a reference to Porter.

1.3 Problem and outline of the paper

The indifference of agricultural economists towards the cluster approach is puzzling. Perhaps the indifference is nothing but an indication of the low priority that is given by the agricultural economics profession to research on the spatial organization of agriculture and agribusiness. This would be regrettable, considering that von Thunen (1826), a farmer and economist who used a beautifully simple model to understand the variations in farming intensities, is also a forefather of economic geography. But we do not intend to pursue this hypothesis any further because it would lead us astray. Rather than inquiring how the agricultural economics profession collectively arrives at its implicit research priorities, we explore the hypothesis that the cluster-perspective promises few insights into the spatial organization and the competitiveness of agricultural industries that cannot be had from alternative research perspectives and theories. In particular, we are concerned with two questions:

- What is the conceptual contribution of Porter's cluster-perspective and what does the perspective offer that alternative approaches to the study of localized economic activity do not have?
- What does the cluster-perspective contribute to an understanding of the competitiveness and organization of the California wine industry?

The questions are mainly concerned with evaluating the cluster-perspective as an approach for studying spatial patterns in economic activity. Like other theoretical perspectives, the cluster-perspective also provides guidance to policy makers, in addition to giving direction to academic research. Our third question therefore is:

- What are the implications of Porter's cluster-perspective for policy making and collective action?

In the rest of the paper we address each question in sequence. In the next section we characterize Porter's concept of clusters against the backdrop of five related concepts: (i) Marshall's notion of the "localized industry", (ii) industrial-complex economics, (iii) agglomeration economics, (iv) social network economics, and (v) the concept of the *terroir*. In Section 3 we are concerned with the usefulness of the concept as a research tool. Here we explore whether some important aspects of the California wine industry that have been studied without the use of the clusters approach would have benefited from the use of the cluster approach. In section 4, we discuss some implications of the cluster perspective on policy making and we close our paper in section 5.

2 ALTERNATIVE EXPLANATIONS OF SPATIALLY CONCENTRATED ECONOMIC ACTIVITY

Like sculptures, new concepts are best appreciated when approached from different angles and seen from different perspectives. In this section we therefore contrast Porter's concept of clusters with other perspectives or models of localized economic activity. Because Porter's concept includes several of the earlier concepts and explanations of localized economic activity, we begin with the brief synopsis of the antecedents and only then turn to Porter's concept.

2.1 Conventional explanations of spatial concentrations

The literature on the economics of the spatial organization of economic activity is vast and we do not intend to summarize that literature. All we can do here is to remind ourselves of conventional explanation of spatial patterns in economic activities that belong to the standard toolbox of economists. Following suggestions by Gordon and McCann (2000) and Johansson and Quigley (2004) we consider three concepts that explain the persistence of clusters: Localized industries, agglomerations, and industrial complexes.

2.1.1 Marshall's "Localized Industries"

The notion of "Localized Industries" can be traced back to Marshall (1920) who, in Chapter X of his "Principles" turns his attention to "The Concentration of Specialized Industries in Particular Localities". In this chapter, Marshall calls an industry that is concentrated in "certain localities" a "localized industry" and he is concerned with two questions (i) What are the causes for an industry to concentrate at a certain location? and (ii) Why is a localized industry "likely to stay there long"?

Chief among the causes for an industry to concentrate at a certain location are, according to Marshall (1979 (1920), p. 223) "physical conditions, such as the character of the climate and the soil, the existence of mines and quarries in the neighborhood, or within easy access by land and water." Other causes discussed by Marshall are "the patronage of a court", today we would probably speak of "regional policy", free industry and enterprise, and pure chance and accident, "that may have determined whether any particular industry flourished in any one town" (Marshall, 1979 (1920), p. 224).

Marshall's causes for an industry to persist at a location where it is concentrated are more intricate and complex than the causes that bring the concentration about. Here Marshall discusses the demystification of the skills and tacit knowledge of a trade that occurs when a skilled workforce is concentrated in a location: "The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously". Also as a consequence of skilled labor being spatially concentrated, "inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed" (Marshall 1979 (1920), p. 225). Moreover, subsidiary industries spring up "devoting themselves each to one small branch of the process of production, and working for great many of their neighbors" (Marshall 1979 (1920), p. 225). Finally, the localized industry benefits from offering a "constant market for skill" and from the "convenience of the customer".

Marshall does not fail to mention that localization of industries is subject to changes in communication and information exchange: "Every cheapening of the means of communication, every new facility for the free interchange of ideas between distant places alters the action of the forces which tend to localize industries" (Marshall 1979 (1920), p. 227).

2.1.2 Industrial complexes

Industrial complexes consist of firms that maintain stable trade relationships among each other and the trade relationships govern their decisions where to locate (Gordon and McCann, 2000). The key variables determining the choice of location are transport costs and transaction costs. No other benefits or costs are usually considered in industrial-complex

explanations of clusters. Membership in an industrial complex is open to all and the benefits of clustering are mediated through anonymous markets.

2.1.3 Agglomerations

Agglomerations, like industrial complexes, are assumed to be open to entry, the relationships among the firms in the agglomeration need not be specific and enduring, and there are no mechanisms for the coordinated provision of public goods. Some additional benefits of agglomerations are: (i) Because of a larger pool of specialized inputs firms can react more flexibly to changes in demand. (ii) Economies of scale can be realized in the use of lumpy investments in public goods, including investment in advertising and research. (iii) Firms may be better informed about market conditions, and (iv) innovative products and production processes may spread more quickly when information does not have to travel far (Johannson and Quigley, (2004). Taken together, all this may contribute to a milieu conducive for a particular industry.

2.2 Networks

In localized industries, industry-complexes, and agglomerations the identities of the firms in the cluster do not matter, and relationships between the firms are generic and not specific for the firms. Furthermore, the mechanism by which information flows from one firm to another is not specified - information somehow diffuses within the cluster.

Network theory - whether it is concerned with social or other networks - requires that the linkages between agents - people, firms, or organizations - are made explicit. The linkages may be physical linkages, such as telephone or other communication connections, or metaphorical linkages, such as relationships. Finally, the links may connect pairs of agents or they may connect agents and events (Wasserman and Faust, 1994).

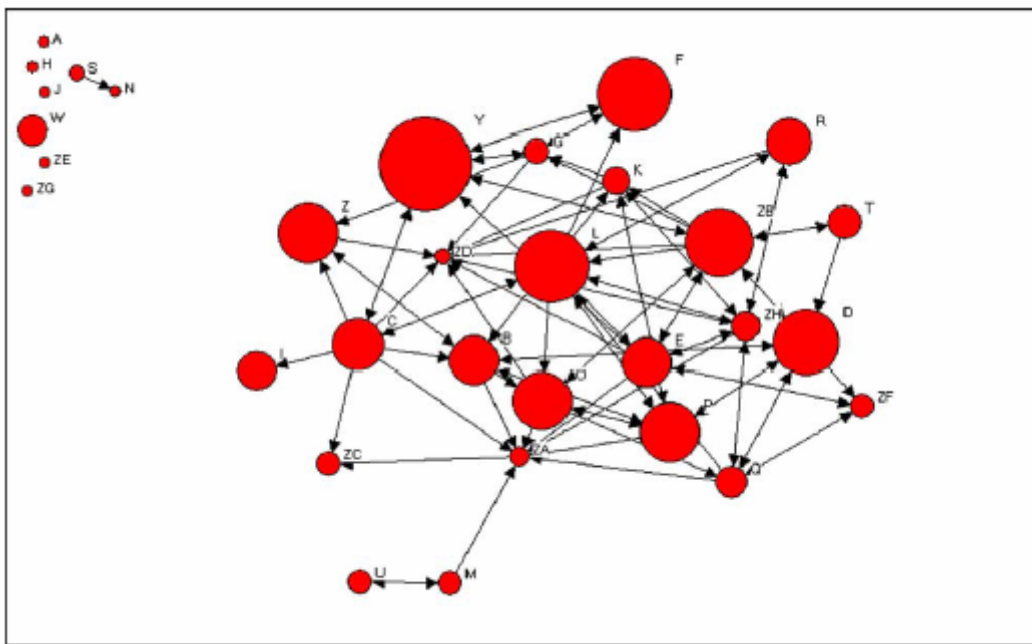
Four characteristics of networks are of interest in relation to localized concentrations of economic activities of a certain kind, such as wine production: (i) Because the identity of actors is known in a network, trust among members may evolve. (ii) Networks save transaction costs, and they reduce the stickiness of information (Hippel, 1994). (iii) Networks are durable club goods that require some investment. An ephemeral network is not considered a network but may be an anonymous market. A firm that is unable to establish a relationship with another firm that is already part of a network cannot become a member of the club. And most social relationships require some effort for their development. Local proximity may, however, reduce the costs of developing linkages. (iv) Networks are not limited to a given location and may reach beyond its boundaries.

When supported by physical networks, social networks are not bound by the tyranny of distance. Information may then travel large distances when firms at different locations maintain social ties and have access to suitable communication facilities.

A network study of a wine cluster was recently reported by Giuliani and Bell (2005) who studied the information networking and knowledge acquisition activities of the wineries and grape growers in Chile's Colchagua valley (Giuliani and Bell, 2005). Chile is among the rising southern stars on the wine firmament. Its wine industry still consists of many small grape growers and wine makers and the industries actively imports know-how from consultant enologists and agronomists, collectively known as "flying wine makers". Under these conditions the "knowledge absorptive capacities" of the wineries is a key issue, i.e. the education, technical training, the experience of professional staff, and the experimentation activities of wineries, as well as their intra- and extra-cluster communication linkages.

The study showed that the Colchagua wine cluster is an "open knowledge system" which has many linkages to external sources of information. This suggests that, at least in this industry, cluster boundaries become blurred when the cluster is defined in terms of information linkages, which are keys to the industry's innovation capacity and competitiveness. Furthermore, the pattern of linkages was far from homogenous within the cluster. Some of the 32 wineries that were studied were densely linked to each other whereas others entertained no information linkages at all to other wineries in the valley (see Fig. 1). Furthermore, as Giuliani and Bell (2005) could show, the level of connectivity, as measured by standard measures used in social network analysis and graph theory, was not related to spatial proximity but to the firms knowledge absorptive capacity, or as we would say, to the wineries' endowment with industry specific human capital.

Fig. 1: Graphical representation of the local knowledge system in Colchagua Valley, Chile



Source: Giuliani and Bell, 2005, p. 57.

2.3 Terroir

Terroir has become a highly fashionable term which has as many shades and hues as a chameleon locked into a mirror box. Terroir, we learn from Ditter (2005, p. 48), "is first of all defined as a definite and homogeneous territory endowed with a strong identity which is characterized by the whole of natural (soil and climate) and cultural (historical and social) resources." Producers that are located within a certain terroir or are involved in the production of a certain terroir wine, may then be considered to be part of a localized industry defined by the terroir.

Holistic definitions often are prone to create confusion because they are open to extension in many directions and a more detailed specification of the connotations of the term terroir is required. There is hardly any disagreement about the physical dimensions of terroir. In this connotation terroir refers to the altitude, inclination, exposition towards the sun, geology, soil type and soil depth, and climate of a piece of land on which grapes are grown. Equally

undisputed is the inclusion in the definition of biological characteristics, such as pests, diseases of the wines, and naturally occurring yeasts that contribute to the distinctiveness of one vineyard or wine growing area compared to some other vineyard or area. Because each characteristic of terroir - in the sense of location - can assume many levels, finely grained terroir-locations can be distinguished, as it is the case in many wine growing areas of Europe.

Some attributes that are employed to distinguish terroir-wines refer not to the location where a wine has been produced but to the process and the inputs used in its production. First among this class of terroir attributes are the practices employed in vine and vineyard management, such as the choice of varieties and clones, spacing and directions of rows, use of fertilizers, pesticides and irrigation, pruning, defoliation, harvesting techniques, and many more production details. For making a unique terroir wine vinification methods also matter: how the grapes are crushed and the juice is fermented, whether and how vigorously it is filtered, which additives are mixed into the must or the wine, the type of barrels in which the wine is allowed to mature, whether oakiness is achieved by means of oak barrels or by means of oak chips, and many other details of vinification.

Some authors assign metaphysical, socially constructed qualities to a terroir wine, such as the history of the place and area where it was grown and vinified, or the social environment in which grape growers and winemakers are embedded, or the whole culture of an area. Curiously, the culture and social environment of vineyard laborers are hardly ever mentioned among the factors that make up a terroir. If they would be included, some terroir-wines in Germany and California would have lost some of their terroir-characteristics when high-wage local laborers were substituted by cheaper migrant workers from Poland in the case of Germany, and from Mexico in the case of California.

The last, and from an economics point of view most important characteristic of a terroir wine is whether or not it enjoys the protection by the state. Many terroir wines in Europe are protected by government regulations, such as the AOC-certified wines in France or the QbA-wines in Germany. Such regulations, when they are sufficiently strict, define monopolistic niches for terroir wines for the benefit of their producers (Ditter 2005). Once installed, such regulations tend to persist, providing a further cause for the continued existence of a localized industry, in addition to the causes mentioned by Marshall (1979).

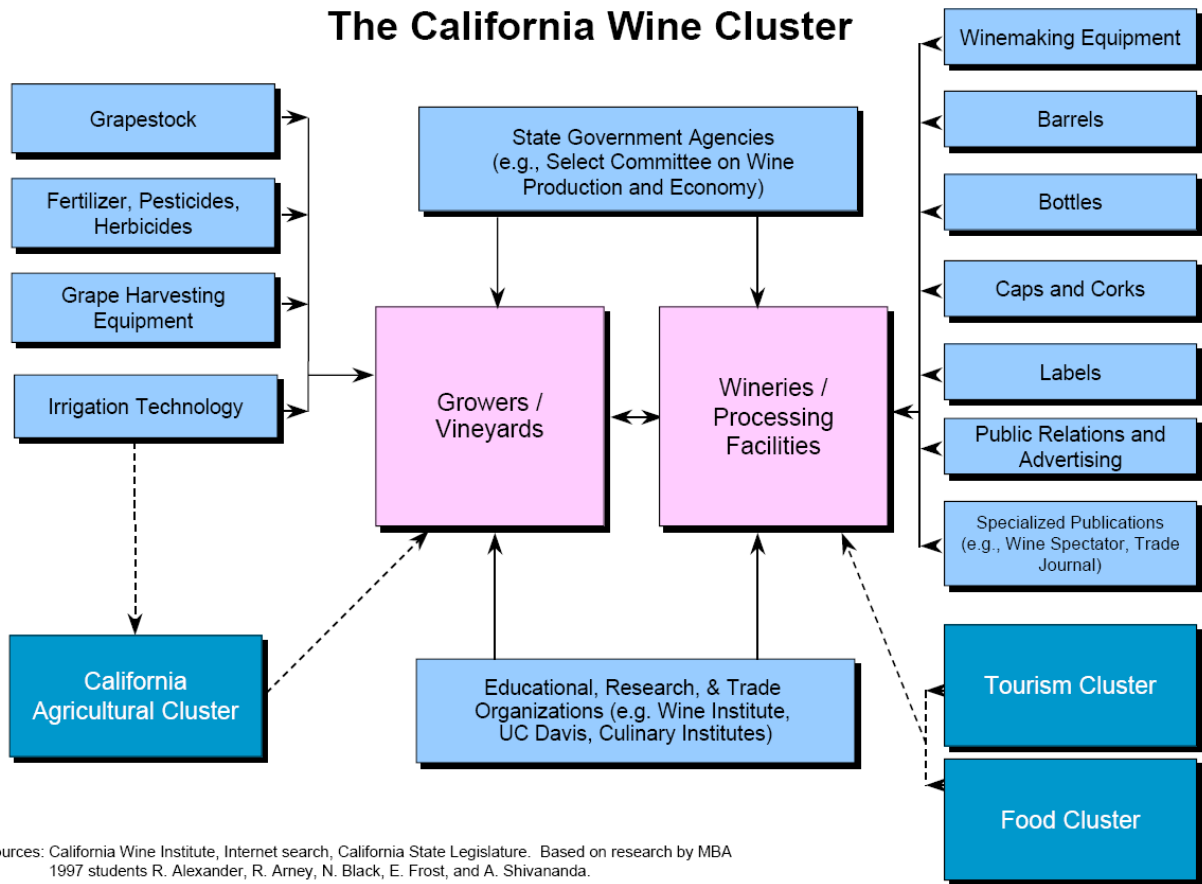
2.4 Porter's clusters

Porter's big theme is competitiveness, and clusters only are one aspect of competitiveness in the global economy where, in Porter's words, "... the enduring competitive advantages ... lie increasingly in local things - knowledge, relationships, motivation - that distant rivals cannot match" (Porter, 1998). Moreover, Porter is convinced that the role of location has been overlooked although the local business environment in which a firm performs is crucial for its competitiveness.

Porter provides a long list of effects of clusters on the performance of the individual businesses that belong to a cluster. Many of these effects are the same as those identified in the economics of industrial-complexes, agglomerations, and social networks. What is of interest here are characteristics and effects of clusters that are prominent and unique in Porter's theory or clusters.

A point that Porter makes, and that is only implicit in other theories of clusters, is that clusters transcend conventional classifications of industries. In his graphical model of the California wine cluster, many partners, suppliers, and complementary industries are included in the cluster (see Fig 2.).

Fig. 2: The California wine cluster



Moreover, Porter emphasizes that some of the competitive advantage of a firm which is part of a cluster lies outside the firm and is derived from the cluster. That is, the cluster is seen as an environment that enhances the competitiveness of the firms that belong to the cluster and that is not available to firms outside the cluster. Porter singles out three broad ways in which clusters affect competitiveness: "first, by increasing the productivity of constituent firms or industries; second, by increasing their capacity for innovation and thus for productivity growth; and third, by stimulating new business formation that supports innovation and expands the cluster" (Porter, 2000, p. 213).

In regard to the impact of clusters on the productivity of firms and industries, there is, with one exception, not much in Porter that is not also in other literatures on the economics of location. The exception is peer pressure and competitive pressure, which, so Porter (2000) argues, are more keenly felt by the members of a cluster.

Competition is a dynamic discovery process (Hayek, 1968) which stimulates innovation. Competition and innovation mutually reinforce each other and for Porter (2000) the rate of innovation is the "ultimate test of health or decline of a cluster". The spread of an innovation is, however, always preceded by the spread of information about the innovation possibility and much of the enhanced innovation capacity of clusters is the result of improved information flows within clusters, which render sticky, impacted, or tacit information more transferable.

There is no magic in the ways that clusters help to improve information flows. Difficult things are often better explained in person than in writing, and the finer points of a trade or art are seldom learned fully from books but by observation and imitation. Both, personal communication and observation require the proximity of clusters. Furthermore, rather than spilling out, valuable information often is shared or traded in enduring personal or business relationships. Taken together, such relationships form innovation networks and Porter (2000) considers clusters to bridge network theory and competition, and for him, "A cluster is a form of a network that occurs within a geographic location..." (Porter, 2000, p. 226).

3 THE CALIFORNIA WINE INDUSTRY

What does Porter's cluster approach contribute towards understanding important aspects and issues of the California wine industry? Before we can turn to this question, we need to provide some facts about the industry, but we need not provide much. The industry has been described in the Wine Cluster Case study of Harvard University and Lapsley (2005) provides more about the size and activities of the industry (see also Sumner et al., 2004). We therefore limit our discussion of the California wine industry to some remarks concerning its competitiveness and to five points that, we hope, contribute to a better appreciation of the strengths and weaknesses of the cluster approach. In particular, we are concerned with two weaknesses and three strengths. We will argue that the cluster approach contributes towards explaining the profits made by wineries but that it contributes little towards the explanation of the actual location of the cluster. Also, the cluster approach is not very clear about whether the California wine industry is better considered to be one or several clusters. Among the strengths of the cluster approach is its focus on relationships and the networks that result from them.

Before we do all that it is useful to have a quick look at the spatial extension of wine growing in California (see Fig. 3). Wine grapes are grown in California in 46 of California's 58 counties and about 23,4 million hl of wine have been produced in the year 2002 by close to 1,400 wineries (Wine Institute, 2004). The grape growing and wine producing area of the state extends from Mendocino in the north of San Francisco for about 650 km to Santa Barbara north of Los Angeles. The east-west extension of the wine area is much larger in northern California than in the south. In the northern part the wine country extends over about 300 km from the Pacific coast across the Central Valley to the legendary gold country in the foothills of the Sierras. In the south, where the climate is hotter and dryer, the wine area hugs the coastline which is kept cool by the Pacific Ocean. California's main wine producing regions are (i) the North Coast, which includes Mendocino, Sonoma Valley, and Napa Valley; (ii) the Santa Cruz Mountains and Monterey, (iii) the Southern Central Coast which includes Paso Robles, Santa Maria Valley, and Santa Ynez Valley; (iv) the Central Valley all the way from the Donnigan Hills and Yolo in its northern section to Modesto, Merced, and Madera in the south, and (v) the Sierra Foothills from North Yuba in the north to Mariposa in the south.

Fig. 3: Map of wine California's wine regions



Source: Johnsen and Robinson, 2002

3.1 Competitiveness of the wine industry

Competition within a cluster is likely to enhance the competitive fitness of the members of a cluster. There is no doubt that competitive pressure from their peers is intense among the wineries from the coastal districts that cater for the somewhat precocious higher segments of the wine market where wines morph from agricultural products into idolized works of art. In the theory of the cluster internal competition is, however, comparable to sparring in the boxing world: the real fight is the competition with firms from other clusters.

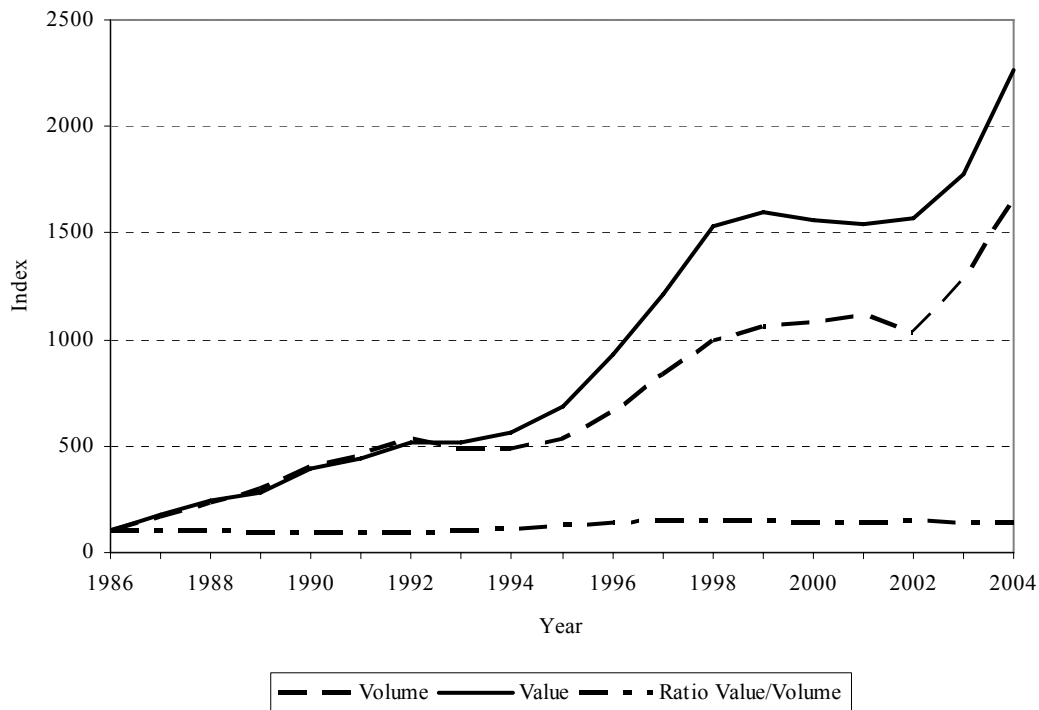
We consider three indicators of competitiveness: California's shares in the national and global wine industry, development of exports, and land values of vineyards. We limit our discussion of competitiveness to the wine industry because we have no comparable data for other industries in the wine cluster.

The US wine economy clearly is dominated by the California wine industry: 87 percent of the country's 383,000 ha of grape bearing area is located in California, 92 percent of the national grape harvest is picked in California, the State is home of nearly 1,400 of the country's 3,725 wineries (National Association of American Wineries, 2004), nearly two out of three bottles of wine consumed by Americans are of California origin, and 65 cents of every dollar that Americans spend on wine is spent on wine from California.

California is the fourth largest wine exporter in the world and is surpassed only by the traditional, European wine exporting countries France, Italy, and Spain whose shares in export markets are declining (Anderson et al., 2004). The export performance of the wine industry is impressive. In the 18 years since 1986 the volume of wine exports from the United States has grown more than 16-fold from 7.2 million gallons in 1986 to nearly 120 million gallons, earning more than \$ 790 million in 2004. Export performance has, however, been uneven. After a period of steady growth from 1986 to 1992 followed a short period of accelerated growth that began in 1994 and lasted until 1998 (see Fig. 4). Then came a 4-year period of no growth until 2002 when exports again grew vigorously. Export growth is, however, largely driven by volume. Export prices received have increased in the 18 years from 1986 by only 40 percent to reach about \$ 6.70 per gallon in 2004. The average price of the wines imported into the USA still is about double the price of the wines exported.

According to widely used budgets published by the University of California Cooperative Extension Service, the net revenue from a Chardonnay vineyard in Sonoma County in 1999 was about \$7,000 per ha above a normal return on land, capital and management. Annual overheads for such a vineyard were estimated to be \$ 15,500 per ha, annual operating costs amounted to about \$ 7,500 per ha, and a 16 ton grape harvest sold at \$ 1,900 per ton returned \$ 30,000 per ha (Sumner et al., 2004). Returns, if expected to continue, are soon reflected in land prices, and that pattern is at play in the vine grape industry. In Fresno County in the San Joaquin Valley vineyards sold for between \$ 3,500 and \$ 7,500 per acre in 2004, whereas in Sonoma County even open vineyard land without vines fetched between \$ 35,500 and \$ 45,000 per acre. As usual, land prices are reflected in current costs for growers and reflect success of the industry in generating revenues above non-land costs (California Chapter of the American Society of Farm Managers and Rural Appraisers, 2005).

Fig. 4: Development of the volume and value of U.S. wine exports, 1986-2004



Data Source: California Wine Institute, 2006

3.2 Origin of the California wine industry

'How did the cluster come into existence?' is a natural question that immediately comes to mind when a spatially concentrated economic activity is observed. The question is easy to answer in the case of the California wine cluster. Although the details of why the wine cluster took root in California is a long story better told by historians (Lapsley 1996; Geraci, 2004), the key themes of that story are only three: First, there is California's unique natural environment, its climate, soils, rootstock, and availability of water, which is favorable for growing grapes. Then, with the gold rush came an influx of a large number of people which boosted local demand for wine when wine was still a local good due to high transport costs. Finally, California attracted immigrants from warmer climates in Europe who had some know-how in growing grapes and in turning grapes into wine.

The birth of the industry does not need to be explained in terms of agglomeration effects, spillovers, networks, or clusters: An explanation in terms of natural conditions, significant demand, and availability of requisite know-how is simpler and more convincing. Probably, the origin of agricultural clusters other than the California wine industry can also be told without taking recourse to cluster concepts.

Although few cluster-forces may have rocked the cradle of the California wine industry, the industry thrived on agglomeration benefits, reductions in transaction and information costs, and competition jogged it on, once it was established. But it is difficult to tell whether the cluster benefits were essential for the development of the wine industry. Historical events suggest that they may not have been the only factor explaining the industry's fate. The hardest shock an industry can be subjected to is a ban on its main product, as it happened to the wine industry during the prohibition from 1920 to 1933. The California wine industry

certainly withered but did not perish, and after the prohibition the industry sprouted very much at the same location where it was before the shock.

Cluster theory would suggest that the location-invariant re-growth of the wine industry lies in the resilience of the cluster: even if many support firms folded during the prohibition and the depression, some knowledge about things related to wine certainly remained in the area, ready to be used again at the next best opportunity. This includes knowledge of the specifics of the terroir, which, as von Thuenen has argued (Kiker 1969), is an important form of human capital in agriculture. Soil scientists, climatologists, and vineyard owners would certainly argue that it is the unique terroir that tied the grape growers, winemakers, and their entourage to the spots where their predecessors had been before. Perhaps this is one of the occasions where agricultural economists may want to side with agronomists.

3.3 Seventeen crush districts - one cluster?

California contains 17 crush districts of more than 100,000 square miles which Porter's associates who wrote the Harvard case study lumped into one wine cluster. Is 17 too many clusters? Or is one too few clusters? We went back to Porter and found some suggestions in relation to the demarcation of clusters.

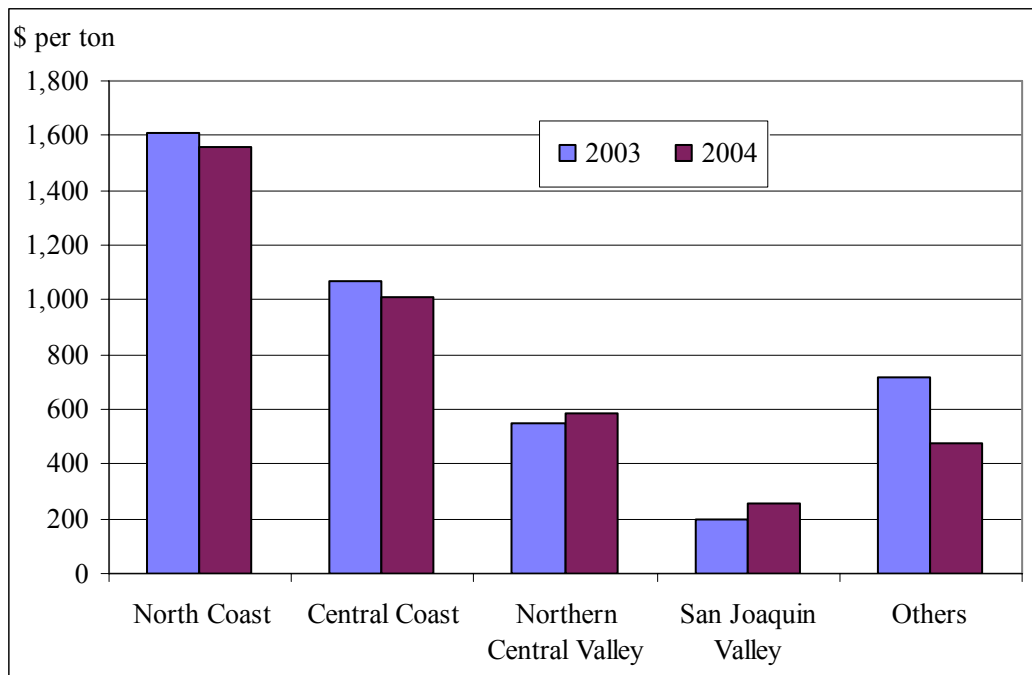
Porter (1998) suggests that a "cluster's boundaries are defined by the linkages and complementarities across industries and institutions that are most important to competition", but he admits that "Drawing cluster boundaries is often a matter of degree, and involves a creative process ..." (Porter 2000). These statements are of little use in drawing a circle on a map. We would agree that empirical analysis always involves elements that are more art than science, but he infusing a heavy dose of ambiguity into the very foundation of the approach reduces its rigor and may compromise its use as a research tool.

Which linkages and complementarities justify - or don't justify - the lumping together of the seventeen crush districts into a single cluster? We believe the linkages and complementarities suggest that there is more than one wine cluster in California. At the minimum there are two: The Central Valley and the Coastal Districts. But this leaves out Southern California and the foothills districts wineries. Moreover, the Coastal Districts stretches for about 600 km, straining the concept of confined locality.

The Central Valley segment produces low-priced grapes that are used for grape juice and low-priced wines; the Coastal Districts produce grapes and wines with higher prices, and no grape juice to speak of. The Central Valley is far less attractive for tourists whereas tourism is an important activity in several Coastal Districts. The Central Valley and the Coastal Districts are different terroirs: their climates differ, they grow different varieties, achieve different yields, employ different vineyard management principles and different vinification methods, and they fetch different prices, even for the same varieties.

Over the decade from 1991 to 2000, the price of all grapes used for crush in Napa County (the highest-price crush district in California) averaged about 8 times the price of grapes in the Southern San Joaquin Valley. Other districts range between these two. About 70 percent of the variation in California grape prices can be explained by a set of fixed effects for crush district. On average they show that, even holding constant fixed effects for variety, the price of grapes in the Southern San Joaquin Valley averaged about \$1,212 dollars per metric ton lower than the average price in Napa County. Figure 5 shows the distribution of average prices of grapes in the year 2000 across regions. Notice that not only are coastal prices far above those in the other regions, grape prices continued to rise in the year 2000 in the North Coast while they fell in other regions (Sumner et al., 2004 based on Lee and Sumner, 2001).

Fig. 5: Average price of crushed grapes in California by region¹, 2003 and 2004,



Source: CDFA/CASS Grape Crush Reports, 2005

¹ The districts 12, 13 and 14 define the region San Joaquin Valley. The districts 1, 2, 3, 4 and 5 define the region North Coast. The districts 6, 7, and 8 define the region Central Coast. The districts 9, 10, 11 and 17 define the region Northern Central Valley. “Other” is the region defined by the districts 15 and 16.

When trade linkages between wine districts are taken into account the number or distinct clusters could easily be extended. Then the Coastal District would split into several sub-clusters because trade in grapes across wine districts is insignificant compared to within-district trade for two reasons: high transport costs and because origin-denominated wines, that are typically produced in the coastal districts, may contain only limited amounts of grapes from different geographical origin.

3.4 Significant relationships: Grape contracts

Clusters are more than a number of firms bunched together in a location. An essential characteristic of clusters and the cluster approach suggests that such relationship are identified and analyzed in studies of spatially concentrated economic activities.

An important relationship in the wine cluster is the contractual relationships between grape growers and wine makers. Most wine producers in California also grow grapes, but the typical large winery buys most of the grapes it uses. The converse is also not uncommon. Some large grape growers operate a small winery, but sell most of their grapes.

The market for grapes is unlike markets where anonymous buyers and sellers meet to conclude transactions on the spot. Rather, the typical situation is for a winery to establish a contract with growers each year with the understanding that, subject to some quality rules, the winery will accept all of the grapes produced on the designated vineyard and the grape grower will deliver all of grapes harvested to the winery (Sumner et al., 2004). A survey of all California grape growers conducted in 1999 (Goodhue et al., 2002 and 2003) showed that contracting for grapes is widespread in the industry: 90 percent of the more than 2000 respondents reported contract usage, and of this 90 percent, 80 percent used written contracts

and 10 percent used oral agreements. Half the contracts were for more than a year and the average contract length was 3.5 years. One in three contracts in this survey contained an evergreen clause, assuring the contracting parties of their partner's intention to continue the contract arrangement.

Clearly, grape growers and wine makers have evolved a network of enduring relationships that helps them to reduce risks, enhance access to finance, and avoid some of the bargaining costs associated with selling grapes shortly before they are ready for harvest. The existence of such contractual relationship was well known before Porter suggested his clusters approach and we are unaware of how the study of contractual relationships could have benefited from adopting a cluster perspective.

3.5 Wine country tourism

Tourism has become an important business line in the California wine cluster where tourism generates revenue of \$ 1.3 billion p.a. from some 15 million visitors. The wine cluster's attractiveness to tourists is certainly enhanced by the variety of wineries that can be visited: from the small family winery, where visitors can chat with the owner and his wife, to Mondavi's impressive exhibition cellar, where hundreds of thousands of visitors each year can walk through one of the finest wine making operation the cluster has to offer.

Tourism, as Porter (1998) has argued, is an industry that thrives on coordination among specialists. Good wine and good food are complements but excellence in cooking is not the domain of wine makers, and neither cooks nor wine makers need to excel as hostellers. Moreover, tourists also enjoy a pleasant natural environment and cultural events. Being attractive to tourists obviously cuts across several industries wineries, restaurants and hotels, cultural events, and environmental stewardship.

Perhaps because few people drive to the countryside to see corn or soybean fields and visit a dairy or hog farm, few agricultural economists are sensitive to the interactions of agriculture with tourism when they actually do occur. Here Porter's approach helps to broaden the somewhat blinkered world-view of agricultural economists.

3.6 Information networks, the information revolution, and transaction costs

When clusters are networks, and networks channel communication, the rapid advances in communication technologies can be expected to affect clusters. But how? One of the mantras of the dot.com-boom at the turn of the millennium was the "death of distance": the world would implode into a global village, markets would become a unified agora, everything could be bought anytime from everywhere, etc.

In such a world clusters would expand, merge, and disintegrate and all specialists that help to reduce transaction costs would lose their function. Tapscott (1996), for example, opined with unrestrained definiteness, "Middleman functions between producers and consumers are being eliminated through digital networks." The prediction has not come true in the California wine industry. In two surveys of the California wine industry conducted in the year 2000 and 2003 we found no drastic move toward wineries marketing their own wine on the web. For that to happen, transportation costs would have to come down too. In California it costs between about \$11 and \$17 to ship a case of wine. Shipping costs to other U.S. states vary from \$13 to \$ 54 per case depending on the destination (Stricker et al., 2003). Unexpected by us, however, is the wineries' frequent use of the web for attracting tourists.

Moreover, the information revolution has done little to alleviate the asymmetry in information between producers and consumers. Asymmetric information still characterize wine sales where only few quality characteristics can be described on a label (Bombrun and Sumner, 2003). Wine branding, reputation building, and rating of wines by experts such as Robert Parker, are therefore as important as ever in the California wine industry.

3.7 Social networks

We know of no completed formal study of social networks in the California wine industry but there is rich evidence of their existence. Several associations, such as the Wine Institute, the Napa Valley or the Sonoma Valley vintners associations, and many other associations and clubs provide platforms for social networking. One association, the Napa Valley Economic Development Corporation, in the year 2005 had put its annual golf tournament under the motto, "Networking in Napa". The association also had plans to conduct a formal networking study in its local segment of the wine cluster.

Other social networks are less visible but hardly less important for that reason. An example for an important informal network of low visibility was the Napa Wine Technical Group, a network of winemakers that was concerned with the application of science to the improvement of the quality of wine. The members of this network researched particular issues, conducted experiments in their wineries, and then reported the results to the entire group (Lapsley, 1996).

Reports about informal networks are rare although clusters theory suggests that they exist. We suspect that the lack of our knowledge about informal social networks is the result of a lack of research attention that has been allocated to the study of informal networks in the California wine industry.

4 CLUSTER POLICY AND COLLECTIVE ACTION IN CLUSTERS

Research is not the only activity pursued by agricultural economists and much of our time goes into providing information to a broader public. From our ruminations of the cluster approach in relation to the California wine industry we gained several insights that seem useful for the management and policy advisor.

The first insight relates to the nature of clusters which affects managers' and policy makers' ability to control them. The spatial pattern of the wine industry in California has not been planned by anybody. It has emerged from the interaction of many firms and organizations that did not intend to bring that pattern about. As a spontaneous pattern the cluster does not serve anyone's purpose, although it may have useful and desirable functions for many (Hayek, 1967). Attempts to manage spontaneous orders such that they serve specific, individual purposes often have highly undesirable side-effect and may undermine the very existence of that order. We know this from markets: Politicians seldom create more mischief than when they attempt to remedy markets that have allegedly failed. Policies aimed at improving clusters or remedying failing clusters could become a similar area of mischievous policy making.

Grape growers, wineries, and the wine entourage can operate more effectively when they have access to public goods and club goods, such as public research, industry standards and associations, and laws constraining individual behavior that may damage the industry's best collective interests. Public policies supporting the supply of public and club goods in the wine industry can hardly be wrong in principle but their appropriate levels of intensity will always be subject to debate. Given the highly skewed distribution of winery size in the

California wine industry, a relatively small number of wineries may collect most of the benefits from publicly provided goods, the lobbying by the few is likely to be intense, and an excessive supply of collective goods supported by taxpayers cannot be ruled out. Alternatively, larger firms may provide such goods internally and taxpayer funded industry service may be used as a competitive lever by smaller firms.

Clusters are defined by relationships and providing support for relationship development and maintenance may be the most important management activity and government policy for cluster performance and survival. Some of the relationship activities must be concerned with the relationships within the clusters – such as providing support of industry associations; but equally important is the development and maintenance of external relationships – such as fostering contacts to foreign competitors and input suppliers. This is important because in the last instance, the California wine industry is unlikely to thrive for long on inbred ideas and cozy relationships. If the industry wants to remain able to compete with the wine industries in Australia, South Africa, and Chile, it also must draw on new information acquired from afar and its wine growers must be willing to outcompete their close neighbors too.

5 CONCLUSIONS

Grapes grow in clusters so it is natural that Porter chose this industry for one of his cluster cases. We have explored the usefulness the clusters as a tool for understanding features of the grape and wine industry, with a focus on California.

We note that one does not need the cluster idea to appreciate why wine grape production is concentrated in certain regions or why wine making is often located nearby. Broadening our consideration to the economics of location and geography, we consider gains from agglomeration that can help certain industries and firms prosper in part because they are nearby other firms and industries that prosper. These positive location-based spillovers may come in many forms.

Clusters transcend conventional classifications of industries: This is an important point for agricultural economists, who tend to think in terms of farms, businesses, value chains, and markets.

Clusters are entities halfway between agglomerations and networks. In contrast to network theory, clusters do not employ graph theory to measure and analyze the networks. The research by Giuliani and Bell (2005) suggests that the cluster approach is of limited use when an industry with a strictly limited location choice is highly dependent on specialized human capital and innovation. Under such circumstances the location of firms is determined by natural conditions and inter-firm linkages may be of little importance. In short, the industry co-locates but need not cluster. A cluster approach, however, may then presume inter-firm relationships that actually do not exist.

The cluster approach assumes that cohesion among the agents within the cluster contributes towards innovation and competitiveness. The behavior of wine industries wedded to the idea of terroir suggests, however, that cohesion may also turn into a force of conformity, technological stagnation, and protection from competitors provided by government regulations.

For the California wine industry, we note that in some cases information networks and adoption and adaptation of innovations have been an important feature of firm and industry success. In some cases, geographical proximity enhances the flow of information and the success of adaptation. For winegrape farms, where accommodating local climate and soil, or, in winemaking terms terroir, is of crucial importance, local information networks may be

natural. But, for much of the winemaking process there seems to be less reason that the information network is local. For example, at the University of California, many, if not most, enology students are from outside California. And, the “flying wine” makers are part of a global network not a cluster.

We agree with Porter that participation in information networks is often crucial to competitive success, and this applied to the wine industry. In this case, however, in order to “hear it through the grapevine” may entail extending one’s network beyond the cluster.

6 REFERENCES

- Anderson, Kym Norman (ed.)** The world's wine markets. Cheltenham, UK: Edward Elgar, 2004.
- Anderson, Kym, Norman, David and Wittwer, Glyn.** "The global picture," in Kym Anderson, ed., *The World's wine markets*. Cheltenham, UK: Edward Elgar, 2004, pp. 14-58.
- Aylward, David.** Working together: innovation and export links within highly developed and embryonic wine clusters. *Strategic Change*, 2004, 13, pp.429-439.
- Bombrun, Helene and Sumner, Daniel A.** "What determines the price of wine? The value of grape characteristics and wine quality assessments." *AIC Issues Brief*, 2003, No.18.
- California Chapter of the American Society of Farm Managers and Rural Appraisers.** *2005 trends in agricultural land and lease values*. Stockton, California, April 2005.
- Ditter, Jean-Guillaume.** Reforming the French wine industry: Could clusters work? *Cahiers du CEREN*, 2005, 13, pp. 39-54.
- Geraci, Victor.** "Fermenting a twenty-first century California wine industry." *Agricultural History*, 2004, 78(4), pp. 438-465.
- Giuliani, Elisa and Bell, Martin.** "The micro-determinants of meso-level learning and innovation: evidence from a Chilean wine cluster." *Research Policy*, 2005, 34, pp. 47-68.
- Goodhue, Rachel E. Heien, Dale M. Lee, Hyunok and Sumner, Daniel A.** "Contract use widespread in wine grape industry." *California Agriculture*, 2002, 56(3), pp. 97-103.
- Goodhue, Rachael E., Heien, Dale M., Lee, Hyunok and Sumner, Daniel A.** "Contracts and quality in the California winegrape industry." *Review of Industrial Organization*, 2003, 23, pp. 267- 282.
- Gordon, Ian R. and McCann, Philip.** "Industrial clusters: Complexes, agglomeration and/or social networks?" *Urban Studies*, 2000, 37(3), pp. 513- 532.
- Grape Crush Report 2005.** California Department of Food and Agriculture, Sacramento, California, March 2006
- Hayek, Friedrich A.** *The result of human action but not of human design*. Chicago, IL: University of Chicago Press, 1967.
- Hayek, F. A. von.** Der Wettbewerb als Entdeckungsverfahren. Kieler Vortraege, NF. Nr. 56. *Kiel: Institut fuer Weltwirtschaft.*, 1968,.
- Hippel, E. von.** "'Sticky information' and the locus of problem solving: Implications for innovation." *Management Science*, 1994, 40(4), pp. 429-439.
- Johansson, Börje and Quigley, John M.** "Agglomeration and networks in spatial economies." *Papers in Regional Science*, 2004, 83, pp. 165-176.

Johnson, Hugh and Robinson, Jancis. Der Weinatlas. 5. Ausgabe. München: Hallwag, 2002.

Kiker, B.F. "Von Thunen on human capital." *Oxford Economic Papers*, 1969, 21(3), pp. 339- 343.

Lapsley, James T. *Bottled poetry*. Berkeley: University of California Press, 1996.

Lapsley, James T. "A quick Look at the California Wine Industry" prepared for the Cluster Workshop, AAEA meetings Providence RI, July 23, 2005.

Lee, Hyunok and Daniel A. Sumner. "Econometrics of Grape Prices in California: the Roles of Grape Supply, Location, Variety, Market Power and Contracted Quality Limits," Draft paper, presented at the Conference, ENOMETRICS VII, St. Helena, California, May 2001.

Marsh, Ian and Shaw, Brendan. Australia's wine industry: Collaboration and learning as causes of competitive success. Australian Business Foundation, Sydney, 2000.
<http://www.abfoundation.com.au/ext/ABFound.nsf/wwwcat/1CF34F0D97D7CCA94A2569380009079F?OpenDocument>

Marshall, Alfred. *Principles of economics. 8th ed.* London: Macmillan Press, 1920 (Reprint 1979).

Martin, Ron and Sunley, Peter. "Deconstructing clusters: chaotic concept or policy panacea?" *Journal of Economic Geography*, 2003, 3, pp. 5-35.

Mytelka, Lynn KL. and Goertzen, Haeli. Learning, innovation and cluster growth. A study of two inherited organizations in the Niagara Peninsula wine cluster. Discussion Paper Series 2004-15, Institute for New Technologies. United Nations University, Maastricht, Netherlands, 2004.

National Association of American Wineries. "Wineries by State", 2004
<http://www.americanwineries.org/newsroom/wineriesbystate.htm>

Oxford English Dictionary. Definition for "Cluster", 2006
<http://dictionary.oed.com>

Porter, Michael E. "Clusters and the new economics of competition." *Harvard Business Review*, 1998, 76(Nov.-Dec.), pp. 77-90.

Porter, Michael E. "Clusters and competition," in Gordon E. Clark, eds., *Oxford handbook of economic geography*. Oxford: Oxford University Press, 2000, pp. 197-2

Stricker, Susanne, Sumner, Daniel A. and Mueller, Rolf A.E. *Wine on the web in a global market: A comparison of e-commerce readiness and use in Australia, California and Germany*. In: Harnos, Z., Herdon, M. and Wiwczaroski, T.B. (eds). Information Technology for a better agri- food sector, environment und rural living. Proceedings of the 4th Conference of the European Federation for Information Technology in Agriculture, Food and the Environment (EFITA). Debrecen and Budapest, Hungary, 5-9 July 2003. pp. 253-263.
<http://www.agric-econ.uni-kiel.de/Abteilungen/II/veroeffentlichungen.htm#2003>

Sumner, Daniel A., Bombrun, Helene, Alston, Julian M. and Heien, Dale. "North America," in Kym Anderson, eds., *The World's wine markets*. Cheltenham: Edward Elgar, 2004, pp. 187- 209. (also available as: **Sumner, Daniel A., Bombrun, Helene, Alston, Julian M. and Heien, Dale.** *An economic survey of the wine and winegrape industry in the United States and Canada*. Davis, CA, 2001. <http://aic.ucdavis.edu/research1/Winegrape.pdf>

Tapscott, D. *The digital economy*. New York, NY: McGraw Hill, 1996.

Thünen, Johann Heinrich, von. *Der isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie: oder Untersuchungen über den Einfluß, den die Getreidepreise, der Reichtum des Bodens und die Abgaben auf den Ackerbau ausüben.* Hamburg: Perthes, 1826.

Visser, Evert-Jan. A Chilean wine cluster? Governance and upgrading in the phase of internationalization. Serie desarrollo productivo # 156. Division of Production, Productivity and Management. ELAC/GTZ project on "Natural Resource-based Strategies Development (GER 99/128). Santiago de Chile, 2004.

Wasserman, Stanley and Faust, Katherine. *Social network analysis.* Cambridge, UK: Cambridge University Press, 2004.

Wine Institute California. California Wine Has \$45.4 Billion Economic Impact On State. June 22, 2004.

http://www.wineinstitute.org/industry/statistics/2004/ca_wine_economic_impact.php

Wine Institute California. U.S. Exports by Year, July 2006

<http://www.wineinstitute.org/industry/exports/2006/docs/ExportsByYear2005.pdf>