

Clusters of Grapes and Wine

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1 INTRODUCTION

1.1 Clusters

Michael Porter is the champion of the new economics of competition. A special aspect of this new economics is the role of location in competition, which is encapsulated in Porter's concept of clusters.

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 (1998) 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 Adoption and diffusion of the cluster concept

When we searched the catalog of the Institute of World Economics, which includes papers from all major economics journals, for journal articles concerned with clusters (excluding cluster analysis) and that appeared after 1998, more than seven hundred articles were listed. Another indication of the success of the concept is the envy with which Porter has met in some quarters of economic geography (e.g. Martin and Sunley, 2003).

1.3 Clusters in agricultural economics research

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, the concept, has become a standard tool in our discipline.

Research on the spatial organization of agriculture and agribusiness has not been high on our common list of priorities. This may 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 there is no time for disciplinary romanticism and we rather address three questions:

- What is the conceptual contribution of Porter's cluster perspective?
- What can clusters contribute to an understanding of the spatial organization of the California wine industry?
- What are the practical implications of a cluster-perspective on the California wine industry?

1.4 Outline of the paper

In the rest of the paper we address each question in sequence. In the next two sections we characterize Porter's concept of clusters against the backdrop of three closely related concepts: industrial-complex economics, agglomeration economics, and social network economics. We turn to the usefulness of the concept in the fourth section of the paper. Here we use clusters as a means for making economic sense of developments in the California wine industry. Those familiar with Porter's work may wonder why we address the California wine industry when Porter and his associates have done that already in a well-known case study. Simply put, we believe that the case study omitted some aspects of the California wine industry that warrant discussion from a cluster perspective.

2. Clusters, agglomerations, and networks

Like sculptures, new concepts are best appreciated when approached from different angles and perspectives. Following suggestions by Gordon and McCann (2000) and Johansson and Quigley (2004) we relate the cluster concept to three concepts that contribute to the explanation of the persistence of clusters. In particular, we briefly review the economic theories of industrial-complexes, of agglomerations, and of social networks.

2.1 Industrial complex economics

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.

Industrial complex theory can explain the co-location of grape-growing and wine-making in the California wine cluster. Although the quality of grapes is influenced by the terroir, the making of wine is not, and, from a technological point of view, wine does not need to be produced where the grapes are grown. But it would not make economic sense to ship high-volume, perishable grapes over long distances. Locating wineries where the grapes are grown is the superior spatial arrangement for producing wine.

2.2 Agglomeration economics

Agglomeration economics has its roots in Marshall (1926), who recognized that firms that are part of agglomerations benefit in three ways from being bunched together. First, when many firms of the same industry co-locate, a local pool of specialized labor emerges from which any one firm in the agglomeration can draw.

Second, in an agglomeration the local supply of non-traded goods, such as physical or institutional infrastructure is enhanced, and third, information flows better among firms that are huddled together in a confined location.

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. Agglomeration theory, however, recognizes some benefits that are ignored by industrial complex economics: (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. Taken together, all this may contribute to a milieu conducive for a particular industry.

Several characteristics of the California wine cluster conform with the agglomeration model. A number of highly specialized input suppliers - from winery equipment producers to marketing agencies and software providers - have set up shop in the wine country. Grape growers draw on a pool of specialized seasonal vineyard laborers, with the better, higher-paid laborers being preferred by the grape growers in the high-priced wine regions of California. Wine brokers feed back into the cluster information on market trends, and the University of California feeds the industry with new information and new technologies useful for growing grapes and making wine.

2.3 Social network economics

In industry-complex and agglomeration models of clusters the identities of the firms in the cluster do not matter, 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. Social network theory attempts to add specificity to clusters. In social network analysis two types of networks are distinguished: networks that consist of actors and links between the actors, and networks that comprise actors, events, and links between actors and events. The latter type is called affiliation networks (Wasserman and Faust 1994). Social networks are intangible networks and physical networks that correspond with the intangible network are not required.

Four characteristics of networks are of interest in relation to clusters: (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 cluster and may reach beyond cluster boundaries.

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

We know of no completed formal study of social networks in the California wine cluster 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. In 2005, one association, the Napa Valley Economic Development Corporation, held its annual golf tournament under the motto, "Networking in Napa". The association also planned to conduct a formal networking study in its local segment of the wine cluster. Networks, it appears, are everywhere, hardly recognized, not measured, and, with few exceptions to which we turn later, not systematically analyzed in economic studies of wine industries.

3 PORTER'S CLUSTERS

Porter's big theme is competitiveness, and clusters are only 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 of clusters.

A point that Porter makes, and that is only implicit in other theories of clusters, is that clusters transcend conventional classifications of industries. This is an important point for agricultural economists, who usually define agriculture quite broadly. Also, empirical research tends to be more difficult when the measurement unit under investigation does not neatly conform to the measurement units for which secondary data are available.

Porter singles out three broad ways in which clusters affect competition: "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. Peer pressure certainly seems to be felt by those wineries from the coastal districts that cater to the somewhat precocious higher segments of the wine market, where wines morph from agricultural products into idolized works of art.

Competition is a dynamic discovery process (Hayek 1968) which stimulates innovation and competition. 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 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 anonymously, valuable information more often is shared or traded in enduring personal or business relationships. An example is 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).

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).

4 THE CALIFORNIA WINE INDUSTRY

There is no need for us to describe the California wine cluster in any detail. The cluster has been described in the Wine Cluster Case study of Harvard University and Lapsley (1996) provides more about the size and activities of the industry (see also Sumner et al. 2004). We therefore decided to limit our discussion of the California wine cluster to some remarks concerning the competitiveness of the cluster 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.

4.1 Competitiveness of the wine industry

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: in 2007, 80 percent of the country's 394,200 ha. of grape bearing area were located in California, 90 percent of wine produced in the United States originated in California, the State was home to approximately 2,400 of the country's 5,500 wineries (National Association of American Wineries, 2008), nearly two out of three bottles consumed by Americans were of California origin, and 65 cents of every dollar that Americans spend on wine was spent on wine from California .

California is the fourth largest wine exporter in the world and 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 California wine industry is impressive. In the 22 years since 1986 the volume of wine exports from the United States grew more than 16-fold from 7.2 million gallons in 1986 to nearly 118 million gallons, earning more than \$ 775 million in 2008. Export performance has, however, been uneven. A period of steady growth from 1986 to 1992 was followed by a short period of accelerated growth that began in 1994 and lasted until 1999 (see Fig. 1). Then came a 4-year period of no growth until 2003 when exports again grew vigorously. Export growth is, however, largely driven by price. Export prices received have increased in the 22 years from 1986 by only 59 percent to reach about \$ 7.75 per gallon in 2008. The average price of the wines imported into the USA was still about double the price of the wines exported.

[Fig 1. Development of the volume and value of US. wine exports, 1986-2008]

Land prices are an important indicator of competitiveness. In Fresno County in the San Joaquin Valley producing vineyards sold in the year 2004 for between \$ 3,500 and \$ 7,500 per acre whereas in Sonoma County open vineyard land without vines fetched between \$ 35,500 and \$ 45,000 per acre. Needless to say that Sonoma grape production outcompetes that in the Central Valley by orders of magnitude.

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 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. 2001).

4.2 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, or networks. 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, e.g. the apples industry in Washington, the tobacco industry in the Carolinas, the grains industry in the Midwest, etc. An exception might be agricultural industries that rely on a substantial fixed investment with substantial economies of scale, such as sugar or cotton, where some coordinated action between farmers and processors is required to kick-start an industry.

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 happened to the wine industry during Prohibition from 1920 to 1933. The California wine industry certainly withered but did not perish, and after the repeal of 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 one of the occasions where agricultural economists may want to side with the agronomists.

4.3 Seventeen crush districts - one cluster?

California 17 crush districts cover more than 100,000 square miles and count more than 500,000 acres of wine grapes, which the Harvard case study lumps into one wine cluster. Is 17 too many clusters or is 1 too few? 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 infusing a heavy dose of art into the very foundation of an approach may threaten its capacity to withstand criticism.

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 Sierra foothills districts' wineries. Moreover, the coast stretches for about 600 miles, straining the concept of locality.

The Central Valley segment produces low-priced grapes that are used for grape juice concentrate and low-priced wines; the Coastal Districts produce grapes and wines with higher prices, and no grape juice concentrate to speak of. The Central Valley is far less attractive to tourists, whereas tourism is an important activity in several Coastal Districts. The Central Valley and the Coastal Districts grow different varieties, achieve different yields, and 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 2 shows the distribution of average prices of grapes in 2003 and 2008 across regions. (Sumner et al. 2004, USDA 2003 and 2008).

[Fig 2 Average price of crushed grapes in California by region, 2003-2008]

When trade linkages between wine districts are taken into account, the number of distinct clusters could easily be increased. 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 laws which limit origin-denominated wines, which are typically produced in the coastal districts, to less than 25 percent of grapes from different geographical regions.

4.4 Significant relationships: Grape contracts

Clusters are more than a number of firms bunched together in a location. A pattern of relationships among firms is an essential characteristic of clusters. To be useful, the cluster approach requires that such relationships be identified and analyzed in studies of spatially concentrated economic activities.

An important type of relationship in the wine cluster is the contractual relationship 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. 2000) 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, 10 percent used oral agreements and 10 percent used both written contracts and 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.

4.5 Wine country tourism

Tourism has become an important business line in the California wine cluster where tourism generates a revenue of \$ 1.3 billion p.a. from some 15 million visitors. 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, environmental stewardship - an aspect of clusters that Porter has repeatedly emphasized but which he or his students who wrote the Wine Cluster case curiously missed.

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 some of the finest wine making operation the cluster has to offer.

4.6 Networks, transaction costs, and the information revolution

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., etc. True, we don't know the location of the web server that we use to buy our wine online. But does this obviate the benefits from local proximity and localized networking? The answer lies in the composition of transaction costs in the wine industry.

Transaction costs arise when the partners of a transaction have less than full information. Moreover, when information is incomplete, the information available to different agents need not be the same and information is asymmetric. Incomplete information is the source of costs of acquiring and communicating transaction-related information, such as finding a specific wine from a particular wine maker, negotiating price, terms of shipping, and the like. This component of transaction costs is reduced when the costs of communication fall. Asymmetric information gives rise to incentive costs of transactions, such as being exposed to misrepresentation of non-verifiable quality claims, opportunistic behavior, or outright cheater. Asymmetric information dominates wine sales where only a few quality characteristics can be described on a label (Bombrun and Sumner 2003). Branding and reputation building are means for reducing buyers' incentive costs which substitute information about the seller's identity for information on the wine's quality that is difficult to convey to buyers. Branding and reputation building require, however, that buyers are able to identify the sellers; similarly, sellers must be able to identify buyers to conclude the transaction and collect payment.

The Internet and the web are the most advanced communication technologies that are widely available in the California wine industry (Stricker 2003). Because of some technical features of the Internet, the identity of trading partners is not assured on the Internet, unless authentication technologies are used, with which most Internet users are thoroughly unfamiliar. Because of the difficulties of verifying the identity of transaction partners, the incentive costs of transactions tend to be higher on the Internet than off it, and the increase in incentive costs may outweigh any savings in information acquisition costs so that total transaction costs may be higher on the Internet than in transactions conducted by conventional means.

The advent of e-commerce on the web has been regarded by some as a tool to bypass market intermediaries. Tapscott (1996), for example, opined that, "Middleman functions between producers and consumers are being eliminated through digital networks." The hopes for market disintermediation have 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 decline. Within California it costs between \$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 and mode of transport (Stricker et al. 2003). Unexpected by us, however, is the wineries' frequent use of the web for attracting tourists.

5 IMPLICATIONS FOR AGRICULTURAL ECONOMICS

5.1 Research

One question in relation to clusters is the degree to which the concept warrants inclusion in the research tool box of agricultural economists. A thorough investigation of the information networking and knowledge acquisition activities of the wineries and grape growers in a wine cluster of Chile (Giuliani and Bell 2005) gives reason for pause. Chile is among the rising southern stars in the wine firmament. Its wine industry still consists of many small grape growers and wine makers and the industry actively imports know-how from consultant enologists and agronomists, collectively known as "flying wine makers". In Chile's Colchagua valley the authors investigated the "knowledge absorptive capacities", i.e. the education, technical training, the experience of professional staff, and the experimentation activities of wineries, as well as the intra- and extra-cluster communication linkages of a sample of 32 wineries.

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 case, cluster boundaries become blurred when the cluster is defined in terms of information linkages, which are crucial to the industry's innovation capacity and competitiveness. Moreover, the pattern of linkages was far from homogenous within the cluster.

Some wineries were densely linked to each other whereas others entertained no information linkages at all to other wineries in the valley (see Fig. 3). Finally, as Guiliani and Bell (2005) 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. 3: Graphical representation of the local knowledge system in Colchagua Valley, Chile]

To us the research by Guiliani and Bell (2005) suggests two things: (i) 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 presume inter-firm relationships that actually do not exist. (ii) The limits of the cluster approach have been revealed with the use of research methods from social network analysis. Whereas clusters share many aspects of networks, network analysis is more methodical and perhaps a more useful research method to the analysis of spatial relationships within an industry than is the cluster approach.

5.2 Advice for management, collective action and policy

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 and the 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 firms (Hayek 1967). Attempts to manage spontaneous orders such that they serve specific, individual purposes often have highly undesirable side-effects 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 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 with 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.

6 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 of 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.

For the 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 vineyards, 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 enology students are from outside California and the United States. 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, hearing it "through the grapevine" may entail extending one's network beyond the cluster.

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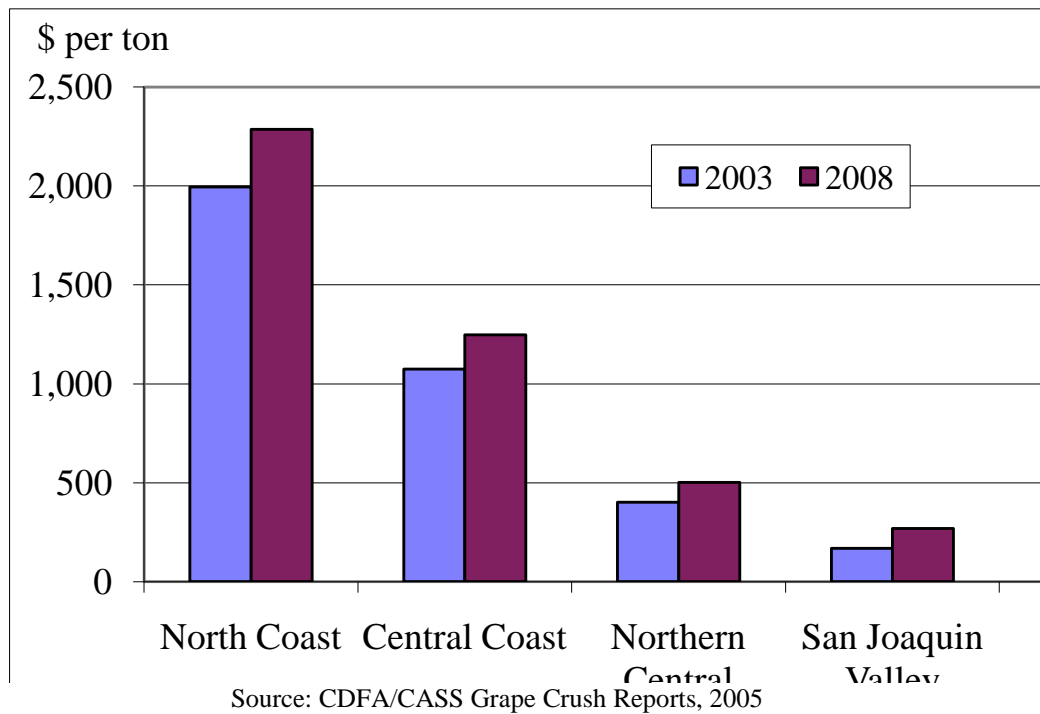
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Fig. 1: Development of the volume and value of U.S. wine exports, 1986-2009

U.S. wine exports, volume, value, and indices, 1986-2009.

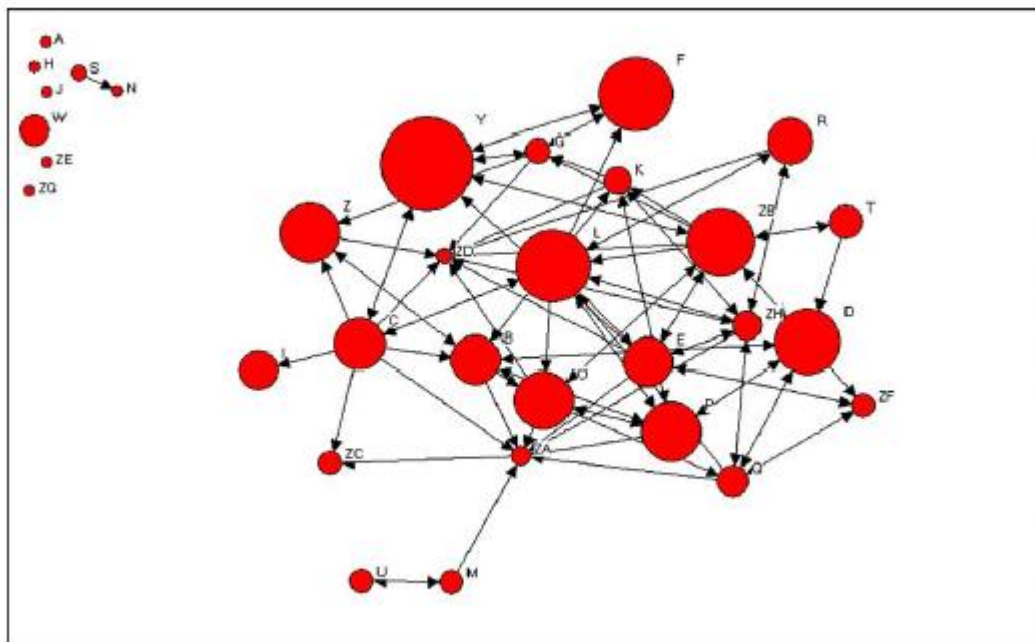
| Year | Volume | | Value | | Ratio Value/Volume | |
|------|----------------|------------|----------|------------|--------------------|------------|
| | [mio. gallons] | 1986 = 100 | [mio \$] | 1986 = 100 | abs. | 1986 = 100 |
| 1986 | 7.2 | 100 | 35 | 100 | 4.86 | 100 |
| 1987 | 11.9 | 165 | 61 | 174 | 5.13 | 105 |
| 1988 | 16.9 | 235 | 85 | 243 | 5.03 | 103 |
| 1989 | 21.9 | 304 | 98 | 280 | 4.47 | 92 |
| 1990 | 29 | 403 | 137 | 391 | 4.72 | 97 |
| 1991 | 33.1 | 460 | 153 | 437 | 4.62 | 95 |
| 1992 | 38.9 | 540 | 181 | 517 | 4.65 | 96 |
| 1993 | 34.9 | 485 | 182 | 520 | 5.21 | 107 |
| 1994 | 35.2 | 489 | 196 | 560 | 5.57 | 115 |
| 1995 | 38.8 | 539 | 241 | 689 | 6.21 | 128 |
| 1996 | 47.5 | 660 | 326 | 931 | 6.86 | 141 |
| 1997 | 60 | 833 | 425 | 1214 | 7.08 | 146 |
| 1998 | 71.9 | 999 | 537 | 1534 | 7.47 | 154 |
| 1999 | 76.8 | 1067 | 560 | 1600 | 7.29 | 150 |
| 2000 | 77.7 | 1079 | 547 | 1563 | 7.04 | 145 |
| 2001 | 80.3 | 1115 | 541 | 1546 | 6.74 | 139 |
| 2002 | 74.5 | 1035 | 549 | 1569 | 7.37 | 152 |
| 2003 | 92.3 | 1282 | 621 | 1774 | 6.73 | 138 |
| 2004 | 118.8 | 1650 | 794 | 2269 | 6.68 | 137 |
| 2005 | 91.3 | 1268 | 606 | 1731 | 6.64 | 137 |
| 2006 | 98 | 1361 | 800 | 2286 | 8.16 | 168 |
| 2007 | 107.9 | 1499 | 862 | 2463 | 7.99 | 164 |
| 2008 | 118.7 | 1649 | 920 | 2629 | 7.75 | 159 |

Fig. 2: Average price of crushed grapes in California by region¹, 2003 and 2004,



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.

Fig. 3: Graphical representation of the local knowledge system in Colchagua Valley, Chile



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