

**Public-Private Networks as Sources of Knowledge and Upgrading Capabilities:  
A Parametric Stroll through Argentine Vineyards**

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**Abstract**

Scholars of development and business increasingly argue that global competitiveness of emerging market firms depends largely on local innovative capacities. But such capacities are often functions of specific constellations of institutions and networks, which demand often unique forms of coordination and governance. This paper uses a unique research design to statistically analyze the impact of inter-firm networks and publicly supported institutions on firm upgrading capabilities in emerging market societies. Our examination of the transformation of the Argentine wine industry in two provinces reveals the importance of a firm's "public-private" network. Links to other firms and institutions appear especially helpful to the extent they help the firm gain access to different communities of producers. Governments can aid upgrading and competitiveness, especially in backward societies, by building public-private institutions that not only offer supply-side resources to firms but also act as bridges across regions.

Key words: Upgrading, networks, institutions, South America, Argentina, agriculture

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## **Introduction**

Scholars of economic development increasingly argue that international competitiveness depends on the ability of a society to upgrade its firms and industries – a shift from lower- to higher-value economic activities by using local innovative capacities to make continuous improvements in processes, products, and functions. (Doner, Ritchie, & Slater, 2005; Giuliani, Pietrobelli, & Rabellotti, 2005b) But just what these innovative capacities compose and how they come about, especially in societies that lack *ex ante* an endowment of “optimal” social capital and institutions, are still subject to open debate. For instance, although scholars increasingly view upgrading as a function of a cluster’s collective efficiencies (Schmitz 2004), instead of simply market access, firm-specific factors, or foreign investors, it is still unclear how public policy, institutions, and networks shape joint action and learning in the developing world.<sup>1</sup>

Many of the problems come from the limited systematic data collection and analysis. The quantitative research on networks has just recently begun to incorporate non-firm institutions and organizations into its models and has done limited data collection in the developing world.<sup>2</sup> The literature on upgrading and clusters has, to our knowledge, rarely attempted to systematically measure inter-firm and institutional networks and test their impacts on firm-level particular upgrading practices using parametric statistical analysis.<sup>3</sup>

This paper attempts to overcome these limitations in two key ways, and in turn, offers a fresh perspective about how publicly supported institutions and inter-firm networks can help firms acquire new upgrading capabilities. First, our research design allows us to control for industry and national factors while analyzing firms that come from different regions in a country better known for its dysfunctional institutions and social capital -- Argentina. We analyze the transformation of the Argentine wine sector, particularly the innovations in grape production, in firms in the two dominant wine making provinces, Mendoza and San Juan. For decades, both provinces produced

large volumes of low quality wine and had virtually no international presence. By the end of the 1990s, the Argentine had witnessed a dramatic turnaround in fine wine exports, led by Mendoza's efforts to pioneer significant advances in process and product innovations. A brief comparison of the two provinces allows us to derive hypotheses about the roles of policies, institutions, and networks that helped unleash upgrading in Mendoza in the 1990s.

Second, our methodology and field work has yielded a unique cross-sectional data set from 2004-05 on a variety of firms from different sub-regions and provinces that measures: a) their ability to upgrade processes and products in wine grapes; b) their relevant demographics such size, ownership, location, and knowledge stock; c) the structure and strength of their inter-firm network; and d) the structure and strength of their ties to a variety of non-firm institutions, such as trade associations, universities, and new public-private support institutions. In turn, we are able to specify systematically the relative impact of firm-level, network, and institutional factors on the upgrading capabilities of firms. This analysis contributes not only to the development literature, but also to growing interest in the quantitative network literature to integrate political and civic institutions. (McEvily, 1999; Powell, White, Koput, & Owen-Smith, 2005; Provan & Milward, 1995; Safford, 2004; Zuckerman and Sgourev, 2006; Stark and Vedres 2006)

We argue that upgrading is driven primarily by the different socio-political networks, in which a firm is embedded. These networks are the ties firms have to one another as well as to different publicly supported institutions. Moreover, the institutional reforms of Mendoza in the 1990s matter not only because they provide needed common resources, like training and research support, but especially because of the way they bridge different socio-economic and knowledge communities. The evidence suggests that governments can reshape existing networks and help build new, broad-based innovative capacities by the way they facilitate the creation of public-private institutions that support upgrading.

Section I discusses the transformation of the Argentine wine industry and the particular importance of coordinated, decentralized product and process experiments across firms and micro-climates. It argues that Mendoza, and not San Juan, became the pioneer largely because of its government's approach to policymaking and institution building – an approach that facilitated the recombination of relationships between firms and sub-regions. Section II lays out our hypotheses about upgrading, paying special attention to the roles of inter-firm networks and publicly supported institutions. Section III discusses our data and methodology. We focus on product and process upgrading in wine grape growing. Grapes are not only the key input for wine, but, as experts continually repeat, “account for 70% of the value of a wine.” (Foster, 1995; Walters, 1999) Section IV discusses the results and their implications for research in upgrading and clusters.

## **I. The Transformation of the Argentine Wine Industry and the Challenge of Upgrading**

“Can Argentina fulfill its potential and produce world-class wines? The answer is an emphatic yes.” *Wine Spectator*, March 24, 2003.

Argentina is historically one of the largest volume producers and per capita consumers of wine in the world, but production focused on low-quality wine and grapes for the domestic market. Through the 1980s, the industry suffered under hyperinflation, negative growth, and heavy regulations, such as price controls and output quotas. Both Mendoza and San Juan had a few large firms, several hundred small and medium size wineries, and thousands of small grape producers, which were often propped up by each province's state owned winery.

By the end of the 1990s, the industry had undergone a profound transformation. Wine exports grew from a few million dollars in 1990 to 1.5% of the world market even at the height of Peso overvaluation to over 3% of the world market (including 3% of the highly competitive UK market) or over \$480 million in 2004. These gains came not simply from comparative costs, but especially from consistent advancements in product quality and innovation. First, Argentine

vineyards gradually improved the quality of their grapes, as varieties of high enological value vastly increased their shares of vine surface area – from about 20% in 1990 to about 43% in 2001. (Cetrangolo et al., 2002). Second, wine quality improved, with the vast majority of wine exports (85%) coming from fine wines (as opposed to cheap table wine) and sold in sophisticated, competitive markets like the United States, EU, and Japan. (See Figure 1.) An ever growing number of Argentine wines are rated by such elite wine magazines as *Wine Spectator*, and receive as a group ever better scores, even when compared to better known Chilean wines (see Figure 2). Average exports prices per bottle also dramatically increased.<sup>4</sup> Third, the Argentine firms focused on producing a greater variety of new products, such as previously undervalued varieties (e.g., Malbec, Torrontes), “redesigned” varieties from other specialized regions of the world (e.g., Tempranillo, Bonarda), and distinctive blends.<sup>5</sup>

Relative to San Juan, however, Mendoza became the leader of this transformation (Cetrangolo et al. 2002; IDR 1998, 1999; Bocco 2003). As shown in Table 1a, Mendoza accounts for a highly disproportional share of Argentina’s wine exports, while San Juan underperforms. As of 2002, 65% of the Mendoza harvest and only 26% of the San Juan harvest were classified as comprised of high and medium quality grapes.<sup>6</sup> Moreover, upgrading spread to zones (regions of Mendoza) like the *Zona Este* and *Zona Sur*, which were historically designated as backward and with substandard climates and soils.<sup>7</sup>

This shift in Mendoza came not simply from new technology or market access but mainly from firms acquiring new capabilities in coordinating multiple, continuous process and product experiments across a variety of organizations and micro-climates (Cetrangolo et al. 2002, Foster 1995, IDR 1998, 1999). Because of the variation in climates, soils, varieties and clones, experimentation is contextualized, knowledge is often tacit, and dissemination is necessarily social and interactive. In turn, firms gained new skills about growing and fermentation, adapting

international standards, and coordinating experiments via institutional resources (e.g., training, R&D, data bases) and complex inter-firm networks (Aylward, 2003; Giuliani et al., 2005a; Henderson, Pagani, & Cool, 2004; Roberts & Ingram, 2002; Walters, 1999).

### **Ia. Explaining Mendoza's Leap Forward – Renovating Public Private Networks**

The literature on upgrading and evolutionary economics argues that such incremental, relational-based innovation is not forthcoming since firms, particularly with limited resources and backward histories, are less likely to invest, alone or together, in new capabilities and share vital information due to the uncertainty of future returns and the experimental process itself (Helper, MacDuffie, and Sabel, 2000). The attendant problems of collective action and coordination are all the more exacerbated in Mendoza and San Juan because of the wide variety of growing conditions, varieties, as well as firm sizes and strategies.<sup>8</sup> (See also Table 1a.) Hence, in discerning how Mendoza was better able to solve such problems and build new innovative capacities than San Juan in the 1990s, we clarify the roles of policy, institutions, and networks in upgrading.

Given the market liberalization policies and elimination of the old wine industry regulations during the Menem administration (1989-99), explanations of the different paths often rely on the determinate power of different social and economic endowments that would give Mendoza firms the *ex ante* capability to exploit external economies and joint action. However, through a careful, longitudinal comparison of the wine and grape sectors in Mendoza and San Juan, McDermott (2006) found this not to be the case. For instance, entering the 1990s, both provinces had similar soils and climates, industry structure, stocks of social capital and knowledgeable elites, access to foreign investors and consultants, and structures of business associations. They were also subject to the same national systems of property rights and regulations. (See also Tables 1a and 1b.)

An alternative understanding about the determinants of upgrading and the emergence of new innovative capacities emphasizes the role of politics and institutions in reshaping social and

knowledge landscapes. The development of innovative capacities can be thwarted by limited state capabilities and the lack of structures which can aggregate and “bridge” the fragmented relationships between producer communities, which individually may be rich in associationalism. (Ostrom 1999, Locke 1995) Government policy may remedy these problems in two ways. First, governments can initiate the creation of a variety of new upgrading resources that the state, firms, or their associations alone can provide by creating and governing new institutions in collaboration with relevant stakeholder groups (e.g., sectoral associations) (Rodrik 2004). Second, to the extent that these new public-private institutions are governed by a variety of public and private actors, they have the potential of recombining existing socio-economic resources and creating new social and knowledge ties among the government and previously isolated producer communities (Stark 1996; Schneider 2004; Tandler 1997).

From this point view, the two provinces developed different upgrading paths during the 1990s because their contrasting policies led to the formation of different public-private networks, in which firms are embedded. For instance, San Juan’s approach focused on an insulated state rapidly imposing high-powered economic incentives on society to induce change. The government’s major inducement for change was the use of federally subsidized tax incentives for investment. By most accounts, this policy did bring in much investment but failed to encourage broad based upgrading. The economic benefits remained concentrated among a few large firms that had little experience or interest in incorporating and diffusing new practices along the value chain and the top down policies exacerbated the fragmentation and animosities between relevant sectoral associations and the state. (Rofman, 1999)

In contrast, Mendoza gradually built a new set of public-private institutions to provide new support services and resources (such low cost hazard insurance, training, R&D, export promotion, etc.). The first experiment came in 1987-88, when the newly elected provincial administration

chose to transform the insolvent, state-owned winery into, Fecovita, federation of cooperatives, which were created from the previously dependent thousands of small grape growers and wineries. This experience not only revitalized the cooperative sector, but also initiated a broader effort by the Mendoza government to generate a variety of new policies and institutions with socio-economic partners over ten years. For instance, through the 1990s, Mendoza created over 75 programs related to the wine and grape sectors mainly with about 50 non-government organizations. In contrast, San Juan's relatively few support programs were controlled exclusively by a particular government office. (McDermott 2006)

This change in policymaking was particularly manifested in the creation of a set of new institutions that supported upgrading in agricultural and especially in the winemaking value chain. Table 2 gives an abridged description of the most prominent institutions. Despite their different origins and areas of activity, these institutions shared key governance traits. The institutions are public-private in their legal form, governance structures, resources, and membership. They are inclusionary, allowing associations and firms from a variety of zones and with a variety of capabilities to participate in the formation, evaluation, delivery, and reception of the new upgrading resources. Lastly, the governance rules that give the relevant government agencies and sectoral associations both joint decision making rights and resource responsibilities have been shown to induce collective-problem solving and iterative deliberations by the governing participants. (McDermott 2006)

The combination of these traits appears to have caused the new institutions to be both self-adjusting and demanding – while participants have the channels and power to demand improvements in programs with more extensive reach, the institutions equally have forced firms to meet ever more stringent standards for continued participation in programs. The firms have increased access to new resources and knowledge while building ties to those from previously

isolated zones. The government has learned how to work with private and non-government actors as well as to use its funds more effectively.

The inclusive formation of these institutions overtime allowed each to become more embedded with one another, the older institutions, and the associations of Mendoza. In turn, their “multiplex” character (Ansell and Padgett 1993) allowed the new institutions to act as bridges (Burt 1992) between the public and private domains as well as between the relevant producer communities. Figure 3 shows the resulting the public-private network via a UCINET analysis of membership and board data of the publicly supported institutions, associations, universities, and government agencies relevant to agroindustry. By 2001, the new institutions (as well as the renovated older institutions and government agencies) tied the different associations and communities together. Moreover, the bridging role of the new institutions is revealed in their relatively high “betweenness” scores, in Table 3.

This gradual change in policymaking and institution building in Mendoza fostered three spillover effects. First, the new institutions became forums for all relevant actors to identify new common needs and act collectively to create additional institutions and force changes in old, previously archaic institutions. Second, the experiences in identifying common constraints and formulating joint strategic responses laid the groundwork for an effort beginning in 2000/01 to replicate the model on a national scale via the creation of the Ley Pevi and its governing body, COVIAR, which is public-private and con-federal in its legal and governance structure.

Third, San Juan has recently witnessed significant changes in firm upgrading and policies, largely due to the demonstration effects from neighboring Mendoza, the recent increased investment by Mendoza firms, and participation in COVIAR. For instance, beginning in 2002, the San Juan government openly criticized the old approach of tax incentives and advocated the creation of new public-private institutional resources for training, R&D, and export promotion. (Gobierno de San

Juan, 2004) Leading grape producers left the old sectoral association to form a new one and actively participate in COVIAR. A key regional agro-extension agency in San Juan now has relevant actors from Mendoza on its advisory board.

## **II. Hypotheses**

The foregoing discussion argues that one's social, institutional, and organizational environment is determinant for the development of firm-level upgrading capabilities. Yet it also yields several competing explanations about the structure of networks and the relative importance of firms, associations, and publicly supported institutions in determining a firm's process and product upgrading capabilities. For instance, recent research in agricultural and manufacturing industries suggests that process innovations are more likely to come from inter-firm ties while new knowledge for product innovation may come from associations and public programs in developing countries (Giuliani et al. 2005; Gereffi, Humphrey, and Sturgeon 2005) At the same, time the burgeoning literature on knowledge diffusion would caution against the statistical significance of the impact of publicly supported institutions.(Kogut and Zander 1992; Powell et al. 2005) More sophisticated knowledge transfer needs many direct interactions, which are more likely to happen between firms than via relatively large institutions, which are often focused in aiding more backward firms. This problem is exacerbated when one has cross-sectional and not longitudinal firm data.

H1-4a: Firms with a greater number of ties to other firms (1), publicly supported institutions (2), associations (3), and cooperatives (4), respectively, are more likely to achieve higher levels of process upgrading.

H1-4b: Firms with a greater number of ties to other firms (1), publicly supported institutions (2), associations (3), and cooperatives (4), respectively, are more likely to achieve higher levels of product upgrading.

To the extent that, i.e., ties to firms and institutions, are positively significant, there could be a number of reasons why. Given the nature of the new support institutions in Mendoza and our arguments about their importance in acting as social and knowledge bridges between distinct

communities, we would expect that the key value of network relationships and institutions are their ability to allow firms to access knowledge from other zones and other firms with whom they have had little or no previous contact. This view of the importance of bridging roles coincides with Burt's notion of the importance of filling structural holes (Burt, 1992, 2001), even for civic institutions (Safford 2004). It is also similar to Obstfeld's (2005) theory of "tertius lungens" and Zuckerman and Sgourev's (2006) notion of "peer capitalism" which highlight the importance of structures bringing previously unconnected actors together. McEvily and Zaheer (1999) also find that participation in public-private regional support institutions improved the competitive capabilities of traditional manufacturing firms, largely because the way the institutions gave firms access to variety of knowledge sources from different locations.

H5-6a: Firms with a greater number of ties to firms (5) and publicly supported institutions (6), respectively, with relatively high geographic diversity are more likely achieve higher levels of process upgrading.

H5-6b: Firms with a greater number of ties to firms (5) and publicly supported institutions (6), respectively, with relatively high geographic diversity are more likely achieve higher levels of product upgrading.

To push this line of reasoning further, we could test the relative value of alters (firms, institutions, etc.) in promoting dense clusters of firms with redundant ties or sparse clusters of firms without redundant ties. Some argue (a la Coleman) that the former is vital to promote trust and limit malfeasance, while others (a la Burt) argue that the latter is vital to promote knowledge diffusion (Kogut and Zander 1992; Burt 2001). Hypotheses for the bridging value of, e.g., the alter firms and institutions, using affiliation networks would be the following.<sup>9</sup>

H7-8a: Firms with affiliation networks via publicly supported institutions (7) and other firms (8), respectively, that exhibit greater cluster densities are more likely to achieve lower levels of process upgrading.

H7-8b: Firms with affiliation networks via publicly supported institutions (7) and other firms (8), respectively, that exhibit greater cluster density are more likely to achieve lower levels of product upgrading.

Although we will not state them as explicit hypotheses, we will also test for explanations based on firm-level and location factors. Typical firm level factors are the presence of foreign owners, size, age, vertical integration, and the stock of knowledge. All of our models have proxies for these. The research in spillovers, diffusion, and clusters all emphasize the role of geography.<sup>10</sup> The above discussion also suggests that firms are housed in distinct sub-regions, with different social, institutional, and resource endowments. For these reasons, all our models include dummy variables for each one of the five zones (the four zones of Mendoza plus San Juan).

### **III. Data and Methodology**

We developed and implemented our survey instrument during 2003-05. The design of the survey and the sample was based largely on 63 interviews with industry experts, policymakers, as well as managers, enologists, and agronomists in wineries and independent grape suppliers in San Juan and the four zones of Mendoza. Our survey instrument captured a firm's process and product upgrading capabilities, demographics, as well as inter-firm and non-firm networks.

Given the detailed, technical, contextual nature of our questions about firm strategies, practices, and networks, we divided the questionnaires into different parts to be filled out by relevant professionals at each firm. For instance, in wineries with vineyards a lead manager or owner responded to parts about firm demographics, sales, strategies, and employment. The lead enologist and agronomist responded to questions about production and product development and about relationships with relevant firms and non-firm institutions in the domains of winemaking and grape growing. For independent grape growers we repeated the same sets of relevant questions for a lead manager or owner and the lead agronomist. To administer the survey in 2004-05 in Mendoza and San Juan, we constructed an infrastructure largely from scratch via collaboration with a leading agro R&D and extension institution in the region, the Instituto de Desarrollo Rural (IDR). Their field consultants interviewed each informant in person for about one hour, using the questionnaire.

### **IIIa. Dependent Variables**

*Product Upgrading* is a movement into more sophisticated lines of products, which can be defined in terms of increased unit values. (Giuliani et al. 2005; Giuliani and Bell 2005) We created an index based on questions asking the respondent to use a 5-point Likert scale to assess the extent to which the firm implemented such practices as introducing new and higher value grape varieties, emphasizing quality over cost, and increasing the production of grapes for high quality wines.

*Process Upgrading* is the transformation inputs into outputs more efficiently and carefully by re-organizing the production system (Giuliani et al. 2005). We created an index from questions asking the respondent to use a 5-point Likert scale to assess the extent to which the firm implemented such practices as root cause detection, constant quality control, the latest methods of pruning, watering, etc, collective problem-solving, and the use of the latest technologies.

We conducted an exploratory factor analysis (Oblimin) on those questions that identified several factors associated with different aspects of product and process upgrading. Questions that loaded in more than one factor and factors with Cronbach's alpha lower than 0.65 were dropped. Cronbach's alpha for the remaining factors ranged from 0.68 to .90. The two sums of the responses to the questions associated to product and process upgrading are the indices, as described above, measuring *Product Upgrading* (4-item, Cronbach's alpha=0.69) and *Process Upgrading* (13-item, Cronbach's alpha=0.86).

### **IIIb. Explanatory variables**

Network data was collected using survey responses from both agronomists and enologists where each firm was asked to identify firm (up to ten) and non-firm entities (up to five) with whom they interact, collaborate, and exchange information regarding specific strategic areas, such as product development, production/growing methods, technology acquisition, training, marketing, and exports. Respondents could choose from a roster of non-firm entities that we developed with

local experts in the wine and agro-industries, or identify entities that were not on the roster. These firm and non-firm “alters” were validated and classified into the following six categories: associations (trade, peak level, etc.), banks, cooperatives, firms (wineries, independent grape growers, technology suppliers, etc.), publicly supported institutions (such as those discussed above), and schools (universities, technical schools etc.). Publicly supported institutions are largely provincial and, hence, firms have access to them within their own respective jurisdictions.

The construction of the network was performed by aggregating the relationships of the surveyed or focal firms to form a two-mode network consisting, on the one hand, of the focal firm, and, on the other hand, of different alter types. Ties were defined as any relationship between the focal firm and the alters. All ties were coded using a binary variable where a ‘1’ represents a tie between any two nodes. All the analyses presented here are based on unique ties between nodes.

*Out-Degree Centrality.* Out-degree centrality (Freeman, 1979) captures a focal firm’s exposure to the knowledge and influence of others (alters) by measuring the focal firm’s total number of ties to other organizations and institutions. It was measured for each of the six categories of alters (firms, associations, publicly supported institutions, banks, cooperatives, and schools) by summing the number of times the respondent mentioned a tie to the given type of alter. This allows one to differentiate the relative importance of ties to different types of firm and non-firm entities.

*Regional Diversity* of network ties was calculated by examining ties to firm and non-firm entities (alters) with high diversity across zones. First, we calculated the total number of ties for each alter and assigned the ties to zones based on the geographic location of the surveyed firms that identified the relationship. These zone counts were then used to derive a Herfindahl Index score for each alter based on the number of ties in each zone, which ranged from zero to one where a value of zero represents the same number of ties from each zone and a value of one represents all ties to the alter from a single zone.<sup>11</sup> Alters were ranked from highest to lowest based on their diversity score

and the top decile was selected. Finally, we calculated the number of ties each focal firm had to these more diversified alters. This measure was calculated first for all alters and then separately for alter firms and institutions.

*Cluster Density.* We use an affiliation network framework (Kogut & Walker, 2001; Wasserman & Faust, 1994) to measure the cluster density of a firm's affiliation network. First, we identified the ties to all entities for each focal firm and selected alters (other firms) that also had a relationship with one of the entities identified by the focal firm. For example, if Firm A is affiliated with Entity Z and Firm B and Firm C also identified a relationship with Entity Z, then Firm B and Firm C were considered affiliated alters to Firm A. Once all alters were identified based on all the affiliation ties of the focal firm, we measured how many of these alters were connected with each other through an entity based on their own relationships (i.e. both alters identified having a relationship with the same organization). This value was then divided by the total number of possible ties between the alters to generate a ratio between 0 and 1 that measures the density or clustering of ties between firms that are tied to the focal firm through other entities. To separate out the effects of different types of entities, clustering variables were calculated for the whole network and then separately for the six different types of entities.<sup>12</sup>

### **IIIc. Control variables**

*Zone.* This variable measures unobserved differences associated to different zones. Firms were assigned to 5 distinctive zones identified by experts (Grand Mendoza, East, Valle Uco, South, San Juan) based on the firm's address.

*Vertical Integration.* This variable measures hierarchical control. Due to high level of asset specificity of the investments involved in grape upgrading, the risks associated with engaging in product and process upgrading would be diminished by the winery owning vineyards. It is a dummy variable that takes value of 1 when the vineyard is owned by a winery, 0 otherwise.

*Education.* This variable is a proxy for the firm’s stock of knowledgeable elites; it is associated to absorptive capacity and learning capabilities (Cohen and Levinthal 1990). Higher educated managers and agronomists are more likely to learn about innovative practices regarding product and process upgrading. It is an index that reflects the education of general managers and agronomist. It is calculated as the sum of a 0, 1 or 2 (when the person holds no degree, technical degree or college degree, respectively) for each general manager and agronomist.

*Agronomist.* This variable is another proxy for the firm’s stock of knowledgeable elites, and associated to learning capabilities of the firm. Our interviews revealed that a firm’s commitment to learning and experimentation agronomist is first signaled when it hires a full-time, salaried agronomist. Hence, this is a dummy variable that takes the value of 1 when the firm has at least one full time agronomist and 0 otherwise (whether part time or none).

*Size.* Size is measured by the area of the vineyard in Hectares. This variable is logged because it is heavily skewed.

### III d. Models

In order to test our hypotheses we created a series of linear regression models of the form:

$$Upgrading_i = \alpha X_i + \beta Y_i + \gamma Z_i + \varepsilon_i$$

Where,  $Upgrading_i$  is the Process or Product Upgrading for firm i  
 $X_i$  is a vector of control variables for i  
 $Y_i$  is a vector of ego network variables for i  
 $Z_i$  is a vector of structural network variables for i  
 $\alpha, \beta,$  and  $\gamma$  are vectors of unknown regression coefficients to be estimated, and  
 $\varepsilon$  is the i.i.d. error term.

Due to high correlation between groups of explanatory variables, in some cases we introduced variables one at time and deleting the highly correlated ones (i.e., out-degree and cluster for different organization types).

### III e. Sample and Data Description

A simple random sample of 200 firms was selected from a roster of firms that covers all the vineyards of more than 10 hectares and 600 wineries in Mendoza and San Juan. Of those, 174 firms completed the questionnaires. The 26 non-respondent firms were substituted by 26 randomly selected new firms of equal activity, size and zone of those that did not respond. In total we obtained responses for all the questionnaires sent to the firm from 194 firms (response rate 97%). Two firms did not provide responses for certain parts and were dropped. We compared demographic data of our sample with data from the 2001 Census of vineyards in Mendoza and we found no significant differences between them. A description of the overall sample by type of firm and location is given in Table 4. The descriptive statistics on our variables are found in Tables 5a & 5b.

**Table 4. Description of Surveyed Firms**

Province	Zone	Wineries	Grape Suppliers	Total by Province
San Juan		22	17	39
Mendoza		90	65	155
-- of which	Gran Mendoza	26	7	
	East	32	28	
	Valle de Uco	15	15	
	South	17	15	
Both Provinces		112	82	194
NB. There are four main zones in Mendoza, but micro-climates can vary within each zone.				

#### IV. Results and Discussion

Table 6 presents the results for *Product Upgrading*. Regarding the control variables, only Foreign Ownership is occasionally significant and positive, whereas Vertical Integration is significant and negative. We found support for the positive effect of ties to *firms* (Hypothesis 1b,) and to publicly supported *institutions* (Hypothesis 2b) on product upgrading (Model 2.1,  $\beta = 0.23$  and  $0.5$  with significant levels of  $0.01$  and  $0.05$ , respectively). The same Model 2.1, also shows a negative and

significant impact for ties to banks. We also found support for Hypotheses 5b and 6b, with a significant and positive impact of being connected to the firms and publicly supported institutions with the most geographically diverse patterns of connections (Model 3.1,  $\beta = 0.40$  and  $0.62$ , significant at 0.05 and 0.1 levels, respectively). Regarding the impact of being connected to other firms via affiliation networks (Models 4.1-7), only the cluster variables related to cooperatives and schools reached significance below the 0.1 levels, but with schools behaving as expected. Cluster variables related to firms and publicly-supported institutions are both negative; but only the variable for the latter gets close to significance (i.e.,  $p = 0.105$ ).

Table 7 presents the results for *Process Upgrading*. Regarding the control variables, only Education is regularly significant and positive. The positive effect of ties to other firms on process upgrading (Hypothesis 1a) finds support at the .01 level (Model 2.1,  $\beta = .51$ ). The positive effect on process upgrading of being connected to other firms with the most geographically diversified patterns of connections (Hypothesis 5a) also finds support at the .05 level (Model 4.1,  $\beta=1.03$ ).

The results for ties to publicly supported institutions are more mixed. Hypothesis 2a finds support in Model 2.0, but not in Model 2.1 (when dummies for zones are included). Regarding the benefits of being connected to other firms via specific affiliation networks, the cluster variables related to firms and institutions were negative, but did not reach 0.10 level of significance. Only the variable for schools was significant and negative (Model 4.6;  $\beta = -18.35$ , significant at 0.05).

#### **IVa. Discussion**

The first major observation is that typical firm level traits alone are not driving variation in upgrading, but rather a firm's public-private network is critical for upgrading. On the one hand, although proxies for foreign ownership and knowledge stock are the only firm level factors that are most often significant and positively related to product and process upgrading, respectively, their

significance drops when the full network variables are incorporated into the model. This finding coincides with Giuliani and Bell's (2005) notion that absorptive capacity is not just a firm level trait but interacts with the structure of a firm's network.

On the other hand, a firm's ties to other firms and to publicly supported institutions, but not necessarily to other entities, such as schools or associations, appear strongly associated to upgrading, especially product upgrading. Clearly, a network discussion demands inclusion of publicly supported institutions, which in turn, steers the discussion of upgrading to issues of politics and policies. Moreover, as indicated in Tables 8a-b, institutions play a more prominent role in Mendoza than in San Juan, especially the new ones listed in Table 2 and discussed above.

But why do we see such variation in the impact and statistical significance of institutions, on the one hand, and inter-firm networks and location, on the other, particularly across product and process upgrading? First, as Tables 8a-b show, since there are less publicly supported institutions and to the extent that they are important for development, then more firms with a variety of capabilities will be tied to them. For instance, the institutions that Mendoza created in the 1990s, along with Fecovita (the federation of cooperatives), have very high centrality measures, indicating that all types of firms, good and bad, find them useful. In turn, the renovated and new institutions of Mendoza may be helping firms in acquiring new skills, information and contacts, but the diversity of membership washes out the net average impact on upgrading measurement. Moreover, given that inter-firm network ties (in the various ways we measured them) are more consistently significant and positively associated with process and product upgrading than a firm's ties to institutions, it appears that institutions may act as an entry point for more backward firms to acquire new capabilities. As the firm advances in its upgrading and connects with more firms, it "graduates" – becoming more discriminating in its use of certain institutions and more dependent on

its inter-firm network. Indeed, more refined information would likely come from other firms than large, more encompassing institutions.

This may not be surprising. Since the pioneering work of Gerschenkron (1962), scholars have found that firms in less developed societies have less voluntary ties that are collaborative. On the one hand, public institutions constructed under certain conditions may help firms and new entrants form new collaborative ties with others and increase the social embeddedness of economic activity. (Tendler 1997, Ostrom 1999) On the other hand, rich, relatively autonomous socio-economic networks are often considered a sign of economic advancement and greater technological sophistication. (Saxenian 1994)

Second, publicly supported institutions appear to have more consistent relative importance in product than process upgrading. To the extent that product upgrading depends more on extra-cluster knowledge (Giuliani and Bell 2005) than process upgrading, then these institutions may be acting as such channels in two ways. In creating relevant data bases and providing such services as R&D, training, export promotion by integrating a variety of knowledge sources, the publicly supported institutions indicate to firms international standards in product quality and variety (Messner 2004; Sabel, 1994, 1996). Moreover, the relative value of the institutions appears to be in their ability to act as “bridges” and bring together different communities (Burt 1992, Safford 2004, McDermott 2006, Obstfeld 2005; McEvily and Zaheer 1999). For instance, the evidence reveals that firms with relatively more ties to institutions and other firms that are leaders in creating a diverse portfolio of ties to different Mendoza zones and sub climates are associated with positive product upgrading capabilities. Also, the affiliation network analysis suggests that schools may have this quality. The institutions and “alter firms” are important for the development of product upgrading when they continually expose a firm to new product information and standards from communities that the focal firm may not access on its own. Note that earlier we noted how the

public-private formation and governance structure of many of these institutions had a similar impact in terms of socio-political relationships between the associations of these firms and communities.

Third, we can start to see the relative value between inter-firm networks and ties to institutions when analyzing process upgrading. On the one hand, while a firm's number of ties to institutions is generally important for process upgrading, the value of the institution gets washed out when controlling for location. On the other hand, inter-firm network measures – degree centrality and the zonal diversity of an alter's ties – have a consistent positive impact on product and especially process upgrading.

Taken together, these results suggest that process upgrading is very much driven by a firm's local socio-economic network and that the relevant knowledge is locally embedded. That is, even if publicly supported institutions are important entry points for a backward firm to learn new methods of process upgrading, as it advances, the ties to firms in its own micro-climate or zone are even more important sources of process upgrading knowledge and demonstration. This also may not be so surprising.

The research on process upgrading in the agroindustries, especially wine grapes, emphasizes that the importation of “best practices” from other parts of the world, let alone other micro-climates, is very much limited by local context. (Giuliani et al 2005; Walters 1999) Since process upgrading is more contextual and fluid, it may demand, relative to product upgrading, more intense, direct, continuous information exchanges that are more likely to occur via ties to other firms than, e.g., ties to institutions or association. But then is location still just a proxy for proximity and endowed natural resources? The evidence and the research suggest not, but rather that inter-firm networks and institutions may co-evolve.

First, the fact that firms in San Juan are associated with relatively high levels upgrading discounts the importance of climate alone being determinant. Indeed, as indicated in Table 8b, the

most central firms are ones originally from Mendoza and the most central institutions are ones that now maintain strong links with their counterparts in Mendoza. Hence, the San Juan firms that are better at upgrading in many ways are learning via direct and indirect ties to Mendoza.

Second, viewing location as a constellation of organizations and institutions can be seen statistically in two ways. Note, for instance, how the R-squared parameters jump when network variables are added to the models with the location controls. Tables 9a and 9b also show the different types of network indicators per firm surveyed for a given type of alter (e.g., association, institution, etc.) organized by zone and province. An analysis of differences by t-tests shows that firms in these different zones and provinces continue to be embedded often by very different types of public-private networks.

This evidence coincides with the growing research that locations are composed not simply of inter-firm networks but rather socio-political networks of particular organizations and public institutions. (Locke 1995, Herrigel 1996, Tandler 1997, Stark and Vedres 2006) These constellations of public and private entities distinct socio-political histories that are slow to change and continue to structure and mediate the flow of knowledge and resources for firms. As mentioned above, not only do the two provinces have distinct social and institutional histories, but so do the distinct zones of Mendoza. The stickiness of local public-private networks has been especially noted in developing countries undergoing massive reforms, such as in East-Central Europe and Latin America.<sup>13</sup>

### **Concluding Remarks**

Research on development, especially upgrading, has increasingly drawn on evolutionary theories of firms and concepts of the social embeddedness of knowledge creation and transfer. Yet as much as these literatures have helped steer the analysis of competitiveness toward an appreciation of inter-firm networks and supporting institutions, they have tended to under specify the impact of these

variables on firm-level capabilities, and in turn, left unclear the role of public policy. Part of the problem is due to the difficulties in collecting systematic data in developing countries for parametric statistical analysis. Also, with a few exceptions, research on networks and organizational capabilities often overlooks the role of public policy and especially the ways in which a firm's ties to both public institutions and other firms can interact.

This paper has attempted to specify the impact of different network structures and of different types of organizations and institutions on process and product upgrading through a unique research design. First, we found a close natural experiment – the transformation of winemaking and grape growing in Mendoza and San Juan. This transformation demanded complex coordination of inter-organizational experiments in process and product upgrading. It appeared that Mendoza's ability to pioneer this change hinged on a new approach to public policy – one based on inclusive, public-private institutions that offered assistance to firms in coordination, learning, and contacts. Second, we designed and implemented a survey of relevant firms that could measure upgrading, firm-level demographics, and firm ties to other organizations and institutions in the two provinces. We analyzed the relationship between these variables for process and product upgrading in the production of wine grapes across vertically integrated wineries and independent grape growers.

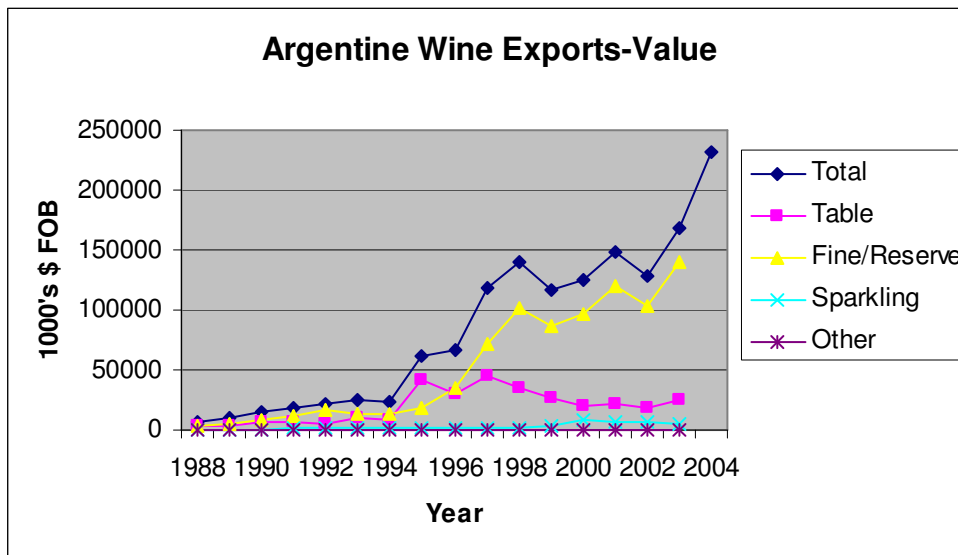
Our findings support the basic premise that firms are embedded in public-private, and not just inter-firm, networks. We have found that not only inter-firm networks but also publicly supported institutions do indeed have significant, positive impact on a firm's upgrading capabilities, especially in product upgrading. The particular impact of institutions appears to be introducing backward firms to a whole new world of standards, skills, technology, and relationships that they would not have access to otherwise, and in linking firms that do not already have ties between them. Moreover, the evidence suggests that while inter-firm networks are particularly important for

process upgrading, firms continue to be embedded in distinctive constellations of local private organizations and public institutions, which greatly shape ones access to knowledge and resources.

These results call for further research in two major domains. First, scholars must find more systematic ways of linking public policy and institutional development to the social roots of learning and technology transfer. In particular, the fact that Mendoza's policies of institutional renovation appears to have had a positive impact on upgrading calls for further research about the ways policy and politics can shape network structures and knowledge flows. What are the political conditions that facilitate or impede the creation of innovative public private networks? How do institutions and inter-firm networks co-evolve?

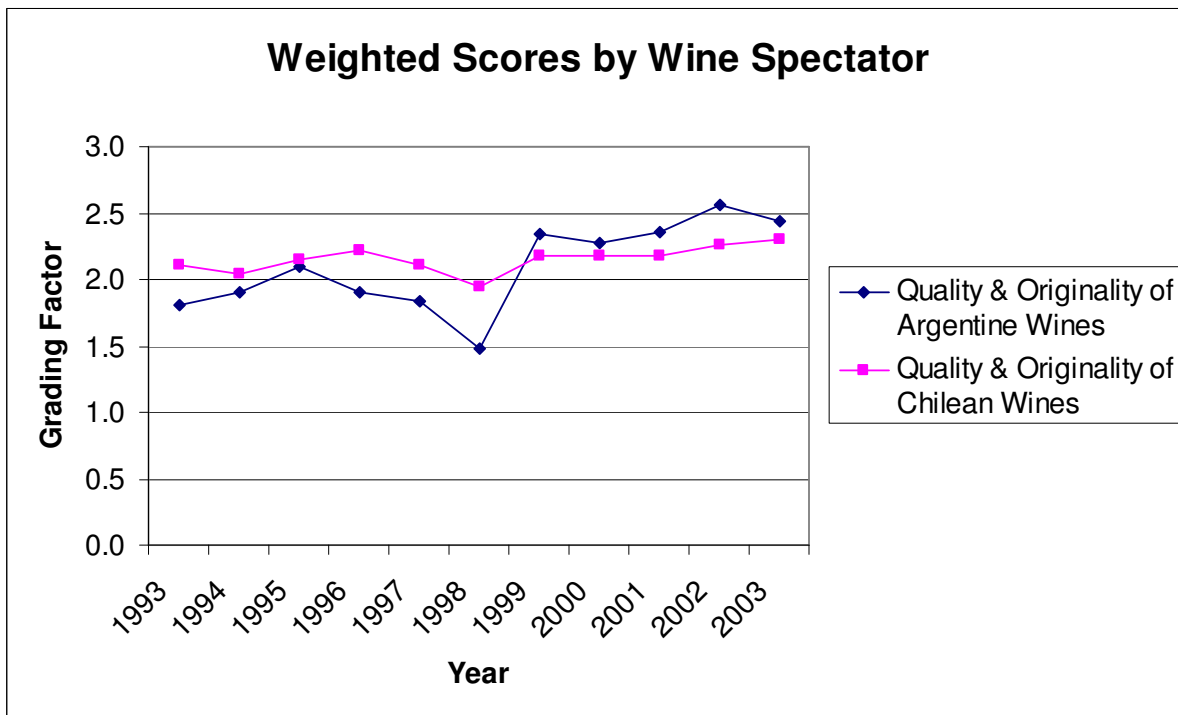
Second, although this article did not directly address the impact of global commodity chains and different types of firms on upgrading, our findings hope to contribute to the growing research on the interaction between global value chains and local network governance (Humphrey and Schmitz 2000; Gereffi et al, 2005; Giuliani et al. 2005). For instance, a key concern in this work is the way certain firms become technological and knowledge gatekeepers. The evidence in this paper suggests that public-private institutions can be constructed in ways to improve knowledge diffusion and limit the monopolization of any particular set of firms.

**Figure 1. The Growth of Argentine Wine Exports (by Value)**



Source: INV, Author's Calculations.

**Figure 2. Weighted Scores for Argentine and Chilean Wines (Wine Spectator)**



Note: Scores were weighted by multiplying the number of wines in a particular range (e.g., 80-84, 85-99, 90-94, etc.) by a grade factor given to the range (1, 2, 3, 4, 5, etc.).

**Table 1a. Wine industry data on Mendoza & San Juan**

(Data from the Argentine Statistical Office, INV, Fiel (2003); authors' calculations)

	Year	Mendoza	San Juan
Winemaking/ ind output	1994	21.10%	26.50%
Mfg Industry/GDP	1993	18.96%	24.69%
Agro/GDP	1993	8.47%	11.11%
SME Mfg Index*	1994	0.9	0.8
Province's Share of National Wine Production	1990	66.55%	24.88%
	2000	61.07%	31.06%
Province's Share of Grapevine Area	1990	69.74%	21.94%
	2001	70.08%	22.51%
Province's Share of Wine Exports	Ave. 2000-03	90.62%	6.40%
Number of Wineries	2004	683	169
No. vineyards	1991	19 661	9032
	2001	16 196	6086
Hctres of vineyards	1991	145 651	46 100
	2001	144 886.5	52 226.3
% of Has. In vineyards <50 Has.	2001	76.5	76.7

\*Ratio of the SME manufacturing intensity of the province as compared to the national average. Measured by UIA (2002), using OECD methods.

**Table 1b. Economic, Social, and Political Data on Mendoza and San Juan**

	Mendoza	San Juan	Argentina
Population( 2000)	1,607,618	578,504	37,074,032
GDP/Capita (1993)	\$7,878	\$4,571	\$7,254
Growth of GDP (1993-00)	1.17%	1.04%	
Gini Coeff (2000)	0.375	0.378	0.491
Human Development Index (2000)	0.747	0.736	0.854
Deficit/GDP (1999)	3.40	2.30	1.89
Fiscal Current Account Balance (Ave. 1996-98)	-5%	4%	
Unemployment Rate (Ave. 1993-99)	5.90%	8.50%	13.93%
No. of 4 yr.Terms Governor Can Serve	One	Two	n/a
Electoral Competition Score (1995)	22.54	19.28	n/a
No. of NGOs/1000 inhabitants**	2.3	2.18	--
No. of Agro Coops as of 1988	64	79	
Crimes against property per 1000 inhabitants	42.6	25.8	--

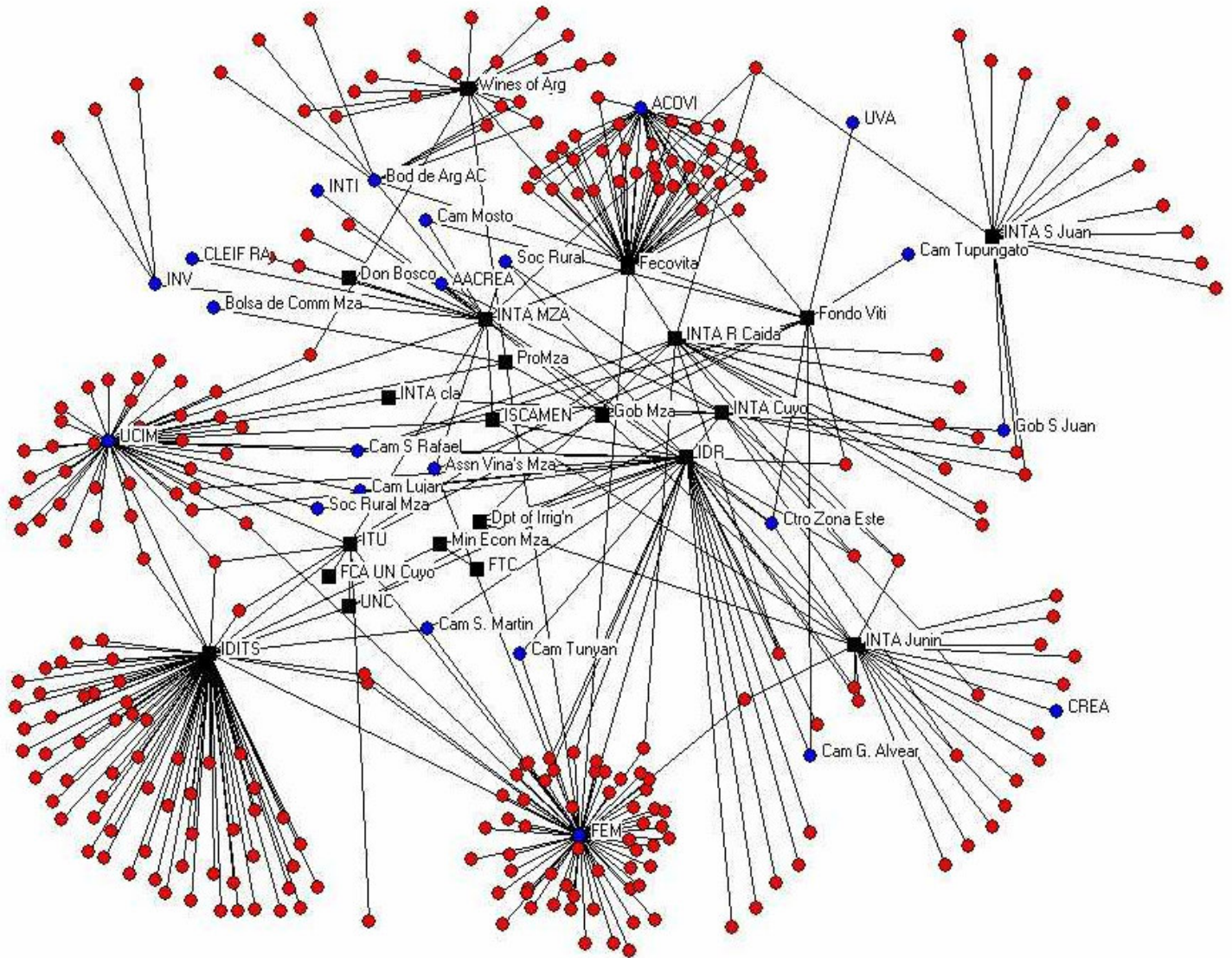
**Table 2. Leading Upgrading Support Institutions in Mendoza in the 1990s**

<b>Institution</b>	<b>Year of creation or restructuring</b>	<b>Governing Members</b>	<b>Activities</b>	<b>Resources</b>	<b>Legal Form</b>
INTA Cuyo	1991	Govts of S Juan & Mza, 9 Agro Ass'ns, 2 Nat'l Univ's	Regional development plan, oversee budgets & activities of EEAs	National & provincial budgets	1 of 15 semi-autonomous Regional Centers; Federal body in Sec. of Agro.
INTA EEAs	1991	Gov't of Mza, Munis. Agro Ass'ns, Nat'l and Prov'l Institutes and Univ's	R&D (inputs, plants, tech), extension training, consulting	Half – nat'l budget (salaries & overhead); Half – services, alliances, gov't Mza, cooperadoras	Part of INTA Cuyo; 4 in Mza, 1 in SJ; Each has 1-4 AERs
Fondo Vitivinicola	1993-94	Gov't Mza, 11 wine/grape Ass'ns	Oversees new wine regulations, promotes wine industry/marketing	Tax on firms from over produc'n of wine	Public, non-state, non-profit entity.
Fondo para la Transformacion y el Crecimiento (FTC)	1993-94	Min. of Economy, Regional advisory councils	Subsidized loans and credit guarantees to SMEs for tech against extreme weather & for grape conversion	Self-financing; initial capital from privatization of gas & oil reserves	Independent legal entity under authority of governor
Instituto Desarrollo Rural (IDR)	1994-95	36 founders – INTA Cuyo, Govt Mza, ISCAMEN, 2 peak ass'ns, various agro sectoral ass'ns	Technical info collection & dissemination; Data base mgmt; R&D, training, consulting	Mza Gov't; services; gradual increase of fees from member ass'ns	Non-profit Foundation; with oversight by Min of Economy
Pro Mendoza	1995-96	Gov't Mza, 3 peak business associations	Export promotion – organize fairs, delegations, strategic information, training	Gov't Mza; Peak ass'ns; services	Non-profit Foundation

Abbreviations: INTA – Instituto Nacional de Tecnología Agropecuaria; EEA – Estaciones Experimentales (Sub-regional centers); Mza – Mendoza; ISCAMEN – Instituto de Sanidad y Calidad Agropecuaria Mendoza; Cooperadors – Non-profit NGOs.

**Figure 3. The Mendoza Wine Industry and Policymaking, 2001**

(NB Red circles are firms and associations; blue are prominent wine/grape associations; black squares are government agencies and public-private institutions)



**Table 3. Largest Betweenness Scores, Mendoza 2001.**

	FEM-peak ass'n	IDITS	UCIM- peak assn	Fecovita	INTA Mza	IDR	Wines of Arg	INTA Junin (EEA)
Betweenness	20718.12	18107.32	13556.21	12894.66	8431.386719	8041.07	5469.87	4148.68
nBetweenness	39.59	34.6	25.91	24.64	16.11	15.37	10.45	7.93

INTA Rama Caida (EEA)	INTA S. Juan	ProMza	INTA Cuyo	Ctr Agro'ts - South Zone	Fondo Viti	Bod. Arg (elites)	Univ Natl Cuyo	Govt Mza	Assn Vinas Mza
3734.21	3429.17	2962.12	2805.07	2498.73	1363.44	1353.71	1205.5	969.71	943.64
7.14	6.55	5.66	5.36	4.78	2.61	2.59	2.3	1.85	1.8

**Table 5. Descriptive Statistics of Variables**

Variable	N	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1 Process Upgrading	164	27.23	11.41	1.00											
2 Product Upgrading	164	10.07	4.15	0.46	1.00										
3 Foreign Ownership	191	0.06	0.24	0.30	0.18	1.00									
4 Area (log)	162	3.90	1.30	0.23	0.15	0.15	1.00								
5 Vertical Integration	194	0.58	0.50	0.28	0.03	0.14	0.40	1.00							
6 Agronomist	194	0.25	0.44	0.25	0.17	0.24	0.12	0.14	1.00						
7 Education	166	3.35	2.36	0.33	0.16	0.29	0.07	0.09	0.38	1.00					
8 Region: North	194	0.14	0.35	0.28	0.04	0.28	0.05	0.20	0.23	0.35	1.00				
9 Region: South	194	0.16	0.37	-0.08	-0.16	-0.06	-0.01	-0.04	-0.13	-0.07	-0.18	1.00			
10 Region: Valle Uco	194	0.15	0.36	0.14	-0.02	0.07	-0.06	-0.07	-0.02	0.13	-0.18	-0.19	1.00		
11 Region: East	194	0.34	0.47	-0.29	0.07	-0.14	0.09	-0.06	-0.01	-0.21	-0.29	-0.32	-0.30	1.00	
12 Region: San Juan	194	0.20	0.40	0.04	0.04	-0.08	-0.09	-0.01	-0.05	-0.12	-0.21	-0.22	-0.21	-0.36	1.00
13 Outdegree: Firms	178	9.16	6.95	0.30	0.20	0.05	0.42	0.45	0.05	0.12	0.22	-0.09	0.05	0.07	-0.26
14 Outdegree: Institutions	178	2.34	2.38	0.20	0.08	0.08	0.09	0.12	0.06	0.31	-0.03	-0.09	0.73	-0.30	-0.22
15 Outdegree: Associations	178	0.78	1.09	0.17	0.02	0.07	0.11	0.33	0.01	0.43	0.10	0.04	0.15	-0.23	0.01
16 Outdegree: Cooperatives	178	0.39	0.71	-0.06	-0.13	-0.05	-0.05	-0.02	-0.04	0.07	-0.19	0.05	0.47	-0.07	-0.25
17 Outdegree: Banks	178	0.73	0.99	-0.04	-0.14	-0.11	0.13	0.04	-0.05	0.00	-0.12	0.13	0.31	-0.21	-0.05
18 Outdegree: Schools	178	0.59	0.93	0.21	0.03	0.08	0.05	0.22	0.13	0.29	0.27	-0.14	0.15	-0.21	0.00
19 Top Geo Diversified Firms	178	2.20	2.53	0.39	0.23	0.20	0.35	0.37	0.21	0.30	0.36	-0.11	0.06	-0.07	-0.21
20 Top Geo Diversified Inst	178	1.43	1.35	0.20	0.11	0.05	0.11	0.08	0.09	0.30	0.09	0.03	0.54	-0.14	-0.46
21 Affil Cluster: Firms	138	0.56	0.27	-0.21	-0.15	-0.05	-0.20	-0.38	0.00	-0.32	0.12	0.12	-0.22	-0.14	0.21
22 Affil Cluster: Institutions	130	0.87	0.13	-0.23	-0.04	0.03	-0.13	-0.13	0.07	-0.05	-0.10	-0.03	-0.44	0.20	0.35
23 Affil Cluster: Associations	64	0.87	0.20	-0.09	0.00	-0.01	-0.06	-0.26	0.08	-0.32	-0.04	-0.16	0.05	0.17	-0.06
24 Affil Cluster: Banks	67	0.91	0.12	-0.08	0.20	0.19	-0.09	-0.08	-0.05	0.03	-0.26	-0.30	0.12	0.14	0.13
25 Affil Cluster: Cooperatives	36	0.91	0.13	0.15	0.22	0.21	0.50	0.34	-0.06	-0.02	0.17	0.09	-0.53	0.43	
26 Affil Cluster: Schools	60	0.91	0.16	-0.30	-0.27	0.03	-0.08	-0.18	-0.04	-0.08	0.10	-0.02	-0.05	0.12	-0.18
27 Affil Cluster: All	155	0.64	0.33	-0.07	0.00	-0.02	-0.24	-0.44	0.01	-0.17	0.18	0.15	-0.25	-0.24	0.27

Variable	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1 Process Upgrading															
2 Product Upgrading															
3 Foreign Ownership															
4 Area (log)															
5 Vertical Integration															
6 Agronomist															
7 Education															
8 Region: North															
9 Region: South															
10 Region: Valle Uco															
11 Region: East															
12 Region: San Juan															
13 Outdegree: Firms	1.00														
14 Outdegree: Institutions	0.25	1.00													
15 Outdegree: Associations	0.31	0.44	1.00												
16 Outdegree: Cooperatives	0.08	0.41	0.17	1.00											
17 Outdegree: Banks	0.16	0.40	0.22	0.34	1.00										
18 Outdegree: Schools	0.31	0.33	0.32	0.16	0.18	1.00									
19 Top Geo Diversified Firms	0.78	0.22	0.27	0.02	0.11	0.35	1.00								
20 Top Geo Diversified Inst	0.34	0.87	0.37	0.41	0.34	0.31	0.28	1.00							
21 Affil Cluster: Firms	-0.36	-0.34	-0.25	-0.11	-0.15	-0.16	-0.31	-0.26	1.00						
22 Affil Cluster: Institutions	-0.29	-0.67	-0.22	-0.26	-0.28	-0.21	-0.16	-0.74	0.13	1.00					
23 Affil Cluster: Associations	-0.24	-0.20	-0.79	-0.22	-0.04	-0.29	-0.30	-0.15	0.15	-0.05	1.00				
24 Affil Cluster: Banks	-0.28	-0.03	0.01	0.00	-0.72	-0.23	-0.35	-0.13	-0.01	0.07	-0.08	1.00			
25 Affil Cluster: Cooperatives	0.37	-0.15	0.18	-0.61	0.15	-0.02	0.28	-0.21	-0.03	-0.09	0.10	-0.01	1.00		
26 Affil Cluster: Schools	-0.23	-0.23	-0.15	-0.02	-0.20	-0.86	-0.36	-0.23	0.31	0.22	0.38	0.30	-0.19	1.00	
27 Affil Cluster: All	-0.42	-0.30	-0.17	-0.23	-0.18	-0.13	-0.35	-0.28	0.70	0.15	0.13	-0.06	-0.06	0.20	1.00

**Table 6. Models with Product Upgrading as dependent variable**

Parameters	Model 0.0	Model 1.0	Model 2.0	Model 2.1	Model 3.1	Model 4.1	Model 4.2	Model 4.3	Model 4.4	Model 4.5	Model 4.6	Model 4.7
Intercept	7.55 *** (1.15)	6.62 *** (1.58)	8.05 *** (1.14)	6.38 *** (1.52)	6.01 *** (1.57)	8.75 *** (2.44)	11.44 *** (3.46)	4.81 (4.40)	3.88 (4.80)	0.36 (7.91)	11.81 *** (3.41)	6.83 *** (2.34)
Foreign Ownership	2.34 * (1.41)	2.44 * (1.45)	1.79 (1.39)	2.12 (1.39)	2.83 ** (1.42)	2.33 (1.54)	2.39 (1.57)	3.11 (2.39)	3.76 (3.19)	4.11 (4.75)	2.46 (1.57)	2.27 (1.47)
Area (log)	0.46 (0.28)	0.49 * (0.28)	0.28 (0.29)	0.27 (0.28)	0.31 (0.28)	0.58 * (0.31)	0.61 * (0.33)	0.47 (0.51)	0.41 (0.48)	-0.31 (0.59)	0.11 (0.37)	0.51 * (0.29)
Vertical Integration	-0.43 (0.72)	-0.45 (0.73)	-1.60 ** (0.79)	-1.96 ** (0.80)	-1.38 * (0.74)	-1.36 (0.95)	-1.16 (0.84)	-0.87 (1.45)	-1.43 (1.01)	-2.93 * (1.44)	0.03 (1.13)	-0.89 (0.91)
Agronomist	1.18 (0.78)	1.16 (0.80)	1.22 (0.81)	1.28 (0.81)	1.21 (0.81)	1.91 ** (0.96)	1.40 (0.94)	1.00 (1.61)	1.98 (1.25)	1.81 (1.70)	2.84 *** (1.02)	1.53 * (0.84)
Education	0.12 (0.16)	0.17 (0.17)	0.08 (0.18)	0.15 (0.18)	0.03 (0.17)	0.08 (0.20)	0.26 (0.18)	0.36 (0.31)	0.13 (0.28)	0.28 (0.40)	0.22 (0.19)	0.18 (0.17)
Region: South		-0.08 (1.37)		1.21 (1.37)	1.04 (1.38)	1.05 (1.51)	-0.14 (1.56)	0.95 (2.12)	-0.05 (2.36)	-0.99 (3.49)	-0.96 (1.79)	0.65 (1.43)
Region: Valle Uco		0.45 (1.21)		-0.46 (1.54)	-0.17 (1.26)	-0.31 (1.35)	-0.53 (1.33)	1.21 (1.83)	1.41 (2.28)	-0.43 (3.15)	0.82 (1.24)	0.38 (1.36)
Region: East		0.67 (1.17)		0.53 (1.14)	1.34 (1.15)	0.08 (1.29)	0.14 (1.38)	2.40 (1.97)	1.30 (2.44)	-1.85 (3.15)	2.15 (1.41)	0.61 (1.31)
Region: San Juan		1.66 (1.27)		3.04 ** (1.24)	3.63 *** (1.37)	1.75 (1.43)	2.02 (1.49)	3.20 (2.08)	1.89 (2.61)	2.09 (1.57)	2.09 (1.57)	1.94 (1.30)
Outdegree: Firms			0.17 *** (0.06)	0.23 *** (0.06)								
Outdegree: Institutions			0.29 * (0.17)	0.50 ** (0.24)								
Outdegree: Associations			-0.18 (0.36)	-0.43 (0.37)								
Outdegree: Cooperatives			-0.85 * (0.47)	-0.51 (0.50)								
Outdegree: Banks			-0.81 * (0.42)	-0.94 ** (0.42)								
Outdegree: Schools			-0.07 (0.38)	-0.18 (0.38)								
Top Geo Diversified Firm					0.40 ** (0.16)							
Top Geo Diversified Institution					0.62 * (0.34)							
Cluster: Firms						-2.56 (1.75)						
Cluster: Institutions							-5.66 (3.49)					
Cluster: Associations								0.31 (3.16)				
Cluster: Banks									3.11 (4.52)			
Cluster: Cooperatives										11.84 * (6.33)		
Cluster: Schools											-6.38 ** (2.75)	
Cluster: All Org Types												-0.28 (1.47)
Observations	143	143	139	139	139	120	115	59	63	35	56	137
R-Squared	0.10	0.12	0.20	0.25	0.19	0.16	0.17	0.23	0.29	0.52	0.45	0.13
Adj R-squared	0.06	0.06	0.13	0.16	0.12	0.09	0.09	0.07	0.15	0.35	0.33	0.06

The North Region is the omitted region. Standard errors in parentheses: \*\*\* if p-value < 0.01; \*\* if p-value < 0.05; \* if p-value < 0.10

**Table 7. Models with Process Upgrading as dependent variable**

Parameters	Model 0.0	Model 1.0	Model 2.0	Model 2.1	Model 3.1	Model 4.1	Model 4.2	Model 4.3	Model 4.4	Model 4.5	Model 4.6	Model 4.7
Intercept	18.98 *** (3.02)	21.00 *** (4.06)	19.29 *** (3.07)	20.16 *** (4.01)	20.47 *** (4.08)	27.18 *** (6.35)	30.64 *** (8.83)	19.80 * (9.86)	18.30 (13.72)	-9.28 (21.90)	35.09 *** (10.82)	17.26 *** (5.97)
Foreign Ownership	7.42 ** (3.71)	5.75 (3.71)	6.60 * (3.72)	5.16 (3.67)	6.17 * (3.70)	5.54 (4.00)	6.20 (3.99)	4.26 (5.36)	9.06 (9.11)	2.26 (13.17)	9.12 * (4.99)	5.06 (3.75)
Area (log)	0.47 (0.73)	0.90 (0.73)	0.04 (0.77)	0.42 (0.75)	0.47 (0.74)	0.58 (0.79)	1.00 (0.85)	0.59 (1.14)	2.45 * (1.36)	0.23 (1.64)	1.40 (1.18)	0.84 (0.73)
Vertical Integration	3.26 * (1.88)	2.93 (1.86)	2.02 (2.12)	1.20 (2.11)	1.95 (1.94)	1.91 (2.46)	2.60 (2.13)	2.00 (3.24)	-0.74 (2.89)	-2.09 (3.99)	0.39 (3.59)	4.54 * (2.31)
Agronomist	2.24 (2.05)	2.46 (2.06)	2.15 (2.18)	2.32 (2.13)	2.40 (2.10)	4.17 * (2.48)	3.39 (2.39)	4.80 (3.61)	-0.61 (3.59)	1.17 (4.70)	2.10 (3.23)	2.97 (2.14)
Education	1.16 *** (0.42)	0.92 ** (0.42)	1.00 ** (0.48)	0.98 ** (0.44)	0.62 (0.44)	0.71 (0.44)	0.94 ** (0.45)	1.07 (0.69)	0.54 (0.80)	1.60 (1.10)	0.77 (0.61)	1.01 ** (0.44)
Region: South	-3.15 (3.51)	-3.15 (3.51)	-1.72 (3.61)	-1.72 (3.61)	-2.40 (3.58)	-3.90 (3.92)	-3.31 (3.97)	-4.80 (4.75)	-0.63 (6.74)	12.94 (9.66)	-2.08 (5.69)	-3.88 (3.66)
Region: Valle Uco	-0.11 (3.11)	-0.11 (3.11)	1.80 (4.06)	1.80 (4.06)	0.14 (3.29)	-2.07 (3.50)	-0.51 (3.39)	1.81 (4.10)	2.78 (6.51)	5.45 (8.72)	-0.68 (3.94)	1.36 (3.47)
Region: East	-6.43 ** (2.99)	-6.43 ** (2.99)	-6.33 ** (3.00)	-6.33 ** (3.00)	-4.96 (3.00)	-6.49 * (3.35)	-5.24 (3.53)	-2.79 (4.41)	-8.89 (6.99)	-5.51 (8.73)	-2.15 (4.46)	-4.71 (3.34)
Region: San Juan	-0.38 (3.24)	-0.38 (3.24)	2.29 (3.28)	2.29 (3.28)	2.44 (3.56)	-0.88 (3.73)	1.09 (3.79)	1.03 (4.67)	-2.91 (7.47)	4.36 (4.98)	-0.07 (3.31)	
Outdegree: Firms			0.33 ** (0.16)	0.51 *** (0.17)								
Outdegree: Institutions			0.77 * (0.46)	0.19 (0.63)								
Outdegree: Associations			-0.91 (0.97)	-1.08 (0.98)								
Outdegree: Cooperatives			-1.93 (1.27)	-1.32 (1.32)								
Outdegree: Banks			-1.27 (1.12)	-1.64 (1.10)								
Outdegree: Schools			0.61 (1.02)	0.18 (1.01)								
Top Geo Diversified Firm					1.03 ** (0.43)							
Top Geo Diversified Institution					0.32 (0.89)							
Cluster: Firms						-6.05 (4.54)						
Cluster: Institutions												
Cluster: Associations							0.05 (7.08)					
Cluster: Banks												
Cluster: Cooperatives												
Cluster: Schools												
Cluster: All Org Types												
Observations	143	143	139	139	139	120	115	59	63	35	56	137
R-Squared	0.20	0.25	0.26	0.33	0.30	0.27	0.28	0.40	0.32	0.55	0.40	0.27
Adj R-Squared	0.17	0.20	0.20	0.25	0.24	0.20	0.21	0.27	0.19	0.39	0.26	0.21

North Region is the omitted region. Standard errors in parentheses: \*\*\* if p-value < 0.01; \*\* if p-value < 0.05; \* if p-value < 0.10

**Table 8a. Top 20 Organizations and Institutions Mentioned by Surveyed Firms-Mendoza**

<b>Alters - Organizations and Institutions</b>	<b>Type</b>	<b>Degree Centrality</b>
INTA (MZA)	I-INSTITUTION	84
INV (MZA)	I-INSTITUTION	57
PROMENDOZA (MZA)	I-INSTITUTION	55
BANCO DE LA NACION ARGENTINA	B-BANK	43
UNIVERSIDAD NACIONAL DE CUYO	S-SCHOOL	42
FONDO PARA LA TRANSFORMACION Y EL CRECIMIENTO (MZA)	I-INSTITUTION	35
IDR (MZA)	I-INSTITUTION	29
AEB ARGENTINA S.A.	F-FIRM	28
FECOVITA COOP. LTDA.	C-COOP	27
MINISTERIO DE ECONOMIA DE MENDOZA	I-INSTITUTION	26
CFI (MZA)	I-INSTITUTION	25
BANCO CREDICOOP COOP. LTDO.	B-BANK	24
CENTRO ENOLOGICO RIVADAVIA S.A.	F-FIRM	24
LABORATORIO LIBERTADOR S.R.L.	F-FIRM	21
LABORATORIO J.M.ZEBALLOS	F-FIRM	19
PEÑAFLORES S.A.	F-FIRM	17
BODEGAS CHANDON S.A.	F-FIRM	16
FACULTAD DON BOSCO	S-SCHOOL	16
BODEGAS DE ARGENTINA A.C.	A-ASS'N	15
FONDO VITIVINICOLA MENDOZA (MZA)	I-INSTITUTION	15

**Table 8b. Top 20 Organizations and Institutions Mentioned by Surveyed Firms-San Juan**

<b>Alters - Organizations and Institutions</b>	<b>Type</b>	<b>Degree Centrality</b>
INTA EEA SAN JUAN	I-INSTITUTION	18
PEÑAFLORES S.A.	F-FIRM	11
BANCO DE LA NACION ARGENTINA	B-BANK	10
BODEGAS Y VIÑEDOS SANTIAGO GRAFFIGNA LTDA.	F-FIRM	9
BANCO DE SAN JUAN S.A.	B-BANK	7
INV (SJ)	I-INSTITUTION	7
BODEGA RESERO	F-FIRM	6
CONSEJO PROFESIONAL DE ENOLOGOS (SJ)	A-ASS'N	6
UNIVERSIDAD CATOLICA DE CUYO	S-SCHOOL	6
BODEGA R.P.B. S.A.	F-FIRM	5
MINISTERIO DE LA PRODUCCION DE SAN JUAN	I-INSTITUTION	5
BODEGAS Y VIÑEDOS GARBIN S.A.	F-FIRM	4
CAMARA DE BODEGUEROS DE SAN JUAN	A-ASS'N	4
UNIVERSIDAD NACIONAL DE SAN JUAN	S-SCHOOL	4
AEB ARGENTINA S.A.	F-FIRM	3
BODEGA CEPAS ARGENTINAS S.A.	F-FIRM	3
BODEGAS BORBORE (VIÑEDOS PIE DE PALO S.A.)	F-FIRM	3
BODEGAS Y VIÑEDOS HORACIO NESMAN S.A.	F-FIRM	3
BODEGAS Y VIÑEDOS TERRANOVA S.A.	F-FIRM	3
CLEIF.RA.	A-ASS'N	3

**Table 9a. Average Out Degree Centrality per Firm for Given Alter, by Zone & Province**

Alter/Location	East (E)	Grand Mza (GM)	South (S)	Valle Uco (V)	Mendoza (M)	San Juan (SJ)
All	2.84 (V)	5.48	5.7	9(E)	5.2	5.6
Associations	0.47 (V)	0.91	0.95	1.5 (E)	0.87	0.93
Banks	0.42 (V)	0.39 (V)	0.9	1.4 (E GM SJ)	0.72	0.63 (V)
Cooperatives	0.35 (V)	0.09 (V)	0.45 (V)	1.13 (E GM S SJ)	0.5 (SJ)	0 (M) (V)
Firms	9.87 (SJ)	11.65 (SJ)	7.85	9.93 (SJ)	9.89 (SJ)	5.2 (M) (E GM V)
Institutions	1.35 (V)	2.04 (V)	1.95 (V)	5.8 (E GM S SJ)	2.61 (SJ)	1.13 (M) (V)
Schools (e.g., Univ's)	0.35 (V N)	1 (E S)	0.3 (GM)	0.9 (E)	0.59	0.6

NB. The letters following each mean indicate the zone or province from which the mean is different at the 10% level; those in bold at the 5% level.

**Table 9b. Average Cluster Score per Firm for Given Alter, by Zone & Province**

Alter/Zone	East (E)	Grand Mza (GM)	South (S)	Valle Uco (V)	Mendoza (M)	San Juan (SJ)
All	0.54 (GM SJ S)	0.79 (E V)	0.78 (E V)	0.48 (GM SJ S)	0.6 (SJ)	0.83 (M) (E V)
Associations	0.93	0.85	0.8	0.89	88	0.84
Banks	0.94	0.79	0.83	0.93	0.9	0.95
Cooperatives	1 (V)	1	0.95	0.85 (E)	0.96	-
Firms	0.51 (SJ)	0.63 (V)	0.65 (V)	0.45 (GM SJ S)	0.54 (SJ)	0.7 (M) (E V)
Institutions	0.91 (V)	0.84 (SJ)	0.86 (SJ V)	0.77 (E SJ S)	0.85 (SJ)	0.96 (M) (GM S V)
Schools (e.g., Univ's)	0.94	0.94	0.9	0.9	0.92	0.84

NB. The letters following each mean indicate the zone or province from which the mean is different at the 10% level; those in bold at the 5% level.

## REFERENCES

- Audretsch, D. B., & Feldman, M. P. 1996. R&D Spillovers and the Geography of Innovation and Production. *American Economic Review*, 86(3): 630.
- Burt, R. 1992. *Structural holes: The Social Structure of Competition*. Cambridge: Harvard University Press.
- Burt, R. S. 2001. Networks and Markets. In J. E. a. A. C. Rauch (Ed.), *Networks and Markets*. New York: The Russel Sage Foundation.
- CEPAL. 2002. Globalization and Development. In CEPAL (Ed.).
- Cetrangolo, H., Fernandez, S., Quagliano, J., Zelenay, V., Muratore, N., & Lettier, F. 2002. *El Negocio de los Vinos en la Argentina*. Buenos Aires: FAUBA.
- Cohen, W. M., & Levinthal, D. A. 1990. Absorptive Capacity: A New Perspective on Learning and Innovation, *Administrative Science Quarterly*, Vol. 35: 128: Administrative Science Quarterly.
- Cornelius, P., & Kogut, B. M. 2003. *Corporate Governance and Capital Flows in a Global Economy*. New York: Oxford University Press.
- Doner, R. F., Ritchie, B. K., & Slater, D. 2005. Systemic Vulnerability and the Origins of Developmental States: Northeast and Southeast Asia in Comparative Perspective. *International Organization*, 59(2).
- Evans, P. B. 1995. *Embedded Autonomy: States and Industrial Transformation*. Princeton, N.J.: Princeton University Press.
- Foster, D. 1995. *Revolucion en el Mundo de los Vinos*. Buenos Aires: Ennio Ayosa Impresores.
- Gereffi, G., Humphrey, J., & Sturgeon, T. 2005. The governance of global value chains. *Review of International Political Economy*, 12: 78.
- Gerschenkron, A. 1962. *Economic Backwardness in Historical Perspective: A Book of Essays*. Cambridge: Belknap Press of Harvard University Press.
- Giuliani, E., & Bell, M. 2005a. The Micro-determinants of Meso-level Learning and Innovation: Evidence from a Chilean Wine Cluster. *Research Policy*, 34(1): 47-68.
- Giuliani, E., Pietrobelli, C., & Rabellotti, R. 2005b. Upgrading in Global Value Chains: Lessons from Latin American Clusters. *World Development*, 33(4): 549-573.
- Gobierno de San Juan. 2004. Proyecto de Fortalecimiento Institucional Para el Desarrollo Rural: Provincia de San Juan.
- Guillen, M. 2001. *The Limits of Covergence: Globalization and Organizational Change in Argentina, South Korea, and Spain*. Princeton: Princeton University Press.
- Helper, S., MacDuffie, J. P., & Sabel, C. 2000. Pragmatic Collaborations: Advancing Knowledge While Controlling Opportunism. *Industrial & Corporate Change*, 9(Issue 3): 443.
- Henderson, J., Pagani, L., & Cool, K. 2004. Collective Resources and Cluster Advantage: An Examination of the Global Wine Industry.
- Herrigel, G. B. 1996. *Reconceptualizing the Sources of German Industrial Power*. New York: Cambridge University Press.
- Humphrey, J., & Schmitz, H. 2000. Governance and Upgrading: Linking Industrial Cluster and Global Value Chain Research, *Institute of Development Studies (IDS). University of Sussex*: 37.
- Humphrey, J., & Schmitz, H. 2004. Globalized Localities: Introduction. In H. Schmitz (Ed.), *Local Enterprises in the Global Economy*. Cheltenham and Northampton: Edward Elgar.
- Kogut, B., & Walker, G. 2001. The Small World Of Germany And The Durability Of National Networks. *American Sociological Review*, 66(3): 317.

- Kogut, B., & Zander, U. 1992. Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. *Organization Science: A Journal of the Institute of Management Sciences*, 3(3): 383.
- Locke, R. M. 1995. *Remaking the Italian Economy: Local Politics and Industrial Change in Contemporary Italy*. Ithaca, NY: Cornell University Press.
- McDermott, G. 2006. The Politics of Institutional Renovation and Economic Upgrading: Lessons from the Argentine Wine Industry: Mack Center, Wharton School.
- McEvily, B. a. A. Z. 1999. Bridging Ties: A Source of Firm Heterogeneity in Competitive Capabilities. *Strategic Management Journal*, 20(12): 1133-1156.
- Moran, P., & Ghoshal, S. 1999. Markets, Firms, And The Process Of Economic Development. (Cover story). *Academy of Management Review*, 24(3): 390.
- Obstfeld, D. 2005. Social Networks, the Tertius Iungens Orientation, and Involvement in Innovation. *Administrative Science Quarterly*, 50(1): 100.
- Ostrom, E. 1999. Coping with Tragedies of the Commons. *Annual Review of Political Science*, 2: 493-535.
- Piore, M., & Sabel, C. 1984. *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books.
- Powell, W. W., Koput, K. W., & Smith-Doerr, L. 1996. Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology, *Administrative Science Quarterly*, Vol. 41: 116: Administrative Science Quarterly.
- Powell, W. W., White, D. R., Koput, K. W., & Owen-Smith, J. 2005. Network Dynamics and Field Evolution: The Growth of Interorganizational Collaboration in the Life Sciences. *American Journal of Sociology*, 110(4): 1132.
- Provan, K. G., & Milward, H. B. 1995. A Preliminary Theory of Interorganizational Network Effectiveness: A Comparative Study of Four Community Mental Health Systems, *Administrative Science Quarterly*, Vol. 40: 1: Administrative Science Quarterly.
- Roberts, P., & Ingram, P. 2002. Vertical Linkages, Knowledge Transfer and Export Performance: The Australian and New Zealand Wine Industry, 1987-1999.
- Rodrik, D. 2004. Industrial Policy for the Twenty-First Century, *Working paper prepared for UNIDO*.
- Rofman, A. B. 1999. *Desarrollo regional y exclusión social: transformaciones y crisis en la Argentina contemporánea*. Buenos Aires: Amorrortu Editores.
- Ross Schneider, B. 2004. *Business Politics and the State in Twentieth-Century Latin America*. Cambridge; New York: Cambridge University Press.
- Sabel, C. 1994. Learning by Monitoring: The Institutions of Economic Development. In N. J. Smelser, & R. Swedberg (Eds.), *The Handbook of economic sociology*: viii, 835 p. Princeton: Princeton University Press.
- Sabel, C. 1996b. A Measure of Federalism: Assessing Manufacturing Technology Centers. *Research Policy*, 25: 281-307.
- Safford, S. 2004. Why the Garden Club Couldn't Save Youngstown: Civic Infrastructure and Mobilization in Economic Crises Paper, *MIT Industrial Performance Center Working Paper*.
- Saxenian, A. 1994. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Cambridge: Harvard University Press.
- Schmitz, H. 2004a. Globalized Localities: Introduction. In H. Schmitz (Ed.), *Local Enterprises in the Global Economy*. Cheltenham and Northampton: Edward Elgar.

- Schmitz, H. (Ed.). 2004b. *Local Enterprises in the Global Economy: Issues of Governance and Upgrading*. Northampton, MA: Edward Elger Pub.
- Schmitz, H., & Nadvi, K. 1999. Clustering and Industrialization: Introduction. *World Development*, 27: 1503-1733.
- Stark, D. 1996. Recombining Property in East European Capitalism. *American Journal of Sociology*, 101: 993-1027.
- Stark, D. & Vedres, B. 2006. Social Times of Network Spaces: Network Sequences and Foreign Investment in Hungary. *American Journal of Sociology*, 111(5): 1367-1411.
- Tendler, J. 1997. *Good Government in the Tropics*. Baltimore: Johns Hopkins University Press.
- Walters, A. 1999. *Rebuilding Technologically Competitive Industries: Lessons from Chile's and Argentina's Wine Industry Restructuring*. Massachusetts Institute of Technology.
- Wasserman, S., & Faust, K. 1994. *Social network analysis: methods and applications*. Cambridge; New York: Cambridge University Press.
- Zuckerman, E. & Sgourev, S. 2006. Peer Capitalism: Parallel Relationships in the U.S. Economy. *American Journal of Sociology*, 111(5): 1327-66.

## ENDNOTES

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<sup>1</sup> On the indeterminate impact of FDI and export firms on upgrading see (CEPAL, 2002; Cornelius & Kogut, 2003; Humphrey & Schmitz, 2004). See, for instance, on networks (Powell, Koput, & Smith-Doerr, 1996; Saxenian, 1994), social capital (Putnam, Leonardi, & Nanetti, 1993), property rights (Johnson, McMillan, & Woodruff, 2000; North, 1990), state coherence and capacity (Amsden, 1989; Evans, 1995; Guillen, 2001), and on “industrial districts” or “clusters” (Herrigel, 1996; Humphrey et al., 2004; Locke, 1995; Piore & Sabel, 1984; Schmitz, 2004a, 2004b).

<sup>2</sup> Recent exceptions to this in the quantitative domain are Giuliani and Bell (2005), McEvily and Zaheer (1999), Powell et al. (2005), and Stark and Vedres (2005).

<sup>3</sup> For a discussion of these deficiencies, see Schmitz and Nadvi (1999), Morosini (2004), Caniels and Romijn (2003), and Giuliani et al (2005). The few exceptions include Doner et al (2005) and Giuliani and Bell (2005).

<sup>4</sup> According to the data of *Wine Spectator* and *Wine Enthusiast*, Chilean and Argentine have about the same median price per bottle at \$10-\$12 and standard deviations (author’s calculations). Chilean producers are alarmed at the ability of Argentine wineries to catch up and sometimes overtake them in terms of export quality and pricing indicators. See, for instance, “La amenaza a las viñas chilenas,” *El Mercurio*, Nov. 2, 2005.

<sup>5</sup> For more on this strategy and the rise of Argentine export prices, see Cetrangulo et. al. (2002); “La amenaza a las viñas chilenas,” *El Mercurio*, Nov. 2, 2005; and the lengthy annual reviews of Argentine wines in *Wine Spectator* (November 15, 1995; December 15, 1997; March 24, 2003; November 30, 2004; November 30, 2005).

<sup>6</sup> Author’s calculations based on data from Instituto Nacional de Vitivinícola (INV).

<sup>7</sup> For instance, the surface area share of high and medium enological value grapes/vines in the *Zona Este* vineyards increased to about 26% of its total by 1998 and to over 37% by 2001. By 2003, about 55% of *Zona Este* wineries had modern quality control systems and also accounted for almost a third of those exporting from Mendoza. The calculations on surface area and high quality grapes are done by the author using the data provided by the INV. See also Cetrangulo et. al (2002) , Bocco (2003), and “Cosecha 1999-2002,” *La revista de la Bolsa*, N° 441, October 2002. The figures on capabilities and exports of firms from the *Zona Este* are from a survey of 400 wineries in Mendoza undertaken in 2003 by the Ministry of Economy of the government of Mendoza.

<sup>8</sup> For instance, there are about 100 micro-climates with the potential to support at least 12 varieties of medium and high value in both provinces (Cetrangulo et al, 2002). The winemaking, exporting, and especially grape growing sectors in both provinces still have relatively low levels of concentration and wide variety of firms in terms of ownership, legal structure, and contracting and product diversification strategies. As of 2003, there were about 200 firms exporting wine, all but a few from Mendoza. The top 5 account for 40% of wine export sales; the top 20 for 70%. FDI controls less than half of the top 30 exporters; it accounts for less than half of the \$1-1.5 billion invested in the wine industry in Argentina between 1991 and 2003; most of FDI came after 1996. According to the 2003 Mendoza government survey of 400 wineries in the province, only 4% have foreign investment, and only 6% are linked to Argentine business groups. Ten percent are cooperatives. According to the 2003 agricultural survey of vineyards in Mendoza, the largest 18 vineyard owners control only 5% of vineyard surface area, and about 1100 owners control 50%.

<sup>9</sup> As we describe in the methodology section below, when testing hypotheses 5 to 8 we also include variables that control for effects based on ties and affiliation networks to other types of organizations that have been identified as important in the process of knowledge transfer (schools, banks, cooperatives, and associations).

<sup>10</sup> See e.g., Audretsch and Feldman 1996; Canepa and Stoneman 2004; Griliches 1957; Schmitz 2004.

<sup>11</sup> This score was then subtracted from one (1 – Herfindahl Index) so that a higher score represented greater geographic diversity in the ties of the organization.

<sup>12</sup> If a firm was not connected to a particular type of organization, it was dropped from the analysis of that organization type.

<sup>13</sup> For work on East Europe, see McDermott (2002), Stark and Bruszt (1998), Grabher and Stark (1997) and on Latin America, see Montero (2002), Snyder (2001), and Tandler (1997).