

KNOWLEDGE SPILLOVERS IN EMERGING WINE REGIONS

ABSTRACT

Nascent firms have long relied on networks, clusters, and alliances to exploit knowledge spillovers (Bruderl & Preisendorfer, 1998; McEvily & Marcus, 2005; Zheng, Singh & Mitchell, 2015). Much of the recent empirical literature on networks focuses on innovative, high-technology companies, showing how a firm's network position affects its innovative activities (McDermott, Corredoira & Kruse, 2009). What about less innovative products and markets? We look at emergent winery clusters in non-traditional US wine-producing areas such as Michigan, Missouri, New York, and Vermont. These firms generally produce lower-quality, less expensive products that are consumed locally, rather than high-quality products for export. Consistent with previous research, we find that a firm's ties to other actors affect its performance (Elfring & Hulsink, 2003; Li, Zubielqui & O'Connor, 2015; Rowley, Baum, Shipilov, Greve & Rao, 2004). Unlike previous work, however, we find that the main determinant of firm performance is the firm's relationship with an industry association, which performs the critical role of network anchor.

Keywords: Entrepreneurship; Networks; Wineries

INTRODUCTION

Agglomeration economies allow firms to benefit from networks, alliances, and clusters, particularly new and small firms (Bruderl & Preisendorfer, 1998, Zheng, Singh & Mitchell, 2015). Knowledge spillovers from inter-firm collaboration have proven particularly important for new and innovative firms (Jaffe & Adams, 1996; Saxenian, 1994). But what about less innovative products and markets? How large are agglomeration economies, and what form do they take, when technological innovation is not the primary driver of firm performance? Which types of network ties are most valuable for nascent firms in mundane markets?

We focus on the role of government agencies, universities, and industry associations as mechanisms for improving the performance of new and small firms in mundane industries. We study network ties in emergent clusters of US wineries in non-traditional areas such as Michigan, Missouri, New York, and Vermont. They represent a growing number of new firms in unconventional wine regions and have the potential to drive local economic development. Because these wineries are characterized by low levels of physical, human, and especially financial resources, we expect that ties with different types of actors, such as firms, industry associations, government agencies and colleges or universities, will have different effects on the value of knowledge spillovers and hence firm performance.

We find that performance depends not simply on whether firms are tied to a variety of actors, but rather how they are tied to particular anchor entities. In our data, and unlike previous studies, industry associations play this connecting role. In US wine production and distribution, industry associations act as knowledge brokers, connecting wineries from different parts of the same state, firms that would otherwise not connect due to distance and transaction

costs. Findings also highlight that different organizations might act as performance leverages depending not only on the industry, but also on its governance structure.

Specifically, we show that ties with industry associations explain 19% of the variance in firm performance in emergent US wine clusters. For firms with less than 10 years of operations, such effect is even higher, accounting for 72% of the variance. Findings also highlight that different organizations might act as performance leverages depending not only on the industry, but also on its governance structure.

INDUSTRY BACKGROUND

The US Wine Industry

Since the end of alcohol prohibition in 1933, US wine production has grown significantly, but irregularly, with an average annual growth rate of 4% (ranging from -13% to 23%) (U.S. Alcohol and Tobacco Tax and Trade Bureau, 2016). Wine production fluctuates from one year to another and from area to area depending largely on climate. The number of wineries has also grown significantly and its growth rate reveals three major moments (Wine Institute, 2016). First, the rebirth of the industry occurred simultaneously to the war period in which the survival rates were low. Second, the postwar period, which began with a peak, remained relatively constant and ended with a year of retraction (1996). Third, the steady growth started in 1970 that lasts until 2016.

Although there were 10,417 wineries in 2014, the majority (78%) are very small, producing less than 5,000 cases per year. The combination of the steady growth with this predominant type of firm profile reveals that most of the US wineries are entrepreneurial startups that are also family owned. They operate in a highly competitive environment, with nearly 99,000 new labels (brands) registered in 2013, mostly from overseas wineries, and permits for domestic increasing by 47% since 2010 (Lee, 2015).

Examining the distribution of wineries by state (Figure 1) reveals three major groups. The first is composed by five states (California, Washington, Oregon, New York and Texas) which represent 65% of US wineries. This group is clearly dominated by California, which represents 41% of the total, with the second player, Washington, representing 9%. The second is composed by seven states (Virginia, Michigan, Pennsylvania, Ohio, Missouri, North Carolina and Colorado) that have very similar shares of the total wineries, from 2% to 3%. The third and last group is composed by all other states that represent 1% or less of US wineries. In this group are states such as Illinois, with 148 wineries, and Delaware, with 5. There are 12 states with 50 to 100 wineries, 16 states with 10 to 50 and 6 states with 5 to 10 wineries. Wine is currently produced in every US state.

[Insert Figure 1 about here]

Profile of Emerging Wine Regions

We investigate the emergent entrepreneurial activity of wine clusters in Michigan, Missouri, New York, and Vermont. Michigan's wine industry dates from after the repeal of Prohibition and has received direct government support, with a state tax of four cents per gallon on Michigan wine and 50 cents per gallon on imported wine. The majority of quality bottled wine is produced in its four American Viticultural Areas (AVAs), a designation analogous to the AOC (*Appellation d'Origine Contrôlée* - Denomination of Registered Origin) commonly used in the global industry. This designation distinguishes geographical features of a local production and together with other idiosyncratic characteristics determine the natural competitive advantage of a region.

Missouri's industry began earlier and by the start of Prohibition was the second-largest wine-producing state in the nation. Wine production was shut down during Prohibition, however. The state received its first certification in 1972 and now it has three small AVAs, but they are inserted in multi-state AVAs (shared with Arkansas and Oklahoma) which inhibit a

pure state designation of its wine production. New York's wine industry began in the 17th century and it is home to the first licensed and bonded winery in the USA. The state has eight AVAs and has enjoyed an industry boost the moment it set aside American native grapes to explore *Vitis vinifera* vines, a species native to the Mediterranean region, central Europe, and southwestern Asia. Vermont had its first commercial winery only in 1997. The cold climate is a challenge for viticulture, which has been focused on cold-hardy French hybrid grapes. The state has no AVAs mostly due to its late industry birth and the climate characteristics that narrow its crop possibilities.

In 2011, the North Central Regional Center for Rural Development (Ross, Chaddad & Gómez, 2012) revealed results from an exploratory comparative analysis describing some of the characteristics and challenges facing wineries in those regions. On average 65% of those wineries have been in business less than ten years and, similar to the national industry, produce in very small quantities. From the owner's or manager's perspective the main motives to enter the industry are non-economic, including passion for food and wine, quality of life, and willingness to get one's hands in the dirt. Managing distribution channels and setting prices are described as the greatest marketing challenges, which squares with other findings that have revealed almost 80% of the wine volume is sold at the winery (the rest is divided almost homogeneously among liquor stores, restaurants, farmers markets, direct shipments, distributors and festivals or community events).

Another characteristic revealed in the survey is that 65% of those wineries are members of a food and wine trail, a type of inter-firm collaboration. The main reasons to collaborate are to share information and resources and promote the wine region. The greatest challenges to collaboration include different business philosophies, lack of priority, and distance. This collective-action strategy reveals that positive externalities via knowledge exchange is the greatest motivation for joining a wine trail and helping promote the local industry. However,

to fully capture those benefits of collaboration, practices to bridge distant firms and integrate them into a common developmental mindset would have to be developed.

Inter-Firm Collaboration

The nature of the wine business stimulates collaboration among firms for several unique reasons. First, viticultural performance is a consequence of knowledge accumulation and the network embeddedness offers readiness and allows a peer review perspective of business practices. Second, due to the complexity of the product enhancement process, interactions with downstream agents allow better understanding of consumer's preferences and guide the product development roadmap. Third, participating in a wine trail has shown to increase traffic at a winery's tasting room and boost sales (Coren & Clamp, 2014). Fourth, judging the quality of inputs (e.g. grapes) is difficult and to deal with this asymmetric information challenge firms tend to seek alternative methods of sourcing. It may start with contractual agreements, but as long as it becomes insufficient to assure the expected quality of inputs or the entrepreneurs fear opportunistic behavior, there will be an incentive to vertically integrate (Fernández-Olmos, Espitia-Escuer & Rosell-Martinez, 2009a; 2009b; Zaharieva, Gorton & Lingard, 2003).

Another unique aspect of the wine industry's network arrangements is the wine trail. Wine trails are designed to create scope economies through collaborative marketing and other types of shared service initiatives (Coren & Clamp, 2014), but the gains can be greater if members agree to invest a share of the cooperation profits into other rent-leveraging activities (Weglarz, 2013). While more wineries means more competition, the agglomeration of several wineries in the form of a wine trail attracts more tourists. The trail in itself is a tourist product and has been associated with the development of food networks and culinary tourism as a whole (Robb & Barry, 2007).

Research on wine trails suggests the need to establish a centralized organization to coordinate activities (Hall, Sharples, Cambourne & Macionis, 2000; Jaffe & Pasternack, 2004; Pavan, 1994a; b; Mallon, 1996). Some vineyard owners have not joined, citing a lack of infrastructure to host wine tours the prospect of disrupting existing business operations as the main reason (Mason & O'Mahony, 2007). These are aspects of the liability of smallness. As noted by Alonso (2011), overall wineries are actively engaged in alternative forms of collaborative relationships such as working as a group, reciprocally promoting wine trails, or simply meeting to exchange ideas.

Once collaboration is established, a region can be registered as an AOC (*Appellation d'Origine Contrôlée* - Denomination of Registered Origin) or AVA (American Viticultural Area). State and federal governments are both motivated by the benefits of tourism and the growth of related industries, and therefore would be interested in fostering cooperative relationships and knowledge sharing throughout the industry. This interest is evident in the existence of Government support institutions, public research centers, and other public organizations dedicated to the industry.

A key concept in the wine industry is *terroir*, the complete natural environment in which a particular wine is produced. Napa Valley's *terroir* in California is commonly pointed out as the main reason for the regional success. While the *terroir*, or natural competitive advantage, is an important factor, social capital and entrepreneurship experience behind technological leadership are actually the most important variables explaining the success of Napa Valley (Hira & Swartz, 2014). Both *terroir* and capabilities allow wineries to charge premium prices and benefit from the resultant entry barrier for competitors from other regions (Cross, Plattinga & Stavins, 2000; Ditter, Brouard, & Benson, 2010). In the US, besides contributing to winery competitiveness, *terroir* has also been identified as a cause of economic development when a region achieves AVA status, expressing its regional quality standard (Hoemmen Rendleman, Taylor, Altman & Hand, 2013). This natural endowment has also been added to

entrepreneurial talent, established quality standards and improved viticulture practices to explain the economic development of Ontario (Carew & Florkowski, 2012). Due to the recognition of a *terroir* as a quality standard, place marketing got into the agenda of local governments and its effectiveness was evidenced on both regional and wine marketing initiatives (Dawson et al., 2011). Other studies have also demonstrated that place marketing allied with wine tourism generates substantial effects on wineries future sales (Menival & Han, 2013).

The success of Napa Valley suggests the importance of social capital in the success of wineries. Willing to take advantage of local social capital, producers join horizontal networks initially for social and commercial reasons and then gradually move to a strategic agenda (Lewis, Byrom, & Grimmer, 2015). Through interactions with participants in the market, firms broaden their capabilities and knowledge base, leverage marketing events, and enhance awareness of their brands. Connected firms can also lobby more effectively to mobilize industrial policies that facilitate their business goals.

Analogous to the other industry network studies, local embeddedness for wineries positively influences the development of successful products, but benefits are subject to decreasing returns (Giuliani, 2013a). More importantly, external openness is more significant than local embeddedness for explaining firm success, corroborating the notion that network closure may lead firms to become “trapped in their own net” (Gargiulo & Benassi, 2000: 183). On the other hand, cohesive networks of wineries explain the stability of knowledge exchange over time (Giuliani, 2013b), reinforcing the need to establish a balance between exploration and exploitation of current and new knowledge networks.

The wine industry includes actors or organization such as industry associations, colleges and universities, government agencies, information portals, and research centers that serve as focal actors. Each contributes with a specific set of activities that defines their offerings. In general this set is comprised by: research funding, research and development, education,

knowledge exchange, problem solving, networking and matchmaking, promotion (events, public relations), and advocacy. Described not only as a composition of clusters, but more precisely as Local Productive and Innovative Systems (LPIS), the wine industry demands its study to adopt regional lenses in order to capture its determinant characteristic of cooperation between local actors.

THEORY AND HYPOTHESES

Factors Driving Performance

We follow the embeddedness approach to networks (Granovetter, 2002) in seeing firms internalizing knowledge available throughout networks to create or reshape dynamic capabilities that allow them to gain and sustain competitive advantage. In this approach, the development and uniqueness of regions depends on the relational structure of their social activity. The embeddedness approach focuses on these differences, analyzing how civic and economic relationships facilitate performance through collective action (Safford, 2007).

The first and preliminary factor that drives firm performance is relationship building. The social bridging characteristics of inter-firm collaboration, mostly associated with the weak-tie argument, broadens the firm's opportunities for knowledge acquisition (Havnes & Senneseth, 2001). Granovetter (1973) argues this type of tie is more likely to link previously isolated agents for exchanging unique information, while strong ties help to obtain fine-grained information and to facilitate trust-based governance. The second and third factors are consequences of the relationship building, cost reduction, and knowledge acquisition, respectively. By establishing relationships firms can develop *economies of scope* through shared activities. This would be applicable for, among other reasons, industry promotion, advertising, and sharing of equipment or personnel. Besides economies of scope, another component may also contribute to the overall cost reduction, the *broadening of the financial basis*. Networks have been shown to allow the access to informal credit, especially helpful for firms in the start-up

phase, commonly confronted with higher financial needs than well-established firms. The entrepreneurship literature has exemplified that in rotating credit associations provided to members of an organization, or for agents with common characteristics (e.g., Yoon, 1991).

The third factor, knowledge acquisition, combines four components. The first is *access to information*. Second, networks allow *access to new customers and suppliers*, a crucial activity to rent leveraging and under certain conditions to exploring economies of scale. A third component is the *exchange of tacit knowledge* (Nonaka, 1994; Polanyi, 1966), in which inter-firm relations allow learning about each other and building relational trust (Larson, 1992). Uzzi (1996) observed that strong ties are favorable to the exchange of tacit knowledge once they may require sequential and constant interactions. Moreover, as not easily codified, they can be characterized as fine grained and high quality, common characteristics of knowledge obtained using strong network ties.

Also well explored in the literature (e.g. Sullivan & Marvel, 2011; Thorgren, Wincent & Örtqvist, 2009) is the notion that a wider range of network ties supports innovative performance, which highlights a fourth component, *increase in innovative skills*, in which collaboration with other firms leads to potential pooling of resources and information (OECD, 2010). Once linked, firms may create a synergistic effect that allows them to innovate both process and products, enhancing their financial performance. Operational improvements derived from the better use of inputs, reduce in production time and costs are examples of benefits extracted in innovative process, while greater output quality, eventually in a least costly way, is a consequence that can be referred as an innovation in products.

All four components denote a network compensation hypothesis that demonstrates how rich social networks can compensate shortfalls in human capital (Light & Karageorgies, 1994). The components are related to each other; for instance, access to new information creates the basis to reach new customers and suppliers. On the other hand, the increase in inno-

vation breadth and speed may only be possible by accessing new information and leveraged through the interaction with new customers and suppliers. Those relationships are also present in the factor level, namely relationship building, cost reduction, and knowledge acquisition. For these reasons, we expect that an increase in inter-firm collaboration would lead to an increase in firm performance. However, to determine the expectations for each type of agent (firms, associations, government agencies, colleges and universities) we must first get into the specifics of the relationship of each type of tie to firm performance.

Network Ties and Firm Performance

The number of partners a firm possesses reflects its level of embeddedness in its network of relationships. The denser the interactions, the easier the exchange of information. This density allows firms to obtain information faster (Burt, 1992) and also validate its reliability, once they have the possibility of confirming it with other partners. Besides obtaining information faster and reliably, direct access to a partner also reduces search costs. Moreover, establishing ties to similar partners results in exploitative learning that leads to higher productivity in joint activities (Levinthal & March, 1994). At the same time those interactions can be beneficial as they create obligations commonly expressed in social norms. A firm which benefits today will tend to recompense its providers tomorrow, creating a self-sustaining cycle of exchanges. If it does not, it loses reputation and compromises its ability to acquire information in the future (Kreps, 1990). Such social obligations or expectations allow firms to trust in network's ability of monitoring and sanctioning non-cooperators. Thus, as a system of exchange, network embeddedness is expected to be beneficial to firms, although at a certain point incremental ties may be redundant to the current knowledge base.

Based on the overall positive effect of network ties in firm performance, we offer the following hypothesis:

Hypothesis 1: The greater the number of ties a firm has to all other actors, the higher its level of performance.

However, the quality and the nature of information that a firm can access through its relationships are also key. Thus, the focus should be not only on the number of ties with multiple partners, but also on the number of ties a firm has with partners that allows them to expand their applied knowledge base and create or reshape its dynamic capabilities. Information quality is imbued with value, context, and meaning (Koka & Prescott, 2002). When those three characteristics are present, entrepreneurs and managers are more likely to relate the information acquired to real life problem solving and consequently turn them to new and applicable knowledge. Experienced organizations tend to be more effective than less experienced ones in applied knowledge sharing. Therefore experienced firms are more likely to be knowledge anchors in a network arrangement. However, once knowledge is asymmetrically distributed, certain types of organizations may be knowledge anchors for certain firms and for others not. Nevertheless, organizations that possess a larger knowledge base and more experience in knowledge sharing will tend to stand out in a network arrangement.

While a growing body of work has identified network embeddedness as a source of valuable resources, the firm's path dependent processes and institutions have demonstrated to change slowly (Artur, 1990; Spencer et al., 2005; Uzzi, 1996). Societies with weak institutions for instance, exemplify this constraining condition (Henisz & Zelner, 2005). This enabling and constraining nature has been exemplified when embeddedness offers benefits but also thwart the access to knowledge (Lin, 2001; Uzzi, 1996) and to relieve such constraints private and public organizations have been recruited. In the private sector, for instance, business groups have shown to support firms (Khanna & Yafeh, 2007; Schutjens & Stam, 2003), even though they are not always substitutes (Chittoor, Kale, P & Purunam, 2015). Other authors have shown that civil mobilization in informal business associations (Safford, 2007) or trade organizations (Zuckerman & Sgourev, 2006) facilitate learning, motivate and offer par-

ticipants peer-review relations. Government support institutions such as public research centers and technology alliances have demonstrated to provide firms access to resources, since they broadly disseminate findings and offer grants to relevant research (Cooke & Wills, 1999; Fukagawa, 2006; McEvily & Zaheer, 1999; Owen-Smith & Powell, 2004; Schoonjans, Van Cauwenberge & Vander Bauwhede, 2013), but narrowing the focus on exclusive ties might end up in lock-in relations and hinder the exploitation of new opportunities (Lee, Seo, Choe & Kim, 2012).

If networks are knowledge resources that allow firms to reshape or enhance their dynamic capabilities, firms should benefit from ties to firms and organizations whose activities underpin access to new and applicable knowledge. In this regard, we can further distinguish the impact of different types of ties willing to uncover which ones specifically contribute to firm performance. An underlying assumption to the proposition of this distinction relies on the fact that all of them (firms, associations, government agencies, colleges and universities) have unique ways of offering knowledge contributions to a firm. Government agencies and associations for instance offer a wide range of activities, while colleges and universities are mostly partners in research and educational support. Firms, in turn, are able to offer accurate knowledge, even though the threat of opportunism may be a concern. This distinction is operationalized in the following additional set of hypotheses:

Hypothesis 2a: The greater the number of ties a firm has to other firms, the higher its level of performance.

Hypothesis 2b: The greater the number of ties a firm has to government agencies, the higher its level of performance.

Hypothesis 2c: The greater the number of ties a firm has to industry associations, the higher its level of performance.

Hypothesis 2d: The greater the number of ties a firm has to colleges and universities, the higher its level of performance.

METHODS AND PROCEDURES

Data and Sample

We test these hypotheses using a cross-sectional survey of winery owners and general managers in Michigan, Missouri, New York, and Vermont, administered in 2015. We sent surveys to a random sample of 465 firms, following up by phone and email, and received 107 usable responses (a 23% response rate). The design and implementation of the survey were conducted through a partnership among the University of Missouri, Michigan State University, and Cornell University.

The average size of the wineries in the sample is similar to the national average, with 79% reporting limited or very small production. Regarding age, 76% of the wineries have been in operation for less than 20 years, and 51% less than 10 years, which reinforces the expected start-up entrepreneurial profile. Regarding distribution channels, 66% of the total production is sold at the winery, 11% is sold at liquor stores, 11% is sold to distributors, and the remaining is divided among restaurants, direct shipments, farmers market and other channels. The predominance of sales at the winery reveals the importance of regional consumption and wine tourism to firm's revenues, which helps to explain why wineries invest in tasting rooms and participate in wine trails to attract potential customers.

[Insert Figure 2 about here]

Variables and Estimation Procedure

Our dependent variable is firm performance and the independent variables are ties to all actors, ties to all firms, ties to associations, ties to government agencies, ties to colleges and universities, and a dummy variable to account for participation in a wine trail. As control var-

iables, age, size, and three dummy variables to account for the effects of location (states) are included in the model.

Dependent variables: To measure performance we use a multidimensional construct built from perceptual, self-reported measures of firm performance in 5-point Likert-type scales. Responses to seven performance related questions were used to generate a continuous variable: (a) competitive position in the wine industry, (b) customer satisfaction, (c) tasting room experience, (d) wine quality, (e) introduction of new, higher value products, (f) profitability, and (g) overall performance. Confirmatory factor analysis (CFA) identified two primary factors (Table 1). The first factor presented higher loads on competitive position in the wine industry, overall performance, and profitability, and can be interpreted as competitive advantage since it mostly deals with advantage over competitors and financial performance. The second factor presented higher loads on customer satisfaction and tasting room experience and can be interpreted as customer satisfaction with emphasis on the most important sales channel. Cronbach's alphas are 0.749 and 0.761 respectively.

[Insert Table 1 about here]

Following McDermott et al. (2009), we weighted the dependent variable by factor loadings to the seven questions loading on the two firm performance factors. A firm's score on each performance related questions was multiplied by the sum of the factor loadings and computed as a whole.

Independent variables: The explanatory variables—ties to all actors and to firms, associations, government agencies, and colleges and universities—were generated from the total count of ties each winery has with other organizations. As a consequence, the amount of ties to all actors captured the overall embeddedness of the firm, assuming homogeneity of different types of actors in knowledge resources provided. Then, similar to previous research (Ahuja, 2000; Lin, 2001; McDermott et al., 2009; Owen-Smith & Powell, 2004), we relaxed this

assumption by decomposing ties to all actors in different types to capture the expected heterogeneity of their knowledge contribution to the winery. As mentioned, we include dummy variables for participation in a wine trail and for states. We also include firm age in years and size (total number of employees, excluding unpaid family workers and labor supplied by third-party contractors).

Table 2 presents descriptive statistics and correlations for all variables used in the analyses. The hypotheses were tested with a set of linear regression models that regressed firm performance and three groups of explanatory variables with the winery as the unit of analysis. The first model was composed by the control variables and the categorical explanatory variable participation in a wine trail. The second model introduced the overall measure of embeddedness, ties to all actors. And the third model decomposed this variable into 4 different types of actors, firms, associations, government agencies, colleges and universities. This dynamic of decomposition is a procedure analogous to McDermott et al. (2009) in order to demonstrate the distinct impact of actors in firm performance and hence allows answering the proposed research question. In order to deepen the knowledge regarding the different characteristics possessed by organizations (treated as non-firms) that may enhance performance, we looked qualitatively at several types of support activities offered to wineries. This procedure also supported analyzing different types of governance among states and an overall perspective of how each state crafts order in its wine industry.

[Insert Table 2 about here]

RESULTS

Baseline Results

Table 3 presents OLS estimates of three alternative model specifications having firm performance as the dependent variable. The most consistently significant control variable is the location of New York, which is negative, followed by size, which is positive, but only signif-

icant in Model 1 at the 10 percent level. Given the limitations of the survey data and the size of the sample, the lack of significance of other control variables is not surprising. However, the consistent significance of the state of New York with a negative coefficient may lead to two alternative interpretations. First, something about its wine industry's institutional setting reduces the benefits of knowledge flow among agents. Second, there is more intra-state competition in the NY wine industry than in other states, and the negative effect of increased competition outweighs the benefits of knowledge sharing.

[Insert Table 3 about here]

Winery size is significant in Model 1 at the 10 percent level and close to statistical significance in the other models. As the measure used for size is the total number of employees, this result suggests that a larger human asset mobilization may be justified by a superior performance. It also calls for extensions in the interactions of firm strategy, size, and performance (Smith et al., 1989), due to the existence of distinct market niches and the fact that vertical integration of grape growers and wine producers (Zaharieva et al., 2003) may create different patterns of human asset allocation. Table 2 shows a moderate degree of correlation between size and age, and though multicollinearity may be a concern, alternative regressions (not reported here) firstly excluding size and secondly excluding age did not change the main results.

With regard to the network variables, participation in a wine trail is not statistically significant. The increase in p-values as we include additional ties suggests that network ties may substitute or diminish the relevance of participating in a wine trail. In addition, the moderate correlation of participation in wine trail and firm size may suggest that bigger firms tend to benefit more from membership in wine trails than smaller firms. Even though bigger firms, usually having higher quality products or offerings better tailored to its customers, may tend to benefit more than smaller firms from trail membership that increases the number of its po-

tential customers. The supposition that smaller wineries would not benefit from wine trail memberships would not completely contradict the related literature. Participating in wine trails requires investments such as accommodations and tasting rooms. Moreover, wine industry entrepreneurs have already listed the liability of smallness as a critical limitation to host wine tours (Mason & O'Mahony, 2007).

As seen in Model 2 ties to all actors has a significant, positive effect on performance, although its economic magnitude is not large ($\beta = 0.02$). This result supports the overall argument that embeddedness is strongly associated with firm performance, as the interactions with multiple actors increase the access to knowledge resources and allow firms to reshape or develop their dynamic capabilities to enhance performance. Following Fleming (2001), Lin (2001), McDermott et al. (2009), and Owen-Smith & Powell (2004), one can argue that wineries in the emergent wine regions analyzed have improved their performance because of the knowledge resources available on networks. This assertion has gained support with the gradual increase of variance explained (R^2 values) in Model 2 relative to Model 1, and got even more evident when actors were decomposed in types (Model 3). Model 2 also serves as a baseline of comparison to Model 3 and helps uncovering which types of actors are responsible for the variance explanation, fulfilling the analytic requirements for the hypotheses test.

Table 3 results provide support for Hypothesis 1 in Model 2, showing that higher levels of firm performance are positively associated with the number of ties a focal firm has to other actors ($\beta = 0.02$, $p < .05$). It also provides support for Hypothesis 2c in Model 3, demonstrating that higher levels of firm performance are positively and significantly associated with the number of ties a focal firm has to industry associations ($\beta = 0.19$, $p < .05$). In both models, the variable estimates for the number of ties a focal firm has with other firms, associations, government agencies, colleges and universities were positive. Regarding the lack of statistical significance, firms and colleges presented a low economic magnitude ($\beta = 0.01$ and $\beta = 0.00$ respectively), with the later presenting a high standard error ($\sigma = 0.31$).

Three of the findings mentioned above are crucial to the interpretation of the results. First is the support for the overall argument that embeddedness is strongly associated with firm performance. Second is that all the variables for the number of ties were positive. And third, after decomposing the total number of actors in ties with different organizations, the only statistically significant variable was ties to industry associations, which also has the largest coefficient estimate among the explanatory variables. Those findings suggest that enhancing firm performance depends on being tied not simply to any or many firms and organizations, but rather to those that act as social and knowledge bridges (McDermott et al. 2009). Industry associations have shown to fulfill this role and act as knowledge brokers among its participants, they also connect wineries from different parts of the same state, which would not otherwise connect due to distance and transaction costs.

As noted by Zuckerman & Sgourev (2006) industry associations offer cross-cutting ties among communities of producers. This cross-cutting feature is explained by the fact that usually a focal firm is predominately bounded to relationships among its productive chain, downstream or upstream. In addition, a focal firm is rarely able to access their focal competitors applied knowledge, that most of the times comes from an integration through the whole productive chain. The possibility of assessing knowledge spilled from suppliers and customers of a firm's competitor and further from other industry peers, may offer benchmarks intra-industry, and depending on the characteristic of the association, inter-industries. Cross-cutting knowledge then, is the reflection of the free flow of knowledge that cuts vertical and horizontal relationships within and across industries.

Correlations among variables on Table 2 allow additional analysis. As expected, firm performance is moderately correlated with size, ties to all actors and ties to associations. Size is significantly correlated to almost all network variables, which suggests that to engage in network activity it is important to have a relevant number of employees. Limited production firms in which the owner, sometimes with the owner's own family, performs most of the

business processes would have natural constraints to explore knowledge resources available outside the winery. Not surprisingly, ties to all actors and ties to all firms are almost perfectly correlated (0.974**), since ties to firms account for 66% of the total number of ties. Ties to government agencies and ties to colleges and universities are moderately correlated, suggesting they may have a joint action. Participation in wine trail and size are also moderately correlated, which reinforces previous findings regarding the liability of smallness. It is also correlated with firm performance that may suggest wineries with relevant size and investment capacity would be able to explore the benefits from wine trails.

The Role of Firm Age

Although all firms in the sample belong to emergent entrepreneurial clusters in non-traditional areas, we conducted a subsample analysis in order to test the role of firm age. The first group composed of firms with less than 10 years of operations ($n = 57$), the second composed of firms with more than 10 years of operations ($n = 50$). Regression results for the sample of younger firms reveal a relevant increase in the variance explained (+0.16, $R^2 = 0.35$). Decomposing the actors, we find that the coefficients on ties to firms ($\beta = 0.03$), associations ($\beta = 0.72$) and government agencies ($\beta = 0.29$) become statistically significant. Segregating firms into competitors, suppliers, hotels, tour operators, and recreation providers reveals that only ties to competitors are associated with increased firm performance ($\beta = 0.13$). Results for the group of established firms also reveal a relevant increase in the variance explained (+0.18, $R^2 = 0.37$). In general, they follow the same pattern of the baseline, with exception to ties to competitors that appeared to significantly decrease performance ($\beta = -0.20$).

The subsample analysis results suggest that young firms also benefit from having ties to other firms, specifically competitors. In contrast, for established firms, the relationship with competitors decrease performance. Such results resemble previous research in which entrepreneurial firms use networks to imitate competitors' conducts (Ahuja, 2000; Greve, 1996;

Henisz & Delios, 2001). And also highlights that established firms, may leak knowledge and incrementally decrease performance by directly interacting with competitors. Baseline results that show the relevance of having ties to associations get even higher for young firms (+0.53, $\beta = 0.72$). But different from established firms, they also benefit from establishing ties to government agencies. This difference reveals the positive role played by public agencies in supporting nascent entrepreneurial activity.

Differences among Industry Associations

Why do industry associations play a stronger network role than other organizations? We looked qualitatively at several types of support activities provided by government agencies, universities, and other services. We focused on the following support mechanisms: (a) research funding; (b) research & development; (c) education; (d) knowledge exchange; (e) problem solving; (f) networking and matchmaking; (g) Promotion, "advertising and PR"; and (h) advocacy. Results are presented in Table 4.

[Insert Table 4 about here]

The first part of Table 4 shows activities performed by industry associations, government agencies, and colleges and universities in the states of Michigan and Missouri. The second exhibits the states of New York and Vermont and list two additional types of organizations, information portals and a privately held company focused on promotion. The third shows industry organizations operating at the national level and adds to the list a research center. Including national organizations is justified by the fact that wineries in a state are commonly confined to their state wine and grape associations, but they can also obtain benefits from national organizations that offer redundant services. This dynamic leads to an interpretation of the state level per each state combined with the national level.

In Michigan the most relevant industry association (Michigan Wines) works as an extension of the Michigan Department of Agriculture & Rural Development. This duo is responsi-

ble for research and dissemination of knowledge, while two other organizations focus on networking, advocacy and shared industry promotion. Michigan State University, in turn, is mostly focused on education. In Missouri the partnership of the most relevant industry association with the state department of agriculture is repeated and is also extended to the University of Missouri, responsible for the Grape and Wine Institute, which offers R&D activities in viticulture and enology. An additional government agency, Viticulture and Enology Science and Technology Alliance (VESTA) reinforces the research funding, R&D and overall knowledge exchange in Missouri. As observed in Michigan, there are other organizations mostly dedicated to networking, advocacy and shared industry promotion, but in the case of Missouri there is a private company that provides these services.

In New York and Vermont the pattern of some associations being focused on research and others on promotion and advocacy is also identified, but in NY there was no evidence of networking and matchmaking activities formally expressed by the available organizations. In addition, in both states the partnership of the most relevant industry association with the state department of agriculture is repeated. In Vermont we could not identify any organization that offers advocacy services and only the Vermont Agency of Agriculture Food & Markets provides research funding. Those characteristics are probably due to the initial stage of development of the wine industry in the state. Industry promotion, in turn, is an activity present in half of the existing organizations and they are all private, demonstrating that in Vermont the private sector had to get organized by itself in order to foster its wine industry. At the national level there is also a dual pattern in which some organizations are focused on research funding and development, and others on networking. In addition, at the national level there is a predominance of industry associations and the high intensity of services related to overall knowledge exchange, networking and matchmaking is a commonality.

To summarize: (1) some states (MI, MO) adopt partnerships between state departments of agriculture and the most relevant industry association. Sometimes this joint action is extended

to colleges and universities, coherent with the correlation observed on Table 2. (2) Among all states there is a common pattern of industry associations focused on research and others on networking and promotion. (3) At both state and national levels, government agencies services are almost exclusively related to research funding. (4) At the national level, associations' offerings are predominantly composed of services related to overall knowledge exchange, networking, and matchmaking. (5) Knowledge exchange and networking occurs on national level associations and usually in the most relevant industry association of the state. Colleges and universities, in turn, have as their main role the dissemination of pre-existing knowledge.

DISCUSSION AND CONCLUSIONS

This study provides evidence that access to diversified knowledge is positively associated with performance and the suggestion that enhancing firm performance depends on being tied not simply to any or many firms and organizations, but rather to those that act as social and knowledge bridges (McDermott et al. 2009). This work reinforces overall previous findings (Fleming & Waguespack, 2007; Safford, 2004; Zuckerman & Sgourev, 2006) and explores specificities of less innovative industrial settings. If previously social and network bridging have allowed wineries to upgrade their products in innovative and mature, export-oriented industries, this work has shown the same mechanism works for less innovative, lower-quality, and less expensive markets locally oriented. One of the distinctive aspects found here is that industry associations have fulfilled the knowledge brokerage role, while in Medonza's case this role have been performed by public and private institutions (McDermott et al., 2009). Thus, further theoretical assumptions should consider that different organizations might act as knowledge anchors depending not only on the industry, but also on its governance structure.

The qualitative investigation on support activities provided to wineries has also proven to be a useful tool to identify how organizations support knowledge flow and integrate communities. Patterns of activities that constitute the offerings of those organizations have also shown to be helpful in characterizing organizations and preparing them to better absorb industry policies. In addition, regression results have demonstrated the suitability of the proposed conceptual model to analyze how inter-firm collaboration enhances performance. The three main factors that explain the phenomenon, namely relationship building, cost reduction and knowledge acquisition have shown to be plausible explanations for the results. Components of those factors such as economies of scope, have also demonstrated to be reliable reasons to understand entrepreneurs' engagement in network activity, once several organizations attract participants offering shared advertising as one of their services.

If helping wineries build an optimal portfolio of relationships and extract the most of their inter-firm collaborations is a managerial goal of this work, the results suggest that wine industry entrepreneurs in those clusters should focus on ties to industry associations. With low levels of resources, choosing wisely where to dedicate their managerial time to capture applied knowledge available on networks becomes crucial for their survivorship and development. Based on regression results, investing time in ties to other firms, including competitors, would not offer significant contributions to older wineries, though it may offer some benefit to newer ones. This may be explained by two reasons. First, competitors may not disclose critical applied knowledge to avoid further competitive pressures, even though they recognize benefits of a cooperative competitive scenario (Branderburger & Nalebuff, 1997). Second, relative to an industry organization that is capable of synthesizing a variety of knowledge through cross-cutting ties to agents within and between industries, gains of one-to-one interactions may be comparatively unproductive.

Entrepreneurs in industries similar to the wine industry may also benefit from these findings. A simplified guideline to optimize their composition of network ties would be based on

analyzing the types, extent, and variety of knowledge sources available in existing organizations, and then rebalancing their network engagement accordingly. Results have also shown the need to analyze and design industrial policies to the specificities of each state governance structure. States that intend to craft order in their industrial activity through partnerships between government agencies and industry associations, such as Michigan and Missouri, may require a different treatment comparatively to those who adopt an independent organization. The benefits of cross-cutting knowledge, previously identified in the literature (Zuckerman & Sgourev, 2006), and the characteristics observed in wine industry associations also denote the importance of incentivizing those organizations to explore inter-industry peer reviews of their practices. Chambers of commerce and trade associations, such as the National Association of Wholesaler-Distributors (NAW), are examples of successful approaches to the design of industry associations once they intentionally foster discussion among different industries and actively share applied knowledge suitable to different industries. Expanding the knowledge search to other industries may avoid the focal industry to be trapped in their own net (Gargiulo & Benassi, 2000).

Limitations and Future Research

Because our data are cross-sectional, we cannot track the changes in firm's network ties and performance over time, or fully address the potential endogeneity of a firm's network position. To test for endogeneity, we ran some alternative regressions with network ties as the dependent variable and firm performance as a regressor. In only one regression, the one using ties to industry associations as the dependent variable, firm performance was statistically significant. Another concern is that ties to associations and firm performance might be associated through a third, omitted variable. Eventually, decomposing industry associations in types, possibly guided by their patterns of offerings portfolio, would reduce this concern. Due to the size of the variance explained ($R^2 = 0.19$) and the complexity of identifying determinants of firm performance, omitted-variable bias may be the greatest drawback.

Further investigations may include pre-existing ties and levels of centrality of actors, once those who occupy more central positions in a network may be more exposed to high quality and fine-grained information than the others. Employing both qualitative and quantitative methods would also be beneficial to uncover omitted variables associated with network ties and performance. It would also be useful to have measures of absorptive capacity (Cohen & Levinthal, 1990) and learning, perhaps inferred by educational levels of firms' general managers and the presence of enologists, respectively. Wine industry entrepreneurs may also underestimate the benefits of product and process upgrading for commercial purposes and stick to usual routines that offer secure returns. Previously mentioned motivations of entrepreneurs leading companies of the sample reinforce that non-financial goals may inhibit them to pursue advanced management techniques that incentivize firms to abnormal returns. Thus, due to the specificities of the wine industry, controlling for profit maximizing intention could also improve the explanatory power of the model.

Adopting an analysis of firm performance per state would also help understanding the different signs and magnitudes of the coefficients found. In addition, it could also be analyzed how firms in each state perform in each type of factor used (competitive advantage and customer satisfaction). Segregating the analysis per state and factor is also justified by the hypotheses that each state can have its own commercial vocation. For instance, states in which customers demand low quality or cheap wine may have lower-performing firms due to its own demand characteristics. Even though the factors used to create the dependent variable present a simple structure (Thurstone, 1947), two alternative sets of specifications were used as a robustness check. The first uses the competitive advantage factor as the dependent variable, and the second uses the customer satisfaction factor as the dependent. As expected their explanatory power were not as high, but once integrated with the previously mentioned analysis per state, they may offer an opportunity to capture additional aspects of the phenomenon.

Based on the suppositions that network ties may substitute or diminish the relevance of participating in a wine trail and wineries of different sizes benefit differently from wine trail memberships, studying participation in wine trails may be more suitable using panel data, once different stages of development of a winery may lead to different uses of wine trail memberships. Since age is usually expected to contingent investigations on firm performance and the economic magnitude found was low and not significant, other types of distribution, such as quadratic, may be a different approach to use age as a control variable. Another complement to avoid misunderstandings is the specification of what is a tie to the respondent. Clarifying this concept right before asking the question is expected to help increasing the accuracy of the data.

Ideally firm performance would be better assessed through firm profits, but it is comprehensible the confidentiality of this information inhibits entrepreneurs to share it. Even though firm performance is widely treated in the literature as a multidimensional concept it is plausible to consider that every improvement in business process or products should be reflected in incremental cash flows, be in the present or in the future. In addition, since firms tend to compete in specific niches, controlling for those niches would also elucidate comparative performances in peer groups. Thus, measuring the dependent variable using firm's profitability and being able to separate firms into market niches could be a suitable way of inferring levels of performance. Alternative explanatory paths through which inter-firm collaboration enhances firm performance may also be adopted. Innovation for example has been described as a mechanism that unlocks performance benefits derived from network embeddedness (Clifton, Keast, Pickernell & Senior, 2010). In the wine industry, innovation could be assessed through the extent to which firms implement practices associated with product upgrading. Based on that, questioning whether the benefits from networks directly translate to firm performance or they manifest themselves through an intermediate business process like innova-

tion, might lead further research to consider alternative paths of explanation (Gronum, Verreynne & Kastle, 2012).

The key finding that industry associations, not government agencies or universities, are the primary knowledge brokers in the emerging wine regions, and that states craft order in their industries in different ways, shows that different organizations might act as knowledge anchors depending not only on the industry, but also on its governance structure. We expect that such approach gets incorporated to further research and becomes a matter of analysis of state and national governments in designing, diffusing and managing industrial policies according to the idiosyncratic features of the wine industry.

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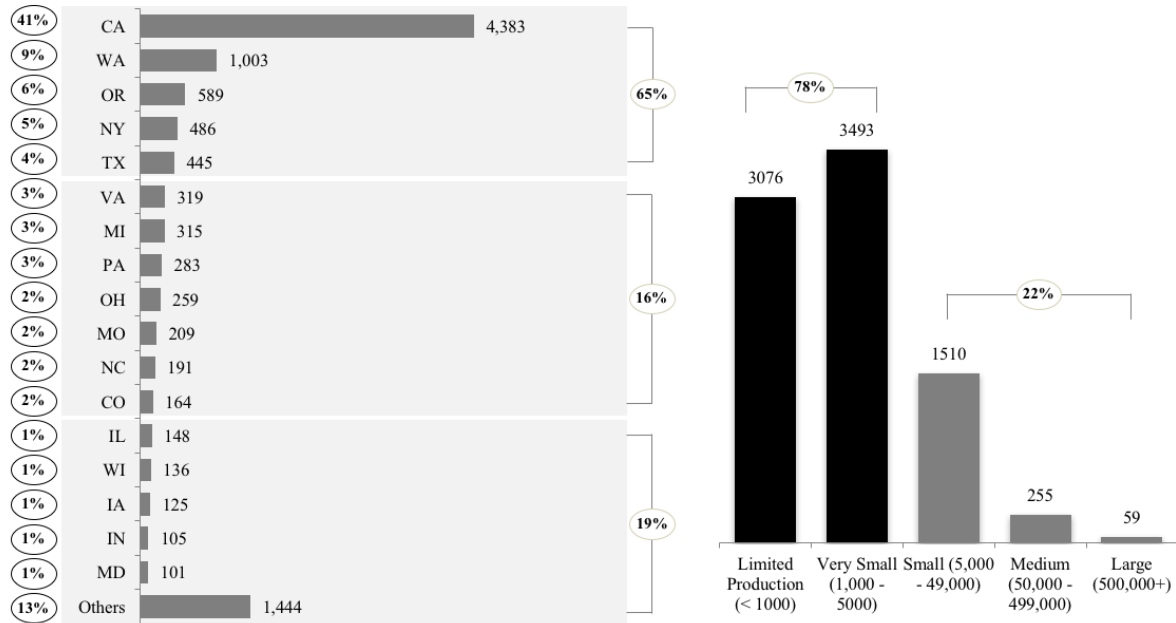
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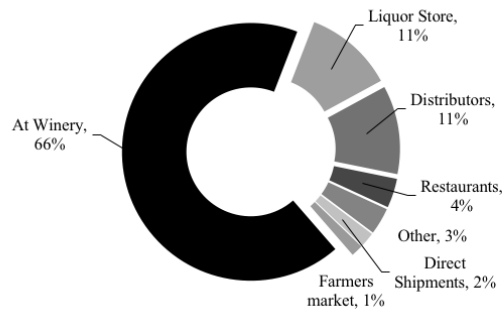
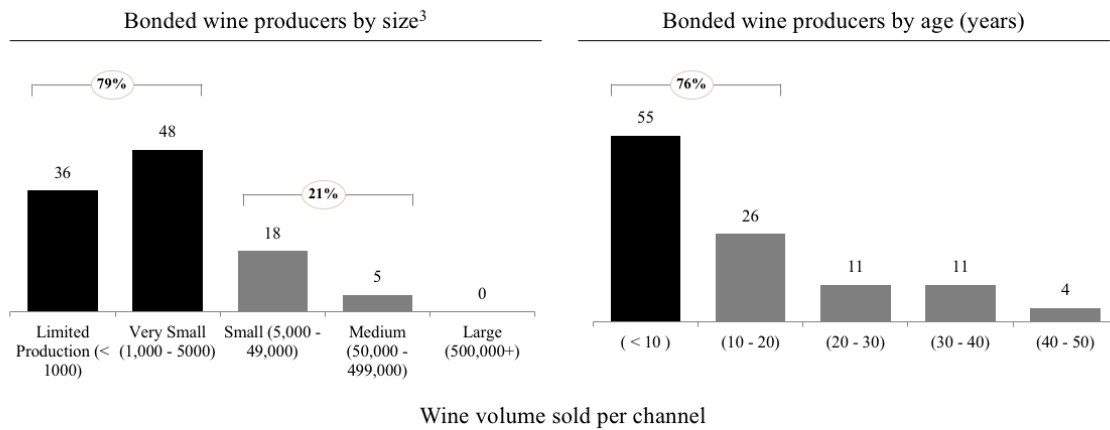
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FIGURE 1
Bonded wine producers by state and size ²



² cases

FIGURE 2
Bonded wine producers by size, age and wine volume sold per channel (Survey)



³ cases

TABLE 1
Rotated Factor Matrix^a

	Factor	
	1	2
(a) Competitive position	0.814	0.148
(g) Overall performance	0.741	0.370
(f) Profitability	0.704	
(e) Introduction of new, higher value products	0.313	0.278
(b) Customer satisfaction		0.973
(c) Tasting room	0.121	0.638
(d) Wine quality	0.340	0.524

Extraction method: Principal axis factoring

Rotation method: Varimax with Kaiser normalization

a. Rotation converged in 3 iterations

TABLE 2
Descriptive Statistics and Correlations

Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12
1. Firm Performance	22.73	3.61	1	.094	.214*	.120	.026	-.130	.274**	.218*	.316**	.182*	.151	.189*
2. Age	13.72	11.75	.094	1	.515**	-.115	-.095	.283**	.216*	.216*	.087	.055	.122	.055
3. Size	18.72	19.99	.214*	.515**	1	-.141	-.023	.208*	.310**	.290**	.111	.265**	.328**	.309**
4. Vermont	0.07	0.26	.120	-.115	-.141	1	-.194*	-.169*	.179*	.138	.309**	-.049	-.023	.047
5. Michigan	0.32	0.47	.026	-.095	-.023	-.194*	1	-.406**	.030	.059	-.014	-.094	-.078	.219*
6. New York	0.26	0.44	-.130	.283**	.208*	-.169*	-.406**	1	.117	.099	-.026	.285**	.276**	.007
7. Ties to all alters	38.98	34.68	.274**	.216*	.310**	.179*	.030	.117	1	.974**	.564**	.309**	.363**	.196*
8. Ties to all firms	31.91	29.89	.218*	.216*	.290**	.138	.059	.099	.974**	1	.391**	.186*	.265**	.171*
9. Ties to associations	2.32	4.10	.316**	.087	.111	.309**	-.014	-.026	.564**	.391**	1	.224*	.293**	.201*
10. Ties to government agencies	1.85	2.78	.182*	.055	.265**	-.049	-.094	.285**	.309**	.186*	.224*	1	.505**	.156
11. Ties to colleges and universities	1.36	1.32	.151	.122	.328**	-.023	-.078	.276**	.363**	.265**	.293**	.505**	1	.173*
12. Participation in wine trail	0.67	0.47	.189*	.055	.309**	.047	.219*	.007	.196*	.171*	.201*	.156	.173*	1

n = 107. Descriptive statistics are based on nominal values.

* Correlation is significant at the 0.05 level (1-tailed).

** Correlation is significant at the 0.01 level (1-tailed).

TABLE 3
Results of Regression Analysis with Firm Performance as Dependent Variable

Variables	Model 1	Model 2	Model 3
Intercept	21.61 (0.77)	21.26 (0.78)	21.29 (0.80)
Age	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)
Size	0.04 (0.02) [^]	0.03 (0.02)	0.02 (0.02)
Vermont	1.44 (1.39)	0.62 (1.42)	0.25 (1.45)
Michigan	-0.39 (0.87)	-0.63 (0.86)	-0.51 (0.86)
NewYork	-1.54 (0.91) [^]	-1.80 (0.91)*	-1.91 (0.94)*
Participation in wine trail	1.00 (0.80)	0.89 (0.79)	0.64 (0.79)
Ties to all alters		0.02 (0.01)*	
Ties to all firms			0.01 (0.01)
Ties to associations			0.19 (0.10)*
Ties to government agencies			0.17 (0.14)
Ties to colleges and universities			0.00 (0.31)
R2	0.11	0.15	0.19

$n = 107$. Standard errors are in parentheses. Missouri is the omitted location

[^] $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

TABLE 4, part 1: Support services on the wine industry – Michigan & Missouri

State	Name	Activities								Type	Legal form	
		Research funding	R&D	Education	Knowledge exchange	Problem solving	Networking & matchmaking	Promotion (marketing, PR)	Advocacy			
MI	Michigan Wines									Association	Public	
MI	Michigan Department of Agriculture & Rural Development	○	○	○	○			○	○	Government Agency	Public	
MI	MSU - Growing grapes for juice and wine			○						College or University	Public	
MI	Michigan Wine Producers Association								○	Association	Private	
MI	Straits Area Grape Growers Association							○	○	○	Association	Private
MO	Missouri Department of Agriculture	○							○	Government Agency	Public	
MO	Missouri Wine		○							Association	Private	
MO	Grape and Wine Institute			○						College or University	Public	
MO	Missouri Grape Growers Association				○	○	○	○	○	Association	Private	
MO	Agri Missouri							○		Government Agency	Public	
MO	Craft Beverages Unlimited Midwest				○		○	○		Company	Private	
MO	Missouri Vintners Association								○	Association	Private	
MO	VESTA - Viticulture and Enology Science and Technology Alliance	○	○	○	○					Government Agency	Public	

TABLE 4, part 2: Support services on the wine industry – New York & Vermont

State	Name	Activities								Type	Legal form
		Research funding	R&D	Education	Knowledge exchange	Problem solving	Networking & matchmaking	Promotion (marketing, PR)	Advocacy		
NY	Cornell - Finger Lakes Grape Program			○	○			○		College or University	Public
NY	New York Wines	○						○		Association	Private
NY	NY State Wine Grape Growers	○							○	Association	Private
NY	NY Wine Industry Association			○				○	○	Association	Private
NY	International Wine Center			○						College or University	Private
NY	NY State Department of Agriculture & Markets	○		○				○		Government Agency	Public
VT	Vermont Grape and Wine Council			○	○		○	○		Association	Private
VT	Vermont Wine			○	○		○	○		Portal	Private
VT	Vermont Wine Merchants Company							○		Company	Private
VT	Vermont Wine Press			○			○	○		Portal	Private
VT	Vermont Wine School			○						College or University	Private
VT	Vermont Agency of Agriculture Food & Markets	○		○						Government Agency	Public

TABLE 4, part 3: Support services on the wine industry – National

State	Name	Activities								Type	Legal form
		Research funding	R&D	Education	Knowledge exchange	Problem solving	Networking & matchmaking	Promotion (marketing, PR)	Advocacy		
US	Wine America	○			○				○	Association	Public
US	American Society for Anology and Viticulture		○	○	○		○			Association	Public
US	American Sommelier			○	○		○	○		Company	Private
US	American Vineyard Foundation	○	○		○		○			Research Center	Public
US	National Grape & Wine Initiative	○	○	○	○		○			Association	Public
US	American Wine Society			○	○		○	○		Association	Public
US	Free the Grapes			○					○	Association	Private
US	Society of Wine Educators			○			○			Association	Private
US	U.S. Department of Agriculture	○	○	○						Government Agency	Public
US	Wine Grape Growers of America				○				○	Association	Private