Value creation and value appropriation in networks: an empirical analysis in the South region of Brazil

Carla Maria Schmidt

State University of West Parana, Brazil

Corresponding author: c.m.schmidt@bol.com.br

Maria Sylvia Macchione Saes

University of Sao Paulo, Brazil

Guilherme Fowler de Avila Monteiro

Insper Institute of Education and Research, Brazil

Abstract

Studies on complex organizations, such as networks, are recent and deserve more in-depth empirical analysis. This paper contributes to this literature by investigating a network that operates within the Agro-Industrial System of wine in Vale dos Vinhedos, South region of Brazil. The network encompasses wineries, grape growers, hotels, restaurants and craftworkers. Within this complex system, several collective actions take shape with special mention to the existence of a certification of origin (Indication of Origin label) for fine wines. Although this certification is supposed to affect the several agents within the network, the actual impact of the certification is unknown. The present paper aims to identify (i) whether the network of Vale dos Vinhedos enables the creation of value for the different agents that operate within it and (ii) how the appropriation of value occurs within the network. Based on interviews and questionnaires conducted with wineries and grape growers, the article performs panel estimations. The main results point to a value creation scenario in the network. Specifically, the certification of origin has a positive impact on sales of both fine and common wines. Results also suggest that the certification has a positive influence on local producers' income. Regarding the appropriation of value, results suggest that the wineries are able to appropriate a greater amount of the value created within the network.

Keywords: Networks. Collective actions. Value Creation and appropriation.

1 Introduction

Important changes have occurred in the institutional environment of organizations since the early 80s. Among these changes, new forms of economic relations between firms stand out, such as strategic alliances and interorganizational networks. This context was strongly applied to the Agro-Industrial Systems, in which the organizations have created models based on collectivity, with interdependence bonds between several actors, posing as complex structures of governance among firms.

It is possible to witness beneficial synergies in complex systems, resulting from the complementary and core competencies. These models aim to create competitive advantages for firms, providing them access to new markets and new technologies, in addition to benefits and costs sharing (SACHS, 2003). This view is reinforced by Loader (1995), who asserts that the higher the level of cooperative behavior among interrelated agents in a complex organizational model, the greater the economic value available to the entire system. However, the collective systems may also present risks and costs, mainly related to the cooperation and opportunism from a few agents involved.

In general, the study of complex organizations, such as networks, needs to be further explored in order to allow empirical analysis (MÉNARD, 2004; ZYLBERSZTAJN; FARINA, 2006). Thus, this research intends to work with a greater understanding on the complex organizational forms, investigating the wine's Agro-Industrial System in the state of Rio Grande do Sul - Brazil, specifically in Vale dos Vinhedos, in Bento Gonçalves city.

We emphasize that the motivation of this study is not to investigate the wine sector in the state of Rio Grande do Sul, but rather to discuss a topic of great interest to the social and economic literature, namely collective actions carried out in complex structures. We chose to study this region for in it there is a network within the wine's Agro-Industrial System, made up of wineries, grape growers, hotels, inns, restaurants and craftworks, allowing the development of an empirical survey on the subject of interest. Within this network, there are several collective actions, with a remark to the acquisition of the Indication of Origin label regarding the fine wines in the region, in 2002.

This certification of origin affected several actors in the system, but the real impact of this action for those involved is unknown. This study specifically focuses on two agents: wineries and grape growers. Besides, in 2009, Vale dos Vinhedos began to seek another certification, the Denomination of Origin of Fine Wines. This certification will again be the result of collective actions and will affect different players. It is noteworthy that the Indication of Origin of the fine wines of the Vale dos Vinhedos was the first to be granted in Brazil, and there is still no Denomination of Origin in the country.

This study intends to foster a greater understanding of the meanings that collective actions and the interdependence of agents take on within complex systems. To this end, some questions guide the research: How does the network inserted in the wine's system in Vale dos Vinhedos enables the value creation for the collective actors involved? What is the influence of the factors - interdependence and collective action - on the creation and value appropriation of the complex organizational form of the Vale dos Vinhedos? How is the distribution of value created between the collective actors in the Vale dos Vinhedos network?

2 Complex Organizational Forms – Emphasis on Networks

The complex systems have received attention from the researchers in Sociology, Business Administration and Economics areas. Several approaches are recognized within the literature of complex systems. Networks, clusters, supply chain systems, net chains, joint-ventures and alliances are concepts which refer to these systems. Considering that the object of this study has the organizational form of a network, such organizational models will be discussed in the present article.

The essence of the networks theory is pointed by Granovetter, sociologist who made a significant contribution for this literature. Granovetter (1973) affirms that basically, two kinds of ties exist within a social network: the strong and the weak. The strong ties exist for a long period of time, and this is a relation of effort, confidence and reciprocity. People who share strong ties in general participate of the same circle or social group, highly clustered. Granovetter proclaims that such ties aggregate little value to the companies in situation of resources search, since due to the homogeneity that they present, they have the same information and resources already existent in the network.

Now, the individuals who integrate a network with weak ties develop punctual transactions among them, so that issues like confidence and reciprocity show little importance. On the other hand, these relations are justly important because they work as a type of bridge, allowing the individuals to be connected to several other social groups, forming a network, unlike the strong ties that are shown as isolated isles.

Thus, Granovetter (1973) evidenced that the so-called weak ties are more important in the maintenance of the social network than the strong ties, for which greater importance used to be given by the sociologists. The weak ties are likely to generate new information and aggregate value to the relationship, since they can connect each actor of the network to other agents, sharing different sources of information. Furthermore, when the same individuals transact for a long period, fact that occurs in strong ties relations, the relationship can get strained and the possibility of innovation becomes smaller and smaller.

Within this perspective, the view of Burt (1992) can be mentioned, when presenting the perspective which he denominated of structural holes, i. e., groups of people who do not know each other or do not share information among themselves can exist within a network.

In order to understand the theory of Burt about the structural hole it is fundamental to imagine that the individuals can be disconnected from each other within the network. Thus, the structural hole represents an opportunity of handling the information flow that exists within it. Burt (1992) supports that some actors can benefit more than the others, i. e., actors who have strategic positions, of centrality and connection within the network can benefit, regarding the information flow and repassage of resources. So, it is understood that the structural holes open space for the actuation of opportunistic agents.

In another work, Granovetter (1985) discusses that the actors do not behave or make decisions out from a social environment, since the human behavior has strong rooting within a system of ties or social relations. Thus, it is evidenced that the networks have to be understood from the analysis of the relations existent among determined social actors. Therefore, it is not correct to interpret behaviors and institutions as independent elements of the social relations, i. e., every action or economical behavior is rooted or involved by social relations.

Larson (1991) also discusses the issue of embeddedness. In their opinion, this phenomenon has significant impact on the company's decision to make alliance with another company or not. It occurs, because the organizations form ties with those, which identify themselves as suppliers of critical resources and abilities that are complementary to theirs. However, they also consider the position of their partners within the social structure of the network, that is, their level of embeddedness. The mechanism of embeddedness enables the organizations to identify complementary and reliable partners, reducing, so, the risks of the cooperation, fundamental for the search of efficiency and competitiveness at any cooperative arrangement. The main risks of cooperation are the opportunistic actions of some agents of the collective system.

In general, the embeddedness of networks is seen as a strategic resource for the companies. The conduct and the performance of the companies are directly influenced by the embedded relationships. The relations are simultaneously competitive and cooperative and, inclusively, the income of the companies is result of their own resources and also of the structure of the network in which they are embedded (GULATI et al, 2000).

Thompson (2003) notes that networks assume theoretical rationality distinct from other governance mechanisms on the basis of characteristics such as non-reciprocity in relationships and non-calculated trust. It is worth noting that the author makes an interesting contribution regarding the limits of these structures. He states that there are no clear boundaries within a network, so that

the limits perceived by one actor may be different from other views, since the network is a multidimensional structure with dynamic borders.

3 The interdependence between collective actors

Lazzarini et al (2001) and Saes (2009) discuss the existence of multiple bonds of interdependence between the networks agents, based on the study of Thompson (1967). Saes (2009) presents three basic types of coordination for the solution of value creation problems, and they differ according to the complexity of the problem.

The first style is called a joint interdependence. In this style, each agent of the system has a contribution defined for a specific task. The relationships between the agents are sparse and the social bonds between them can be considered weak. In this type of interdependence, the prices reflect all the required incentives. However, the agents involved have little influence on the products prices, which are set by the market. This is a low-complexity problem, in which the appropriate vertical governance structure is the market.

The second type of interdependence is the sequential type. In this case, an activity sequentially precedes the other and the process involves several actors. According to Saes (2009), the type of solution regarding the complexity of the problem in this case is considered average, however, the hierarchy-based authority is necessary so that strategic information are not scattered. In terms of result, this structure can be more beneficial to the agents than the joint interdependence, since there is the creation of a value to be negotiated.

Finally, the third style is called mutual interdependence. In this style, each agent is mutually dependent on the choices and actions made by the other actors, since the actions of one affect the activity of others. In this case, the co-specialized knowledge occurs, that is, the knowledge of an agent strongly depends on the knowledge of another agent (LAZZARINI et al, 2001). Regarding the decision rights, they are distributed among the agents, involving a complex process of solution. For Saes (2009), due to the complexity and, consequently, difficulty to imitate, the resources created in this system can improve the appropriation of the margin by the agents involved. However, as there are several actors, there may be opportunistic behaviors, such as free-riders.

This type of interdependence is close to the networks approach, thus being the ideal style for the viticulture network under study. In Vale dos Vinhedos, the mutual interdependence possible occurs when wineries have contracts only with the network growers and, likewise, when the wine growers exclusively hire processing firms that are part of the network.

Next, we present a discussion on the complexity of the collective organizational forms, based on an understanding of the opportunities and risks existing in these structures.

4 Collective actions in networks: costs and opportunities for value creation

One of the most cited works in the literature of collective action is *The Logic of Collective Action*, developed by Mancur Olson in 1965. His approach has made significant contributions to the subject.

By understanding the collective actions logic, Olson (1999) analyzed the rationality of individuals, investigating individual rationality versus the collective rationality. For the author, the collective benefits are insufficient to motivate the individual contribution, and in most cases, the collective agents do not tend to behave in a rational way to achieve the common goals for the group.

In his theory of social groups, Olson (1999) analyzed the influence of group size for the collective behavior. The author showed that smaller groups are more efficient than large ones, because the larger the group, the less it would promote towards the common interests. In addition, he identified the presence of free-riders on the group formation, and, in large groups, the actors tend to tolerate their presence more easily than in small groups.

Overall, Olson (1999) argues that individuals hardly seek the collective wellbeing as a result, contrasting the individual welfare. Even sharing the same interests, the agents do not tend to act collectively, because they believe their effort is greater than the benefit they would achieve with the collective action. In the author's view, agents need incentive mechanisms to overcome this problem of non-participation. These incentives can be economic, social, or psychological and include prestige, respect, and friendship. Olson (1999) distinguishes two types of incentives: positive, meaning private benefits that are offered to the collective agents; and negative, punishments for individuals who do not contribute to collective actions. Both serve as motivation for individual contribution to the collective action.

Another significant contribution to the collectivity subject is presented by Ostrom (2007). The focus of his theory lies in understanding why individuals cooperate in a social dilemma, when they can take advantage of the contributions of other group members. In general, the author agrees with Olson's view, by affirming that even though the actors have common interests, there are forces opposed to a collective action, as they may think their effort would be greater than the benefit of joint action.

However, it is important to recall Burt’s perspective (1992) on the structural holes existing in the collective system. For Burt, the structural hole is an opportunity to arrange network information flow, that is, actors who have strategic positions of centrality and connection within the network may benefit in respect to the information flow and forwarding of resources. Thus, it is understood that the structural holes give an opportunity for the performance of opportunistic agents.

However, despite the existence of cooperation costs and the possibility of opportunistic behaviors in collective systems as networks, it is believed that these structures are only adopted by agents when gains exceed losses. In this perspective, it is essential to identify the potential sources of economic value creation for networks and collective arrangements. For such, an investigation effort was carried out, based on authors of different theoretical perspectives, as described below:

a) Innovation – the creation and combination of unique resources (GRANOVETTER, 1973; POWELL, 1990; PETERAF, 1993; LARSON, 1991; SAUVÉE, 2002; KIM; MAHONEY, 2006; 2007; GRANDORI, 2009);

b) Reduction of monitoring costs (WILLIAMSON, 1996; GULATI; GARGIULO, 1999; LAZZARINI ET AL, 2001; CLARO, 2004; ZYLBERSZTAJN; FARINA, 2006);

c) Positive externalities (ECONOMIDES, 1996; PORTER, 1999; GULATI ET AL, 2000; LAZZARINI ET AL, 2001; ZYLBERSZTAJN; FARINA, 2006);

d) Reduction of transaction costs (WILLIAMSON, 1996; SAUVÉE, 2002; MÉNARD, 2004; CLARO, 2004, 2009; FOSS; FOSS, 2005; ZYLBERSZTAJN; FARINA, 2006);

e) Generation of knowledge and exchange of information (LAZZARINI ET AL, 2001; CLARO, 2004, 2009, GRANDORI, 2009).

It was found that different theoretical perspectives basically recognize five major sources of value creation of complex systems, which is in accordance with Lazzarini et al (2001), by stating that complex organizational models may create value from different forms.

5 Construction of the study hypothesis and theoretical model

The literature review identified that the collective forms are competitive structures that enable the creation of value for the collective agents involved, a fact that motivates these actors to cooperate and work collectively.

Thus, this study considers the central assumption that networks are potential sources of value creation, due to their particular characteristics. This assumption outlined the main hypothesis of the study, as shown below.

Hypothesis 1: The network of wine's Agro-Industrial System of Vale dos Vinhedos allows the value creation for the investigated collective actors (wineries and growers).

Burt (1992) and Ostrom (2007) highlight the difficulty of cooperation in networks, in view of the existence of opportunistic individuals, the conflicts between the individual rationality of agents and the ideal results for a group, in addition to the abuse of common resources by a few agents involved. However, since the collective actors are free, it is believed that where there is no gain by cooperation, the collective action seems to be unsustainable in the long term.

Moreover, the assumption that the investigated viticulture's network allows the value creation for the collective agents involved is based on the arguments of several authors, as presented, for which the networks are presented as competitive advantage structures, since they enable the formation of several sources of value, such as: innovative products and processes; reduction of monitoring and transaction costs; formation of positive externalities and generation of knowledge and information. This hypothesis is divided into two others:

Hypothesis 1a: The collective actions (certification) developed between the actors of the network of Vale dos Vinhedos positively influence the value creation of that structure.

It is believed that one of the factors that positively influence the value creation of the network of Vale dos Vinhedos are collective actions developed between the actors of the system, which in this case occurs with the certification of fine wines.

The theory of collective systems reveals that through joint actions, the agents are able to obtain resources that are not easily available, since almost no company or agent can be considered self-sufficient. The synergy present in the joint action, resulting from the complementary and core competencies, may generate competitive advantages, as it combines low cost with differentiation. Thus, the partnerships become advantageous for the actors involved, so that the higher the level of cooperative behavior among the agents interrelated in the network, the higher the income level available to the network as a whole.

Hypothesis 1b: The interdependence level of collective actors also has a positive influence on the value creation of the network.

Given that it is a network, we believe that the actors of Vale dos Vinhedos develop a mutual interdependence, in which each agent is mutually dependent on the choices and actions made by other actors, since the actions of one affect the activity of others.

As seen in the literature, due to the complexity and difficulty of imitation present in the mutual interdependence, such mutual interdependence allows the appropriation of results by the agents involved. It is thus understood that the wineries and growers in the Vale dos Vinhedos that have contractual relationships with each other and produce fine grapes specifically for certification (governance structures that approximate the logic of mutual interdependence) provide forms of governance which favor value creation in the network.

Hypothesis 2: There is greater value appropriation by wineries than by grape growers.

Because the Indication of Origin of Fine Wines from the Vale dos Vinhedos was an innovative initiative by the wineries, and it is up to them to determine the conditions of production

organization, it is believed that these processing firms are able to appropriate more of the value created within the network than grape growers. Another factor that further contributes to this assumption is that the wineries have information about the collective process as a whole (cost of production of grapes, asset specificity, future strategies for the sector), which can lead to a better bargaining position vis-à-vis producers.

This hypothesis is further supported by the fact that the certification of fine wines from the Valley of Vineyards not only restricts the fine grape varieties, but also limits the yield per area, requirements which entail transaction and production costs for grape producers.

Based on the discussion of the hypotheses and the literature review, a theoretical model for this study has been developed, as shown in Figure 1.

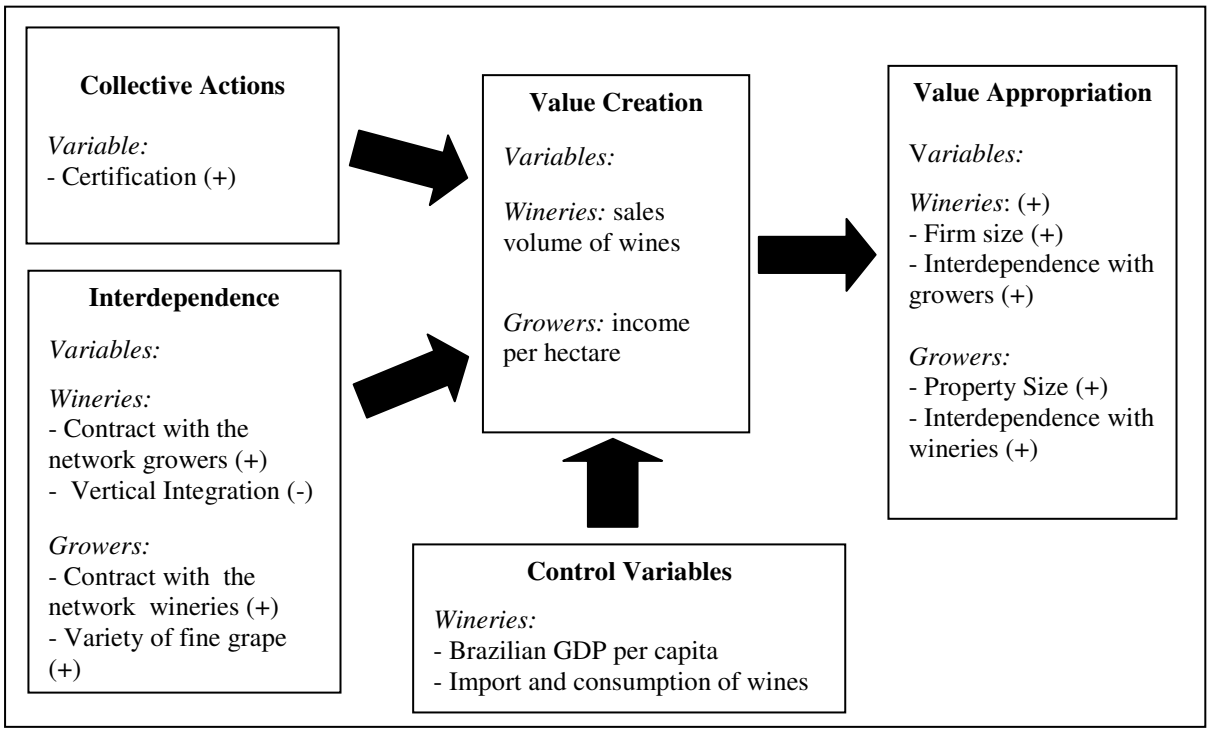

Figure 1 – Value creation and appropriation in networks

It is worth to mention that this theoretical construct served as a guide for the empirical survey that will be presented in the following sections.

6 Methodological procedures

The empirical research was conducted by means of primary data, obtained through surveys and questionnaires accomplished next to the grape growers and wineries (wine processing companies) of Vale dos Vinhedos. Therefore, a pre-test was accomplished in August, 2009, both with the wineries and the producers, in order to find possible failures in the instruments of data gathering to be used. The second and definitive data gathering happened in September, 2009.

In total, 31 wineries are inserted within the geographical delimitation of Vale dos Vinhedos, whereas from this total, 25 integrate the collective system of the region, i. e., they are associated to Aprovale, being, therefore, focus of this study. It was intended to accomplish a census research paper with the wineries; nevertheless, three entrepreneurs did not collaborate with the research, so it was possible to interview 22 wineries, which represented a sample of 88% of the total population. However, it is worth pointing out that during the interviews, it was verified that two wineries were created a few months ago; therefore they do not show historical data and neither possibility of answering the questions. Thus, it was opted to work with data of 20 wineries.

Concerning the grape growers, even in contact with the wine institutions, up-to-date data were not obtained regarding the number of establishments which produce grapes. Thus, the information of 2006 was used, released by Embrapa Grape and Wine. According to the institution, in 2006 there were 308 entries on winegrowing regarding Vale dos Vinhedos region.

So, it was accomplished a research work in loco in the entire region of Vale, through visits to the residencies of the producers, reaching a total of 109 grape growers interviewed. It is highlighted that during the research it was possible to notice that the number of rural establishments running is inferior to 308. Maybe, it is justified by the fact that Embrapa data are out-of-date. Besides, it was verified that in the same establishment it can exist more than one entry on winegrowing, once the farmers are used to registering several members of the family, and the result is that in a single property there are two or three entries. Thus, because of this inconsistence about the exact number of producers, it was not possible to work with sampling, whereas the territorialization was the most appropriate technique for the context.

It should be noted that data were analyzed through econometric tests (specifically regressions with panel data from 10 years). Two estimations were made for the wineries, each involving 158 observations, using as proxies Sale of Fine Wines and Sale of Common Wines. For producers, a single estimate was made with 992 observations, using the proxy Producers' Income per Hectare. The independent variables are described in the results analysis which follows.

In addition, we used the descriptive analysis, which allowed the interpretation of the half-open issues of the research instruments, as well as the speeches of the interviewees, once there was direct personal contact with all the researched subjects.

7 The empirical results

Value creation for wineries

The main purpose of this section is to identify whether the network included in the wine's agro system of Vale dos Vinhedos enables the value creation for the wineries. In this regard, we intend to discuss the influence of the collective actions and interdependence on the value creation of the wineries. In total, data from twenty wineries were used, which regard to the period between the years of 1999 and 2008. The data were organized in a panel model. The model is described as follows:

$$Y = \beta_0 + \sum_{i=1}^{10} \beta_i * \mathrm{X}_i + \varepsilon$$

It is worth to point out that two estimates were made, only changing the dependent variable. Table 1 gives a more detailed description of the variables used. In total, the estimates carried out with the wineries indicate seven independent variables and three control variables.

Table 1 - Description of Variables - Value Creation by wineries

Variable	Description
Y = Coefficient of the dependent variable *Trading Volume of Fine Wines*	Volume of fine wine (liters) sold by each company. Dependent variable of the first regression performed
Y = Coefficient of the dependent variable *Trading Volume of Common Wines*	Volume of common wine (liters) sold by each company. Dependent variable of the second regression performed
β0 = Intercept of the regression	
β1*X1 = Coefficient of the Independent Variable *Label*	Certification of fine wines from Vale dos Vinhedos. Dummy variable. Value 1 corresponds to the early years of the Label (2002) and subsequent years up to 2008 and value 0 corresponds to the years prior to 2002
β2*X2 = Coefficient of the Independent Variable *Supplier from Vale dos Vinhedos only.*	Dummy variable. Value 1 corresponds to the characteristic of possessing exclusive grape supply from Vale dos Vinhedos and value 0 corresponds to other types of supply
β3*X3 = Coefficient of the Independent Variable *External Supplier Only.*	Dummy variable. Value 1 corresponds to the characteristic of possessing exclusive grape supply from outside Vale dos Vinhedos and value 0 corresponds to other types of supply
β4* X4 = Coefficient of the Independent Variable *Own Production Only*.	Dummy variable. Value 1 corresponds to the characteristic of possessing own production only and value 0 corresponds to having suppliers
Note in relation to β2*X2, β3*X3 and β4*X4. Four possibilities to obtain grape were analyzed: a) obtaining grapes only from suppliers in Vale dos Vinhedos; b) obtaining grapes only from external suppliers; c) having its own production only; d) mix between own production and both types of suppliers, being this case the comparison basis	
β5*X5 = Coefficient of the Independent Variable *Microenterprise*	Dummy variable. Value 1 corresponds to the company's characteristic of being a micro enterprise and value 0 corresponds to the other corporate sizes.
β6*X6 = Coefficient of the Independent Variable *Small enterprise*	Dummy variable. Value 1 corresponds to the company's characteristic of being a small enterprise and value 0 corresponds to the other corporate sizes.
β7*X7 = Coefficient of the Independent Variable *Medium enterprise*	Dummy variable. Value 1 corresponds to the company's characteristic of being a medium enterprise and value 0 corresponds to the other corporate sizes.
Note regarding β5*X5, β6*X6 and β7*X7. There are four potential corporate sizes: (micro, small, medium and large). For this, three dummy variables were created, and the comparison basis is the large size company. The company sizes were create based on the number of employees (Source: IBGE/SEBRAE)	
β8*X8 = Coefficient of the Control Variable *GDP per capita*	Annual gross domestic product (GDP) per capita of Brazil
β9 * X9 = Coefficient of the Control Variable *Volume of Fine Wines Import*	Volume of imported wines (liters) per year in Brazil
β10*X10 = Coefficient of the Control Variable *Brazilian consumption of wine per capita*	Consumption of wine (liters) per year per Brazilian inhabitant
ε = Stochastic error	

In general, it is expected for the *sales volume of fine wines* from wineries to improve after the introduction of the Indication of *Origin label* of Fine Wines. The *label* variable is of great interest for the research, as it represents the most significant collective action developed between the actors of Vale dos Vinhedos. Regarding the possibilities of obtaining the grapes, it is expected that the one indicating the greatest positive impact on the sales volume of fine wines is the variable *supplier from Vale dos Vinhedos only*, since it represents the strongest degree of interdependence between wineries and grape growers.

On the other hand, regarding the corporate size, it is estimated that the larger the company, the greater the opportunities for investment, such as industrial adjustments in relation to the Origin Label and also in the products marketing, factors that might positively affect the companies' sales

volume. In addition, the estimates have three control variables that possibly affect the sales volume of wineries: *the National GDP per capita, the volume of wine imports in Brazil and the Brazilian per capita consumption.*

Before proceeding to the analysis of the estimates, one aspect should be remarked. The initial purpose of the research was for the dependent variable to be the annual revenue (R$) of the wineries. However, several companies did not provide this information, hindering such a proposal[i]. Thus, the proxy that indicated greater ability to explain the history of value creation for the wineries is their volume of wine sold.

Initially, estimates were made considering fixed and random effects. By conducting the tests for the significance of these effects, we found that both were significant. In this case, the Hausman test was used to determine which of the two estimates would be the most appropriate. The test indicated that the difference of the coefficients for fixed and random effects is not systematic, thus the random effects model was chosen. Before proceeding, three conditions were analyzed: the presence of heteroscedasticity, serial autocorrelation and independence between cross-section units. The results indicated a strong presence of heteroscedasticity and the presence of serial autocorrelation, the latter one was measured by Wooldridge's test. In order to identify the existence of independence between units, the Pesaran`s test was supposed to be used, which could not be estimated as the panel was unbalanced. Thus, to a lesser bias, it was considered that the cross-section units are not independent.

Since the temporal dimension of the panel (10 years) is lower than the number of cross-section units (20 wineries) and based on Beck; Katz (1995) used the Prais-Winsten model instead of the Model of Generalized Least Squares[ii]. Table 2 shows the evolution of all steps taken. However, the discussion takes place only on the Prais-Winsten estimation, as it indicates the final results found.

Table 2 – Estimation for wineries – Fine wine sales

Dependent variable:	**Trading Volume of Fine Wines**		
Cross-section units		**20**	
Time		**1999 - 2008**	
Number of observation		**158**	
[Standard error in brackets]			
	Fixed Effects	**Random Effects**	**Prais-Winsten**
Microenterprise	**-**	**-631548.2**	**-652732.8**
		[155522.1] *	[59793.32] *
Small enterprise	**-8769.70**	**-397973.8**	**-443897.2**
	[76487.65]	[168232.4] **	[89654.41] *
Medium enterprise	**-27283.79**	**1393963**	**1892427**
	[173030.4]	[205583.3] *	[115889.3] *
Label	**32052.1**	**88610.98**	**93818.25**
	[59369.75]	[90810.33]	[41092.8] **
Supplier from Vale	**143348**	**-103136.7**	**-69590.27**
	[156990.7]	[98620.57]	[21350.17] *
External Supplier	**149108.1**	**-158533.6**	**-106934.5**
	[221838.5]	[96636.33]	[30594.5] *
Own Production	**16609.91**	**-135553.2**	**-94827.91**
	[97735.91]	[76370.88] **	[31394.48] *
GDP per capita	**-3.41**	**-8.83**	**-8.46**
	[17.16]	[26.30]	[11.82]
Volume of wines import	**-0.00038**	**0.0006**	**0.0006**
	[0.003]	[0.004]	[0.0021]
Consumption of wine	**46723.97**	**23316.36**	**-13260.36**
	[158129.6]	[241651]	[113364]
Constant	**151913**	**722089.9**	**752213.5**
	[264293.2]	[425310] **	[197823] *
R-squared	0.052	0.85	0.86
Wald-Chi2 (10)		262.40	22936.61
Prob. > Chi2		0.000	0.00
* significance at 1%; ** significance at 5%; *** significance at 10%.			
Notes:			
1. Fixed effects test: F(19. 129) = 48.70 ; Prob > F = 0.00			Fixed Effects are significant.
2. Random effects test: chi2(1) = 3.27; Prob > chi2 = 0.0707			Random effects are weakly significant.
3. Test for heteroscedasticity: chi2 (20) = 1.2e+35; Prob>chi2 = 0.0000			Strong presence of heteroscedasticity.
4. Wooldridge test for autocorrelation: F(1. 17) = 710.785; Prob > F = 0.0000			Presence of autocorrelation

By analyzing the results of Prais-Winsten's estimation, it is possible to observe some important aspects. The Indication of Origin label – a network's collective action – had a positive impact on the sales volume of fine wines from the wineries, that is, after the introduction of the certification, the average sales of fine wines from the wineries have increased, showing that the *label* has a positive influence on the value creation of the wineries. Whereas the certification strategy is pioneer in Brazil – despite being widely used in other countries – it is possible to say that there were still several questions regarding its performance, including among the collective actors of the network. This uncertainty could be noticed during the interviews with employers, as some of them were not sure on the label's result, which can explain why 20% of the interviewed companies had never requested the label for their fine wines.

As the certification is the most significant representation of the complex structure of Vale dos Vinhedos, the result found partially answers the main inquiry of the research. In some measure, because it only reflects the reality of the wineries, to which the network structure allows the value creation. However, the impact of the network for the other analyzed actors remains unknown.

Therefore, it is understood that the effort from the collective and pioneer work of the network under analysis, as well as the wineries' investment (search for local raw materials, quality and monitoring) are worthwhile for the firms. It is worth to remember the work developed by Aprovale, an entity representing the wineries of the region, which played a key role in the process to obtain the certification.

The second issue of great interest refers to the influence of the interdependence level on the value creation. It specifically aims to find out what happens concerning the raw material (grapes) supply for the production of wine, or, the most appropriate governance structure for the wineries. In this subject, as previously shown in Table 1, four cases were analyzed: a) exclusively possessing network suppliers; b) exclusively possessing suppliers outside the network; c) exclusively working with its own production (vertical integration) and d) mix between own production and both types of suppliers (from Vale dos Vinhedos and from other regions). It thus represents the comparison basis.

The theory leads us to believe that the option that creates more value is the first one, representing the mutual interdependence between the actors and enabling the label acquisition, followed by the vertical integration option, as it is also an alternative that completely allows the label acquisition. However, the result found in the estimation does not agree with the theoretical presumption. The first three cases were all significant, but adversely affect the value creation, refuting Hypothesis 1b of the study, for the case of wineries. In other words, the result shows that the three dummies analyzed in the estimation represent opportunities for wineries that are worse than the alternative, which is the comparison basis for this case, that is, having a mix between own production and both types of suppliers. It is noteworthy that 30% of the analyzed firms are in this scenario.

This result leads us to believe that the diversity of options for the supply of grapes is crucial and it is more advantageous for the wineries to have a wider choice of fine-grape suppliers than to rely on just one type of supplier, or even, to simply rely on the own production of the winery. One can also infer that it is important that firms work with certified wines, but not exclusively, since the grapes acquired from outside Vale dos Vinhedos cannot have the label.

However, it is worth to point out that the option of *obtaining grapes from external suppliers only* (which includes 15% of the firms analyzed) and *vertical integration only* (40% of the wineries interviewed) are respectively, the alternatives that present the worst performance for the wineries

from Vale dos Vinhedos. This reinforces the result that the network structure creates value for the wineries.

In addition to the analysis above, another aspect shall be highlighted: during the empirical research, it was found that there is a great size disparity between the wineries in the network, which led to the verification of the firms size influence on their value creation. The estimation indicated that the average size (which represents only 5%) have a positive impact on the wine sales, in contrast to micro and small enterprises, which have negative influence on the sales volume. Therefore, it was found that medium enterprises indicate better performance than large enterprises (comparison basis in this case) and that small and micro enterprises have, respectively, the worst results.

This result is very close to what was expected. There was only one change in relation to the results from medium enterprises, which were believed to have lower performance than the large ones. It is worth to point out that the results presented in the estimation were already expected by the owners, as some of the respondents from small and micro enterprises were concerned about their companies' performance and work focus, stating that they need to organize and create strategies focused on their particular reality, similar to what larger companies do.

An additional aspect regarding the estimation refers to the fact that control variables have not indicated any significance. Even though it was not the research focus, it was believed that the external factors analyzed had influence on the sales volume of fine wines. Among them, there was a greater intuition on the volume of wine imports, especially because this factor was identified as critical in the interviews with the entrepreneurs from the wineries. However, the insignificance of this control variable can be explained because the wines that represent strong competition are exactly those acquired in a clandestine manner, they are thus not considered in this survey.

As mentioned in the beginning of the section, another estimate was performed for the wineries, considering *the sales volume of common wines* as the dependent variable. At first, this analysis may seem inappropriate, as the IPVV certification only refers to the fine wines of the region. However, the purpose in this case was to verify whether the collective actions undertaken in the network create positive externalities for the wineries, specifically regarding the sales of common wines.

The same procedures regarding the estimation method were conducted, that is, the fixed and random effects were firstly estimated, and they were both significant. Hausman's test indicated that the coefficients difference for both effects is not systematic, so the random effect model was chosen again. Then, the conditions regarding the presence of heteroscedasticity, serial autocorrelation and independence between the cross-section units were analyzed.

The results indicated the presence of heteroscedasticity and serial autocorrelation. Again, the Pesaran test could not be estimated, assuming that the cross-section units are not independent. The complete evolution of the steps taken can be seen in Table 3.

Table 3 – Estimations for wineries: Common wine sales

Dependent variable:	**Trading Volume of Common Wines**		
Cross-section units		**20**	
Time		**1999 - 2008**	
Number of observation		**158**	
[Standard error in brackets]			
	Fixed Effects	**Random Effects**	**Prais-Winsten**
Microenterprise	-	**-100923.9**	**-104875.7**
		[532312.9]	[17755.91] *
Small enterprise	**256518.4**	**39083.37**	**-358934.1**
	[170802.7]	[545258.8]	[40750.64] *
Medium enterprise	**311244.5**	**-42648.71**	**-738841.5**
	[386389.9]	[608642.9]	[79717.8] *
Label	**234108.8**	**227937.2**	**180726.4**
	[132577.1] ***	[130.553] ***	[76938.7] **
Supplier from Vale	**-3159.69**	**-178342.4**	**-612965.8**
	[350572.1]	[230405.5]	[78116.67] *
External Supplier	**-10879.98**	**-261103.9**	**-541079.3**
	[495382]	[273466.6]	[65458.53] *
Own Production	**-82588.58**	**-192474.5**	**-568789.1**
	[218251.7]	[172107.3]	[73910.12] *
GDP per capita	**-33.04**	**-30.80**	**-23.15**
	[38.32]	[37.78]	[20.80]
Volume of wines import	**0.0040**	**0.0038**	**0.00271**
	[0.007]	[0.0069]	[0.0037]
Consumption of wine	**159680.6**	**152056.6**	**119035.5**
	[353115.4]	[347448.6]	[195403.4]
Constant	**-140429.3**	**84761.25**	**535336.8**
	[590186.6]	[782528.8]	[324547.4] **
R-squared	0.0026	0.062	0.2176
Wald-Chi2 (10)		6.46	535.55
Prob. > Chi2		0.77	0.00
* significance at 1%; ** significance at 5%; *** significance at 10%.			
Notes:			
1. Fixed effects test: F(19. 129) = 13.85 ; Prob > F = 0.00			Fixed Effects are significant.
2. Random effects test: chi2(1) = 250.3 ; Prob > chi2 = 0.00			Random effects are significant.
3. Test for heteroscedasticity: chi2 (20) = 1.1e+34; Prob>chi2 = 0.00			Strong presence of heteroscedasticity.
4. Wooldridge test for autocorrelation: F(1. 17) = 3.277 ; Prob > F = 0.08			Presence of autocorrelation

By analyzing the results of Prais-Winsten estimation, it can be observed that the label indicates a positive influence on the sales volume of common wines from wineries. This result shows that after the introduction of the certification, the average sales of common wines from wineries have also increased, which means the *label* (variable that represents the collective actions) generated positive externalities. Therefore, it created value for the wineries. This result is in accordance with the networks theory, which suggests the positive externalities as one of the sources of value creation of complex systems, as previously shown.

Moreover, it is worth to point out that in this estimation, the medium size of firms has a negative influence on the *sales volume of common wines*, being the type of firm that indicates the worst performance in this respect. Overall, the results of the other variables are very similar to those found in comparison with fine wines. For this reason and because common wines are not the focus of this study, other results are not specifically discussed.

Based on the results found in both estimations, it became clear that the viticulture network of Vale dos Vinhedos allows the value creation for the wineries that are part of it. The next section presents the results of the research conducted with the grape growers in that region.

Value creation for growers

This topic aims to identify whether the wine network of Vale dos Vinhedos allows the value creation for the growers that are part of it. Similar to the wineries case, it intends to discuss the influence of the collective actions and interdependence on the value creation of growers and on the relations that occur between the collective actors. In total, it is based on data from one hundred producers[iii] from 1999 to 2008. These data were organized in the panel, and the model was defined as follows:

$$Y = \beta_0 + \sum_{i=1}^{7} \beta_i * \mathrm{X}_i + \varepsilon$$

Table 4 presents a detailed description of each variable of the model. The estimations carried out with the growers have a total of seven independent variables. The greatest expectation refers to the *Label* variable, since it represents the most significant collective action developed between the actors from Vale dos Vinhedos. In general, even though it is an innovation created by the wineries in the region, it is expected for the *Indication of Origin Label* to have a positive influence on the income per hectare of grape growers, since it represents a collective action developed in the network.

Concerning the three sales possibilities for the grape production, it is expected for the one providing the best performance to the grower to be the variable *delivery to Vale dos Vinhedos only*, since it represents the alternative showing greatest interdependence between the wineries and grape growers of the region, a relevant factor for the long-term sustainability of the wine network.

Another discussion that takes great interest refers to the variables *production volume of fine grapes* and *production volume of common grapes*. It is believed that both types of production are important and positively affect the grower's income. Regarding the *fine grape dummy* variable, it is believed that the grower cultivating fine grapes may report a higher performance than the one only producing common grapes, due to the certification of fine wines in the region. With respect to the

property size, it is estimated that this variable also indicates a positive relation on the grower's income, so that the larger the property, the higher the income per hectare of the surveyed growers.

Table 4 – Description of Variables - Value Creation of growers

Variable	Description
Y = Coefficient of the Dependent Variable *Income per hectare*	Annual income (R$) for each grower per hectare of grape
β0 = Intercept of the regression	
β1*X1 = Coefficient of the Independent Variable *Label*	Certification of fine wines from Vale dos Vinhedos. Dummy variable. Value 1 corresponds to the early years of the certification (2002) and subsequent years up to 2008 and value 0 corresponds to the years prior to 2002.
β2*X2 = Coefficient of the Independent Variable *Delivery to Vale dos Vinhedos only.*	Dummy variable. Value 1 corresponds to the grower's characteristic of delivering their production to wineries from Vale dos Vinhedos only and value 0 corresponds to grower's characteristic of delivering their production to wineries outside Vale dos Vinhedos.
β3*X3 = Coefficient of the Independent Variable *Delivery to external wineries only.*	Dummy variable. Value 1 is assigned to the grower that delivers its production only to wineries outside the network and value 0 is assigned to the grower that delivers its production to wineries from Vale dos Vinhedos.
Note in relation to β2*X2, β3*X3. There are three possibilities for the delivery of grape production: a) selling grapes exclusively to wineries from Vale dos Vinhedos, b) selling grapes exclusively to wineries outside Vale dos Vinhedos; c) selling grapes to wineries both in and out Vale dos Vinhedos, being this case the comparison basis for the dummies created.	
β4*X4 = Coefficient of the Independent Variable *Produces Fine Grapes*	Dummy variable. Value 1 is assigned to the grower who produces fine grapes and value 0 is assigned to the producer who does not produce fine grapes.
β5*X5 = Coefficient of the Independent Variable *Property Size*	Property size (hectares) of each grape grower
β6*X6 = Coefficient of the Independent Variable *Production volume of common grapes*	Annual volume of common grapes produced per grower (kg)
β7*X7 = Coefficient of the Independent Variable *Production volume of fine grapes*	Annual volume of fine grapes produced per grower (Kg)
e = Stochastic error	

Before proceeding to the analysis, one aspect shall be highlighted. The purpose of the research was to use two control variables: the average annual price of fine grapes and the average annual price of common grapes. However, the representative institutions of the sector provide no information on average prices, arguing that the price paid for the grapes is exclusive to each company. These institutions only informed the minimum price of grapes, as determined by Conab – a National Supply Company. However, it was noted that this information would not provide definitive answers, since each winery applies its own price, varying according to the variety, group and product degree, among other market factors and the exclusive negotiation with each producer. Thus, it was not possible to apply the control variables for the growers.

Initially, estimates were made considering fixed and random effects. By conducting the tests for the significance of these effects, it was found that both were significant. The Hausman test indicated that the coefficients difference for both effects is not systematic, so the random effect model was chosen. The presence of heteroscedasticity, serial autocorrelation and independence

between cross-section units was also analyzed. The results indicated the presence of heteroscedasticity and serial autocorrelation. The Pesaran test indicated that the cross-section units are dependent.

As the temporal dimension of the panel (10 years) is lower than the number of cross-section units (100 growers), the Prais-Winsten's model was used. Table 5 shows all the steps taken in the estimation of growers: Fixed Effects, Random Effects, tests and Prais-Winsten estimation.

Table 5 - Forecasts for Growers - Income per hectare of grape

Dependent variable:	**Income per hectare**		
Cross-section units **= 100** Time **= 1999 - 2008** Number of observation **= 992** [Standard error in brackets]			
	Fixed Effects	**Random Effects**	**Prais-Winsten**
Property Size	**588.19**	**-245.12**	**-234.47**
	[362.47]	[75.972] *	[67.89] *
Production volume of common grapes	**0.004**	**0.0055**	**0.0036**
	[0.0012]*	[0.0012] *	[0.0013]*
Production volume of fine grapes	**0.094**	**0.0890**	**0.0035**
	[0.0058]*	[0.0055] *	[0.0081]*
Label	**226.12**	**205.78**	**1340.29**
	[288.64]	[293.64]	[678.18]**
Delivery to Vale dos Vinhedos only	**-1059.32**	**154.20**	**762.37**
	[1150.86]	[782.64]	[828.67]
Delivery to external wineries only	**-254.71**	**-524.08**	**-635.10**
	[429.84]	[372.46]	[376.30]***
Produces Fine Grapes	**-3786.89**	**-2223.15**	**-1396.86**
	[1043.76] *	[557.24] *	[723.26]**
Constant	**-1291.82**	**3647.36**	**7857.60**
	[2407.16]	[790.56] *	[665.05]*
R-squared	0.108	0.344	0.1802
Wald-Chi2(9)		821.07	291.60
Prob. > Chi2		0.0000	0.0000
* significance at 1%; ** significance at 5%; *** significance at 10%.			
Notes:			
1. Fixed effects test: F(99. 883) = 14.30 ; Prob > F = 0.0000			
2. Random effects test: (Breusch-Pagan): chi2(1) = 1205. 13 ; Prob > chi2 = 0.0000			
3. Test for heteroscedasticity: chi2 (100) = 39437.33; Prob>chi2 = 0.0000			
4. Wooldridge test for autocorrelation: F(1. 99) = 24.503 ; Prob > F = 0.0000			
5. Pesaran test for independence of cross-section units = 3.764 ; Pr = 0.0002			

The discussion is made based on Prais-Winsten, since it indicates the final results. In this sense, some important aspects shall be highlighted. Firstly, it can be observed that the certification of fine wines of the region, *label variable*, has a positive impact on the income per hectare of grape growers. Specifically, the result shows that after the certification, the income per hectare of growers increased on average 1.340.00 BRL, proving the label has a positive influence on the value creation of growers. It is believed that the information is relevant for the actors involved, since during the

interviews several growers reported that in their perception, the certification indicates more requirements than benefits for the growers.

However, reflecting on this result, some questions arise: What is the relationship of the Indication of Origin label between growers who do not grow fine grapes? And between those who do not deliver their production to the wineries in Vale dos Vinhedos? Why would the label have any impact on those growers? What could help explain is the presence of positive externalities with the introduction of the certification (collective action of the network). That is, the introduction of the label in the region has caused the wineries sales to increase, and consequently, increased the demand for raw material (grape), both the wine grape varieties and the common varieties.

Regarding growers who currently do not negotiate with the wineries of Vale dos Vinhedos, there are no definitive answers yet. Possibly, the recognition of the collective action of Vale dos Vinhedos has created an appreciation of the grape production from that region, increasing the price paid for grapes even by wineries that are not part of the network, that is, who are not specifically interested in seeking the certification, but who are looking for high quality grape. Also, some growers have reported in the interviews that they perceive the recognition they are having in other regions due to their production quality.

Overall, it is possible to state that the *label* had an important role for the agricultural farms, which shows that for the investigated case, the collective action was favorable for the value creation of the agents. This result confirms Hypotheses 1 and 1a, for both wineries (previously confirmed) and growers.

In addition, it is worth to point out that, since the certification is the most significant representation of the complex structure of Vale dos Vinhedos, the result positively answers the main question of this research. Thus, it is understood that the effort spent in the network cooperation, as well as the investment from growers towards the certification (search for quality, limit of varieties and limit of production) is worthwhile for these agents.

The second issue of great interest is the influence of the interdependence level on the value creation for growers (Hypothesis 1b). To be specific, it aims to find out the best way to sell the production, or the most appropriate governance structure for the growers. In this regard, as previously shown in Table 4, three specific cases were analyzed: a) exclusively sell to the wineries of the network, b) exclusively sell to the wineries from outside the network, c) sell the grapes to wineries from Vale dos Vinhedos and other regions, with the latter one serving as the comparison basis. Considering the interdependence theory, it is believed that the first option is the one that adds the most value, since it represents the mutual interdependence among the actors, besides providing the possibility of selling grapes for certified wines. In this context, it is estimated that the second best alternative is the last one, since it also allows the sale of grape for wine with the label.

However, the result found in the estimation shows that the variable *deliver to wineries from Vale dos Vinhedos only* is not significant, that is, it neither has positive nor negative influence on the growers' income, contradicting the theoretical assumption and Hypothesis 1b. However, it is worth to mention that the result is in line with the expectations in comparison with the second alternative, since the estimation shows that the option *delivery to external suppliers only* has a negative relationship with the income per hectare, that is, growers who find themselves in this situation (70% of respondents) have their average income per hectare reduced by 635.00 BRL when compared to growers who deliver to both wineries in and out of the network. Therefore, this alternative is the one that presents the worst performance for the grape growers, which demonstrates the importance of maintaining and strengthening the interdependence within the network for the case of growers.

This result indicates that the ideal for producers is for them to negotiate production with more than one processing firm and not only with wineries in the network. Possibly, such evidence may indicate that the common wine has an increased market share and/or better price out of the network analyzed. Furthermore, it is worth to point out that the results found here regarding the interdependence are very similar to those found for the wineries, to which the diversity of options in relation to the supply of grapes also appeared to be the most efficient alternative.

Regarding the influence of *fine* and *common grape volumes* on the income per hectare, the result is as expected, that is, both variables were significant and have a positive impact on the income, so that the higher the production volume, the higher the income per hectare.

However, the results indicated an intriguing situation with regard to the variable *produces fine grape*. The estimation shows that it has a negative influence on the grower's income, that is, wine grape growers (30% of respondents) lose approximately 1.396.00 BRL per hectare as compared to those who only grow common grapes. It is a fact, however, that this reality was presented by wine growers, who reported during the interviews that the fine grapes yield less value than the common ones, due to the high production costs and the production limit per area.

By trying to understand this scenario, it seems that it gets to a point of consensus between the growers reports and the logic of the collective action generated by the network. That is, since it was previously evidenced that the label creates value for the growers and now there could be observed that the fine grapes are less efficient for these actors, it is possible to conclude that the value created for the growers is not a direct result arising from the certification, but the externality generated by it, such as the increase in the number of wineries in the region and the recognition of the grape quality from that region.

Finally, with regard to the *property size*, contrary to the expectations, this variable indicates a negative relationship with the income per hectare, that is, increasing the property in 1 hectare, the

average income/hectare reduces by 234.00 BRL. Again, a result that is not easy to interpret. It is believed that two reasons may help explain this evidence. First, after a given size growers may have higher production costs, depending on the need to outsource, while in smaller properties, the work is performed by the family workforce. Second, small properties nearly have their entire area cultivated, which does not occur to larger properties, in which there is a higher loss due to the construction of improvements and non-cultivable area.

The findings so far lead to an understanding of value creation for key stakeholders involved in the network structure under study. The next section will present discussions that indicate whether there was also value creation for the Vale dos Vinhedos region as a whole.

Externalities as sources of value creation for the entire network

This topic aims to identify the implications for the various actors in the Vale dos Vinhedos of the network introduced into the wine agro-industrial system, thereby determining whether the system enables the collective creation of value for the region as a whole.

To this end, we list some empirical observations about the existence of positive externalities formed by the collective system. These externalities have been identified through interviews with winemakers and producers, and from secondary data. The externalities have been identified through the theory of complex systems as potential sources of value creation networks.

It is believed that the most significant network externality of the Vale dos Vinhedos is the increasing number of tourists in the region each year, as seen in Table 6.

Table 6 - Evolution of tourist visits to the Vale dos Vinhedos

Year	Number of tourists
2001	45.000
2002	60.000
2003	82.000
2004	102.000
2005	115.737
2006	105.617
2007	120.962
2008	153.779
2009	182.229

Source: Aprovale (2010)

In 2001, 45,000 tourists visited the valley, while in 2009 this number increased to more than 182,000. In other words, over eight years the number of tourists has increased more than fourfold. This demonstrates that the process of development of the Valley is occurring at an accelerated rate. It is possible that the collective actions undertaken by the network have contributed to these developments, especially initiatives such as the development of tourist itineraries, participation in exhibitions and fairs, and beautification of properties.

According to Hall (1996), this type of tourism may involve different attractions, such as visits to vineyards and wineries, festivals, wine exhibitions, life experiences, relationships with art, and wine and food tastings; visitors are most attracted to tastings and the opportunity to enjoy the culture and other attributes of a wine region.

Getz (1998) posits that wine tourism has the potential to provide a competitive advantage to the wine regions, generating business for processing firms and other interrelated businesses, thereby positively influencing the economic, social, and cultural values of the territory. It is therefore believed that the development of tourism in the Vale dos Vinhedos is a factor that adds value to the entire region, positively affecting wineries, hotels and inns, restaurants, sellers of artisanal products (jellies, sweets, wines, crafts), and local trade as a whole.

As a result of developments in tourism, direct sales of both wines and derivative products at the counter also increase. When asked about the performance of direct sales, 55% of respondent winemakers reported being very satisfied. Regarding the impact of tourism, producers reported improvements in sales of fresh grapes, wine, and handicrafts, and noted significant improvements in roads in the region. However, the growers also mentioned two negative points arising from the increase in tourism: increased violence (especially burglary) and a considerable increase in noise and traffic in the rural area.

Another positive externality which was pointed out by both wineries and grape producers is the strong appreciation of properties in the region; 85% of winery owners are very happy about that aspect, and reported that this occurred after the development of tourism in the valley and the introduction of the fine wine certification.

Likewise, many producers reported a significant increase in the value of their property after the national recognition of the region. Some now view selling their farms and moving to urban centers as an economically viable alternative. At the same time, these producers are hesitant to dispose of their properties and make such a drastic change to their lifestyle.

After certification there was a considerable increase in the number of wineries located in the region. Of those associated with Aprovale, seven were established after the year 2002. Likewise, there was a notable increase in the opening of unlicensed bars. The older-established winemakers consider these aspects to be negative due to the new competition within the area.

However, one can infer that the increase of companies had a positive impact on the network as a whole with regard to generating income and jobs in the area. It is also worth bearing in mind that, according to Sachs (2003), cooperation and competition between ventures in a complex system can generate extremely beneficial synergies, depending on the interchangeability of complementarities between firms.

A fifth network externality that should be considered very relevant to the region under study is the recognition of the name, or brand name, "Vale dos Vinhedos" throughout the country, and even abroad. On this question, 90% of the wineries interviewed indicated that after the introduction of certification, the Valley's brand became nationally known. In terms of global projection, 65% of wineries believe that the Vale dos Vinhedos has become a recognized name as a wine region, and 96% of producers said that after the entry of the seal of fine wines, the Vale dos Vinhedos has become a recognized region. It is worth mentioning that the participation of wineries in important exhibitions and fairs, both nationally and abroad, may have contributed to this result.

Recognition of a Vale dos Vinhedos collective brand may not represent an important factor for companies already established in the market since they enjoy individual brand recognition, especially on the national scene. However, this externality is crucial for small businesses which were not known or recognized before certification and vitivinicultural networking.

It is also worth noting that the network has brought benefits such as environmental preservation, beautification of farms, and the preservation of local culture; 76% of winery owners reported an increasing concern with nature preservation on the part of local residents.

Likewise, 66% of farmers interviewed mentioned increased commitment and investment in the care and beautification of properties after the introduction of the seal and the increase in tourism to the region. The talks held by Aprovale in the valley communities addressing the importance of environmental conservation and the beautification of vineyards may have played a key role.

Regarding the maintenance of the culture of the Vale dos Vinhedos, which is home to Italian traditions and customs surrounding the cultivation of grapes and wine, 80% of winemakers stated that after the formation of the network there was an increase in public concern with the preservation of these traditions. The implementation of the Cultural Program of the Vale dos Vinhedos, being planned by Aprovale, will play a vital role in this aspect.

In this section, it is evident that the vitivinicultural network of the Vale dos Vinhedos facilitates the formation of externalities which positively affect different actors such as wineries, hotels and inns, restaurants, producers, and local trade in general, in addition to benefiting visitors and the surrounding population of the valley.

Consequently, these externalities envision a scenario for creating value within the network of the Vale dos Vinhedos as a whole, mainly as a result of certification, but also of other collective actions undertaken by actors.

The next topic addresses the discussions about the distribution of value within the network, created by the actors directly involved in the collective system: the wineries and grape growers.

8 Appropriation of value generated in the network: are there differentiated gains among the actors?

This section aims to answer one of the research questions through an investigation of the distribution of the value generated in the vitivinicultural network of the Vale dos Vinhedos, especially in relation to two types of actors, the wineries and grape growers.

Hypothesis 2 argues that there is greater value appropriation by wineries than by grape growers, for three reasons: a) it is for wineries to determine the conditions of the certification organization ; b) wineries have a better bargaining position vis-à-vis the producers; and c) the certification entails many requirements that imply transaction and production costs for grape producers.

To discuss this issue, it is important to review the results found in the Prais-Winsten regressions, since in these three estimates the dependent variable is related to the generation of value and/or income. Furthermore, it was possible to verify in all of them the influence that the fine wines certification had on the actors' value generation over the same time period.

It is known that measures of the dependent variables of these estimates are not exactly equal for both types of actors (sales volume in the case of wineries and gross income per hectare for producers). However, both refer to income generation, and among the measures which we could access these best represent the reality of each segment investigated.

When examining the regression results, it is observed that the certification has increased the volume of sales of fine wines by 12.5%, and of table wines by 33.7%, representing an increase of 46.2% on the total average sale of wines from wineries. For producers, it is evident that the seal has increased the average gross income per hectare of these actors by 17%.

These results suggest that even despite positive growth for both segments, the wineries are able to appropriate more value generated by the network than the growers. This result was expected since it is the wine industries that coordinate the wine certification process, and serves to confirm Hypothesis 2 of the study.

This study also aimed to verify whether there is a difference in value appropriation among the players in the same segment. First, an analysis was conducted of the wineries. These study assume that there is a difference in income distribution among the winery segment, so that the greater their interdependence with the producers in relation to the governance structure of the raw material (grapes), and the larger the company size, the greater the value appropriation by the winery.

By revisiting the regression results, it is possible to observe that the greater appropriation is by wineries that have a mix between their own grape production and suppliers from the Valley and outside the network, for both fine and common grapes, which refutes the hypothesis about this

aspect. Regarding the influence of firm size on value appropriation, it is evident that large and medium-sized businesses demonstrate the best performance, a result that is in line with expectations.

A similar analysis was conducted on income distribution in the producers' sector. It is believed that a difference in value appropriation also exists among the actors in this segment. Similar to the wineries, it is expected that the greater the interdependence of the wineries on winegrowers with respect to the governance structure of production, and also the larger the property, the greater the value appropriation by the producer.

The results presented earlier in the regression did not confirm the first expectation, because the variable that represents the highest degree of interdependence among the actors does not have any statistical significance. However, the option that represents the smallest interdependence among the actors (the variable External Delivery Only) shows the worst performance for growers, which is in line with expectations.

Results for the influence of property size also invalidated the assumption, since the estimate showed that the larger the property, the lower the value appropriation by the producer. For all these reasons, one can conclude that the network actors have differentiated gains, and that in general the wineries appropriate more of the value generated in the collective system than do the grape growers.

Coming to the most appropriate governance structure, it appears that for both the winery and grape growing segments the greatest gain is with those having more than one governance alternative. It is also worth bearing in mind that the size of the firm or rural property translates to value appropriation by the actors, so that large and medium-sized wineries and small grape producers obtain better gains within the network than other agents in the same segment.

9 Final Considerations

By considering that the study of complex organizations such as networks is relatively recent, which begun around 1990, it is believed that this study has provided an important theoretical and empirical contribution to the construction of a model that considers the influence of collective actions and the interdependence level within complex forms, such as networks, as well as from the completion of empirical analyzes in a network introduced in the wine's Agro-Industrial System. Specifically regarding the empirical study, it is believed to bring contributions since it presents the impact from the collective actions and the interdependence for the two actors directly involved in the certification process, wineries and growers, allowing both realities to be shown.

The main objective of the study was to investigate whether the network of Vale dos Vinhedos enables the value creation for these collective actors. In this sense, the main results indicate a positive scenario, that is, value creation in the analyzed wine network. The Indication of

Origin label – which is a collective action of the network – has a positive impact on the sales of fine wines of wineries, besides positively influencing the sale of common wines from these processing firms, leading to an externality formation context within the network. It also showed that the certification had a positive effect on the income per hectare for growers in the region. These results are important, if taken into account the need for empirical studies in this area, as well as the divergence in the literature on the impact of collective systems.

Furthermore, it is important to stress that the network enables the creation of value for other stakeholders such as hotels, restaurants, shops, inns, and craft sellers, since it promotes the generation of positive externalities. These include the increase in the number of tourists and wineries in the region; the recognition of the Vale dos Vinhedos around the country and abroad; job creation; increased direct sales of wines, grapes, and derivatives; the strengthening of the various commercial establishments in the valley; a rise in land value; and the preservation of the environment and beautification of rural properties. This result demonstrates that the network, and especially the certification of origin of wines, created value for the investigated region as a whole.

This research has shown that the gains and sources of value creation in existing networks outweigh the losses, costs, and risks perceived in these collective systems. This result is very important, especially if we consider that the region of the Vale dos Vinhedos serves as a model for other wine regions in the country, having pioneered geographic certification in Brazil.

However, regarding the appropriation of value generated by the network, it became clear that the actors enjoy different gains. The results suggest that the wineries are able to appropriate more value than the growers; this was expected, because it is the wineries themselves that create and coordinate the wine certification process. It is therefore suggested that producers, like the wineries, create a body that represents them collectively and is focused specifically on the network. Farmers need to organize themselves to create strategies which recognize the importance of maintaining the network over the long term.

Finally, it is believed that further research should be carried out in order to compare the performance of two types of wine regions: networks such as the Vale dos Vinhedos, and other regions which lack collective organization.

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[i] To fullfil this gap, we tried to get the average price of wines and multiply it by the sales volume of each company. However, this data was not obtained, even in contact with the representative institutions of the sector (Embrapa, Agavi, Uvibra, Ibravin and Sindicatos). These institutions argued that they have no information concerning the average prices of wines, since there is no fair trade price, but each company's own price.

[ii] As observed by Beck and Katz (1995), the generalized least squares model may generate overconfident standard deviation estimates, leading to a greater probability of rejection concerning the insignificance hypothesis of the estimated coefficients.

[iii] Nine questionnaires did not have all the information required and, therefore, were not used.

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