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Quality and governance mode choice: a transaction cost approach to the wine industry

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Abstract— We analyze the relationship between product quality and governance mode choice using the results of a survey of DOC Rioja wineries. Wineries that produce high-quality wines are more likely to vertically integrate than are wineries that produce low-quality wines. Consistent with Transaction Cost Economics, we find evidence that asset specificity and uncertainty are important determinants of vertical integration. Finally, the size of the winery is also an important factor that affects governance mode choice in viticulture.

Keywords— quality, governance mode choice, transaction cost.

I. INTRODUCTION

Food quality is an increasingly important issue in the agricultural sector. Indeed, the competitiveness of food companies in national and international markets depends upon their ability to adopt production processes which meet quality requirements [1].

To date, research about vertical relationships in agriculture has come to be dominated by the principal-agent framework. In this approach, protecting input quality has been suggested to be a possible motivation for the use of contracts over the spot market alternative, especially in the presence of imperfect quality measurement [2]. A majority of this literature relies on theoretical models and simulation exercises. While these contributions have enhanced our understanding of vertical relationships, supporting evidence has been weak [3].

On the contrary, many empirical studies have found support for the transaction cost theory's main hypotheses. That is, asset specificity and uncertainty are the main determinants of the integration choice. But although it has been recognized that the concept of food quality is closely related to the notion of transaction cost, less attention has been paid to this fact. Among the few existing studies, [4] investigates the relationships between quality and the marketing channels used for Polish hog transactions.

Taking into account that the increasing demand for food quality accentuates the degree of interdependence among different levels of the supply chain, it is an important omission from most of the previous empirical literature not

to analyse quality issues as a possible determinant of vertical relationships.

We analyze Qualified Appellation of Origin (DOCa) Rioja wine market, an industry with a wide variety of vertical relationships and a considerable variation among types of wines. Industry participants implicitly associate having own vineyard with protecting grape quality. Using data from a survey of DOCa Rioja winegrape processors, we identify how wine quality interacts with the choice of governance mechanism. Like [5] and [6], we seek to enhance understanding of the determinants of vertical coordination by studying an industry where quality is an important consideration. Unlike these studies, examines the choice not only of spot market and contracts, but of vertical integration as well.

The remainder of the paper is divided into four sections. The following section provides the theoretical background and hypothesis for governance mode choices. In section 3 the measures and data collection procedures are described. An empirical section follows that describe the findings of several models and how these relate to the hypotheses. A final section presents a discussion of the implications of the study and suggestions for future research.

II. THEORETICAL FRAMEWORK

Williamson [7] maintains that transaction costs are not directly measurable since they represent the potential consequences of alternative decisions. Hence, Williamson [7] builds the TCE framework on a set of dimensions that are proposed to determine the transaction costs incurred under different organizational forms.

Analysis of the discrete governance structures

Williamson [8] distinguishes three generic forms of economic organization, market, hybrid and hierarchy, by different instruments as Table 1 shows. The hybrid mode includes intermediate forms such as various types of long term contracts, joint ventures, dual sourcing (partial vertical integration), etc.

Table 1: Distinguishing attributes of Market, Hybrid, and Hierarchy governance structures*

Attributes	Governance structure		
	Market	Hybrid	Hierarchy
Incentive intensity	++	+	0
Administrative controls	0	+	++
Autonomous adaptation capacity	++	+	0
Coordinated adaptation capacity	0	+	++
Contract law	++	+	0

* ++= strong; +=semi-strong; 0=weak

Source: Adapted from Williamson [8]

Determinants of governance mechanisms

The factors determining the governance mode choice are grouped into four broad categories: (1) the specificity of the assets required to produce the good, (2) the uncertainty surrounding the transaction, (3) the size of the winery and (4) the product quality.

Asset specificity

Williamson [9] emphasized asset specificity as the critical factor in determining choice of governance structure. Asset specificity can take several forms: physical asset specificity, human asset specificity, site specificity, dedicated assets, temporal specificity and brand name capital. For the purposes of this study, we focus on physical asset specificity and dedicated assets.

Physical asset specificity describes the situation where assets are tailored to a specific relationship and are difficult to re-deploy for other purposes without the sacrifice of productive value. Accordingly, the TCE hypothesis that has been repeatedly in the literature, and that we test as well, is that when the value of physical specific assets increases, vertical integration is more likely to be used.

Dedicated asset specificity refers to grapes which were cultivated for the purpose of one particular vintner. Since winegrapes are extremely perishable, the vintner could seek to appropriate rents by taking advantage of the grower's need to harvest and sell his grapes in a relatively short period of time [6]. Similarly to the previous specificity, it is expected that when the value of dedicated asset specificity increases, vertical integration is more likely to be used.

Uncertainty

A second transaction dimension is uncertainty, which affects the ability of parties in a transaction to specify fully the range of future contingencies [9].

A basic assumption of Transaction Cost Theory is that all transactions are conducted under a certain level of imperfect information, which takes different forms- behavioral and environmental- that can impact exchanges.

Behavioral uncertainty is linked to measurement. Contracting parties should be able to evaluate the elements exchanged, in quantity and quality. If performance cannot be easily assessed, the market will fail because it is known what to reward and how [10]. Based on this reasoning, we hypothesize that increased behavioral uncertainty will lead to increased use of vertical integration.

When the circumstances surrounding the exchange cannot be specified in advance, environmental uncertainty appears. Nevertheless, Williamson argues that unpredictability per se does not favour vertical integration, only in interaction with asset specificity. This argument suggests that when environmental uncertainty increases, in the presence of asset specificity, vertical integration is more likely to be used.

Frequency is another important factor mentioned by Williamson [7]. It refers to the regularity of the transaction. For the purposes of this particular study, however, we do not measure the effects of the frequency because all transactions that were examined occurred with the same frequency.

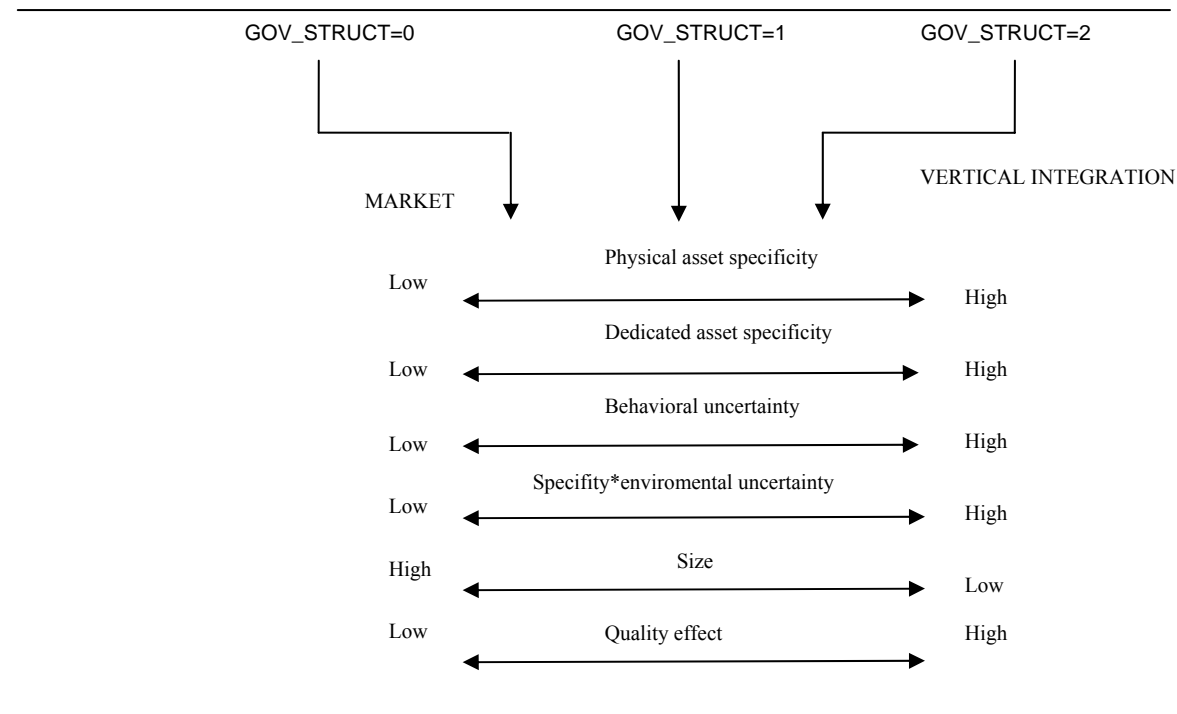
Winery Size

Williamson [11] points to diseconomies of scale as a factor limiting the extent of vertical integration. This is because internalization comes at the cost of additional bureaucracy and lower-powered incentives [9]. All of this suggests that big-size wineries are less likely to vertically integrate than small-size wineries.

Product quality

Another factor that may affect the governance mechanism choice is whether the differentiation is an important feature of the delivered product. Agricultural products in general, and viticulture in particular, are extremely sensitive to the differentiation effects. In the wine grape supply industry, differentiation is a critical issue, and one that is important in distinguishing competitors. If a winery has a reputation for highly differentiated wines, given the relatively low price sensitivity of consumers, that winery will have a distinct competitive advantage over other wineries that do not have the same reputation. When the importance of differentiation is combined with measurement problems, the contracting poses special hazards, consistent with the standard moral hazard problem. In this sense, wineries producing highly differentiated wines are exposed to serious risks of loss and damage if the quality of the grapes they use isn't as it is expected. Consequently, such wineries will seek the maximum control of the process to minimize the chances of reputation losses. Since the third party use is associated with loss of control, we hypothesize that wineries producing differentiated wines are more likely to integrate their grapes.

Table 2: Summary of hypotheses



Research design

The above hypotheses were tested on survey data from the wine industry with an illustration of a specific case in Spain, the Qualified Appellation of Origin “DOCa Rioja”. We selected one industry, rather than several, to detect real differences in practice that might otherwise be confounded with industry-specific effects. This limits the generalizability of results, but does allow us establish internal validity (Anderson, 1985).

The population from which the sample is drawn consists of wineries who fulfil the following requisites¹: (1) to belong to the Designation of Origin Rioja (2) to be wine-making processors (3) to have the obligation to present accounting information in the public registry and (4) not to be cooperatives.

The survey was returned by 187 participants², the 88,2 per cent of the population. In order to limit the influence of external shocks, the study period refers to the past 3-year period. A comparison of responding wineries with the population of all general wineries using the chi-square test ($p=0,094$) showed no statistically significant differences between the sample and the population in regard to size using the European Commission’s classification of Small and Medium-Sized Firms. The largest number (68%) of wineries in the sample had less than 10

employees while 27% had between 10 and 49 employees and 5% had more than 50 employees.

Variable operationalization

The constructs were operationalized with a mix of original and adapted scales relied on previous survey-based transaction cost studies.

Dependent variable: Governance mode choice

We build the dependent variable (GOV MECH) according to Williamson’s classification where we have distinguished three generic types of governance structures: market, hybrid and hierarchy. The survey asked the respondent to indicate the percentage of each type of governance mechanism they used to provide their grape needs. The database contains a variable named “Mechanisms of Governance” upon which we build the dependent variable as follows:

GOV_MECH=0 or “Market mode” if a winery buys at least 80 percent of its grape needs through the market mechanism

GOV_MECH=2 or “Hierarchical mode” if a winery has integrated vertically at least 80 percent of its grape needs

GOV_MECH=1 or “Hybrid mode” if the remaining firms that haven’t been classified previously. In this category are included either wineries that establish a contract for at least 80 percent of its grape needs or wineries that combine different mechanisms governance without rising the 80 percent in one of them.

In short, the higher value of the dependent variable, the more the governance mechanism is located to the hierarchy pole.

There is little consensus in the literature with regard to the value of percent cutoff that should be established. Given this

1. ¹ The population was drawn from the 2007 list provided by the Control Board of the Designation of Origin Rioja.

2. ² All the questionnaire returned were usable responses because we followed up missing questionnaires.

absence of a general rule, we decided to establish the cutoff by inspecting the distribution of the dependent variable for natural breaks. In particular, this cutoff yielded 32 wineries in market mode (17 percent), 73 wineries in hybrid mode (39 percent), and 82 wineries (44 percent). To establish the robustness of the results, we also obtained a simulation exercise with the cutoff changed to 70% and to 90%.

Independent variables

We use items on seven-point scales anchored by “strongly disagree” and “strongly agree” to measure both transaction cost dimensions, specificity and uncertainty.

Physical asset specificity (PAS): This variable shows the degree to which the investments in the relationship are not redeployable to other relationships. A mathematical average of two items were used to measure this variable (correlation=0.246, $p<0.001$). One item asked about the investments by the grape grower, and the second dealt with the winery investment.

Dedicated asset specificity (DAS): Measured as the excess of capacity that a grower has to support if the grapes which were cultivated for the purpose of one particular winery are rejected by it.

Behavioral uncertainty (BU): This variable shows the degree to which it is difficult for the winery to know the real effort made by the grower in the grape production process in absence of monitoring.

Environmental uncertainty (EU): The scaling of this concept is based on the mathematical average of two items that indicate respondents' perception on the uncertainty existing in grape yield and quality, respectively (correlation=0.677, $p<0.001$).

As we mentioned earlier, the effect of environmental uncertainty on governance mode choice is conditioned by the presence or not of specificity. Following to Coles and Hesterly (1998a), this condition was operationalized by means of an interaction between a dummy variable (λ) and environmental uncertainty. This dummy variable takes a value of 1 if the value of the overall level of specificity³ is above 1, and 0 for values of 1.

Size (SIZE): We used the logarithm of average capacity over the period 2002-2004 as a proxy of size because variables based on assets are directly dependent upon the decision to integrate production activities (Leiblein and Miller, 2003). With regards to the variable based on sales we don't use it because managers are reluctant to give this type of information.

Product quality: In order to examine the impact of vertical differentiation on the integration decision we adapt the measure of quality utilised by Coles and Hesterly (1998b). We divide Rioja wines into three categories according to the classification provided by the Board: Joven, Crianza and Reserva⁴. As there are three groups, we code them with two dummy variables. On the one hand, low added value (AVLOW), coded 1 if a winery produces at least 50 percent of the first group and zero otherwise. On the other hand, high added value, (AVHIGH),

coded 1 if a winery produces at least 50 percent of the third group and zero otherwise.

3. MODEL ESTIMATION AND RESULTS

To test the hypotheses, we analysed the distribution of the dependent variable, the governance mechanism choice, resulting in a discrete variable with three outcomes: market, hybrid and hierarchy mode. Consistent with transaction cost theory, these outcomes are ranked by vertical coordination. When the dependent variable is inherently ordered, the most appropriate method for estimating this model is an ordered logit. However, the results of the Brant test indicate to us that the ordered logit model is not appropriate because the parallel regression assumption of the ordered logit is violated by many variables (see table 3).

Then, we search for more flexible parametric models for ordered dependent variables, in which the multinomial logit model stands at one extreme in terms of high flexibility. The multinomial logit model builds in the assumption that the choice between any pair of alternatives is independent of the availability of other alternatives. We verify it with the Hausman test and Suest- based Hausman test, which don't confirm the independence of irrelevant alternatives (IIA) assumption in all categories (see table 4). Hence, this model is not appropriate either.

Finally, we estimate a generalized ordered logit, which is less restrictive than an ordered logit and more parsimonious than a multinomial logit [16].

The marginal effects of the generalized ordered logit used to test the hypotheses are presented in table 5. As we mentioned earlier, we estimated for maximum likelihood a model for each cutoff (90, 80 and 70) of the dependent variable. Given that the statistical significance of coefficients is quite similar in all cut-offs, evidence of robustness of the results is obtained.

Looking at the results, we see that as physical asset specificity increase, the probability of choosing vertical integration increases, while the probability of the hybrid mode decreases as does the probability of the market mode. With respect to temporal specificity, its effects are the same in direction and significance than physical asset specificity.

Turning to the behavioural uncertainty, increases in this variable result in more vertical integration and less hybrid mode. With regards the market mode, this variable has not a significant influence on it. The interaction effect between specificity and environmental uncertainty (λ EU) displays similar patterns of results for hierarchical and hybrid modes. However, it has a negative and significant effect on market mode.

With respect to size, increases in this variable do not affect the market mode, but they result in more hybrid mode and less vertical integration. This result is intuitive. The greater the winery is, the greater the grape needs it has. If the winery has a large size and it wants to integrate their production of grape, it is impossible to plant all their vineyards next to it. In this case, vertical integration can be inefficient due to high time and transport costs to control the vineyard.

As we expected, for discrete change of high quality from 0 to 1 the probability of choosing hierarchical mode increases. Conversely, the probability of choosing hybrid and market

³ The overall level of specificity is the mathematical average of physical asset specificity (EAF) and dedicated asset specificity (EAD) (correlation=0.268, $p<0.001$).

⁴ Gran Reserva is included in this category.

mode decreases. Likewise, marginal effects of low quality have the expected sign, but they are not significant.

Table 3. Brant Test of Parallel Regression Assumption						
Variable	χ^2	p> χ^2	χ^2	p> χ^2	χ^2	p> χ^2
All	27.80	0.000	38.47	0.000	20.91	0.004
Physical asset specificity (<i>PAS</i>)	4.9	0.027	1.92	0.166	0.32	0.569
Dedicated asset specificity (<i>DAS</i>)	0.00	0.971	0.24	0.627	0.54	0.463
Behavioral uncertainty (<i>BU</i>)	12.49	0.000	16.52	0.000	5.43	0.020
Environmental Uncertainty (λ <i>EU</i>)	0.31	0.579	0.01	0.909	0.03	0.858
Size (<i>SIZE</i>)	11.60	0.001	18.17	0.000	13.06	0.000
Low Added Value (<i>AV_{LOW}</i>)	0.97	0.326	2.19	0.139	0.48	0.487
High Added Value (<i>AV_{HIGH}</i>)	1.53	0.217	2.54	0.111	1.10	0.293

Table 4: IIA tests: Hausman test (*) and Suest-based Hausman test (**)

Drop	Y=ORD90	Y=ORD80	Y=ORD70
Y=2	p> χ^2 0.999 (*)	p> χ^2 0.000 (**) <i>It fails IIA test</i>	p> χ^2 0.000 (**) <i>It fails IIA test</i>
Y=1	p> χ^2 0.000 (*) <i>It fails IIA test</i>	p> χ^2 0.839 (*)	p> χ^2 0.006 (**) <i>It fails IIA test</i>
Y=0	p> χ^2 0.985 (*)	p> χ^2 0.08 (**) <i>It fails IIA test</i>	p> χ^2 0.986 (*)

Table 5: Marginal effects for generalized ordered logit models

Parameter	<i>Vertical Integration</i>			<i>Hybrid</i>			<i>Market</i>		
	90	80	70	90	80	70	90	80	70
PAS (H_1)	0.101**	0.127**	0.110**	-0.066**	-0.088**	-0.059**	-0.036**	-0.039**	-0.051**
DAS (H_2)	0.066**	0.071**	0.072**	-0.043**	-0.049**	-0.039**	-0.023**	-0.022**	-0.033**
BU (H_3)	0.050*	0.072**	0.088**	-0.065**	-0.084**	-0.082**	0.015	0.012	-0.006
λ EU (H_4)	0.063**	0.115**	0.124**	-0.041*	-0.080**	-0.067**	-0.022**	-0.036**	-0.057**
SIZE (H_5)	-0.159**	-0.190**	-0.170**	0.154**	0.188**	0.153**	0.005	0.001	0.017
AV _{LOW} (H_6)	-0.049	-0.084	-0.130	0.031	0.057	0.067	0.018	0.027	0.064
AV _{HIGH} (H_7)	0.368**	0.475**	0.326**	-0.294*	-0.383**	-0.210*	-0.073**	-0.091**	-0.116**
Chi-square statistic	0.000			0.000			0.000		
McFadden's Adj R ²	0.327			0.363			0.324		
Predicted capacity	71.66%			71.12%			70.59%		

* p<0.05, ** p<0.01

III. CONCLUSIONS AND IMPLICATIONS

There is no doubt that food and agribusiness firms have increasingly to deal with competitive markets in which food safety has become a decisive aspect for competitiveness.

We have established the nature of the relationship between product quality and vertical coordination in DOCa Rioja winegrape industry. Our analysis of the choice among market, hybrid and vertical integration suggests that more vertical coordination is associated with higher product quality.

Further, consistent with transaction cost economics, we find that vertical integration can be an efficient means of protecting relationship-specific investments or mitigating other potential conflicts under incomplete contracting in viticulture. In particular, we find evidence that asset specificity and uncertainty are important determinants of vertical integration. Likewise, our results reinforce the importance of the interaction effect between specificity and environmental uncertainty on vertical integration. As predicted by our model, the size of the winery is a factor that should be taken in account in our area of study.

We are conscious that there are a number of important limitations to this particular study that suggest the need for further empirical work. The fit of the model, though good for basic research, may be improved not only by developing better measures (e.g., using multi-item measures), but also by including variables not covered here, such as the existing regulation.

In spite of these limitations, this paper may have interesting managerial implications which are worth mentioning here. Given that our analysis characterizes the quality-coordination relationship and the determinants of governance mode choice, we believe that our findings will be of interest to those industries with a variety of governance modes, and with a significant concern for quality.

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