DOCUMENTOS DE TRABAJO

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An Empirical Test of Transaction Cost Theory: Validating the Analysis of Discrete Structural Alternatives

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Abstract

The purpose in the current study is to test the transaction cost theory's propositions regarding the options of market, hybrid and hierarchy through surveying wineries in DOC Rioja. In general, we find evidence to support the view that the higher the transaction costs relative to market governance, the more it is likely that the governance mechanism will move towards hierarchy. However, this framework is by no means a complete explanation. Our results indicate that other variables outside the framework, such as production experience and quality play an important role in the governance mode decision.

EconLit alphanumeric subject codes: L220, Q130
Keywords: Transaction cost economics, experience, quality and governance mode choice.

Resumen

El objetivo del presente trabajo es comprobar las predicciones de la teoría de costes de transacción considerando las alternativas del mercado, híbrido y jerarquía a través de una encuesta realizada a las bodegas en DOC Rioja. En general, se encuentra evidencia de que a mayores costes de transacción vinculados con el mercado, mayor probabilidad de que el mecanismo de gobierno elegido esté más próximo a la integración vertical. Sin embargo, este marco teórico no ofrece una explicación completa. Nuestros resultados indican que otras variables, tales como la experiencia en la actividad de producción y la calidad desempeñan un importante papel en la elección del mecanismo de gobierno.

Palabras clave: Economía de Costes de Transacción, experiencia, calidad y elección del modo de gobierno.

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> *The question of why there is so much vertical integration remains interesting, but no more so than the question of why there are so many market - (and quasi-market) mediated transactions*.
> Williamson, 1991, p.234

1. INTRODUCTION

Once a firm decides to produce an output, a difficult question must be resolved. Should its production of input be internalized? Increasingly, theorists of Transaction Cost Economics have acknowledged that this is the wrong question. The right question is what coordinating mechanism should be chosen, whereby there are a continuum of them ranging from market towards intermediate or "hybrid" forms and vertical integration at the extreme (Williamson, 1985).

Movement along this continuum of coordinating mechanisms implies resource commitments, few of which can be revoked without incurring some costs. Hence, the central question of transaction cost analysis is: Should a firm make its own inputs, buy them on the spot market, or maintain an intermediate form of vertical coordination?.

A majority of the literature using transaction cost theory to examine the vertical boundaries of firms has focused on testing the determinants of the make-or-buy decisions as the major governance forms of vertical coordination. In this make-or-buy decision, many empirical studies have found support for the theory's main hypotheses (e.g., Monteverde and Teece, 1982; Anderson and Schmittlein, 1984; Masten, 1984; Joskow, 1985). Although TCE studies have focused principally on the polar opposites of markets and hierarchies, it is haunted by a troublesome fact: a great deal of economic activity takes place within hybrids (Goldberg and Erickson, 1987). However, a smaller number of studies have analyzed the factors that determine which types of transactions are mediated through intermediate forms of vertical coordination (e.g., Adler *et al.,* 1998; Buvik, 2002). Moreover, conversely to the make-or-buy decision results, the results of the hybrid relationship studies provide relatively little support for TCE (Carter and Hodgson, 2006).

Drawing on Williamson´s (1985) original framework, our purpose in the current study is to examine the factors that determine why firms are using hybrid mechanisms as replacements for traditional "make or buy" decisions. While there have been studies

focusing on the motives for vertical integration and others focused on the motives for hybrid forms of vertical coordination, to our knowledge no study addresses the issue of motives for vertical coordination analysing simultaneously the choice among market, hybrid and vertical integration. Why transaction cost theory has not focused on the choice among these options can be attributable to the difficulty to distinguish between them empirically (Tirole, 1988).

We also expand on the previous literature in at least another important dimension. We study an agrarian industry, as opposed to the primarily manufacturing focus previously reported in the literature (Bhuyan, 2005). In most manufacturing production processes, there are standard methods for measuring whether the observed input satisfies the quality requirement. On the contrary, our examination of the wine-making industry provides a setting where analytical tests of grape properties involve technical concepts such as imprecision and inaccuracy. Hence, controlling all the grape production process plays a critical role to know the real level of quality of the inputs. Then, we expect that a particular factor that may affect the governance mode choice in agriculture is whether the differentiation is an important feature of the processor's product. Our results are consistent with the hypothesis that firms producing highly differentiated products are more likely to vertically integrate their inputs.

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. Using data from a survey of DOCa Rioja winegrape processors, we identify how wine quality interacts with the choice of governance mechanism.

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.

2. THEORY AND HYPOTHESES

Since the publication of Coase´s article, "The Nature of the Firm" (Coase, 1937), transaction cost economics (TCE) has become one of the leading perspectives in the study of structures of economic organization. In its origins, this approach positioned the

market and the firm as alternative mechanisms that could be chosen to conduct a transaction.

Further research[1] by Williamson (1991) responds to the critics of this dichotomic character by identifying three alternate forms of transaction governance: market, hybrid and hierarchy. Each form can be distinguished on the basis of its contract law, and each employs its own coordination and control mechanisms. Market governance is supported by classical contract law, in which the identity of the parties of the transaction is irrelevant and no dependency relations exist between them. Hard bargaining between parties characterizes these transactions, and their rules of governance are strictly applied. Neoclassical contract law, which applies to the hybrid forms, better facilitates continuity and adaptation than classical contract law. In this regime the parties to the transaction maintain autonomy but are bilaterally dependent in a nontrivial way. By contrast with a market contract, this contract foresees unanticipated disturbances, provides a "tolerance zone" within which misalignments are absorbed, requires information disclosure if adaptation is proposed, and provides for arbitration (prior to resorting to the courts) in the event of disagreement. The internal organization, hierarchy, is still a more elastic and adaptive mode of organization. Bilateral adaptation effected through fiat characterizes this structure. Rather than relying on the courts, which is denied, the parties must resolve their differences internally, being the hierarchy its own court of ultimate appeal. This implicit contract law of internal organization is known as contract law of forbearance.

Given this characterization of governance mechanisms, TCE maintains that there are "rational economic reasons" for choosing among them (Williamson, 1985, p.52). This is captured in what Williamson (1991, p.277) called the "discriminating alignment hypothesis", which holds that opportunist and limitedly rational agents align transactions, which differ in their attributes, with governance structures in a discriminating (i.e. transaction cost economizing) way. In other words, economic agents will choose that form of governance that reduces any potential exchange problems created by bounded rationality, on the one hand, and by the threat of opportunism, on the other, at the lowest cost. The principal attributes of transactions, according to TCE,

[1] There have been many elaborations and extensions to the transaction cost framework. However, we focus only on the analysis elaborated by Williamson (1975, 1981, 1985, 1991) regarding the forms of economic organization-market, hybrid and hierarchy.

that make bounded rationality and opportunism problematic are asset specificity, uncertainty and frequency.

First, the asset specificity refers to the degree to which assets "can be redeployed to alternative uses and by alternative users without sacrifice of productive value" (Williamson, 1991, p.282). As investments in asset specificity increase, parties incur in small-number conditions with considerable exposure to opportunism. This contractual hazard is denominated as hold-up, whereby the party whose investments in the transaction have significant value in alternative use expropriates quasi-rents from the party who invested in transaction-specific assets that have low value in alternative use (Klein *et al.*, 1978; Williamson, 1985). Williamson argues that as bilateral dependency sets in, assuming uncertainty exists in some intermediate degree[2], the high-powered incentives of markets impede coordinated responses among transaction parties, incurring in maladaptation costs. Accordingly, asset specificity increases the relative attractiveness of hierarchies and hybrids-despite their additional costs. As we mentioned earlier, the hybrid mode is located between market and hierarchy with respect to incentives, adaptability and bureaucratic costs. Then, we predict that, in presence of uncertainty, transactions with low asset specificity will be undertaken in the market, those with intermediate asset specificity in hybrid forms, and those with high asset specificity in hierarchical forms of governance (Williamson, 1985).

(see Williamson 1991, p. 284, for a graphical representation of this)

> Hypothesis 1: *The greater the value of asset specificity, in presence of uncertainty, the more it is likely that, ceteris paribus, a move from market spot to the hybrid mode and from hybrid mode to vertical integration will be observed.*

The second important dimension of transactions is uncertainty, which refers to the unanticipated changes in circumstances surrounding a transaction. The effect of uncertainty on the choice of governance form needs to be examined in conjunction with asset specificity. Absent asset specificity, market governance should be preferred whatever the degree of uncertainty since continuity has little value for these transactions and new trading relations are easily arranged (Williamson, 1979, p.254). When asset

[2] Uncertainty is a necessary condition for asset specificity to push transactions into vertical integration. Without uncertainty, bounded rationality is irrelevant because a perfect contract specifying all current and future states in an exchange could be written. There is no possibility of hold-up, hence no need for more adaptive governance mechanisms (Barney and Hesterly, 1996).

specificity is present to a nontrivial degree, uncertainty increases the relevance associated with the continuity between the transacting parties and adaptive capabilities, rendering market governance. This is because market mode is subject to costly haggling and maladaptiveness. Accordingly, as uncertainty increases (in the presence of asset specificity), hybrids and hierarchies become preferred over markets (Williamson, 1979, p. 254). Although the efficacy of all forms of governance may deteriorate in the face of increasing uncertainty, the hybrid mode is the most susceptible because its adaptations cannot be made unilaterally (as with market governance), or by fiat (as with hierarchy), but require mutual consent, which takes time (Williamson, 1991, p.291). Hence, at high levels of uncertainty, the "intermediate range" of asset specificity within which hybrid forms are preferred tends to shorten, and may even disappear in favour of market and hierarchy, which become preferable to hybrids (Williamson, 1991, p.292).

> Hypothesis 2: *The greater the value of uncertainty, in presence of asset specificity, the more it is likely that, ceteris paribus, a move from market spot to the hybrid mode and from hybrid mode to vertical integration will be observed.*

Finally, frequency refers to the regularity with which transactions recur. It operates similarly to uncertainty. If asset-specific transactions are recurrent, constant monitoring effort is required in the market. Conversely, if they are occasional, continuous attention is not needed and it does not deserve a hierarchical mode due to its bureaucratic costs. Hence, given a non-trivial degree of specificity, frequency raises transaction costs associated with market governance. For the purposes of this particular study, however, we do not measure the effects of frequency because all transactions that were examined occurred with the same frequency.

While vertical integration provides a resolution to the problem of transaction specific investments under uncertainty, there are, however, factors limiting its extent. Hierarchy comes at the cost of additional bureaucracy and lower-powered incentives, which limit the size of firms (Williamson, 1974).

> Hypothesis 3: *The greater size of the firm, the more it is likely that, ceteris paribus, the governance structure will be vertical integration.*

Empirical research on governance mode choice has not tended to consider the effects of product quality on these decisions. Product quality, however, is an important consideration in many industries, particularly in agrarian industries. Since quality is

often dependent upon the characteristics of inputs obtained from suppliers, some authors have suggested that protecting product quality is a motivation for vertical coordination (e.g., Goodhue *et al.*, 2003).

In this paper's analysis, we proxy for the effects of product quality on governance mechanism choices using a variable that measures the degree of product differentiation in the industry in question. Our reasoning is based on the work of Coles and Hesterly (1998), combined with transaction cost logic. In their study of service firms, Coles and Hesterly (1998) showed empirically that hospitals are more likely to integrate those services that have a significant potential to impact quality and cause harm to a patient. Following this line of research by Coles and Hesterly (1998), we argue that wineries producing differentiated wines will seek the maximum control of the process in order to maximizing the quality of their grapes. Thus, we hypothesize that quality will push transactions away from the market and into more coordinated mechanisms.

> Hypothesis 4: *The more differentiated a product is, the more it is likely that, ceteris paribus, a move from market spot to the hybrid mode and from hybrid mode to vertical integration will be observed.*

Williamson (1999) has suggested that while economic agents are assumed to have the capacity to look ahead and recognize contractual hazards and investment opportunities, the requisite recognition will come as a product of experience.

As discussed by Arrow (1962), production experience provides learning opportunities that enhance firm's production capabilities. Moreover, it is expected that such experientially derived capabilities improve subsequent production along a given trajectory in terms of both efficiency (e.g., Rapping, 1965; Henderson, 1984) and technical performance (e.g., Clark, 1987; Dosi, 1988). As a result, we hypothesize that a firm with production experience will be more likely to integrate because it provides learning opportunities that enhance its production capabilities. Empirical evidence has been provided to support this idea (e.g., Brouthers *et al.*, 2003; Leiblein and Miller, 2003; Bigelow and Argyres, 2007).

> Hypothesis 5: *The greater a firm´s experience producing the product, the more it is likely that, ceteris paribus, the governance structure will be vertical integration*.

3. EMPIRICAL ANALYSIS

We chose the DOC Rioja wine industry to test the hypotheses. One industry, rather than several, was chosen to detect real differences in practice that might otherwise be confounded with industry-specific effects (Anderson, 1985).

The sector under study is the Appellation d'Origin Rioja, which represents the most significant part (39.5 per cent) of the wine industry in Spain and is the most relevant one within the market of the quality wines. We chose this industry because it shows a great variety in the governance mode that each firm use for its inputs needs. Moreover, the wine industry provides an industry in which controlling all the input production process is essential to know the real level of quality of the inputs (Fernández, 2008).

Governance mechanisms in the wine industry

In this study, our aim is to examine the motives for governance mode choice in the Rioja Designation of Origin wine industry. Hence, the first criterion in selecting the sample was that the firm belongs to the DOC Rioja[3] and was wine-making processor[4]. The second criterion was that they presented accounting information to the authorities.

The data for this study were collected through the use of a letter sent through regular mail. We aimed to develop a questionnaire which was well adapted to the wine industry. To do this, we first had discussions with several individuals who had a clear understanding of the activity. Based on these sources of information and on our theoretical framework, the survey was designed to elicit information about transactional attributes.

The survey was returned by 187 participants[5], 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 with regards to size using the European Commission's classification of small and medium-sized firms. The largest number

[3] The population was drawn from the 2007 list provided by the Regulatory Council of the Rioja Designation of Origin.
[4] Winemaking cooperatives were excluded because they don't face the "make" or "buy" decision since their members are usually vineyard owners, who deliver grapes to the cooperative.
[5] All the questionnaires returned were usable responses because we followed up missing questionnaires.

(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 operationalisation

Dependent variable: the adopted governance mechanism. We build the dependent variable (GOV_MECH) according to Section 2 where it is has been distinguished three basic types of governance mechanisms: spot market, hybrid and vertical integration. Consistent with prior work (e.g. Lilien, 1979; Harrigan, 1986; John and Weitz, 1988 and Parmigiani, 2007), a 10 percent cutoff[6] was used such that grape needs that were produced internally 90 percent or mode often were considered "vertical integration", those that were acquired in the spot market 90 percent or more often were considered "spot market", and finally those that were provided with an hybrid mode 90 percent or more often were considered "hybrid mode".

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.

This form of measuring presents the disadvantage of its subjectivity; it depends on a personal evaluation. However, subjective estimations of specificity and uncertainty have often been used in empirical studies, which is mainly due to a lack of direct qualitative information (e.g. Anderson and Schmittlein, 1984; Anderson and Coughlan, 1987; Anderson and Weitz, 1992).

Specific assets (Hypothesis 1): The degree of specificity can be measured by the difference between the cost of the asset and the value of its second best use (Williamson, 1985). Asset specificity can take several forms: physical asset specificity, human asset specificity, site specificity, dedicated assets, temporal specificity and brand name capital. For the purpose of this study, we focus on physical asset specificity and dedicated assets.

Physical asset specificity describes the situation where physical assets are tailored to a specific relationship and are difficult to re-deploy for other purposes without sacrificing productive value. Many empirical studies provide support to the basic TCE assumption that physical asset specificity is positively associated with the

[6] We don´t use a 99 percent cutoff because it involves several problems related to the respondents´ memory (Parmigiani, 2007). Then, by using the 90 percent cutoff , we can have more confidence in the logit models that compare vertical integration, hybrid and spot market.

decision to integrate (e.g., Klein *et al.*, 1978; Monteverde and Teece, 1982; Joskow, 1985; Hennart, 1988; Lieberman, 1991; Ohanian, 1994). Two complementary measures of asset specificity were developed. The first measure is the degree of downstream physical asset specificity, which measures the level of total fixed investment made by the processor. A second measure, the degree of upstream physical asset specificity, asked about the fixed investments made by the primary producer.

Dedicated asset specificity refers to assets which are assigned for the purpose of the current transaction only and would result in significant excess capacity if the transaction terminated prematurely (Williamson, 1983). Less attention has been paid to this type of specificity than to physical asset specificity. One exception is Adler *et al.* (1998), who operationalised dedicated asset specificity as the time to meet the buyer's requirements from contract start date to product acceptance.

Applied to our study, dedicated asset specificity refers to grapes which were grown for one particular vintner. As wine grapes 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 (Goodhue *et al.*, 2003). Given this definition, dedicated asset specificity was operationalised as the excess capacity that a primary producer has to support if the grapes which were grown for a particular winery are rejected by it.

All measures of transaction-specific assets are developed and scaled such that higher scores imply higher degree of specificity in the transaction.

Uncertainty (Hypothesis 2): A basic assumption of transaction cost theory is that all transactions are conducted under a certain level of imperfect information[7], which can preclude both the formulation of a contract ex-ante and/or the ability to verify compliance ex-post (Grover and Malhotra, 2003). The former (environmental uncertainty) appears when the circumstances surrounding the exchange cannot be specified in advance. This complicates writing contracts since parties will have to devote a lot of time trying to identify the diverse contingencies that may arise. This positive effect between unpredictability and asset specificity have been found by Anderson (1985), Coles and Hesterly (1998), Fan (2000), Leiblein and Miller (2003) and Díez-Vidal (2007). In our activity of analysis, the high level of dependency of

[7] It is a necessary condition for asset specificity to induce vertical integration. Without uncertainty, a perfect contract covering full contingencies could be written and hence, there is no need for vertical integration (Fan, 2000).

viticulture to exogenous conditions such as hazardous and risky natural environment (drought, pests, flooding, insect infestations, disease, etc) is one of the main reasons of environmental unpredictability. The scaling of this concept is based on one item that indicates respondents´ perception of input price volatility.

The latter (behavioural uncertainty), which is linked to difficulty of evaluating performance, is recognized in Williamson´s later writings (1981) as "internal" uncertainty. Contracting parties should be able to evaluate the service or product being exchanged. If performance cannot be easily assessed, the market will fail because what to reward and how is not known (Williamson, 1981). This general prediction has gained some degree of support in empirical research (e.g. Anderson and Schmittlein, 1984; Anderson, 1985; Gatignon and Anderson, 1988; John and Weitz, 1988; Majumdar and Ramaswamy, 1994). Difficulty of evaluating performance may occur in the viticulture activity for two reasons. First, it is difficult to assess objectively the grape quality (Oczkowski, 2001). Second, responsibility for vineyard production may not be assignable to an individual grower when a team of growers have worked the same vineyard. One question adapted from Anderson and Schmittlein (1984) addressed the perceived difficulty of measuring the results of individual growers equitably.

Nevertheless, although transactions will be completed less smoothly than in more certain environments, the market mode is still advantageous. Hence, uncertainty per se does not favour vertical integration, only in interaction with asset specificity (Williamson, 1979; 1985). This interaction effect between uncertainty and specificity has been found by Anderson (1985), Fan (2000), Leiblein and Miller (2003) and Díez-Vidal (2007). Following Coles and Hesterly (1998), this condition was operationalised by means of an interaction between a dummy variable (λ) and (environmental / internal) uncertainty. This dummy variable takes a value of 1 if the value of all items of specificity is above 1 (the minimal value of the scale), and 0 for values of 1.

Size (Hypothesis 3). This has been measured with a number of different variables in the literature, such as assets (Anderson, 1985), sales (Pisano, 1990; Leiblein and Miller, 2003) or logarithm of capacity (Ohanian, 1994). Since variables based on assets are directly dependent upon the decision to integrate production activities, we use the logarithm of average capacity over the 2002-2004 period as a proxy of size (Leiblein and Miller, 2003). With regards to the variable based on sales, it was not employed because managers are reluctant to provide this type of information.

Differentiation effect (Hypothesis 4): Previous studies (e.g. Coughlan and Flaherty, 1983; Coughlan, 1985; Anderson and Coughlan, 1987) have measured product differentiation with dummy variables coded 1 for highly differentiated goods and 0 for lowly differentiated goods.

In order to examine the impact of differentiation on the integration decision we adapt the measure of quality utilised by Coles and Hesterly (1998). We divide Rioja wines into three categories according to the classification provided by the Board, which are ordered by value added. In the Spanish nomenclature, the first group includes mostly "guarantee of origin" wines, which have not been aged in oak casks. The next group of wines includes "crianza" wines, which have been aged for at least three years, with one year in oak casks. Finally, the third group comprises "reserva" and "high profile" wines, which are carefully selected. As there are three groups, we code them with two dummy variables; on the one hand, *low added value* (AV_{LOW}), coded 1 if a winery produces at least 50 percent of the first group and zero otherwise; on the other, *high added value*, (AV_{HIGH}), coded 1 if a winery produces at least 50 percent of the third group and zero otherwise.

Experience (Hypothesis 5). This variable refers to the extent to which a firm has skills and capabilities for producing the good and an understanding of the underlying technology. Following prior empirical studies (e.g., Gatignon and Anderson, 1988; Hennart, 1991; Padmanabhan and Cho, 1996; Brouthers *et al.*, 2003), we measure experience as the number of years of experience in the wine-making activity.

Methodology

To test the hypotheses, we analysed the distribution of the dependent variable, the governance mechanism choice, resulting in a discrete variable with three outcomes: spot market, hybrid and vertical integration. Consistent with transaction cost theory, these outcomes are ranked by vertical coordination (Williamson, 1991). When the dependent variable is inherently ordered, the most appropriate method for estimating this model is an ordered logit[8] (Borooah, 2001). This is the reason why we began estimating an ordered logit. The ordered logit model is based on the assumption of parallel slopes, which requires the coefficients to be equal when comparing across equations based on ordinal outcomes (Long and Freese, 2006; Williams, 2006).

[8] A discrete dependent variable destroys the linearity assumption between the dependent and independent variables so that least squares method is clearly inappropriate (Amemiya, 1984).

However, this may be unrealistic. To test the validity of this assumption, we use the brant[9] test of the parallel regression assumption. (see table 1).

Table 1. Brant Test of Parallel Regression Assumption

Variable	**$\chi 2$**	**p> $\chi 2$**
All	28.61	0.001
Upstream Physical asset specificity (*UPAS*)	0.29	0.592
Downstream Physical asset specificity (*DPAS*)	3.56	0.059
Dedicated asset specificity (*DAS*)	0.08	0.779
Environmental uncertainty (λEU)	0.01	0.933
Internal Uncertainty (λIU)	10.32	0.001
Size (*SIZE*)	14.31	0.000
Low Added Value (AV_{LOW})	0.36	0.547
High Added Value (AV_{HIGH})	1.58	0.209
Experience (*EXP*)	0.18	0.671

The results 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. 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 2). Hence, this model is not appropriate either.

Table 2: IIA tests: Hausman test (*) and Suest-based Hausman test (**)

Drop	Hausman test	Suest test
GOV-$MECH_2$ (Vertical integration)	$X^2(10)=-0.094$	$X^2(9)=9.88$ Prob>$X^2=0.360$
GOV_$MECH_1$ (Hybrid mode)	$X^2(10)=-14.82$	$X^2(9)=40.63$ Prob>$X^2=0.000$
GOV_$MECH_0$ (Spot market)	$X^2(10)=-1.38$	$X^2(9)=12.38$ Prob>$X^2=0.193$

[9] The Brant (1990) test assesses whether or not the coefficients are the same for each group of the dependent variable. This produces Wald Tests to test the hypothesis that the coefficients in each independent variable are constant across categories of the dependent variable. Significant test statistics provide evidence that this assumption has been violated.

Finally, we estimate a generalized ordered logit, which is less restrictive than an ordered logit and more parsimonious than a multinomial logit (Williams, 2006). Consequently, we model a slightly modified version of ordinal logit where a series of regressions are reported predicting differences at each level of the dependent variable, holding constant those variables that do not violate the parallel regression/proportional odds assumption across the regression models. By holding constant many of the independent variables in the model, we were able to run the model without violating the assumption. We confirmed this in our data: GOV_MECH: $\chi^2(7)=5.20$, $p>X^2=0.635$.

Then, a generalized ordered logit was used as the primary technique for investigation of the hypothesis. The basic structure of the proposed model, which tests the factors with governance modes (vertical integration, hybrid mode and spot market), then, is as follows (Williams, 2006):

$$P\left[GOV\_MECH_i > j\right] = \frac{e^{(\alpha_j + X_i\beta_j)}}{1+e^{(\alpha_j + X_i\beta_j)}}, \quad j = 0,1$$

This model gives results that are similar to running a series of logistics regressions, where first it is category spot market versus all others (hybrid and vertical integration) and then category market and hybrid versus category vertical integration.

Descriptive analysis

A preliminary analysis was conducted to determine the relationships between pairs of independent variables. Table 3 shows Spearman´s correlations[10] for each pair. One strong correlation to note here is between both dummy variables of quality, which is large and negative. Nevertheless, in whole there is no indication of major multicollinearity problems. Further evidence of lack of multicollinearity is given by the stability of the coefficients in the estimation of the models.

Table 3: Spearman´s correlations

	UPAS	DPAS	DAS	EU	IU	SIZE	AV_{LOW}	AV_{HIGH}	EXP
UPAS	1								
DPAS	0.246**	1							
DAS	0.103	0.322**	1						
EU	0.090	0.179*	0.303**	1					
IU	0.262**	0.134	0.236**	0.266**	1				
SIZE	-0.019	-0.094	-0.156*	-0.074	-0.083	1			
AV_{LOW}	-0.075	-0.020	-0.028	0.012	-0.007	-0.236**	1		
AV_{HIGH}	0.110	0.013	-0.054	0.029	0.068	0.060	-0.372**	1	
EXP	0.070	-0.092	-0.082	-0.031	-0.022	0.170*	-0.013	0.006	1

[10] The Kolmogorov-Smirnov test determined that the variables are not normally distributed. So we cannot use Pearson´s correlations.

Next, table 4 provides means of the variables for each functional sample, as well as the results of ANOVA tests evaluating significant differences across functional groups. As expected, the differences are statistically significant.

Table 4. Means and standard deviation for independent variables, and ANOVA tests

Variable	Entire sample (n=187)	Market (n=27)	Hybrid (n=92)	Hierarchy (n=68)	F Statistic	Significance
Upstream physical asset specificity	4.545	3.370	4.457	5.132	9.865	0.000
1 _____ 7	(1.847)	(1.621)	(1.667)	(1.939)		
Strongly disagreed Strongly agreed						
Downstream physical asset specificity	4.813	2.815	4.902	5.485	20.172	0.000
1 _____ 7	(2.041)	(2.001)	(1.905)	(1.732)		
Strongly disagreed Strongly agreed						
Dedicated asset specificity	3.904	2.519	3.598	4.868	16.464	0.000
1 _____ 7	(2.092)	(1.762)	(1.933)	(2.001)		
Strongly disagreed Strongly agreed						
External uncertainty	5.112	4.185	4.957	5.691	10.655	0.000
1 _____ 7	(1.581)	(1.881)	(1.482)	(1.363)		
Strongly disagreed Strongly agreed						
Internal uncertainty	3.588	3.259	3.033	4.471	13.482	0.000
1 _____ 7	(1.883)	(1.789)	(1.572)	(1.996)		
Strongly disagreed Strongly agreed						
Size	14.144	14.259	14.630	13.441	17.713	0.000
Ln(capacity)	(1.362)	(1.095)	(1.473)	(0.952)		
Low Added Value	0.401	0.556	0.359	0.397	1.691	0.000
Dichotomous variable	(0.491)	(0.506)	(0.482)	(0.493)		
High Added Value	0.171	0.074	0.130	0.265	3.612	0.000
Dichotomous variable	(0.378)	(0.267)	(0.339)	(0.444)		
Experience	34.685	21.259	29.315	47.279	4.637	0.011
Number of years in the activity	(45.288)	(21.811)	(34.689)	(60.014)		

4. RESULTS AND DISCUSSION

Table 5 gives the coefficient estimates and goodness of fit measures for the five hypothesized determinants of governance mode choice with the generalized ordered logit. An important issue in a model is its stability. To test for this, different models were estimated across various specifications. Model I includes only the effect of

experience and serves as the baseline. Model II adds the dummy variables associated with differentiation effect. In model III, we include the measure for size. Model IV adds our measures of uncertainty, environmental and internal. Model V reports the results from our full model, which includes the measures of transaction dimensions (specificity and uncertainty), the size and differentiation. Likelihood statistics and measures of overall model fit are showed in the bottom line of the table. Our results show that likelihood ratio test statistics comparing each model to its immediate predecessor are all significantly different from zero. Likewise, the percent of observations correctly classified and the Nagelkerke-R^2 improve substantially when the variables are included. As shown at the bottom of the column, Model V has the highest Nagelkerke-R^2. Given the stability of our results across specifications, our discussion focuses solely on Model V.

Model V reports the results of the generalizad ordered logit model examining movement across the governance mode thresholds by transaction cost dimensions and quality effect. Threshold 1 refers to a movement from "spot market" to "hybrid and vertical integration", and so on.

Consistent with transaction cost theory, hypothesis 1 predicted that transactions with low asset specificity will be undertaken in the market, those with intermediate asset specificity in hybrid forms, and those with high asset specificity will be vertically integrated. Results for threshold 1 showed that an increase in moving up a level on a producer´s asset specificity scale will increase the odds of a firm moving from the spot market to hybrid market by a factor of 1.288, or a relative increase of 28.8%. With respect to processor´s assets specificity and dedicated asset specificity, the effects are in the same sense, being the relative increase of 35.3% and 38.7%, respectively. These findings are also consistent across the threshold 2, corroborating hypothesis 1.

Environmental uncertainty, in presence of asset specificity, has a strong significant positive effect on vertical coordination. In fact, results suggest that for every point increase in its scale, the odds that a firm will move on to the next level of coordination increase by 46.2%. Contrary to our expectations, the magnitude of the effect of internal uncertainty varies by threshold. Beginning at threshold 1, the presence of internal uncertainty had not a significant effect on moving from spot market to hybrid mode. In threshold 2, however, the result presented supports the existence of a significant direct effect between internal uncertainty and vertical integration.

Hypothesis 3 argued that firms having greater size are less likely to internalize their input needs due to diseconomies of scale. The result of this variable in threshold 2 indicates that size affect negatively firms´ vertical integration decision. As we expected, it was no longer significant in threshold 1, which involves that this variable doesn't affect the choice between spot market and hybrid mode.

As anticipated in hypothesis 4, results suggest that being a membership of high quality group significantly increased the odds of firms moving from spot market to higher levels of vertical coordination. However, being a membership of low quality group does not affect the governance mode choice.

Finally, our estimated results found support for the variable of experience, consistent with previous empirical research. In accordance with hypothesis 5, production experience is likely to enhance the odds that a firm will choose a more coordinated mechanism along a given trajectory in 1.5 %.

On balance, the robustness of the estimated coefficients across model specifications suggests that asset specificity, uncertainty, size, product quality and the production experience influence firms´ governance mode decisions in the wine industry.

Table 5: Estimations from generalizad ordered logit[Ψ]

	Threshold 1: Market vs Hybrid & Hierarchy				
	Model I	Model II	Model III	Model IV	Model V
Upstream Physical Asset Specificity					1.288* (1.054-1.573)
Downstream Physical Asset Specificity					1.353** (1.131-1.618)
Dedicated Asset Specificity					1.387** (1.150-1.674)
External Uncertainty				1.608** (1.307-1.980)	1.462** (1.162-1.839)
Internal Uncertainty				0.993 (0.775-1.271)	0.824 (0.621-1.092)
Size			0.823 (0.624-1.084)	0.814 (0.605-1.095)	0.857 (0.619-1.188)
Low Added Value		1.063 (0.579-1.952)	0.691 (0.357-1.336)	0.672 (0.337-1.343)	0.766 (0.366-1.605)
High Added Value		2.519* (1.108-5.720)	2.936* (1.186-7.265)	3.161* (1.125-8.891)	3.861* (1.293-11.531)
Experience	1.011** (1.003-1.019)	1.010** (1.002-1.018)	1.013** (1.005-1.022)	1.012** (1.003-1.022)	1.015** (1.004-1.025)

	Threshold 2: Market & Hybrid vs Market				
	Model I	Model II	Model III	Model IV	Model V
Upstream Physical Asset Specificity					1.288* (1.054-1.573)
Downstream Physical Asset Specificity					1.353** (1.131-1.618)
Dedicated Asset Specificity					1.387** (1.150-1.674)
External Uncertainty				1.608** (1.307-1.980)	1.462** (1.162-1.839)
Internal Uncertainty				1.392** (1.139-1.702)	1.320* (1.058-1.647)
Size			0.440** (0.329-0.589)	0.403** (0.291-0.560)	0.371** (0.259-0.532)
Low Added Value		1.063 (0.579-1.952)	0.691 (0.357-1.336)	0.672 (0.337-1.343)	0.766 (0.366-1.605)
High Added Value		2.519* (1.108-5.720)	2.936* (1.186-7.265)	3.161* (1.125-8.891)	3.861* (1.293-11.531)
Experience	1.011** (1.003-1.019)	1.010** (1.002-1.018)	1.013** (1.005-1.022)	1.012** (1.003-1.022)	1.015** (1.004-1.025)
Crag-Uhler (Nagelkerke) R^2	0.026	0.04	0.144	0.251	0.356
Likelihood ratio Test	-181.392	-178.715	-159.462	-139.582	-119.917
Chi-square statistic	0.017	0.017	0.000	0.000	0.000

[Ψ] Data are given as odds ratio (95% confidence interval). The sample N=187. All models include intercepts. Complete model results are available from the corresponding author on request.

Levels of significance: * p<0.05; **p<0.01

5. CONCLUSIONS AND IMPLICATIONS

Transaction cost economics has been criticized because it attempts to explain the make or buy decision. However, rather than choosing either "make" or "buy" alternatives, firms increasingly use hybrid mechanisms for fulfilling governance needs (Adler *et al.*, 1998). Although that objection has begun to be addressed by recent treatments of hybrid mechanisms (Kalnins and Mayer, 2004), the abstract attributes that characterize the choice among spot market, intermediate forms and hierarchy have remained obscure.

This paper tests transaction cost hypotheses about the determinants of market-or hybrid-or hierarchy decisions on data drawn from the DOC Rioja wine industry. Contrary to the implications of Williamson´s framework, the expected continuum of coordinating mechanisms was not found; this finding is consonant with Parmigiani´s (2007) that this choice does not appear to be a simple weighted average of coordination along a make/buy continuum.

On the whole, the transaction cost framework appears to offer a useful explanation of the governance mode choice among spot market, hybrid forms and hierarchy. This is a major contrast to the previous hybrid relationship studies, whose results haven't been very consistent with this framework (Carter and Hodgson, 2006). Then, not only the recognized statement "TCE is an empirical success story…" (Williamson, 2000, p. 605-607) is appropriate in the simple dichotomy between the decision to "make" internally or "buy" though the market, but it is also generalized to hybrid forms.

However, this framework is by no means a complete explanation. Other variables outside the framework are related, and not all transaction cost hypothesis are supported. The evidence presented in this paper points to the fact that it is important to examine not only the production experience, but to examine the role of quality in a context of transactions where quality can not be precisely measured by observing only the outcome.

Several caveats about limitations deserve consideration. First, our study focused on governance mode choice in the viticulture industry. This, conclusions and inferences about the results may be limited to this setting and may not address the governance mode choice in other industries. However, we believe many of the factors that determinate different governance mechanisms in this study can be found in other

settings in which it is difficult to measure input quality by only observing the input. One example could be the olive oil industry.

Second, the purpose of this study was to study hybrid modes as alternative to either spot market or vertical integration. Clearly, investigators need to better understand hybrid governance structures and determinants in the context of economic theory. While this study has provided initial insight into the underlying factors that determine the choice of this type of governance mechanism, additional research is needed. Further research may find improvement not only by developing better measures, but also by including variables not covered here. One such variable is trust. Much of the management literature from a transaction cost viewpoint indicated that trust reduces transaction costs by reducing or eliminating both *ex ante* and *ex post* opportunism (Zaheer and Venkatraman, 1995).

Additionally, due to the limited nature of the scope of this study, we do not examine why firms choose among different hybrid mechanisms (short-term contracts, long-term contracts, concurrent sourcing…) along the governance continuum to its input needs. The generalizability of the findings could be enhanced with the study of different hybrid types used. A future research agenda includes overcoming some of the weaknesses and limitations of this paper.

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