Differentiation Strategies, Transaction Costs and Capabilities as Determinants of Vertical Integration

Marta Fernández Olmos and Jorge Rosell Martínez

This study evaluates the importance of a product differentiation strategy as a determinant of vertical integration in the firm. The proposed model also controls for known determinants of integration such as transaction costs and firm-level capabilities. By identifying transaction-, firm- and strategy-level determinants, we derive testable predictions about the choice of vertical integration. To test these predictions we analyze the case of the Rioja wine industry with a representative sample of 187 firms. In general, empirical evidence indicates that firms vertically integrate to mitigate opportunism, to deal with unforeseen contingencies, to internally exploit their capabilities and to improve their success in vertically differentiating their products.

Keywords: Transaction Cost Economics, Resource Based View, Product Differentiation, Vertical Integration.

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Introduction

The organization field is fundamentally concerned with explaining differential firm’s boundaries, which represents a question of great strategic importance for its managers (Butler and Carney, 1983; Leiblein et al., 2002; Díez-Vial, 2007). Indeed, understanding why some firms produce a good or service themselves while others procure it from another organization is one of the central questions in industrial organization.

A large number of explanations for the vertical integration decision have been offered. In the strategic management literature, a high degree of vertical integration between the links in the value chain is emphasized as a success factor for quality control and innovation ability (Porter, 1980). That is, vertical integration may be an adaptive response to a product differentiation strategy that is driven by rapidly changing markets, new technologies and an almost worldwide competition. Some economists, though, have emphasized the decision of vertical integration is based on economising on transaction costs. As asset specificity becomes substantial, bilateral dependence is deepened and vertical integration will be relatively more efficient because of its coordination capacity (Williamson, 1979). Finally, the basic assumption underlying the resource based view is that vertical integration may be pursued by a firm competing to achieve competitive advantage property and to increase the chance to be able to appropriate economic rents or to guarantee rare, difficult to imitate and costly resources (Barney, 2002).

Marta Fernández Olmos, Department of Business and Economics, Faculty of Economy, University of Zaragoza, Spain. Email: maferno@unizar.es
Jorge Rosell Martínez, Department of Business and Economics, Faculty of Economy, University of Zaragoza, Spain.
While all cited points of view have contributed to our understanding of vertical boundaries of the firm, each approach offers managerial prescriptions that are individually incomplete. We contend that if followed in isolation, each framework can lead to inferior performance.

This paper tries to improve upon prescriptions from the literature by constructing and testing a model that integrates several views in a single framework. In doing so, the paper extends the empirical literature in vertical integration by examining the relative economic and statistical importance of these prescriptions associated with strategic management literature, transaction cost economics and the capability-based view. We seek to offer a complete and accurate understanding of how firms establish their vertical boundaries and resolve the trade-offs involved in the different explanations.

Many empirical studies of vertical integration decisions testing transaction cost economics have found support for the theory’s main hypotheses. As compared with transaction cost economics, much fewer empirical papers that have examined the effects of firm’s capabilities on the vertical boundaries of the firm. Some of these recent studies have suggested that vertical integration is conditioned not only by transaction costs but also by production cost differences (Argyres, 1996; Jacobides and Winter, 2005; Madhok, 2002). Finally, in strategic management literature most studies have focused on discussing specific strategic issues associated with vertical integration in the value chain. These include improved ability to differentiate the product and increases in product and process quality (e.g., Kumpe and Bolwijn, 1988; Kindel, 1991). It is therefore remarkable that the empirical literature throws so little light on how product differentiation strategy creates motivations for firms to vertically integrate. To fill this gap, this work also contributes by analysing the role that product differentiation strategies play in determining vertical integration in addition to other factors.

Traditionally, discussions of vertical integration have focused on manufacturing (e.g., Anderson and Schmittlein, 1984; Ohanian, 1994; Bigelow and Argyris, 2007; Parmigiani, 2007). This leads to emphasis on the valuation of production costs, which may be or may be not higher under vertical integration. Although it has recognised that differences in quality are increasingly relevant, less attention has been paid to their role. We focus on the integration of a particular agrarian activity, viticulture. The issue is whether to buy grapes from independents growers or to cultivate grapes in own vineyard. The resolution of this issue turns on quality differences, because differences in production costs are negligible in this setting.

In other words, the aim of this paper is to evaluate the importance of a product differentiation strategy in the firm as a determinant of its vertical integration decisions, accounting for other well-known determinants as those from transaction cost economics and from the resource based view. We test our hypothesis on Rioja wine industry. This industry offers some advantages as a research case. Its main input (grapes) is a non standardized supply; it is a relevant world known producing region; vertical product differentiation may be objectively determined; it offers enough variability among firms; and finally, it is a bounded industry so a highly representative sample is achievable.

The paper proceeds as follows. Section 2 discusses the theoretical framework for understanding vertical integration decisions, integrating three main approaches: transaction cost economics, resource-dependence theory and industrial organization. Section 3 describes the data and methodology used to test these hypotheses. A
discussion of the results is obtained in the fourth section. Finally, section five presents the main conclusions of the study.

**Theoretical Framework**

There is no shortage of factors of the occurrence of vertical integration. Economic theory, as well as empirical literature, has shown that vertical integration may be induced by transaction costs, the development of strategic capabilities and even by the choice of a differentiation strategy. Nevertheless, compared with transaction costs and capabilities, there are fewer empirical studies that provide evidence of differentiation strategy as determinant. All these determinants are jointly explored in our model.

**Vertical Integration and Transaction Costs**

Research on transaction cost theory maintains that there are hazards associated with conducting certain kinds of transactions through the market, and that these kinds of transactions will therefore be performed more efficiently within a firm (Coase, 1937). Williamson (1985) and Klein et al. (1978) suggest that the main contractual hazard is hold-up, whereby the party whose investments in the transaction can be freely transferred across applications expropriates quasi-rents from the party who invested in transaction-specific assets that are non-valuable in alternative uses. TCE predicts that internalization, or hierarchy, may reduce the potential for such opportunistic behavior by reducing the incentive for contracting parties to engage in hold-up, in part by creating an environment in which “adaptive, sequential decision-making” supported by the threat of fiat may occur, and where the courts forbear from intervening (Williamson, 1975, 1991). Internalization, however, implies added bureaucratic costs and lower-powered incentives (Williamson, 1985). Therefore, we can advance that:

*Hypothesis 1*: The greater the potential transaction specificity of assets, the greater the likelihood of using vertical integration.

The earlier model developed by Williamson (1975) proposed other three important factors that also drive integration decisions, namely transaction frequency, uncertainty, and small number bargaining.

According to Williamson (1975), transactions characterized by small numbers bargaining are also hazardous because such transactions are more subject to haggling, delay, and other strategic behavior by the parties when contractual disturbances arise. The evidence to support the hypothesis that vertical integration rises with supplying industry market concentration, even controlling for asset specificity, has been obtained in various prior studies (e.g., Levy, 1985; Caves and Bradburd, 1988; Leiblein et al., 2002). In terms of food industries, Frank and Henderson (1992) and Bhuyan (2005) find supporting evidence for vertical integration in the U.S. food manufacturing industries. Accordingly, the small numbers bargaining hypothesis is the following:

*Hypothesis 2*: The smaller the number of suppliers in the upstream market, the greater the likelihood of vertical integration by downstream producers.
A basic assumption of transaction cost theory is that all transactions are conducted under a certain level of imperfect information\(^1\), which can affect exchanges.

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. Nevertheless, although transactions will be completed less smoothly than in more certain environments, the market mode is still advantageous. Hence, unpredictability per se does not favour vertical integration, only in interaction with asset specificity (Williamson, 1979; 1985). This interaction effect between unpredictability and asset specificity have been found by Anderson (1985), Coles and Hesterly (1998), Fan (2000), Leiblein and Miller (2003) and Diez-Vial (2007). The following hypothesis can therefore be proposed:

**Hypothesis 3:** The greater the environmental uncertainty, in the presence of asset specificity, the greater the likelihood of using vertical integration.

A second form of uncertainty, which is linked to difficulty of evaluating performance\(^2\), 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). Based on this reasoning, we hypothesize that increased internal uncertainty in the transaction will lead to an increased use of vertical integration. This general hypothesis 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).

**Hypothesis 4:** The greater the internal uncertainty, the greater the likelihood of using vertical integration.

Frequency refers to the regularity of the transaction. 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.

Besides specificity and uncertainty, Williamson (1981) agrees that other factors are also bound to operate in a given setting. In particular, Williamson (1974) 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 (Williamson, 1985). Empirical evidence has been provided to support this idea (Martin, 1986; Scherer and Ross, 1990; Russo, 1992; Bhuyan, 2005). All of this leads us to consider the following hypothesis:

**Hypothesis 5:** The larger the firm is, the smaller the likelihood of using vertical integration.

**Vertical Integration and Firm Capabilities**

The resource- and capability-based view of the firm emphasizes the management of a firm’s resource and capability portfolio as a key determinant of the configuration

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\(^1\) 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).

\(^2\) Alchian and Demsetz (1972) refer to this concept as the difficulty with which individual productivity can be metered.
and boundaries of the firm. This view has provided additional theoretical and empirical explanations of vertical integration decisions. The central premise of this framework is that firms are heterogeneous in terms of the resources and capabilities they own and control (Schumpeter, 1942; Penrose, 1959; Wernefelt, 1984). This heterogeneous character of resources can be determined by factors such as resource-market imperfections (Barney, 1991), inability to alter the accumulated stock of resources over time (Carroll, 1993) or difficulty to imitate (Dierickx and Cool, 1989). Capabilities refer to those abilities, organizational processes, knowledge and skills that allow a firm to combine its resources to achieve superior performance over competitors (Amit and Shoemaker, 1993; Grant, 1996, Prahalad and Hamel, 1990). Within this line of reasoning, vertical integration decisions may be led by firms’ attempts to leverage and protect idiosyncratic capabilities. Argyris (1996) tested this theory using several examples from a manufacturing firm. The findings support the proposition that firms outsource when suppliers possess superior capabilities, except when higher costs are accepted in the short run while capabilities are being developed in-house. Likewise, Poppo and Zenger (1998) empirically linked the presence of skill sets to vertical integration decisions. Barney (1999) suggests that integration decisions are jointly determined by the expected cost of opportunism associated with accessing a factor through the market-place as well as the expected cost of creating that factor inside the firm. Hence, a firm that owns innovation and marketing skills, which are valuable and difficult-to-imitate capabilities due to their intangible nature, will be more likely to integrate than its competitors. Therefore, we hypothesize:

**Hypothesis 6:** Marketing-intensive firms are more likely to choose integration for their transactions.

**Hypothesis 7:** Innovation-intensive firms are more likely to choose integration for their transactions.

With the constant pressure to meet consumer demands and the need to be competitive, firms must continually acquire, develop and upgrade their resources and capabilities (Wernefelt and Montgomery, 1988; Robins and Wiersema, 1995; Argyris, 1996). Hence, the identification of the origin of strategic resources and capabilities (those that establish and enhance the firm’s sustainable competitive advantage) represents one of the most complex challenges facing a firm. Although some authors ascribe capabilities to luck (Barney, 1986), resources and capabilities are traditionally considered as the product of a history of specific routines developed experientially at the firm. They are said to develop cumulatively, as firms learn to perform routines over time (Nelson and Winter, 1982; Amit and Schoemaker, 1993). As a result, some authors hypothesize that a firm with production experience will be more likely to integrate because it provides learning opportunities that enhance its production capabilities (Arrow, 1962; Conner, 1991; Leiblein and Miller, 2003).

**Hypothesis 8:** The greater the experience of the firm, the greater the likelihood of vertical integration.

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3 Marketing skills may enhance the ongoing relationship between customers and a brand thus increasing the competitive advantage of the firm (Larsen and Srinivisan, 2003). With respect to innovation capability, investments in R&D may lead to the development of superior product designs also increasing the competitive advantage of the firm through product differentiation (Kotabe, 1990).
Vertical Integration and Product Differentiation Strategy

A well-known product strategy in mature markets is differentiation. Mature industries become more dynamic and more complex, what accentuates the degree of interdependence among different levels of the supply chain. Market directedness of product and services and the efficiency and reliability of their delivery become decisive aspects for competitiveness chain (Ziggers and Trienekens, 1999). It explains that a product differentiation strategy based on high quality performance has become a cornerstone of many firms’ competitive strategies.

Strategic management literature has abundant studies that focus in a variety of benefits of vertical integration that influence the product differentiation. A common issue is that increased control over adjacent stages may enhance the ability of a firm to differentiate its product (Perry, 1989; Porter, 1980; Buzzell, 1983). It can be distinguished specific strategic issues associated with integrating forward and backward in the value chain. Whereas backward integration may allow the firm to obtain specialized inputs through which it may improve or at least distinguish its final product, forward integration gives the firm better or more timely access to market information, allowing a more rapid or specified adjustment of product to consumer demands (Porter, 1980; Ouden et al., 1996). Therefore, this strand of the literature argues that firms that seek a product differentiation strategy are motivated to vertically integrate because this decision allows them for product quality improvements through control of input quality and distributions and service of outputs (Johnston and Lawrence, 1988; Hill and Jones, 2008). Based on this reasoning, we establish the following hypothesis:

\textit{Hypothesis 9:} The more differentiated the product of the firm, the larger the likelihood of vertical integration.

In summary, we hypothesize that firms vertically integrate in order to: (1) mitigate ex-ante (small number) and ex-post (asset specificity) opportunism; (2) deal with unforeseen contingencies in transactions; (3) avoid opportunist behavior due to measurement problems; (4) internally enhance their capabilities; and (5) improve the performance of their differentiation strategy (see Figure 1).

\begin{center}
\textbf{INSERT FIGURE 1}
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Empirical Analysis

The Case Study

Wine industry may be considered a mature market in most developed countries. A singularity of this world market is that among the most important competing actors are regions, e.g. Bourgogne, Rioja, Champagne, Sherry, Oporto and so on. Regions act as industrial districts that base their competitive advantage in a collective reputation, or collective brand, of quality and differentiation among them.

The concept of collective reputation is directly applicable to the protected designation of origin labeled products. Since many individual wine producers are not known directly by the consumer, consumers tend to rely on the image of the collective brand that guarantees and promotes the particular label. For all those belonging to the label, this collective reputation acts as a public good. Then, if the collective reputation
of the product is excellent, a label with the indication of its origin will be a powerful tool to signal quality as well as other attributes and perceptions. Moreover, the implementation of a label with collective reputation as those cited previously will reduce the search costs associated with the consumer’s choice (Loureiro and McCluskey, 2000). For this reason, wineries have a high incentive to belong to an appellation of origin. But to do it, high standards of quality control and management must be assured by wineries of the region. This kind of rules and standards are established and controlled by a board which is responsible of the label and the registered trade mark.

Rioja is a wine producer region with a protected label DOCa Rioja (Denominación de Origen Calificada Rioja). It is well known for its red wines with traditional elaboration methods. Nowadays there are about 600 wineries, and about 10,000 growers (not associated in cooperatives), with an annual production of about 280 mill. liters of wine.

It was selected one region, rather than several, because a wide variability in the business inside this region is detected. This design allows to establish internal validity (Anderson, 1985). In this sense, though quality standards and traditional methods of production are common among firms, centenary wineries compete with young successful ones, and diversified firms coexist with specialized ones.

Rioja wines are divided into four categories according to the classification provided by the Regulatory Board of DOCa Rioja, which are ordered by value added. In the Spanish nomenclature, the first group includes mostly “garantía de origen” wines, which have not been aged in oak casks. The next group of wines includes “crianza” wines, which must spend at least two years at the winery before being released. The third group comprises “reserva” wines, which must have at least three years ageing both in barrel and bottle. Finally, “gran reserva” wines are made from the best vintages, using only the finest red grapes; they must spend at least five years in the winery. These four categories are proportional with a growing value added in the product, or in other terms, with a growing willingness to pay by the consumer. These objective categories allow to establish a vertical differentiation of the product in the Industrial Organization sense.

**Sampling and Data Collection**

In this study, our aim is to examine the motives for vertical integration in the Rioja Designation of Origin wine industry. Hence, the first criterion in selecting the sample was that the firm belongs to the DOCa Rioja and was wine-making processor. The second criterion was that they presented financial information to the public registries. Wineries that were created as cooperatives of growers were excluded of the study since these firms cannot adopt an independent decision about its vertical integration.

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

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4 Two wines are said to be vertically differentiated if one wine captures the whole demand when both are supplied at the same price. One wine dominates the other and differences in willingness-to-pay for “quality” across consumers explain why both wines are present in the market (Dos Santos Ferreira and Thisse, 1996).

5 The population was drawn from the 2007 list provided by the Regulatory Council of the Rioja Designation of Origin.

6 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.

7 It is a prerequisite of transparency of information that implicitly excludes micro-firms from this study.
understanding of the activity. Based on these sources of information and on our theoretical framework, the survey was designed to elicit information about industrial, transactional and firm-specific attributes. Surveys were mailed to all respondents along with a letter on university stationary from the researchers explaining the coding systems, the purpose of the study and the confidentiality of the replies. Respondents were offered a summary of the results to encourage their participation. Surveys were returned directly to the researchers in pre-addressed, postage-paid envelopes provided with the survey to emphasize the academic control of the information. One follow-up mailing with a duplicate survey and cover letters was sent to non-respondents.

The survey was returned by 187 valid participants, 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 (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.

Variables Operationalisation

A total of eleven determinant variables were operationalized for the current investigation. These measures were grouped in the three sets identified from the literature. Transactional attributes, firm-level capabilities and product differentiation strategy formed the three sets. We describe each of the eleven measures, by set, below.

(i) Measures for Transaction Attributes

For this set of determinant variables, we operationalized measures of specific assets, small numbers, uncertainty and size.

We use items on seven-point scales anchored by “strongly disagree” and “strongly agree” to measure some 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). The constructs were operationalized with a mix of original and adapted items relied on previous survey-based transaction cost studies.

**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.

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8 All the questionnaires returned were usable responses because we followed up missing questionnaires.
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 decision to integrate (e.g., Klein et al., 1978; Monteverde and Teece, 1982a; 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 operationalized 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 operationalized 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.

Small numbers (Hypothesis 2). To test for the effect of small numbers on the probability of vertical integration, the number of existing (or available) suppliers in a given period of time has been used traditionally as a measure of small number bargaining problems in previous literature (e.g., Pisano, 1990; Lieberman, 1991; Leiblein and Miller, 2003). Yet, many studies have ignored that this measure may be affected by vertical integration decisions in prior periods. An exception is Bigelow and Argyres (2007), who recognized that using a forward measure of existing suppliers could introduce an endogeneity problem in their regressions, causing the coefficient estimates to be biased. Likewise, they recognized that using a lagged measure of existing suppliers also has disadvantages. While this measure helps with the endogeneity problem, it fails to account for expectations about the future number of suppliers. Then, in order to limit the influence of the year analyzed, we used one item that asked each processor how many growers on average would be willing to contract with him. Following to Fowler (1995), instead of asking the exact number of suppliers, seven choices were provided in a scale such that higher scores indicate a smaller number of available suppliers. This improves accuracy by cueing the respondent’s memory and avoids relying entirely on a respondent’s ability to remember this number.

Environmental uncertainty (Hypothesis 3). Following to Williamson (1975), we highlight one type of environmental uncertainty, that of environmental unpredictability. In our activity of analysis, the high level of dependency of 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 environmental volatility.

As we mentioned earlier, the presumption of market superiority is undisturbed unless assets are specific to a nontrivial degree (Williamson, 1979). Following Coles and Hesterly (1998), 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 all items of specificity is above 1 (the minimal value of the scale), and 0 for values of 1.

Internal uncertainty (Hypothesis 4). Difficulty of evaluating performance is referred to as behavioral uncertainty (Anderson and Schmittlein, 1984; Anderson, 1985; John and Weitz, 1988; McNally and Griffin, 2004). It 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.

Size (Hypothesis 5). 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). In particular for wineries, there are two direct indicators of a winery’s size: the number of acres owned by the winery and the storage capacity of the winery (Benjamin and Podolny, 1999). It is used the logarithm of the second one because the variables based on assets owned by the winery are directly dependent upon the decision to integrate production activities (Leiblein and Miller, 2003).

(ii) Measures for Firm-Level Capabilities

Marketing intensity (Hypothesis 6). The relationship between advertising and promotional expenditures and marketing communication have been found in the works of Farris and Buzzell (1979), Balasubramanian and Kumar (1990) and Zinkhan and Cheng (1992). Similarly to these empirical works, we use the ratio of advertising and promotional expenditures to sales as a proxy for marketing communication intensity. Innovation intensity (Hypothesis 7). Research and development expenditures are used as a proxy for innovation capability in a large number of studies in the economics literature (e.g., Hirschey, 1982; Hirschey and Weygandt 1985; Connolly and Hirschey 1990; Hirschey and Spencer 1992; Sougiannis 1994; Green et al., 1996; Lev and Sougiannis 1996; Stark and Thomas 1998; Barth and Kasznik 1999; Graham and Frankenberger, 2000). Therefore, an appropriate indicator of a firm’s innovation capability is the intensity of its spending on research and development (measured by research and development expenditures to sales).

Experience (Hypothesis 8). 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.

(iii) Measure for Product Differentiation

See Pakes and Griliches (1984) for an explanation of this relationship.
Product differentiation (Hypothesis 9). In order to examine the effect of the vertical product differentiation we measure the weight $s_i$ of every category ($P^i$) of product in total firm sales. The corresponding categories are the previously described: Garantía de Origen, Crianza, Reserva and Gran Reserva. A firm with a high share in the two latter should be considered a firm focused in high willingness-to-pay products. A firm with high shares in garantía de origen and crianza, should be considered a firm focused in low value added products.

Following this classification, we calculate the quadratic $^{10}$ shares of each type of wine in each firm’s total sales. The variables are referenced by appending a subscript (the name of the category) behind the name “Share”.

Dependent Variable and Methodology

In order to measure the dependent variable, the degree of vertical integration between two stages in the production process, respondents (wine-making processors) were directly requested to indicate the percentage of inputs (grapes) used that is internally provided. A tobit technique was conducted to statistically relate the survey items to the vertical integration decision. This model is preferred over OLS regression, since the dependent variable is censored $^{11}$ in the range (0% to 100% of vertical integration).

Results and Discussion

Table 1 shows descriptive statistics and inter-correlations $^{12}$ among our variables. Although there are some significant correlations between some pairs of variables, 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 estimations across the models.

Insert Table 1

Table II gives the coefficient estimates and goodness of fit measures for the nine hypothesized determinants of vertical integration with the Tobit estimation. An important issue in a model is its stability. To test for this, different models were estimated across various specifications. Model 1 includes only the variables associated with transaction-level effects for asset specificity, ex ante small numbers bargaining situations, environmental uncertainty interaction and measurement problems. Model II represents the transaction cost model and adds the control variable size. In model III, we include our firm-level measures for marketing intensity, innovation intensity and the experience. Model IV reports the results from our full model, which includes the transaction and capability level variables as well as our index for product differentiation. Likelihood statistics and measures of overall model fit are showed in the bottom line of the table. The robustness of the estimated coefficients across model specifications

$^{10}$ It corresponds to the disaggregated index of diversification suggested by McVey (1972). It has the form $\sum s_i^2$, where $s_i$ is the share of the $i^{th}$ product in total sales.

$^{11}$ The nature of the variable dependent destroys the linearity assumption between the dependent and independent variables so that the OLS regression is clearly inappropriate (Long, 1997).

$^{12}$ The Kolmogorov-Smirnov test determined that the variables are not normally distributed. Consequently, we use Spearman’s correlations instead of Pearson’s correlations.
suggests that transaction costs, capabilities as well as the product differentiation strategy influence firms’ vertical integration decisions in the wine industry (Models I to IV). It is shown in the likelihood ratio test statistics of each model compared with those of its predecessor, which are all significantly different from zero. Given the stability of our results across specifications\textsuperscript{13}, our discussion focuses solely on model IV.

Our results provide strong support for some of the hypotheses derived from transaction-cost analysis. According to hypothesis 1, transaction specificity of assets leads to integration. It has been largely corroborated with the parameters of upstream specificity of physical assets and dedicated assets. Conversely, the downstream specificity of physical assets is nearly insignificant. Contrary to our expectations, the results fail to support the existence of a significant direct effect between small numbers and integration (hypothesis 2). Hypothesis 3 is confirmed, so environmental uncertainty is positively related to vertical integration in presence of a non-trivial degree of asset specificity. We do not find support for the hypothesis 4 referred to the positive effect of measurement problems on vertical integration.

Hypothesis 5 argued that firms having greater size are less likely to internalize their input needs due to diseconomies of scale. As we expected, the result of this variable indicates that size affect negatively firms’ vertical integration decision.

The findings in this paper are not consistent with all our hypotheses based on the resource and capability-based view. In accordance with hypothesis 6, marketing-intensive firms are more likely to choose integration for their transactions. We find weak evidence for this hypothesis (the coefficient associated with innovation intensity has a p-value=0.052). With respect to innovation-intensive firms, our evidence fails to support the hypothesis 7. However, our results provide stronger support for hypothesis 8, which implies that the experience is significantly associated with vertical integration.

Consistent with strategic management literature, hypothesis 9 predicted that superior quality product mix will push transactions away from the market into vertical integration. In particular, it was argued that the likelihood of market failure was most severe in exchanges that exhibited high differentiation based on product quality. Our results in model 4 provide partial support for this hypothesis. While the coefficients on \( \text{share}_\text{GARANTIA\,DE\,ORIGEN}^2 \) and \( \text{share}_\text{CRANZA}^2 \) individually do not affect significantly to vertical integration, the variables corresponding to the highest quality wines, \( \text{share}_\text{RESERVA}^2 \) and \( \text{share}_\text{GRAN\,RESERVA}^2 \) support the existence of a significant direct effect between vertical product differentiation and integration.

As a robustness check, ordered logit models\textsuperscript{14} that included eight choices for the dependent variable\textsuperscript{15} were run to replicate the tobit models, using all variables included in model IV. Table III reports the results of this analysis, and provides a very similar picture from what the tobit model presents.

\textbf{Insert Table iii}

\textsuperscript{13} The coefficient associated with the variable marketing communication intensity in model 4 is nearly statistically significant (p-value=0.052).
\textsuperscript{14} The multinomial logit model is not appropriate because the independence of irrelevant alternatives assumption is violated.
\textsuperscript{15} We established the eight options of the dependent variable used by Parmigiani (2007) in her ordered logit:

| Over 90 % | 75-90 % | 50-74 % | 26-49 % | 11-25 % | Over 0-10 % | 0 % |
Discussion

Our results provide evidence that the combination of strategy, transactional and firm-specific factors appears to offer a useful explanation of the firms’ vertical integration decision in the wine industry.

The incremental benefit from including each set of factors in the analysis can be evaluated with the statistical significance. In this way, transactional attributes are highly effective at explaining vertical integration decisions (Nagelkerke’s $R^2=0.374$). Transactional attributes have a contribution to the vertical integration choice in different ways. Consistent with transaction cost analysis is the finding that the decision of vertical integration is reinforced as asset specificity increases: firms integrate to avoid problems of lock-in that may arise from large sunk investments. It is observed that upstream physical asset specificity and dedicated asset specificity present the appropriate sign and are statistically significant. However, downstream physical asset specificity has a much lower significant impact on the decision to integrate these transactions. This result is consistent with the fact that a winery’s profitability is increasingly not limited to winemaking. Indeed, many regional winemakers diversify their winery activities in order to develop additional income streams through a commitment to wine and cultural tourism (Lumbreras, 2004).

The results fail, however, to support the small-number hypothesis, which is a less central prediction of the transaction cost model. This finding is in contradiction to prior empirical work (e.g., Levy, 1985; MacDonald, 1985; Caves and Bradburd, 1988; Martin, 1988). However, we caution that this non significant result can have at least two explanations. One possible explanation for this is that in DOC Rioja wine industry, there were a simply a sufficient number of suppliers available to make small number bargaining problems a minor consideration. Another possible explanation is that our measure of existing suppliers is a noisy measure of actual supplier availability (Bigelow and Argyres, 2007). The insignificant effect of small numbers was also obtained by Lieberman (1991) and Bhuyan (2005).

We also find support for Williamson’s (1985) proposition that environmental uncertainty, in presence of a non-trivial degree of specificity, raises transaction costs appreciably. Thus, hypothesis 3 is supported. We also performed these analyses for the case where the dummy variable $\lambda=1$ for the values of all items of specificity above 2, and 0 otherwise. The results of the empirical analyses were not substantially changed by altering the interaction variable in this way.

The results provide weaker support for hypothesis 4, that increased measurement problems in the transaction leads to an increased use of vertical integration. This result apparently contradicts other empirical papers. However, industry singularities might explain this divergence. European wine growers and wine processors live in small villages in which people know one another quite well through an efficient mouth-to-mouth communication network. Hence, the contractual parties know each other prior to lease. Some of them are family members and others are introduced by a neighbor or relative. In such a circumstance, reputation certainly matters and it diminishes the possible effect of internal uncertainty, because cheaters would soon become known in the industry (Fernández, 2008).

Consistent with hypothesis 5, the size of the winery is negatively related to vertical integration. According to transaction cost reasoning, the incentive for vertical integration is lower in larger firms.
integration is negated by strong diseconomies of scale, supporting that diseconomies of scale could be a factor limiting the extent of vertical integration (Williamson, 1974). Applying this argument to viticulture, the diseconomies of scale are generated by the distance between the vineyard and the winery. It is known that a key aspect of improving wine quality is control of the entire production process from vineyard planting to the finished product. When a winery needs large quantities of grapes, their supplying vineyards cannot all be near the winery. Hence, in large wineries with integrated production of grapes, managers would need to spend a lot of time visiting their vineyards.

In order to examine whether the internal pool of capabilities really add explanatory power to our model, Nagelkerke’s $R^2$ was compared between the model 3 and the model 2. The observed increase in Nagelkerke’s $R^2$ was 0.085 and demonstrates that firm-specific capabilities also increase the explanatory power of the model. In general, the availability or the building of capabilities in the firm definitely increases the degree of backwards vertical integration. However, research and development expenditures are insignificant, indicating lack of support for hypothesis 7. Similar to hypothesis 4, the discrepancies could be due to differences in the specific characteristics to the industry in which innovation efforts in wineries appear not to affect the grape crop.

To the contrary, hypothesis 8 relates the effect of experience on vertical integration. This hypothesis is tested with the coefficient of the term experience. This coefficient is positive and highly significant, what corroborates the hypothesis proposed.

**Insert Table iii**

We have finally obtained support for the hypothetical relation between a firm’s focus in high value added products and the degree of vertical integration. This result is consistent with the classical Edmonds’ (1923) proposition that an important motivation for vertical integration is that “the purchaser of the high-priced automobile prefers to buy a car which is manufactured by the company rather than simply assembled” (p.436), suggesting a high quality level or willingness-to-pay effect associated to vertical integration. In many manufacturing industries such proposition has become weaker as advances in standardization and information technologies has allowed stronger *de facto* integration with external suppliers. However, the proposition conserves its validity in the food industry where such advances have been less evident.

In table IV, we summarize the hypothesis formulated above and the results obtained.

**Insert Table iv**

Finally, a global reflection about the determinants of vertical integration arises the question about endogeneity of the explanatory variables, or the real direction of the cause-effect relations. However, the interpretation of the results is unambiguous: a vertical product differentiation strategy towards high willingness-to-pay products is afforded with higher levels of vertical integration, once controlled the effects of other known determinants for vertical integration. At least, it is true for those industries where the control of the processes all along the value chain is important for a high quality guaranty.
Conclusions

Understanding the factors that determine which type of transactions are mediated through markets and within firms has been an important subject of theoretical and empirical work in the economics and management literature. Despite the considerable research on determinants of vertical integration, this paper develops and tests a model of vertical integration choice that contributes to the literature by analyzing strategies, transactions and firms attributes. The main results indicate that transaction costs, firm-level capabilities and differentiation strategies independently and significantly influence firms’ vertical boundaries choices.

The results of this study are generally consistent with the existing empirical literature on the subject. Previous studies have suggested that undertaking new stages in the value chain is conditioned by not only transaction costs but also production cost differences (Argyris, 1996; Jacobides and Winter, 2005; Madhok, 2002; Leiblein and Miller, 2003). As in these studies, we found that firms integrate to reduce transaction costs and protect strategic resources and capabilities, among other motives. Similar to Díez-Vial (2007), we also found that transactional attributes are more relevant than capabilities in explaining firms’ boundaries. While this result appears to contradict other empirical papers, measures differences might explain this divergence (Walker and Weber, 1984; Leiblein and Miller, 2003).

Along with the transaction cost and the capability-based view, the strategy management literature appears to offer a useful explanation of the use of vertical integration. The influence of product differentiation strategy on the vertical integration decision is an important distinction in our model. Our study suggests that firms that seek to have highly differentiated products are associated with a greater likelihood of internalizing production.

The analysis presented here leaves unanswered some interesting questions about governance mode choice. Our study focused on vertical integration decisions in the wine industry. Thus, conclusions and inferences about the results may be limited to this setting and may not address vertical integration choice in other industries. However, we believe many of the factors that are associated with firm boundaries in the current study can be found in other settings, particularly in differentiated-product industries with low – standardized supplies.

Another potential complementary perspective to explore the determinants of vertical integration decision could be the economics of property rights (e.g. Coase, 1988; Alchian, 1977; Demsetz, 1988; Eggertson, 1990; Barzel, 1997). For this approach, property rights to resource attributes consist of the rights to use, consumer, obtain income from, and alienate these attributes (Foss and Foss, 2001). As a consequence, property rights are important in viticulture because a vineyard owner’s ability to create, appropriate, and sustain value from it partly depends of the property rights that he or she holds and how well they are protected.

A cross-sectional research design was chosen for this paper in order to provide comparability with extent research on the vertical boundaries of the firm (e.g. Monteverde and Teece, 1982a, 1982b; Walker and Weber, 1984, Masten, 1984; Poppo and Zenger, 1998). The stability of the relationships between attributes of a given transaction, relevant capabilities, and governance decisions over time remains an untested area deserving of attention. In the wine industry, it would have been helpful if
we had had data on the wineries’ experience in previous growers-wineries relationships. With this information, we could analyse how this factor reduces negotiation costs and allows the winery to develop useful capabilities for choosing and governing new relationships.

While this study emphasizes insights derived from different views in the management and economics literature on vertical integration, interactions among perspectives are not considered. Given that we found some correlation between explicative factors, it would be interesting in future research to test how they influence each other.

References


Table I. Descriptive statistics and Spearman’s correlations

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N=187 Levels of significance: * p<0.05; ** p<0.01
Table II. Estimates using Tobit for censured data at two extremes (0, 100)

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<th>Variables</th>
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<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
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<td>3.266 (2.079)</td>
<td>3.342 (1.886)</td>
<td>2.744 (1.805)</td>
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<td>7.194 (2.360)**</td>
<td>6.741 (2.247)**</td>
<td>5.259 (2.039)*</td>
<td>4.620 (1.946)*</td>
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<td>Dedicated specific assets</td>
<td>5.869 (2.137)**</td>
<td>5.315 (2.036)*</td>
<td>5.533 (1.883)**</td>
<td>6.234 (1.857)**</td>
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<tr>
<td>Small numbers</td>
<td>4.123 (2.373)</td>
<td>3.033 (2.278)</td>
<td>1.714 (2.084)</td>
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<td>λ*Environmental uncertainty</td>
<td>11.787 (2.579)**</td>
<td>10.296 (2.452)**</td>
<td>8.165 (2.252)**</td>
<td>8.975 (2.168)**</td>
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<td>Internal uncertainty</td>
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<td>Innovation intensity</td>
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<td>2.008 (1.550)</td>
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Notes:
* N=187 for all models
Levels of significance: * p<0.05; ** p<0.01
Parameter estimates for constants are omitted.
λ. It represents the non-trivial degree of specificity
Table III. Ordered logit model

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<th>Estimated parameters coefficients (standard errors)</th>
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<td>Downstream physical specific assets</td>
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<td>Upstream physical specific assets</td>
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<td>Dedicated specific assets</td>
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<td>Size</td>
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<td>Innovation intensity</td>
<td>0.079 (0.076)</td>
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<td>Experience</td>
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Table IV: Summary of main results

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<td>H\textsubscript{4}: Internal uncertainty</td>
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<td>H\textsubscript{5}: Size</td>
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<td>Resource and Capabilities Theory</td>
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<td>H\textsubscript{7}: Innovation intensity</td>
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<td>Strategy Management</td>
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<td>Corroborated</td>
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\(λ\) It represents the non-trivial degree of specificity
Figure 1. A model of vertical integration decisions incorporating transactional, firm-level and industrial attributes.