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**Explaining vertical integration:
Transaction cost economics and
competence considerations**

by

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Abstract

This study develops a conceptual model that explains vertical integration as a synthesis of transaction costs economics and the competence perspective. Our empirical results show that asset specificity and closeness to present competence are positively related to vertical integration, while tacit knowledge is negatively related to vertical integration. The empirical results indicate that the synthesis provides a more powerful framework for explaining vertical integration than each perspective may contribute alone.

INTRODUCTION

Theoretical and empirical work devoted to explaining vertical integration has taken a number of different approaches. One important perspective is transaction costs economics (Williamson 1985; 1991). However, in recent years the competence perspective (Conner & Prahalad, 1996; Grant, 1996; Kogut & Zander, 1996) has proposed alternative theoretical explanations for vertical integration. While both perspectives focus on efficiency considerations, their predictions rest on different behavioral assumptions, and they pay attention to different factors which determine the firm's efficient boundaries.

Transaction cost economics focuses on market failure, and how to reduce opportunism as the explanation as to why firms integrate activities (Williamson, 1985; 1991). However, it has been argued that when studying vertical integration, there is also a need for theories that can explain the limits of firm size, beyond the market failure argument (Wiggins, 1991). Several researchers claim that the competence perspective should be well suited for this issue (e.g., Barney, 1996; Conner & Prahalad, 1996), as it focuses on organizational resources and competencies. The competence perspective emphasizes that the performance gains from assessing internal capabilities and competencies are important for understanding boundary decisions (Argyres, 1996). However, the competence perspective neglects the performance losses from opportunism and market failure (Conner & Prahalad, 1996; Kogut & Zander, 1992). Consequently, the possibility of integrating transaction cost economics and the competence perspective into one coherent model should be examined.

Since transaction cost economics and the competence perspective have asked complementary questions and provided complementary answers to vertical integration and firm boundaries, each perspective neglects critical issues. The objective of this article is to fill this gap by

developing a synthesis of the two perspectives, and to empirically test hypotheses derived from the synthesis. The study thus contributes to the theory of the firm literature by linking organizational resources and competencies with market failure arguments. Such a research effort has been requested in the literature (e.g., Connor & Prahalad, 1996; Williamson, 1999), but few contributions exist.

The paper is organized as follows: After reviewing transaction cost economics and the competence perspective, we outline the behavioral assumptions of the study. We then develop an integrated research model for the antecedents of vertical integration, and four research hypotheses are derived. After reporting the research methodology of the study, the empirical results of the hypotheses testing are presented. Finally, the results are discussed and implications for theory and practice are emphasized.

THEORY AND HYPOTHESES

The efficient organization of economic activities is an important issue both in organizational economics and strategy. The question of when a firm should perform activities in-house, buy in the market or cooperate through a hybrid organizational arrangement has considerable effect on firm performance. Our aim is to examine the efficient boundaries of firms by linking organizational resources and competencies with market failure considerations. While the market failure argument has been well studied through transaction cost economics, theories explaining vertical integration by addressing organizational resources and competencies have been rather meager. Traditional scope considerations are insufficient in this respect. According to Teece (1993), future development should emphasize the firm as a unique bundle of resources. Furthermore, he recognizes that bits and pieces of such a theory can be found in the contributions from the resource-based perspective (e.g., Penrose, 1959; Wernerfelt, 1984) and

evolutionary economics (Nelson & Winter, 1982). More recently, these two perspectives together with the core competence literature have been labeled as the competence perspective (Williamson, 1999). Transaction cost economics and the competence perspective are thus the theoretical underpinnings of this study. Below, these perspectives are reviewed and discussed.

Transaction cost economics

Transaction cost economics (TCE) identifies different governance modes for transactions. The costs of organizing transactions differ depending on the characteristics of the transaction in question (Williamson, 1985). These characteristics are uncertainty, the frequency of the particular transaction, and the degree to which durable, transaction specific investments are required to realize the least cost supply (Williamson, 1985). TCE proposes that transactions with highly uncertain outcomes that occur frequently and require transaction specific investments will be performed most efficiently within hierarchies.

Even though all the three dimensions are expected to affect the choice of governance form, asset specificity, defined as “*durable investments that are undertaken in support of particular transactions*” (Williamson, 1985), is the critical one. “*Asset specificity is both the most important dimension for describing transactions and the most neglected attribute in prior studies of organization*” (Williamson, 1981: 555). Asset specificity is also the most frequently used dimension in empirical studies, and support for the hypothesis that asset specificity increases vertical integration has been found in several studies (e.g., Joskow, 1988; Mahoney, 1992; Shelanski & Klein, 1995; Rindfleisch & Heide, 1997). It is thus tenable to argue that asset specificity is the most important determinant of vertical integration according to TCE. With regard to the other variables, few empirical studies have examined transaction frequency, and the reported studies have not been able to find any positive association between high

transaction frequency and hierarchical governance (Rindfleisch & Heide, 1997). Uncertainty has been widely used in empirical studies of vertical integration, but the effect of uncertainty on governance is mixed. Harrigan (1986) found that uncertainty reduces the probability of integration, while Walker & Weber (1987) found that uncertainty increases the probability of integration.

Critics of transaction cost economics. Transaction cost economics has been criticized for the assumption of opportunism. TCE assumes opportunistic actors, but the theory is not able to “give refutable prediction about the implications of a deviance from opportunism” (Heide & John, 1992: 32). Furthermore, TCE does not specify the mechanisms through which opportunism is created or reduced (Ghoshal & Moran, 1996). TCE thus ignores possible problems related to opportunism within organizations, as it supposes that firms can always curb internal opportunism by fiat. Moreover, TCE does not focus on firms’ potential production constraints, as there is no attention to what extent the integration of an activity will fit the firm’s existing competence or resource base. It has also been claimed that TCE has little to offer in low asset specificity situations other than an exclusive advantage for the market (Wiggins, 1991). TCE assumes that when asset specificity is low, it will always be efficient to use the market due to weaker incentives and higher transaction costs for a hierarchical solution. TCE has also been criticized for ignoring the importance of trust (Ring & Van de Ven, 1992). Although trust appears to be an essential element in explaining the nature of economic organization (e.g., Bradach & Eccles, 1989; Arrow, 1974; Hennart, 1982), it is not incorporated into the mainstream model of TCE.

In a review of transaction cost economics, Rindfleisch & Heide (1997) summarize the research needs within this framework. *First*, further research is needed to clarify the role of production

costs vs. transaction costs in determining appropriate governance structures. *Second*, research should focus on costs of internal organization, i.e., to what degree transaction costs may exist within firms. *Third*, they ask for studies that address the implications of deviations from opportunistic behavior. Additionally, Shelanski & Klein (1995) criticize empirical studies for not testing alternate hypotheses that may also fit the data as well as the standard TCE variables. Thus, they argue that there is a need for studies that explicitly compare TCE derived hypotheses with hypotheses derived from other perspectives.

The Competence Perspective

Evolutionary economics (Winter, 1988; Nelson & Winter, 1982), the resource based view of the firm (Penrose, 1959; Wernerfelt, 1984) and the core competence literature (Prahalad & Hamel, 1990) have provided an alternative to TCE for understanding the economic organization of firms. Here, firms are viewed as heterogeneous, knowledge bearing entities. Conner (1991) argues that firms exist because some co-specialized assets make ‘a better fit’ within some firms than within other firms. Kogut & Zander (1992) argue that firms exist because they have some higher-order organizing principles that markets cannot supply. Such higher-order organizing principles include ‘shared coding schemes’, ‘values’, ‘a shared language’, and ‘mechanisms by which to codify technologies into a language accessible to a wider circle of individuals’. Thus, what firms “*do better than markets is the sharing of and transfer of the knowledge of individuals and groups within an organization*” (Kogut & Zander 1992: 383). Firms exist because coordination, communication, and learning “*are situated not only physically in locality, but also mentally in an identity*” (Kogut & Zander 1996: 502).

In contrast to transaction cost economics, the competence perspective does not give a detailed description as to which variables are most important for understanding firm boundaries. However, tacit knowledge and some kind of closeness to present competence base seem to be important. The studies by Kogut & Zander (1993) and Zander & Kogut (1995) provide valuable insight by pointing out that the degree of tacit knowledge involved in transferring goods between interfaces affects the governance of transactions. A high degree of tacit knowledge implies that the buyer is unable to fully explain, articulate and write the knowledge or the ‘theory’ that lies behind the vendor’s performance of the activity. Furthermore, the competence perspective generally points out that relatedness is important for understanding firm expansion. As Winter states: “... *when a firm grows by vertical integration, it is not just a question of ‘more of the same’. But it is [also] more of something closely related, something about which the firm already has some degree of relevant knowledge. The evolutionary view suggests that this ‘degree’ is probably an important determinant of where integration takes place and where it does not*” (1988: 176). A firm will thus fail with vertical integration if a new activity does not fit the firm’s existing competence base.

While asset specificity is the most important predictor from TCE, tacit knowledge and relatedness or closeness to present competence can be viewed as important predictors from CP. Both asset specificity and tacit knowledge are extensively discussed in the literature. However, we do not find any clearly defined concept in the literature that theoretically or operationally suggests how we should test the prediction that closeness in competence to existing activities will affect vertical integration. We will therefore discuss and define such a concept below.

Closeness to present competence (CPC). As already pointed at, evolutionary economics argues that when firms grow by vertical integration they grow in a direction of something closely related to present competence base. Furthermore, the resource-based view of the firm and the core competence literature argue that firms will expand in those areas where their existing competence is the foundation for the firms' value creating processes. For a buyer, the competence that is close to the present competence base would be the target for 'borrowing' from the vendor. A buyer may realize that several of the required competence elements already exist within their own organization, and therefore may try to imitate the remaining elements in order to perform the transaction in-house. Or the buyer may, as a result of long-time cooperation with the seller, have incorporated many elements through internal learning processes. It is thus the closeness in competence that is the main argument for the buyer to incorporate new competencies into the pool of competence. The present competence base is consequently used as a catalyst (Verdin & Williamson, 1994) in the further process of accumulating those competencies that without the existing competence base would be much slower and costly to build and incorporate. Closeness to present competence can thus be defined in the following way: *the degree to which the firm's present competencies can be used as a catalyst in the internal learning processes, and in the process of imitating environment-specific competencies.*

Critics of the competence perspective. The competence perspective has been criticized for not being able to explain why there should be more organizing principles, co-specialization or common codes within firms than in markets. In response to Conner (1991) and Kogut & Zander (1992; 1996), Foss (1996) states that in absence of opportunism why cannot co-specialization or higher order organizing principles develop in markets as well as in firms. Furthermore, Williamson argues: "Given that all firms are repositories of knowledge and

relations, the question is when is this best done in separate firms rather than in one. That issue is never addressed, much less worked through, in a comparative institutional way” (1999: 1097). However, from a contractual point of view, firms are constructed to curb opportunism, and the reason why there is more of co-specialization or higher order organizing principles within the firm than in the market is because *“firm-organization is the transaction cost-minimizing mode of organizing for this type of asset”* (Foss, 1996: 474).

Regarding research needs within CP, Barney (1996) asks for studies that integrate a competence-based view with transaction cost economics. He argues that resource or competence-based theories have to explain why firm organization is needed, which implies a discussion of the limitations and weaknesses of TCE. He continues by asserting that such a discussion has not been incorporated in existing competence-based theories of the firm.

By comparing transaction cost economics and the competence perspectives, it is reasonable to argue that the weakness or shortcoming in one perspective is the strength in the other and vice versa. The two perspectives are clearly complementary, and we will outline in the next section a synthesis of the two perspectives.

Behavioral assumptions

As Simon (1991) states, the choice of assumptions is the foundation of a theory, as it influences the selection of variables included in a model. Since TCE and CP start out with different assumptions, they end up with different predictions. As the perspectives have different behavioral assumptions, they also draw attention to different aspects of vertical integration. We thus believe that further progress in theory development on the make or buy decision has been impeded by the tendency to treat the behavioral assumptions from TCE and CP as separate and

distinct. Our framework assumes, as TCE, bounded rationality and opportunism. However, our use of the assumptions differs from TCE.

Our assumption of bounded rationality is based on the fact that firms are exposed to both production and contractual constraints. The two considerations complement each other as they draw attention to different aspects of firm constraints, including contractual problems as well as the cognitive limitations of conducting new and different tasks. In this way, the competence perspective supplements the bounded rationality assumption as it is used in TCE, by incorporating actors' limitations in performing new productive activities.

While TCE assumes opportunism, CP does not include such an assumption. Based on the critique of competence-based theories of the firm (e.g., Conner & Prahalad, 1996), we share Foss' view that we cannot explain firms and firm boundaries without the concept of opportunism (Foss, 1996). We argue that the assumption can be incorporated into both TCE and CP by using the logic presented by Arrow (1974) and Hennart (1982) as the 'connecting bridge'. We assume that economic actors can be characterized by opportunism, and that opportunism can exist both within and outside firm boundaries. The possibility for employees in a firm to act opportunistically will depend on management's ability to detect and punish such behavior. This managerial ability will depend on the degree to which the firm's common codes can be used to control behavior (Arrow, 1974). The use of common codes is thus the internal mechanism that reduces opportunistic behavior (Hennart, 1982). Following Arrow: "*[Firms] become less efficient in acquiring and transmitting information not easily fitted into the code*" (1974: 57), and if a firm cannot use existing codes, it is likely that this will result in increased opportunism and decreased trust (Hennart, 1982). Both transaction costs and production costs are likely to increase, if a firm's common codes can only be used to a minor

degree when performing a new activity. The argument is thus an answer to Foss stating that a competence perspective may complement TCE in the analysis of various agency-problems in internal organization: “... so that - for example - the organizational knowledge residing in business culture is also seen as influencing the organization’s agency cost”, and “... as the ... firm moves increasingly away from its core competencies..., it may confront increasing agency costs, as increasingly unfamiliar activities produce more severe moral hazard and adverse selection problems” (Foss 1996: 747).

A unified research model and hypotheses

The distinction between production and contractual constraints, combined with the fact that firms’ common codes and routines can be used to curb opportunism, enable us to make predictions about vertical integration based on TCE and CP in the same model. Firms that consider the vertical integration of an activity face the challenge of doing something different from their existing activities. According to TCE, firms should integrate activities characterized by high levels of asset specificity. Due to the fact that economic actors are characterized by bounded rationality and opportunism, contracting with external agents will, in such situations, incur large transaction costs, as an extensive use of safeguards is required. By performing the activity in-house, transaction costs can be lowered. However, the firm’s ability to lower transaction costs in-house is dependent upon whether the firm can use its organizing principles or common codes as means to curb opportunism inside the organization. We argue that if a firm does not have closeness in competence to the new activity, the problems caused by bounded rationality and opportunism cannot more easily be handled within the firm compared to contracting with an external agent. Furthermore, if firms possess the relevant knowledge for accomplishing the activity in question, the production costs will be lower, compared to integrating an activity far away from the present competence base. On the other hand, if a high

level of tacit knowledge is involved in performing the activity, production costs will be higher due to the difficulties of learning the required capabilities for efficient performance of the activity.

Our predictions about vertical integration will thus be based upon both production and transaction cost efficiency. The assumptions of bounded rationality and opportunism as they are used in this study, direct attention to potential problems within firms as well as in relation to external agents. This implies that economizing on transaction costs within firms will be solved more easily when firms can use existing common codes and routines to control behavior. Firms will be confronted with increasing agency costs as they move away from their present competence base, as increasingly unfamiliar activities produce more severe moral hazards and adverse selection problems (Foss, 1996).

Asset specificity and closeness to present competence along with tacit knowledge are thus the independent variables in our research model. In the following, we will propose four hypotheses linking these variables to vertical integration. We will develop one hypothesis for each of the three independent variables, and furthermore one hypothesis proposing an interaction effect between asset specificity and closeness to present competence. The hypothesized relationships between the variables are depicted in Figure 1 below.

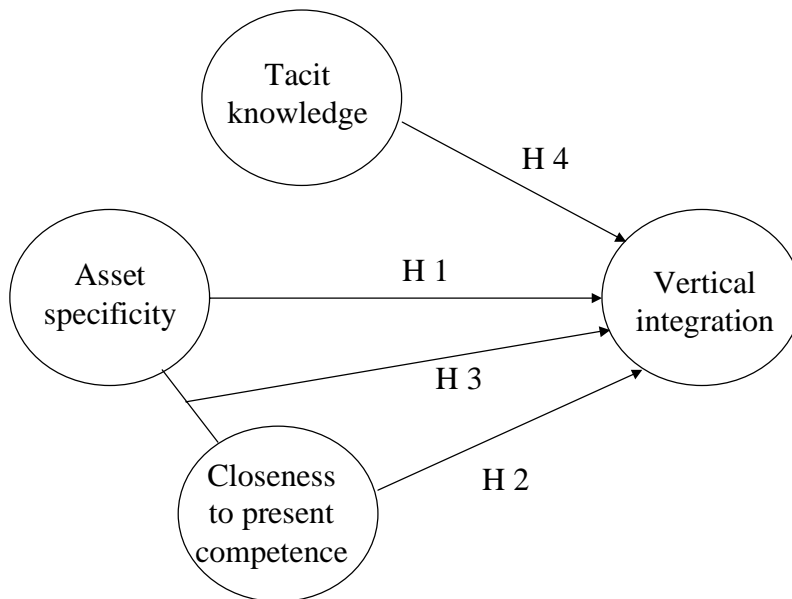


Figure 1 Research Model

Asset specificity. Investments in specific assets will create a safeguarding problem due to the vulnerability of potential opportunistic behavior from the other party. Investments in such assets are supposed to create a lock-in effect (Williamson, 1985). The lock-in effect will create a condition where autonomous trading conditions *ex-ante* should be supplanted by unified ownership (Williamson, 1985). The underlying argument for this proposition is that with high degrees of asset specificity, the expected transaction cost savings by internalizing the activity will exceed the extra production costs that are supposed to exist internally. Based on Williamson (1985, 1991) and empirical studies of vertical integration (e.g., Monteverde & Teece, 1982; Masten, 1984; Walker & Weber, 1987), we state the following hypotheses:

Hypothesis 1: Asset specificity will have a positive effect on vertical integration.

Closeness to present competence. As argued by scholars within the competence perspective, an integration of a new activity that is not linked to the firms' existing competence base will result in large production costs. However, if closeness to present competence is high, the buyer can use existing competence as a guide in learning and imitating relevant competence from the vendor. With increasing CPC the production cost difference between producing internally and using a vendor will be reduced. On the other hand, if CPC is low, it will take considerable time and resources before the buyer will be able to absorb and learn the relevant knowledge necessary for efficiently performing the activity. Furthermore, performing completely different activities will also increase the transaction costs. Opportunism within the firm will increase if management lacks the common codes necessary to detect cheating (Hennart, 1982), and the firm will be exposed to many of the same problems as in conventional market transactions. In sum, as CPC increases, the buyer's production costs will gradually be equal to the production costs of the vendor. Furthermore, at a high level of CPC, the internal governance costs will be lower than the governance costs of market procurement, *ceteris paribus*. We thus propose the following hypothesis:

Hypothesis 2: Closeness to present competence will have a positive effect on vertical integration.

Interaction effect of asset specificity and closeness to present competence. In situations with a high level of asset specificity, the buyer is exposed to high transaction costs, independent of the degree of closeness to present competence. Accordingly, the buyer's ability to control opportunism by the vendor is initially low and can only be reduced by adding safeguards that increase transaction costs. Transaction costs will gradually increase with increasing levels of

asset specificity (Williamson, 1985). By internalizing, the buyer will economize on transaction costs by using common codes and organizing principles as guidelines to control behavior (Arrow, 1974; Hennart, 1982). Thus the interaction effect of closeness to present competence and asset specificity increases the transaction cost difference between market exchange and internal organizing. An increase in asset specificity will increase the transaction costs of market procurement, while an increase in closeness to core competence will, simultaneously, decrease the transaction costs of internal production. However, the interaction effect will not influence the production cost difference. This allows the following hypothesis:

Hypothesis 3: The interaction of asset specificity and closeness to present competence will have a positive effect on vertical integration.

Tacit knowledge. Tacit knowledge represents knowledge that is difficult to transfer across firm boundaries (Winter, 1987; Kogut & Zander, 1992; 1993). Accordingly, the easier the knowledge underlying the activity is to articulate, the easier it is for the buyer to imitate relevant knowledge from the vendor. On the other hand, if a substantial part of the knowledge required for performing the activity is perceived by the buyer as tacit, the buyer will be less able to imitate the vendor. A high degree of tacit knowledge will increase the buyer's production costs when performing the activity in-house compared to a situation with low tacit knowledge. The rationale for the impact of tacit knowledge on vertical integration is thus related to production cost efficiency. Kogut & Zander (1993) received empirical support for the hypothesis suggesting that the degree of tacit knowledge was positively related to the internal diffusion of manufacturing, and negatively related to the use of an external agent. Imitating a firm that possesses capabilities involving a high degree of tacit knowledge may be

extremely difficult, and it is rather unlikely that such knowledge will be transferred from the vendor to the buyer. We thus propose the following hypothesis:

Hypothesis 4: Tacit knowledge will have a negative effect on vertical integration.

METHOD

Empirical setting and data collection

The hypotheses were tested in the hydroelectric power industry in a European country. Procurement of mechanical maintenance activities in vertical relationships between buyer and vendor was chosen as the unit of analysis, and focus was on buyer's make or buy decision of the activity in question. Empirical data were gathered by using structured questionnaires mailed to key informants in the buying firms. Questionnaires were sent to the top-level managers of the firms, and each top-level manager was asked to distribute the questionnaires to all managers responsible for the relevant business units within his/her firm. If the firm consisted of only one business unit, the top-level manager was asked to answer the questionnaire.

Of a population of 214 firms, a sample of 118 hydroelectric power firms was selected and 411 business units were identified. Each firm consisted of one to five business units. Five firms replied that their firm was not relevant for the study. Questionnaires were mailed to the remaining 113 firms. Five questionnaires were mailed to firms with five units, and four questionnaires were mailed to firms with four units, and so on. A total of 411 questionnaires were mailed, and 116 questionnaires were returned. This gives a response rate of 28 %. Of the 113 firms that received questionnaires, 75 firms returned one or more questionnaires.

Measures

Dependent and independent variables were measured by multi-item measures. All measures are listed in Appendix A.

Vertical integration. The method of hypothetical choices (Whyte, 1994) was used to indicate if the firm would continue to buy the goods from the vendor or if the firm would perform the activity in-house. The construct was operationally defined as the degree to which the firm intended to buy the goods from the vendor in the future, or if the firm intended to perform the activity in-house (Whyte, 1994).

Asset specificity. The asset specificity scale described the extent to which the buyer had made specific investments tailored to the specific vendor. Williamson (1985) identifies four types of asset specificity. Human asset specificity is considered to be most relevant in the power maintenance industry. Human asset specificity refers to specialized investments in human capital tailored to a specific transaction. Based on previous empirical studies (Stump & Heide, 1996; Buvik, 1995), five items reflecting the construct were used.

Closeness to present competence (CPC). This variable was operationally defined as the buyer's perceived degree of closeness to the vendor's competence. Since the variable has not previously been empirically measured, we first developed a pool of 14 items based on the definition of the construct and interviews with industry experts. Based on further expert evaluations and preliminary empirical testing, we ended up with a measure consisting of four items.

Tacit knowledge. The tacit knowledge scale captures to what extent performing a task requires learning-by-doing, without manuals or records to guide the learning process (Nelson & Winter, 1982). Seven items were used based on the scales developed by Kogut & Zander (1993). Kogut and Zander's scales were especially developed for measuring the degree of tacit knowledge related to manufacturing, which is quite similar to the maintenance activities in this study.

Control variables. We also included four control variables in order to reduce the likelihood of spurious and suppressed effects in our hypothesized model. These are (1) investments in asset specificity by the vendor, (2) uncertainty, (3) size, and (4) inter-firm trust.

Previous studies have shown a high correlation between the buyer and vendor's asset specificity (e.g., Buvik, 1995; Stump & Heide, 1996). Vendor's asset specificity may thus also be associated with vertical integration (Williamson, 1985). The scale was based on Stump & Heide (1996) and Buvik (1995).

Moreover, empirical studies have illustrated either a negative (Harrigan, 1985, 1986) or a positive (Anderson & Schmittlein, 1984; Walker & Weber, 1987) relationship between environmental uncertainty and vertical integration. Furthermore, an increase in environmental uncertainty may lead a firm to invest in less transaction specific assets (Mahoney, 1992). The scale was based on Noordewier et al. (1990).

Williamson (1985) argues that larger firms or units tend to integrate more easily than smaller firms or units because of their potential to economize on scale and scope. Size may thus be correlated with closeness to core competence as well as with vertical integration. The size of

the business unit was measured as annual sales. This information was received from the hydroelectric power industry's trade organization (EnFO).

Chiles & McMackin (1996) suggest that inter-firm trust will alter the efficient boundaries of the firm, since it decreases the costs of negotiating, drafting as well as monitoring contracts, and thus results in lower transaction costs. If trust is present, higher degrees of transaction specific investments are expected both in the market and hybrid mode of governance than in the absence of trust. Inter-firm trust may thus be correlated both with asset specificity and vertical integration. Inter-firm trust was defined as a willingness to rely on an exchange partner in whom one has confidence, and the scale was based on Moorman et al. (1992).

Data analysis

Descriptive statistics. Descriptive statistics are presented in Table 1. The Table shows that item 11 and item 21 have very high absolute skewness and kurtosis values. These two items were thus deleted due to unsatisfactory normality. Except for these items, the Table indicates no problems related to skewness and kurtosis (Kaplan, 1990).

TABLE 1
Descriptive statistics

	Mean	Std. dev.	Skewness	Kurtosis	N
Vertical Integration					
Item 1	2.788	1.724	0.846	-0.432	113
Item 2	2.368	1.592	1.289	1.012	114
Item 3	2.588	1.828	0.976	-0.312	114
Item 4	2.421	1.708	1.346	0.943	114
Tacit knowledge					
Codifiability					
Item 5	3.807	1.504	-0.172	-0.909	114
Item 6	3.947	1.703	-0.081	-0.964	114
Teachability					
Item 7	4.319	1.633	-0.378	-0.764	113
Item 8	3.982	1.603	-0.169	-0.748	113
Item 9	4.114	1.655	-0.149	-1.080	114
System dependency					
Item 10	4.263	1.900	-0.181	-1.225	114
Item 11 ^a	6.114	1.062	-2.089	5.979	114
Item 12	4.184	1.659	-0.394	-0.791	114
Closeness to present competence					
Item 13 ^a	3.430	1.551	0.177	-0.935	114
Item 14	3.596	1.550	1.575	-0.822	114
Item 15	2.921	1.575	0.824	-0.218	114
Item 16	3.018	1.609	0.586	-0.664	113
Asset specificity					
Item 17	2.901	1.763	0.721	-0.560	111
Item 18	2.416	1.450	1.118	0.324	113
Item 18	2.688	1.513	0.945	0.036	112
Item 20	2.699	1.362	0.693	-0.303	113
Item 21 ^a	1.858	1.141	1.863	3.593	113

^a Deleted items

Measurement model. Confirmatory factor analysis (LISREL 8.14) (Jöreskog & Sörbom, 1993) was used for testing the measurement model. The evaluation of the constructs in the measurement model followed the procedure recommended by Anderson & Gerbing (1988). We first evaluated the overall model fit and the unidimensionality of the measures by assessing various goodness-of-fit indices. Next, the reliability of the measures was assessed. Two different models were tested. The first model based on all items except for item 11 and item 21

received reasonable model fit. However, item 13 (representing CPC) showed high crossloadings with other constructs, and this item was therefore deleted. By excluding this item, a substantial improvement in chi-square (from 271.77 to 196.06 with 188 and 168 df, respectively) with a p-value of .068 was observed (see Table 2). Improvement in RMSEA was also achieved (RMSEA = .038, p (close fit) = .80). This model received an acceptable and good fit by all fit indexes (e.g., Browne & Cudeck, 1993; Hu & Bentler, 1995), and was therefore chosen as the final measurement model. All factors were significant, and no crossloadings and correlated error terms were observed (e.g., Anderson & Gerbing, 1988). The three reliability measures (individual item reliability, composite reliability, and average variance extracted) recommended by Bagozzi & Yi (1988), as well as the factor loadings and error terms with the accompanying *T*-values are presented in Table 2.

TABLE 2
Measurement Model: Reliability Measures and Factor Loadings

Factor loadings ^a			Error term ^a		Item	Average	Composite
	/T-values				reliability	variance	reliability
						extracted	
Vertical integration							
$\lambda_{1,1}$	.84	10.83	$\theta_{1,1}$	.30	6.58	.70	
$\lambda_{2,1}$	.89	11.93	$\theta_{2,2}$	.21	6.00	.79	
$\lambda_{3,1}$	.92	12.78	$\theta_{3,3}$	.15	5.10	.85	.80
$\lambda_{4,1}$	.93	12.88	$\theta_{4,4}$	.14	4.96	.86	.94
Tacit knowledge							
Codifiability							
$\lambda_{5,2}$	.80	4.93	$\theta_{5,5}$	.36	1.55	.64	
$\lambda_{6,2}$	.57	4.28	$\theta_{6,6}$	.68	4.61	.32	.48
Teachability							
$\lambda_{7,3}$	.83	10.36	$\theta_{7,7}$	.31	5.27	.69	
$\lambda_{8,3}$	.93	12.21	$\theta_{8,8}$	.14	2.54	.86	.70
$\lambda_{9,3}$	.75	8.80	$\theta_{9,9}$	.46	6.48	.54	.87
System dependency							
$\lambda_{10,4}$	.71	4.87	$\theta_{10,10}$	.50	2.76	.50	
$\lambda_{11,4}$	.44	3.79	$\theta_{11,11}$	.80	6.38	.20	.35
Closeness to present competence							
$\lambda_{12,5}$	.70	8.32	$\theta_{12,12}$	.51	7.05	.49	
$\lambda_{13,5}$	.90	12.10	$\theta_{13,13}$	.19	4.60	.81	.74
$\lambda_{14,5}$	.95	13.27	$\theta_{14,14}$	.09	2.44	.91	.89
Asset specificity							
$\lambda_{15,6}$	.45	4.76	$\theta_{15,15}$	.80	7.27	.20	
$\lambda_{16,6}$	.55	5.90	$\theta_{16,16}$	.70	7.03	.30	
$\lambda_{17,6}$	.95	11.15	$\theta_{17,17}$	.11	1.15	.89	.48
$\lambda_{18,6}$	.71	7.99	$\theta_{18,18}$	.49	5.81	.51	.77
Summary statistics							
	$\chi^2 = 196.06$						
	(df = 168)						
	(p = .068)						
	RMSEA = .038						
	(p(close test) = .80)						
	NNFI = .97						
	CFI = .98						
	IFI = .98						

^a Standardized coefficients

The item reliability varies from .20 to .89. Even though no exact standard for item reliability exists, a rule-of-thumb says .25 or higher¹. Item 11 and item 15 show a value below .25. The reliability of these two items implies that they may explain a small portion of the variance of the construct they reflect. With the exception of ξ_4 (system dependency), all theoretical constructs show acceptable values of composite reliability and average variance extracted. Only item 11 may to some extent violate the assumption of unidimensionality. Part of the systematic variance of this item is thus not attributable to the latent construct. Therefore, the systematic variance is reflected in the low item reliability of the item. However, item 11 is not radically below .25, and the test of composite reliability of ξ_4 showed a value of .50. Furthermore, system dependency was only measured by two items, therefore the item was retained. The problem with item 15 is mainly related to its high random error variance (i.e. low reliability seems mainly to be caused by random, rather than systematic error variance). High inter-correlations alone, however, are not sufficient in order to obtain good measurement if we are not able to capture all the facets of the construct (Bollen & Lennox, 1991). The item was thus included for further analysis in order to maintain a broader domain for the asset specificity construct.

Hypotheses testing. Three main effect hypotheses and one quasi moderator hypothesis (Sharma, Durand & Gur-Arie, 1981) were tested². Following the recommendations by

¹ This rule-of-thumb is derived from Bagozzi & Yi's preliminary fit criteria, implying that factor loadings ideally should exceed .50. Given the formula of item reliability this should approximate a value of .25.

² Sharma, Durand & Gur-Arie (1981: 292-294) distinguish between three different types of moderator variables: homologizer, quasi moderator and pure moderator. The first type implies that the strength (and not the form) of the relationship between the predictor and the criterion is influenced by the moderator. The study has hypothesized a bilinear functional form of the interaction effect. This implies that moderator variables (*Z*'s) are hypothesized to change the form of the relationship between a predictor (*X*) and the criterion (*Y*). Thus, the slope of the relationship between *X* and *Y* is supposed to change across values of the moderator. A quasi moderator as well as a pure moderator interacts with the *X* to modify the form of the relationship, and is not

Cronbach (1987) we centered the composite X's prior to forming the multiplicative term in order to avoid multicollinearity. Moreover, summated scales of the observed variables were used as the method for calculating the latent variables. The score was computed as the average of the items reflecting the latent construct. The concept of tacit knowledge was conceptualized as a higher-order formative concept caused by the three dimensions of codifiability, teachability and system dependence. Following Winter (1987), we did not treat the dimensions as separate when testing the hypotheses. Finally, two empirical tests were conducted. First, the theoretical model was tested. Second, we included the control variables in order to test the robustness of the findings in the theoretical model. In this way we were able to handle the possibility of masked and spurious effects. Both models were tested by OLS regression analysis.

RESULTS

Table 3 reports the parameter estimates for the estimated models. Regarding Model 1, the results show that the main effects of asset specificity ($\beta = .322, p < .001$), closeness to present competence ($\beta = .434, p < .001$), and tacit knowledge ($\beta = -.265, p < .01$) on vertical integration are all significant (hypotheses 1, 2, and 4, respectively). The interaction effect of closeness to present competence and asset specificity ($\beta = .164, p < .05$) on vertical integration is also significant (hypothesis 3). All four hypotheses were thus supported.

significantly related to X. What distinguishes a quasi moderator from a pure moderator, is that the former kind of variable will act as predictor variable itself.

TABLE 3
Regression Analyses

Dependent variable:	Model 1 Baseline model		Model 2 Baseline model and control variables	
	Vertical integration		Vertical integration	
	Beta ^a	T ^b	Beta ^a	T ^b
Asset specificity	.322	4.373***	.294	3.238**
Closeness to present competence	.434	5.098***	.429	5.019***
Asset specificity x closeness to present competence	.164	2.120*	.172	2.189*
Tacit knowledge	-.265	-3.201**	-.250	-2.872**
Control variables:				
Asset specificity by the vendor			.056	.619
Uncertainty			.032	.418
Size (annual sales)			.047	.585
Inter-firm trust			-.134	-1.771*
Adjusted R ²	.439		.441	
F-value	17.463***		10.193***	
N	114		114	

^a Standardized regression coefficients; ^b One-tailed test - OLS regression

*p < .05; **p < .01; ***p < .001

Model 2 reports the results of the multiple regression analysis including the control variables. In addition to the variables in the baseline model, the model includes asset specificity by the vendor, uncertainty, size (annual sales), and inter-firm trust. The inclusion of the control variables did not change the overall pattern observed in the baseline model. The *Beta* and *T* values for the independent variables showed only minor changes when the control variables were included. The results indicate no spurious or masked effects for the hypothesized relationships. We can therefore conclude that all four hypotheses were supported.

DISCUSSION

Discussion of the results

The empirical results show that both closeness to present competence and asset specificity, as well as the interaction effect of these two variables are positively related to vertical integration, while tacit knowledge is negatively related to vertical integration. This implies that asset specificity, closeness to present competence and tacit knowledge are important factors in determining whether a firm will vertically integrate a particular activity or not. In situations characterized by high levels of asset specificity and closeness between present competence and the competence required for performing the activity, firms are likely to vertically integrate the activity. On the other hand, if a high degree of tacit knowledge is involved in performing the activity, it is less likely that the firm will integrate the activity.

The results support both transaction cost economics and the competence perspective. Integrating the two perspectives into a unified research model enhances our understanding of vertical integration compared to relying on only one perspective. The results show that it is possible to link contractual and organizational constraints in an analysis of vertical integration and firm boundaries. Internal capabilities and competencies along with the need for reducing possible opportunism are separately (as well as combined) important factors in determining the efficient organization of economic activities. As a first attempt to link transaction cost economics and the competence perspective, the study is promising, as we have demonstrated that it is possible to conduct empirical tests of the unified research model.

Limitations

Throughout this article we have used efficiency, bounded rationality and opportunism as core assumptions. In the theoretical discussion we have *a priori* assumed that firms pursue their

goals in a rational, economizing way. First, this implies that we have searched for explanations based on firms' interests in choosing the most efficient governance form. Second, this implies that firms beforehand calculate the efficiency of different governance forms, and that they will choose the most efficient one. However, in the literature on vertical integration, other motives like power and resource dependency have also been addressed. The exclusion of such motives can be criticized, especially from a sociological point of view. Our reason for not including these motives is related to the fact that such motives are not directly related to efficiency. However, as Chiles & McMackin state: "*Ultimately, the question of which paradigm or alternative explanation is capable of explaining the most variance in governance structures is an empirical one*" (1996: 95). Future studies should thus examine other explanations for vertical integration, and compare the effect of these explanations with the efficiency-driven explanations provided in this study.

Moreover, the empirical test of the study has examined integration as a strategy of internal expansion. No effort was made to distinguish between the different options available for vertical integration. Thus, the present findings should be interpreted in the light of the study's methodological limitations. Measuring the dependent variable by a hypothetical measure may introduce some uncertainty in the interpretation of the results. In particular, the most common problem with this normative theory has been described as the preference reversal problem (Slovic & Lichtenstein, 1983). In short, this problem relates to a discrepancy between an individual's preferences and choices. We have measured the firms' intention to vertically integrate an activity, and not the firms' choices to integrate. In order to overcome this problem, in future studies of vertical integration one could conduct longitudinal studies measuring preferences at one point in time, and subsequently follow up with measuring real choices at a later time. In this way, the consistency between preferences and choices could be

used to evaluate to what degree hypothetical measures are valid indicators. The operationalization of the dependent variable is, however, consistent with a rational choice approach, assuming preferences to be consistent with choices.

Theoretical implications

The main purpose of this study has been to address the question of vertical integration and firm boundaries by combining insights from both transaction cost economics and the competence perspective, and developing a unified research model with a common set of assumptions. We have argued that many of the shortcomings in earlier empirical and theoretical research based on TCE and CP are partly attributable to inadequate specifications of the behavioral assumptions. We have shown how the behavioral assumptions can be extended to include constructs and predictions from both perspectives. We have thus emphasized that firms have production constraints as well as contractual constraints. This argument clearly deviates from TCE, as TCE focuses mainly on contractual constraints. We have also viewed firms as repositories of knowledge and skills, which in some cases provide firm advantages over autonomous market exchange. Furthermore, we have specified the mechanisms (i.e. the use of common codes) through which internal opportunistic behavior can be reduced. In this way, our assumption of opportunism also rests on arguments from the competence perspective.

The effect of asset specificity on vertical integration is consistent with previous research within the TCE-framework. The effect of closeness to present competence on vertical integration fits well into evolutionary economics and the resource-based perspective. The operationalization of the closeness to present competence construct represents an empirical contribution to the literature. In addition, our research shows that tacit knowledge has a negative effect on vertical integration. This observation supports previous studies examining tacit knowledge (e.g., Kogut

& Zander, 1993; Zander & Kogut, 1995), and is consistent with a broader evolutionary economics framework. The interaction effect of asset specificity and closeness to present competence is an important empirical contribution, as it illustrates empirically the relevance of integrating the perspectives.

Managerial implications

Ghoshal & Moran (1996) argue that transaction cost economics is ‘bad for practice’, primarily due to the normative implications of opportunism. Not only are the prescription drawn from TCE likely to be wrong, they state, but “*also dangerous for corporate managers because of the assumptions and logic on which it is grounded*” (Ghoshal & Moran, 1996: 13). Our model has to some extent added more realism to the assumption of opportunism compared to TCE. Even though it seems to be widely recognized that some economic actors act opportunistically, studies have also shown a clear discrepancy from such behavior. However, we presume that most managers have experienced that actors both inside and outside the organization can act opportunistically if the firm lacks the ability to evaluate performance and control behavior. From a managerial point of view, we argue that organizational routines and common codes can be used to control opportunism within the firm. When firms consider an expansion, they should also evaluate whether their routines and common codes are suitable for evaluating and controlling the performance of the new activity.

When managers evaluate integration decisions, they cannot only be concerned about transaction-cost-economizing calculus, i.e. the costs of solving contractual issues. They should also be concerned about the ability to perform activities within their own boundaries. We therefore recommend that firms should use more time and resources to map and identify the competencies they possess, and evaluate which activities they are capable of performing inside

the boundaries of the firm if they decide to expand. In such an evaluation, firms need to take into account both how close new activities are to existing activities, as well as the degree of tacit knowledge involved in performing the new activities.

CONCLUSION

We have shown in this article how the study of vertical integration can benefit from an integration of transactions cost economics and the competence perspective. By doing so, we have also indicated the promise of a fruitful integration of the two perspectives in general. Common for most academic endeavors, the study has demonstrated that it has both strengths and limitations. Most of the limitations arise out of the fact that no single study can address all aspects relevant for studying a particular phenomenon. Particularly, this is evident with respect to our choice of assumptions and methodology, as well as the way we have operationalized the dependent variable. However, these limitations may illustrate useful directions for future research. It is only through a collection of studies that the issue of integrating transaction cost economics and the competence perspective can be properly unraveled.

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APPENDIX A

Measures of constructs

Vertical integration

Four-item, seven-point scale anchored by “very poor description” and “very good description.”

- We are considering taking over the principal responsibility for performing the maintenance activity in-house in the future.
- If the need for maintenance should arise unexpectedly, next time the activity will be performed internally within our own organization.
- If the need for maintenance can be foreseen, next time the activity will be performed by our own organization.
- It is very likely that our own staff will perform the activity next time.

Asset specificity

Four-item, seven-point scale anchored by “very poor description” and “very good description.”

- We have spent significant resources in reorganizing the power production in relation to this particular collaboration.
- Employees handling the relationship to the supplier were trained especially for this purpose.
- During the collaboration, we had to learn several sides of the supplier's operations.
- We have spent significant time in order to acquire knowledge concerning the supplier's technical standards.

Closeness to present competence

Three-item, seven-point scale anchored by “very poor description” and “very good description.”

- The knowledge we possess in our power station is comparable to the knowledge the supplier's employees possess in performing the activity.
- Our organization's skills are well suited for performing the activity, compared to the skills of the supplier.
- Our routines and procedures are well suited as a base for performing the activity approximately as well as the supplier.

Tacit knowledge

Seven-item, seven-point scale anchored by “very poor description” and “very good description.”

Codifiability

- It is possible for us to write a manual describing how the supplier performed the activity.
- Extensive documentation describing how the supplier performed the activity exists in our organization.

Teachability

- It is easy for our personnel to learn how to perform the maintenance activity by, for example, talking to skilled personnel
- Our personnel can easily learn how to perform the activity by studying manuals, drawings, plans, etc.
- It is easy to train new personnel how to perform the maintenance activity, if they possess general technical practice from power stations.

System dependence

- It is possible for one person to know everything about how to perform this activity.
- Workers performing the activity need to stay in permanent contact with other workers possessing different expertise.

Control variables

Asset specificity by the vendor

Five-item, seven-point scale anchored by “very poor description” and “very good description.”

- Our supplier spent significant resources in reorganizing the production in relation to this particular collaboration.
- The supplier’s employees who handled the relationship with us were trained especially for this purpose.
- During the collaboration, the supplier had to learn several sides of our operations.
- The supplier spent significant time in order to acquire knowledge concerning our technical standards.
- The supplier spent resources on training and development of our personnel.

Uncertainty

Five-item, seven-point scale anchored by “very poor description” and “very good description.”

- The availability of alternative vendors for this maintenance activity is highly uncertain.
- Uncertainty regarding the performance of the maintenance activity is a large problem in this market.
- The market in which we buy the maintenance activity is complex.
- The market supply for performing the maintenance activity is unstable.
- Prices for performing the maintenance activity are volatile.

Inter-firm trust

Three-item, seven-point scale anchored by “very poor description” and “very good description.”

- We trusted the supplier to perform the work in a 100 % honest and truthful way
- We were confident that the supplier acted in our best interests.
- We generally trusted the supplier.

Size

- Annual sales.