Asymmetrical deployment of specific assets and contractual safeguarding in industrial purchasing relationships

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Abstract

The marketing literature based on transaction cost analysis (TCA) has only scantily explored whether the identity of the party (i.e., the buyer or the supplier) that employs specific assets is of importance in instances when alignments of contractual safeguards of specific assets occur in buyer–supplier relationships. Imbalanced deployment of specific assets highlights the problem of asymmetrical dependence in purchasing relationships. This article draws heavily on TCA and related works in marketing in an attempt to analyze and compare interfirm dependence, exposure to opportunism, and formalization of purchase contracting (FORM) across channel dyads where the buyer and the supplier respectively carry out relation-specific investments. In particular, an investigation of 161 industrial purchasing relationships demonstrated that the level of formalized purchase contracting was significantly greater when the supplier unilaterally deployed specific assets in a relationship as opposed to situations where mainly the buyer employed assets at risk. This and other findings clarify the issue of asymmetrical dependence structures in industrial marketing relationships. © 2000 Elsevier Science Inc. All rights reserved.

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1. Introduction

The deployment of specific assets in buyer–seller relationships involves the problem of interfirm dependence and high switching costs (Heide and John, 1988). When one of the transacting parties employs substantial specific investments that are dedicated to the relationship, that party's dependence on an incumbent exchange partner is reinforced because an alternative use of such investments implies a substantial sacrifice of productive values (Williamson, 1975, 1985). Recent research has addressed and highlighted the problem of asymmetrical dependencies in vertical marketing relationships (e.g., Buchanan, 1992; Heide, 1994; Heide and John, 1988, 1992). In particular, this research has suggested and focused on the need for formalized contractual arrangements in handling interfirm dependence.

Transaction cost analysis (TCA) considers the transaction constituting the economic exchange between buyer and seller as the unit of analysis. Asset specificity, the frequency of economic exchange, and the uncertainty associated with the exchange of resources between buyer and seller represent the core dimensions of a transaction. The combination of these dimensions generally determines the most cost-efficient mode of governance, and bilateral governance is expected to replace market governance as asset specificity increases in relationships between independent trade partners (Williamson, 1991a). High-level specific assets in supplier–buyer relationships are usually presented as a customization of products or as a tailoring of production processes *by the supplier on behalf of the buyer* (Williamson, 1981, 1985). Such dispositions are expected to shift the conditions of trade from those of conventional market transactions to small-numbers conditions, which involve substantial interfirm dependence and a need for specific safeguarding of assets at risk. However, in the event that the buyer *unilaterally* deploys specific assets in a relationship does the same kind of bilateral dependence occur? It is argued herein that exposure to opportunism and the need for safeguarding devices are substantially different in this case.

Traditionally, the marketing and TCA literatures have paid little attention to distinctions such as this. This

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shortcoming needs to be addressed so as to improve the capabilities of TCA in the context of inter-organizational relations. With this in mind, this article focuses on the asymmetrical (unilateral) deployment of specific assets. Exposure to opportunism, bilateral dependence, and bilateral governance are compared across various supplier–buyer relationships with unilateral buyer-held and unilateral supplier-held specific assets, respectively. In the former case, the buying firm may adapt to a specific supplier by, for instance, tailoring its production or product design to a set of components provided by one specific supplier. In the latter case, the buyer may, for instance, engage the supplier in the development of customized components or transportation facilities so that the supplier may provide a better fit for the buyer's production facilities and logistical requirements. Finally, this paper examines bilateral dependence and interfirm organization in buyer–seller relationships in cases where both buyer and seller apply substantial specific adaptations and employ investments in skills used in the organization of production (e.g., just-in-time relationships). These conditions are compared with business-to-business trade based on conventional market transactions.

2. Do unilateral buyer-held specific assets induce buyer risk and bilateral dependence?

When a buyer *unilaterally* deploys specific assets in a relationship, the customization of products and/or specialization of production processes on the supplier side are assumed to remain modest in that the supplier's product and marketing efforts are expected to *appeal to several buyers*. For what reasons should the buyer tailor his/her own production facilities or product design to a particular supplier? This is particularly evident in situations that involve small market segments with heterogeneous product preferences where customer-specific adaptations on the supplier side may be unprofitable due to economies of scale considerations. In such situations, the deployment of specific assets on the part of the buyer could *postpone product differentiation* to a point that is closer to the time of purchase (Bucklin, 1965, 1973). The best strategy for the buyer would therefore be to make specific adaptations to the supplier who offers the best fit to an ideal product specification in the first place. From the buyer's perspective, the purpose of such adaptations is to provide cost reductions (e.g., in procurement or production) or to add customer value for end-users and thus gain competitive advantages. The critical question is then whether such adaptations to the supplier expose the investing buyer to opportunistic behavior and create a safeguarding problem.

In accordance with the TCA perspective: "all parties will behave opportunistically if such action is possible and profitable," (Heide and John, 1988, p. 24). Under conditions that involve substantial deployment of specific assets

by the buyer and low asset specificity on the supplier side (e.g., low product customization), the profitability and possibility for the supplier to act opportunistically is restricted for several reasons. For instance, products that involve low or modest levels of customization on the supplier side are expected to *appeal to several buyers*. Exposure to opportunism is therefore less of a concern because of reputation effects as the whole segment of buyers provides some collective insurance against moral hazard (Rubin, 1990; Milgrom and Roberts, 1992). Furthermore, when several buyers are in a position to watch a supplier's performance, conventional verification procedures continue to be enforceable (Heide and John, 1990).

An important point to be considered is that when the buyer unilaterally carries out specific assets, the risky investments are not deployed *on behalf of the supplier* as long as conventional market conditions prevail. These conditions involve several buyers of the focal product. Accordingly, buyers who unilaterally deploy specific resources are less dependent on suppliers in their design and utilization of their own specific assets. As reciprocity in these conditions is modest and several buyers observe the performance of suppliers, conventional terms of trade agreements will guide interfirm trade.

Moreover, resource dependence considerations hold that unilateral deployment of buyer-specific assets renders the buyer dependent on the supplier and thus forces the buyer to relinquish authority and control (Heide and John, 1988, 1992).

Given these circumstances, how are buyers to behave when they unilaterally deploy specific assets? The TCA-framework assumes that the contracting parties are farsighted and anticipate potential risks and dependence conditions at the outset because the contracting process is assumed to be examined in its entirety (Williamson, 1991b). As unilateral deployment of buyer-specific assets intends to provide advantageous utilization prospects for the buyer (e.g., product differentiation or cost savings), the economic utilization prospects for the buyer should then carry some part of the hazard premium and relax the need for safeguarding arrangements under this condition.

3. Unilateral supplier-held specific assets and interfirm adaptation

When the supplier unilaterally deploys specific assets in a vertical relationship, the supplier is assumed to customize his/her own products or tailor the production processes *on behalf of a specific buyer* (Williamson, 1981, 1985). This creates two forms of bilateral dependence. The first stems from the market failure problem caused by the fundamental transformation into small-number conditions and leads to an exposure to opportunism and the need for contractual safeguarding (Williamson, 1975, 1985). A bilateral monopoly usually prevails in these conditions. For instance, only one

Conditions of trade	ALLOCATION OF SPECIFIC ASSETS	
	Unilateral Buyer-held	Unilateral Supplier-held
Customization of the *focal product* in the transaction	Modest	Substantial
Number of buyers of *focal product*	Several	One (few)
Incentive for opportunism	Modest	Substantial
Verification of supplier's product	Market standard/Court	Private ordering
Incentive for safeguarding of specific assets	Modest	Substantial
Need for coordinated/mutual adaptation	Modest	Substantial

Fig. 1. Comparison of conditions of trade across relationships with unilateral buyer-held and unilateral supplier-held specific assets.

buyer and only one seller are involved when product customization and investments in a specialized production technology are substantial and concern only one buyer. Accordingly, no other buyers are in a position to observe the supplier's performance and a specific arrangement of the terms of trade will appear urgent so as to support interfirm trade in this situation (Williamson, 1981, 1985).

The second form of dependence is due to reciprocity and the involvement of both parties in *joint design and utilization* of relation-specific resources on the supplier side. In accordance with TCA reasoning, the supplier is expected to deploy specific assets on behalf of the buyer (Williamson, 1981, 1985). The important issue is that this deployment of specific assets by the supplier is assumed to provide cost reductions or added-value which, in turn, are beneficial for *both buyer and seller*. Accordingly, when the buyer requests the supplier to deploy specific assets, both parties have to be involved in cooperative efforts so as to effectively design and utilize the idiosyncratic resources. Hence, bilateral dependence will be increased and the need for *coordinated adaptation* will occur (Williamson, 1991a). Thus, private ordering and interfirm coordination are warranted so as to cope with the enforced interfirm dependence. A comparison of conditions of trade appears below in Fig. 1. These comparisons are drawn across relationships with unilateral buyer-specific and supplier-specific assets, respectively.

4. Research model and hypotheses

The TCA-perspective holds that specific assets represent the most significant dimension with respect to shifts in the mode of governance from market transactions to bilateral governance. A basic TCA prediction is that asset specificity enforces interfirm dependence and transforms conditions of trade from conventional market transactions to small-number conditions. High asset specificity is assumed to create a safeguarding problem for the party that is exposing assets at risk. If the trade partner is able to exercise opportunistic behavior (e.g., when negotiating about prices and service performance), the investing party is vulnerable because specific assets cannot be re-deployed for other purposes without a comprehensive sacrifice of productive values. Under such conditions, a formalized contract, which states some basic devices for the regulation of terms of trade (e.g., cost documentation and change-order procedures), is warranted so as to economize on transaction costs (e.g., haggling and bargaining difficulties about prices and product performance).

4.1. Formalized purchase contracting

Several authors (Stinchcombe, 1985; Dwyer and Oh, 1987; Heide, 1987, 1994; Heide and John, 1990; Noorderwier et al., 1990) have highlighted various aspects of interfirm closeness and vertical coordination such as vertical interaction, cooperation, joint action, bilateral contracting, and relational norms in order to describe the shift from market-based exchange to bilateral governance. This research has focused on the planning dimension of nonmarket governance (Heide, 1994). It refers to proactive devices that are used to support business-to-business trade by providing a framework within which adaptations of terms of trade are intended to take place. From the perspective of economic contracting theory (Stinchcombe, 1985), the extent of formalized interfirm contracting reflects specific devices for the handling of interfirm interactions. It thus provides for the safeguarding of assets at risk (Williamson, 1981, 1985) and for coordinated adaptation in business-to-business trade (Williamson, 1991a). Formalization of

Purchase Contracting (FORM) refers to rules, fixed policies, and procedures used to govern purchasing relationships. It provides a framework for the exchange and flows of information and resources between supplier and buyer (Stern and Reve, 1980). Several issues are subjects to such coordination. They include: (a) the handling of disputes and conflicts (Stinchcombe, 1985), (b) access to price- and costs documentation (Stinchcombe, 1985; Milgrom and Roberts, 1992), (c) product design and value analysis (Droozdowski, 1986), and (d) production planning (Schonberger and Gilbert, 1983; Frazier et al., 1988; Spekman, 1988).

Specific assets refer to relation-specific investments in physical assets, production facilities, tools, and knowledge deployed by buyer and/or supplier in a specific buyer–seller relationship. For the purpose of creating a construct reflecting the *composition of specific assets*, we developed constructs of both buyer-specific and supplier-specific investments. We based ourselves on Heide (1987) and thus used the sample median of these constructs so to assign their values into low and high categories in accordance with the description given in Fig. 2 below. Our central focus is the relationships between *independent* manufacturing firms. These relationships constitute the empirical unit of analysis in this research. Consequently, hierarchic governance or internal organization remains irrelevant as governance mode in the present analysis. More precisely, we focus on how the buying firm perceives the composition of specific assets and interfirm coordination in a specific supplier relationship. Research hypotheses specify how the composition of specific assets is related to contractual safeguarding devices (formalized purchase contracting). Fig. 2 depicts the specific research model.

4.2. Hypotheses

In the preceding section, some core attributes that describe conditions of trade were compared across buyer–seller relationships with unilaterally buyer-held and unilaterally supplier-held specific assets, respectively (see Fig. 1). The important point is that exposure to opportunism and need for safeguarding devices seem to be far more evident under conditions with unilateral supplier-employed specific assets than under conditions where the buyer unilaterally employs specific assets. Under conditions where specific assets are unilaterally held by the buyer (see cell 3 in Fig. 2), the focal product will still be available to several buyers. This implies that reputation effects come into play and the whole buyer group will provide a collective insurance against opportunism (Rubin, 1990). These trade conditions display much similarity to conventional market conditions and the level of formalized purchase contracting is not expected to deviate significantly from conventional market conditions with *mutual-low asset specificity* (see cell 4 in Fig. 2). Accordingly, the following hypothesis is proposed:

H1. *There is no significant difference in formalized purchase contracting between buyer–seller relationships with unilateral buyer-held specific assets (cell 3) and mutual-low asset specificity (cell 4).*

Under conditions where the supplier unilaterally deploys specific assets on behalf of a specific buyer (see cell 1 in Fig. 2), exposure to opportunism will be increased because conditions of trade are transformed into small-number conditions. For instance, this may occur under conditions where substantial product customization is called for. Bilateral monopoly should then prevail and thus no other buyers would have the opportunity to watch the supplier's performance. Conditions of trade would then deviate significantly from situations which predominantly involve (a) conventional market conditions with mutual-low asset specificity (see cell 4 in Fig. 2) and (b) trade conditions with unilateral
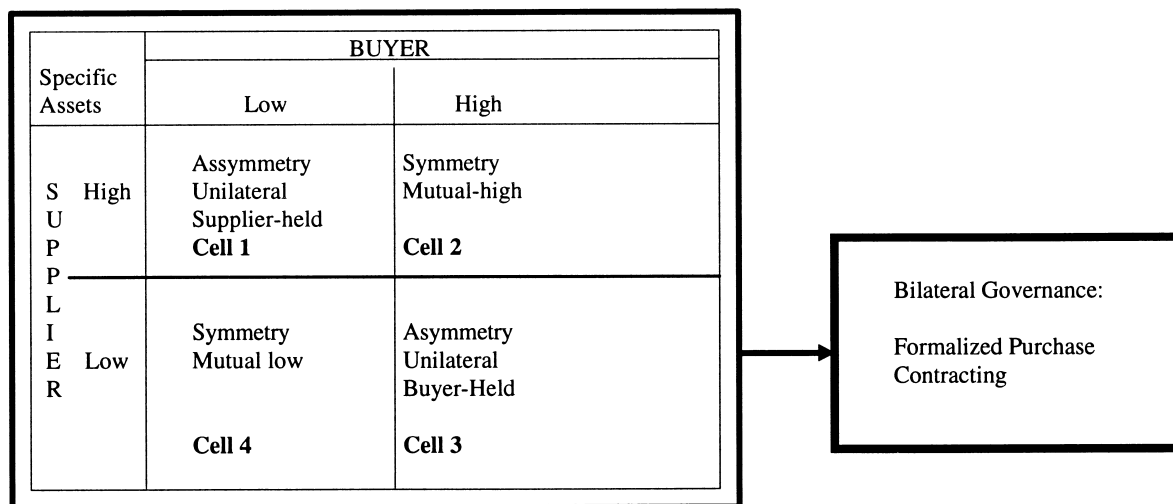
Specific Assets		BUYER	
		Low	High
S U P P L I E R	High	Assymmetry Unilateral Supplier-held **Cell 1**	Symmetry Mutual-high **Cell 2**
	Low	Symmetry Mutual low **Cell 4**	Asymmetry Unilateral Buyer-Held **Cell 3**

Bilateral Governance:

Formalized Purchase Contracting

Fig. 2. Research model.

buyer-held specific assets (see cell 3 in Fig. 2) as stated in H1. Accordingly, the two following hypotheses are suggested:

H2. *In relationships with unilateral supplier-held specific assets (cell 1), the level of formalized purchase contracting is greater than in relationships with mutual-low asset specificity (cell 4).*

H3. *In relationships with unilateral supplier-held specific assets (cell 1), the level of formalized purchase contracting is greater than in relationships with unilateral buyer-held specific assets (cell 3).*

Mutual deployment of specific assets in buyer–seller relationships implies that both actors make specific adaptations to certain dimensions of the other party's productive resources (e.g., development of skills and know-how in R&D-projects and information technology in a JIT-organization). Mutual-high asset specificity (see cell 2 in Fig. 2) represents a co-specialization of assets in that one actor's specific assets work as complementary resources to the other party's investments (Milgrom and Roberts, 1992). When co-specialized assets are deployed in a relationship, efficient utilization of such assets warrant substantial inter-firm coordination. This situation shows some correspondence to team production (Alchian and Demsetz, 1972) in that the marginal productivity of each actor's specific assets (i.e., production resources) is dependent upon the way the other party disposes of its assets. Under this condition, the problem of information asymmetry and exposure to opportunism will enhance the need for vertical coordination. These problems are of less concern when trade conditions are similar to conventional market conditions with mutual-low asset specificity or unilateral buyer-held specific assets. Accordingly, we propose the following hypotheses:

H4. *In relationships with mutual-high asset specificity (cell 2), the level of formalized purchase contracting is greater than in relationships with mutual-low asset specificity (cell 4).*

H5. *In relationships with mutual-high asset specificity (cell 2), the level of formalized purchase contracting is greater than in relationships with unilateral buyer-held specific assets (cell 3).*

4.3. Control variables

Three other variables are included to further specify the model. No formal hypotheses are specified for these variables. However, their expected effects on formalized purchase contracting are based on recent inter-organizational research findings.

Buyer's Manufacturing Technology (BUYTECH) refers to the way intrafirm tasks such as production and procurement are structured in the buying firm and reflects the equipping and sequencing of activities in the work-flow (Amber and Amber, 1962; Woodward, 1965; Thompson, 1967; Hickson et al., 1969). For instance, order production is characterized by unpredictable, complex, and flexible interactions between the performing units whereas process production involves extensive automation of production with rigid schedules and fixed technological structures reflecting a high degree of work-flow rigidity. In accordance with Hickson et al. (1969), production technology is described with respect to several dimensions: (a) the automation of operations technology, (b) the sequencing of operations, (c) the specificity of evaluations of operations, and (d) operation continuity. These dimensions are assumed to reflect task uncertainty, performance flexibility, and the planning horizon materialized in the firm's organizational design. In an inter-organizational setting, the operation technology of the buying firm is assumed to be related to procurement activities and hence, to affect technological ties between the suppliers and the buying firm (Buvik, 1998). Several inter-organizational studies have examined the effect of the BUYTECH on interfirm organization. Johanson (1982) found that the level of rigidity of the BUYTECH was positively related to the enforcing and formalization of contracts in industrial buyer–seller relationships. Similarly, Heide (1994) found a negative relationship between the rigidity of a buyer's production technology and flexible adjustment mechanisms in industrial relationships. Based on these findings, the rigidity of a BUYTECH is expected to be positively associated with formalized purchase contracting.

Moreover, parties to a high-stakes exchange are expected to face more difficulties and demand more comprehensive contracting when terms of trade are to be realigned. The buying center literature suggests that higher stakes attract parties from multiple organization levels and across several departments within each firm and thus make the industrial purchasing process more complex (Johnston and Bonoma, 1981). In fact, most discussions of interfirm relations find the size of business-to-business trade to reflect a significant stake (e.g., Spekman, 1988). We therefore expect a buyer's annual dollar purchases (*PURCHASE*) from a specific supplier to be associated with the level of formalized purchase contracting.

Finally, the *frequency of exchange (FREQ)* among the transacting parties is assumed to influence the efficacy of specialized governance arrangements. Williamson (1985) holds that increases in transaction frequency provide stronger interfirm coordination because they facilitate the recovery of costs of specialized governance arrangements (comprehensive purchase contracting). This association is expected to appear in this research.

5. Research setting and data collection

The empirical setting for this study consists of manufacturing firms from eight different two-digit SIC groups with

highest representation among firms from chemical production (25%) and engineering production (45%). An extensive search of literature was undertaken in order to capture the domain of the constructs in the research model (Churchill, 1979). In a subsequent step, an explorative study was conducted among purchasing professionals in manufacturing firms, purchasing consultants, and academics working in the areas of procurement, logistics, and operations management. Additionally, an archival study of standard purchasing contracts was undertaken across four different industries so as to examine whether the governance issues discussed above corresponded to common and actual contractual terms applied in industrial purchasing agreements. Another pilot study among 14 manufacturing firms was then conducted to obtain preliminary assessments of our measures and to capture relevant aspects for the subsequent development of prospective measures of asset specificity. This resulted in some scale improvements and yielded a revised questionnaire. Finally, a pretest of the revised questionnaire was carried out. It was based on personal interviews with eight purchasing agents. The pretest revealed no significant problems with any of the remaining measures or scaling formats.

The final version of the questionnaire was mailed to 684 industrial procurement professionals with membership in the National Association of Purchasing and Logistics. Among them, 114 reported that they did not meet the criteria in the target definition of being an active industrial purchasing agent. Among the remaining 570 informants, 183 (32%) completed the questionnaire after two call-backs. This is within the range reported in studies of this type in the marketing literature (e.g., Heide and John, 1988, 1992; Heide and Miner, 1992). The sample structure is described below.

Description of the sample	Mean values
Annual number of orders	95.37
Annual purchasing volume from focal supplier in bill ($)	1.47
Size of the buying firm (annual gross production in bill, $)	94.05
Size of the focal supplier firm (annual gross production in bill, $)	53.71
Fraction of focal supplier's gross sales absorbed by the focal buyer (%)	11.80

Non-response bias was measured by comparing early and late responders (Armstrong and Overton, 1977). Most of the questionnaires (64%) were returned before two call-backs. The second call-back captured the remaining 36% of our sample. No significant differences emerged between the two groups of respondents with respect to (a) length of the relationship, (b) firm size, (c) purchasing volume, and (d) key informants' knowledge and involvement with the selected supplier firms. Finally, firm size was compared between the firms that responded

and a sample of 160 non-responders. No significant differences were detected. Among the firms that responded, most (161 of the 182 informants) completed all of the 23 items used to measure various aspects of the research model.

6. Measure development and assessment of construct validity

Buyer-held specific assets and supplier-held specific assets refer to investments and adaptations made by the buyer and supplier, respectively in physical assets, production facilities, tools, and knowledge tailored to a specific relationship. The scaling of these concepts was based on items developed by Heide and John (1990, 1992), Masten et al. (1991), and Anderson and Weitz (1992). Asset specificity was expected to reflect a magnitude of resources tailored to the relationship (Williamson, 1991a) and the measures were constituted as reflective scales. Each of the specific asset scales was composed of six items. Separate principal component factor analyses assigned all items in each of the two item pools to their construct factor. Next, each scale score was computed as the mean value of the items loading on the construct. The scales displayed satisfactory levels of internal consistency with $\alpha = 0.81$ for buyer-specific assets and $\alpha = 0.85$ for supplier-specific assets, respectively. FORM describes the extent to which conflict settlement, monitoring, and interfirm flows of activities and resources are formalized through fixed policies and procedures. Various authors have recommended reflective scaling of this construct (i.e., John, 1984; John and Reve, 1982; Reve and Stern, 1986; Heide, 1987). Empirical studies conducted in manufacturing settings have provided constructive guidelines for selecting significant issues which reflect this concept (i.e., Heide and John, 1990; Noordewier et al., 1990). Five items were thus generated. Principal component factor analysis assigned each of the five items of the scale to a single construct factor. The scale score was computed as the mean value of these items. The scale showed satisfactory levels of internal consistency with $\alpha = 0.77$. Discriminant validity was then assessed by a principal component factor analysis of the 17 items designed to measure buyer-specific assets, supplier-specific assets, and FORM. The factor analysis extracted three factors. It was apparent that each item pool was assigned to its corresponding construct factor. This was taken to indicate satisfactory levels of discriminant validity for the three composite scales (see Appendix 2).

BUYTECH was measured as the degree of work-flow rigidity in the buying firm. The measure was based on four different technological dimensions reflecting this concept (Hickson et al., 1969). They were: (a) the automation of operation technology, (b) the sequencing of operations, (c) the specificity of evaluations of operations, and (c) operation continuity. Principal component factor analysis as-

signed all items to a single factor. The scale score was computed as the mean value of these items; and the scale showed a satisfactory level of reliability with $\alpha = 0.75$.

A seven-point Likert-type scale format was used for all intervally scaled items. Anchor points were "inaccurate description" and "accurate description." Items and reliability estimates are presented in Appendix 1.

The *Frequency of Exchange* and *Volume of Trade* are both single-item measures based on ratio scales (annual number of order effectuations and amount of $) and were not subjected to the measure purification process described above.

7. Tests of hypotheses

An ANCOVA model was used to test the research hypotheses. FORM was modeled as the dependent variable (metric) and the composite of specific assets was taken as the grouping variable (see Table 1). The control variables; purchasing volume, BUYTECH, and frequency of exchange were included in the ANCOVA model as covariates. Normality plots revealed that both the dependent variable and the three covariates did not violate the normality assumption. Homogeneity of variance tests (Cochran's C and Barlett-Box) displayed no differences in variance across the different categories of the grouping variable (composition of specific assets). The hypothesis tests were based on a contrast design with comparison of mean values and adjusted effect sizes of the composition of specific assets on formalized purchase contracting corresponding to the hypotheses.

In accordance with H1, the contrast design demonstrates that there was no significant difference in FORM between cases with mutual-low asset specificity and unilateral buyer-held specific assets, respectively ($b_1 = 0.09$, $t = 0.30$, $p = 0.65$). The effect size of contrast 2 lent support to H2 and thus showed that the level of formalized purchase contracting was significantly higher in buyer–seller relationships with unilateral supplier-held specific assets than in conventional market conditions with mutual-low asset specificity ($b_2 = 1.05$, $t = 3.56$, $p < 0.01$). Contrast 3 showed that the level of FORM was significantly greater in channel dyads with unilateral supplier-held specific assets than in relationships with unilateral buyer-held specific assets ($b_3 = 0.96$, $t = 2.68$, $p < 0.01$). This lent support to H3. H4 was tested by the effect size of contrast 4, which confronts cases of mutual-high asset specificity with those of mutual-low asset specificity. The empirical findings supported H4 and showed that FORM was significantly higher in buyer–seller relationships where both actors had deployed substantial specific investments than in conventional market conditions with mutual-low asset specificity ($b_4 = 1.10$, $t = 4.50$, $p < 0.01$). H5 predicted that the level of FORM would be greater under conditions with mutual-high assets specificity than under conditions involving unilateral buyer-held specific assets. The size effect of this contrast was significant and in the expected direction and provided support for H5 ($b_5 = 1.01$, $t = 3.22$, $p < 0.01$).

The control variables in the research model were associated to FORM in accordance with current inter-organizational research. High work-flow rigidity of BUYTECH usually leads to process-based production runs that require predictability and forecast-based production. Formalization

Table 1
ANCOVA analysis. Composition of specific assets and FORM in buyer–seller relationships, mean values (standard deviation)
Homogeneity of variance tests: Cochran's $C = 0.28$, $p = 0.96$ (appr.), Bartlett-Box (F;32,558) $= 0.36$, $p = 0.77$.
Model fit: $F(6,154) = 10.30$, $p < 0.01$, $R_{Adj}^2 = 0.26$.

Cell 1 (C1): asymmetry unilateral supplier-held specific assets mean: 4.51 (1.31), $n = 26$	Cell 2 (C2): symmetry mutual-high asset specificity mean: 4.61 (1.30), $n = 71$
Cell 4 (C4): symmetry mutual-low asset specificity mean: 3.28 (1.35), $n = 49$	Cell 3 (C3): asymmetry unilateral buyer-held specific assets mean: 3.32 (1.12), $n = 27$

Hypothesis tests	Mean difference	Adjusted effect sizes
H1: Contrast 1: C3 vs. C4	0.04	$b_1 = 0.09$ ($t = 0.30$)
H2: Contrast 2: C1 vs. C4	1.23	$b_2 = 1.05$ ($t = 3.56$)[a]
H3: Contrast 3: C1 vs. C3	1.19	$b_3 = 0.96$ ($t = 2.68$)[a]
H4: Contrast 4: C2 vs. C4	1.33	$b_4 = 1.10$ ($t = 4.50$)[a]
H5: Contrast 5: C2 vs. C3	1.29	$b_5 = 1.01$ ($t = 3.22$)[a]

Covariates	Estimated coefficients
Frequency of exchange	$b_6 = 0.17$ ($t = 2.35$)[b]
Purchasing volume	$b_7 = 0.15$ ($t = 2.10$)[b]
Manufacturing technology	$b_8 = 0.15$ ($t = 2.11$)[b]

[a] Indicates $p < 0.01$ (two-tail).
[b] Indicates $p < 0.05$ (two-tail).

Table 2
Regression analysis, dependent variable: formalized purchase contracting
$R^2_{adj} = 0.29$, $F(6,167) = 11.76$.

Independent variables	β-coefficients	t-values
CONSTANT (β_0)	1.69	2.76[a]
Buyer-specific assets (β_1)	−0.04	−0.16
Supplier-specific assets (β_2)	0.31	1.97[b]
Buyer-specific assets × supplier-specific assets (β_3)	0.14	0.47
Purchasing volume (β_4)	0.12	1.63[c]
Frequency of exchange (β_5)	0.16	2.33[b]
Buyer's manufacturing technology (β_6)	0.18	2.62[a]

[a] Indicates significance at $p < 0.01$.
[b] Indicates significance at $p < 0.05$.
[c] Indicates significance at $p < 0.10$.

of purchasing relationships is expected to enforce the efficacy of inbound logistics in this situation. Accordingly, our findings demonstrated a significant and positive association between the rigidity of BUYTECH and FORM ($b_8 = 0.15$, $t = 2.11$, $p < 0.05$).

The frequency of interfirm exchange is supposed to enforce the efficacy of interfirm coordination, and our findings showed a significant and positive relationship between the annual number of orders and FORM ($b_6 = 0.17$, $t = 2.35$, $p < 0.05$).

Finally, the empirical findings correspond with the expectation that high stakes relationships are expected to face more difficulties and demand more comprehensive contracting. Accordingly, annual purchasing volume was positively associated to FORM ($b_7 = 0.15$, $t = 2.10$, $p < 0.05$).

The median split approach for the specific asset scales represents only one of several ways of reorganizing continuous data, and may involve some degree of inherent arbitrariness. An alternative linear model with metric scaling of specific assets was therefore estimated to assess the robustness of our results:

$$FORM = \beta_0 + \beta_1 * BUYSPEC + \beta_2 * SUPSPEC + \beta_3 \\ * BUYSPEC \times SUPSPEC + \beta_4 * PURCHASE \\ + \beta_5 * FREQ + \beta_6 * BUYTECH + \epsilon$$

where: FORM = Formalized Purchase Contracting; BUYSPEC = Buyer-held specific assets; SUPSPEC = Supplier-held specific assets; BUYTECH = Buyer's manufacturing technology; PURCHASE = Annual purchasing volume; FREQ = Annual number of orders.

Goodness-of-fit estimates showed that the re-specified model fit the data well ($R^2_{Adj} = 0.29$ and $F(6,154) = 11.76$, $p < 0.01$). The results of the regression analysis showed that the estimated main effect of buyer-held specific assets was not significant ($\beta_1 = \div 0.04$, $t = -0.16$, $p = 0.88$). This finding corresponds to the statement of H1, which proposes no effect of unilateral buyer-held specific assets on FORM.

In accordance with H2, supplier-held specific assets were positively associated to purchase contracting ($\beta_2 = 0.31$, $t = 1.97$, $p < 0.05$). There was no significant interaction effect of buyer-held and supplier-held specific assets on formalized purchase contracting ($\beta_3 = 0.14$, $t = 0.47$, $p = 0.63$).

Taken together, these findings coincide entirely with the outcome of the ANCOVA analysis and thus provide evidence for the robustness of the model (Table 2).

8. Discussion and implications

8.1. Theoretical implications

This research has examined how the composite of specific assets affects interfirm governance in industrial purchasing relationships. The empirical findings demonstrated that when suppliers unilaterally deployed specific assets on behalf of a buyer in a vertical relationship, bilateral governance was significantly greater than under conventional market conditions. When the supplier unilaterally employed specific assets, small-number conditions will occur and lock both parties into a bilateral monopoly (Williamson, 1975, 1985). Under this condition, private ordering of interfirm trade based on formalized contracting represents a response to interfirm ties in an arena of trade restricted to a single buyer and a single seller. No other buyers are in the position to observe or exercise influence on the supplier's performance. Hence, specific ex ante agreements are vital in order to handle exposure to opportunism. This reasoning coincides completely with mainstream TCA studies which focus on hybrid arrangements (i.e., Palay, 1984; Heide and John, 1990; Parkhe, 1993; Stump and Heide, 1996). For instance, Parkhe (1993) observed a significant and negative relationship between the perception of opportunism and contractual safeguards among manufacturing firms. Palay (1984) found a significant and positive relationship between asset specificity on the supplier side and contractual governance.

Furthermore, our analysis has demonstrated that mutual dependence incurred by *mutual deployment* of specific assets enforced the use of contractual safeguarding. This finding contradicts the original hostage model advocated by Williamson (1983). This model considers such mutuality as an exchange of hostages that should, in turn, increase credible commitments and reduce the problem of moral hazards. However, reciprocal arrangements of this

kind have been shown to be insufficient on their own in efforts to afford protection of assets at risk (Heide, 1994). The problem of asymmetric information and uncertain evaluation of the value of the sacrificed hostages (specific assets) maintains the need for supportive safeguarding devices in order to create credible commitments in reciprocal relationships (Williamson, 1985). Mutual deployment of specific assets in buyer–seller relationships implies a co-specialization of resources (Milgrom and Roberts, 1992) and shows strong similarity to close complementarity (Richardson, 1972). Close complementarity implies that particular activities and resources have to be vertically coordinated across the transacting firms so as to obtain efficient division of work. Such circumstances deviate substantially from conventional market conditions and call for comprehensive interfirm organization (e.g., contracting or cooperative arrangements).

Our findings showed that when specific assets were unilaterally deployed by the buyer in a relationship, interfirm governance turned out to be quite similar to what was observed under conventional market conditions (mutual-low asset specificity). Safeguarding of buyer-held specific assets relates to a buyer's incentives to protect assets at risk. Based on the observed modest levels of contractual safeguarding of buyer-held specific assets, it could be questioned whether such adaptations really correspond to *substantial buyer risk*. Buyer-held specific assets are obviously *risky assets* in that they are vulnerable and lose productive values if the interfirm trade is terminated. On the other hand, the design and utilization of such resources, as well as the profit prospects of such investments, remain in the hands of the buyer and will carry some part of the risk premium.

Unilateral deployment of buyer-held specific assets implies a postponement of product customization from the supplier and to the buyer (Bucklin, 1965, 1973). The data analysis showed that when a buyer unilaterally employed specific assets, she/he absorbed, on average, a smaller fraction of the focal supplier's total sales (4.2%) than is the case where the supplier unilaterally deployed specific assets (17.6%). The mean difference across these two groups of buyer–seller relationships (13.4%) was significant ($t = 2.89$, $p < 0.01$) and indicates that the opportunities for economies of scale advantages on the supplier side are modest when buyers unilaterally carry out specific assets in a relationship. Under such conditions, advantages that stem from economies of scope on the buyer side could put the buyer in the best position for making desirable adaptations. This should represent an appropriate adaptation strategy in small markets with heterogeneous product preferences.

When specific investments are unilaterally employed by the buyer, the focal product offered by the supplier still appeals to a broader market segment with several other buyers. Thus, specific adaptations made by a single buyer should not substantially influence the dispositions of the focal supplier. This means that a supplier's marketing strategy will be designed to match the preferences of the whole portfolio of buyers and to provide comparable terms of trade for all buyers with "standardized safeguarding" (e.g., product quality and service performance guarantees). This should offer a buyer some collective insurance against moral hazards on the supplier side because reputation effects should weaken the supplier' incentive for acting opportunistically (Rubin, 1990).

8.2. Managerial implications

Management magazines and business consultants have often portrayed and viewed interfirm coordination as desirable (Heide and John, 1990). Our findings have indicated that the requirement of interfirm governance arrangement is highly dependent on the present level of interfirm dependence. The nature of this bilateral dependency is the most critical guideline for estimating the costs and benefits attached to various governance arrangements. Comprehensive contracting or cooperative arrangements induce costs and ought to be restricted to situations where it is advantageous and possible for the transacting partners to exercise moral hazard and/or when the need for coordinated interfirm adaptations is significant.

From the buying firm's perspective, possible trade hazards connected to unilateral employment of specific assets will, to some extent, be safeguarded by conventional terms of trade agreements and reputation effects as long as several other buyers are in the position to observe the supplier's performance. On the other hand, supplier concentration and imperfect competition could weaken this safeguarding mechanism and have to be carefully considered. Closer investigation of the market conditions and of current competitive strategies of suppliers might be appropriate for this purpose. Another offsetting strategy for the buying firm is to connect the supplier's trademark to components in the finished products designed to the market of end-users. In this case, several business actors will observe the supplier's performance. Reputation effects will thus be enforced and could therefore mitigate prospective moral hazards (e.g., quality deterioration).

When a supplier makes specific adaptations and investments for the purpose of meeting the specific requirements of a buying firm, a lock-in situation involving the buyer and the supplier is established. Under this condition, comprehensive interfirm governance arrangements are warranted in order to make interfirm trade work more smoothly and to provide guidelines for adaptations to changing market conditions and technological changes.

For a buying firm with a heterogeneous portfolio of suppliers, interfirm organization should be differentiated in accordance with the present level of interfirm dependencies and trading hazards. On the other hand, when the purchasing activities taking place in a specific business relations are interrelated to trading activities with other suppliers, standardization of purchasing arrangements might provide administrative economies of scale benefits. A joint assess-

ment of governance set-up costs and ongoing governance costs may therefore be warranted to reveal the overall benefits and coordination costs for the entire portfolio of purchasing relationships.

8.3. Limitations and further research

Much remains to be done to elaborate on how the composition of specific assets in buyer–seller relationships affects bilateral governance. Implicitly, the research agenda that is proposed here reflects the limitations of current and past research. This research is generally based upon a buyer's perception of interfirm dependence and bilateral governance in channel dyads. Several empirical studies report satisfactory correspondence between measures of the same variables across both sides in channel dyads (e.g., Heide and John, 1990, 1992; John and Reve, 1982). For instance, John and Reve (1982) found a significant and positive association between wholesaler and retailer reports of the following: (a) vertical interaction, (b) formalized contracting, and (c) centralization in marketing channels. Furthermore, Anderson and Weitz (1992) reported a strong association between the way industrial manufacturers and distributors perceived each other's deployment of specific assets and the perception of their trade partners' credible commitments.

Notwithstanding these findings, communication and perception of trade partners' deployment of specific assets remain a critical issue. For instance, the prospects of opportunism and strategic behavior incurred by disclosed information or hidden actions may preclude efficient allocation of specific assets and hence increase direct opportunity costs (maladaptation costs). The roles of experience and learning may also be brought into consideration when assessing asset specificity. Assets that are perceived as being of high specificity by a newcomer in a business may be considered to be of low specificity by an experienced actor. In the same way as the learning curve affects costs, it is possible that there is a learning curve affecting the evaluation of asset specificity (Reve, 1990). Research on data from both sides of the channel dyad is therefore desirable to further elaborate on these issues.

The present research has focused on trade partners' incentives to protect assets at risk. The *ability* of channel members to safeguard assets at risk should lead to several interesting issues for further research. For instance, a possible interaction effect of relational norms and asset specificity on bilateral governance may be one such issue. Heide and John (1992) found that a buyer's control over a supplier's decisions were negatively related to the level of buyer-held specific assets. However, this association turned out to be moderated by relational norms. Specifically, in situations where both parties shared substantial relational norms, higher levels of buyer-held specific assets led to increased buyer control. In the absence of such norms, higher deployment of specific assets by the buyer under-

mined the buyer's influence over terms of trade. The question remains as to whether or not this pattern will be replicated for other types of hybrid governance. Further inquiry on the effect of the interplay between asset specificity and prior length of relationships may enrich this analysis.

Secondly, the interaction between structural power and asset specificity should also be considered in future investigations. Even if both market power and resource-based power play a modest role in the TCA-perspective (Williamson, 1991b), the interplay between asset specificity and structural power remains an interesting theoretical issue to study. Based upon empirical findings from an industrial setting, Heide and John (1992) found a positive interaction effect of buyer-held specific assets and buyer's bargaining power on buyer's influence over supplier's decision-making. This effect could appear for other hybrid arrangements as well. An interesting follow-up issue for future research is to explore the interplay between asset specificity and buyer's bargaining power in order to examine whether structural power would enforce the buyer's ability to have specific assets protected by contractual safeguarding devices.

8.4. Summary and concluding remarks

A basic prediction of transaction cost analysis is that the level of specific assets associated to a transaction dictates how inter-firm relationships are to be organized in an efficient manner. Our research has attempted to explore whether the *composition of specific assets* influences the alignment of governance arrangements in supplier–buyer relationships. Our findings demonstrated that the calibration of formalized purchase contracting is highly dependent on the present composition of assets at risk. Specifically, the research findings indicated that the composition of specific assets affects both bilateral dependence and exposure to opportunism while also reflecting the market structure surrounding buyer–seller relationships. Under conditions with mainly buyer-held specific assets, terms of trade showed great similarities to conventional market conditions (mutual low asset specificity). The empirical findings revealed that the buyer concentration measured as the fraction of the supplier's sales absorbed by a specific buyer did not deviate across these two situations.

It was suggested that when the supplier was engaged by the buying firm and tailored its productive resources to the relationship, small-number conditions would occur with a subsequent need for comprehensive interfirm governance. The research findings provided support for this prediction and did further demonstrate that the buyer concentration was significantly higher under this condition than in the case where unilateral buyer-held specific assets and conventional market conditions (mutual low asset specificity) prevailed.

Appendix A. Item description and reliability measures

Scales	Sample of items
BUYSPEC: Buyer-Held Specific Assets, six items, $\alpha = 0.81$	We have committed a lot of time to the training of personnel for this supplier (BUYSPEC 1). Our firm has committed a lot of time and resources to learn and adapt to the technical standards of this supplier (BUYSPEC 2). We have made comprehensive investments in transportation equipment dedicated to deal effectively with this supplier (BUYSPEC 3). We have committed a lot of time and resources to develop specific equipment and routines for product control of deliveries from this supplier (BUYSPEC 4). Our firm has made comprehensive investments to restructure and integrate our production facilities with this supplier's production (BUYSPEC 5). Our firm has made significant investments in information technology dedicated to the interaction with this supplier (BUYSPEC 6).
SUPSPEC: Supplier-held Specific Assets, six items, $\alpha = 0.85$	Our supplier has invested in production equipment to a great extent in order to adjust to our purchasing requirements (SUPSPEC 1). Our supplier has carried out considerable product adjustments in order to meet the requirements from our company (SUPSPEC 2). Our supplier has committed a lot of time and resources to the training and development of our company's personnel (SUPSPEC 3). Our supplier has carried out extensive investments in transportation equipment to deal with the deliveries to our firm (SUPSPEC 4). Our supplier has committed a lot of time and resources to meet our firm's requirements as regards routines and equipment for product control (SUPSPEC 5). Our supplier has made comprehensive investments to restructure and integrate own production with our firm production (SUPSPEC 6).
FORM: Formalized Purchase Contracting, 5 items, Reflective scale, $\alpha = 0.77$	Firm procedures describe specific procedures for the follow-up of orders to our firm (FORM 1). Exchange of information on price and costs are pre-planned and carried out regularly (FORM 2). Regular meetings between our firms provide the planning, development and testing of products delivered to our firm (FORM 3). Our firms have set firm agreements for how to integrate the supplier's capacity planning with our firm's purchase scheduling (FORM 4). Written contracts line out how to handle complains and disputes between our firms (FORM 5)
BUYTECH: Rigidity of Buyer's Manufacturing Technology, $\alpha = 0.75$	The work-flow in our production department is highly preprogrammed (BUYTECH 1). Information technology is extensively used for control and scheduling purposes (BUYTECH 2). The production technology in our firm consists of sequences of automatic processes (BUYTECH 3). It is very costly and resource-demanding to redesign our production for new lots of products (BUYTECH 4).

Appendix B. Factor analysis of FORM, BUYSPEC, and SUPSPEC. Three-factor principal component solution with varimax rotation

Items[a]	F1: Supplier-Held Specific Assets	F2: Buyer-Held Specific Assets	F3: Formalized Purchase Contracting
SUPSPEC 1	**0.80**	0.10	0.11
SUPSPEC 2	**0.83**	0.14	0.15

SUPSPEC 3	**0.49**	0.22	0.26
SUPSPEC 4	**0.57**	0.34	0.17
SUPSPEC 5	**0.71**	0.27	0.18
SUPSPEC 6	**0.74**	0.22	0.23
BUYSPEC 1	0.35	**0.59**	0.22
BUYSPEC 2	0.11	**0.68**	0.15
BUYSPEC 3	0.04	**0.79**	0.05
BUYSPEC 4	0.29	**0.64**	−0.08
BUYSPEC 5	0.30	**0.66**	0.05
BUYSPEC 6	0.13	**0.67**	0.19
FORM 1	0.16	0.08	**0.74**
FORM 2	0.07	0.21	**0.72**
FORM 3	0.39	0.03	**0.60**
FORM 4	0.20	0.14	**0.60**
FORM 5	0.11	−0.00	**0.74**
Eigen value	6.03	1.91	1.41
Explained variance (55.3%)	35.5%	11.3%	8.3%

[a] Items labels correspond to definitions given in Appendix 1.

References

Alchian A, Demsetz H. Production, information, and economic organization. Am Econ Rev 1972;62:777–95.

Amber GS, Amber PS. Anatomy of Automation. Englewood Cliffs: Prentice-Hall, 1962.

Anderson E, Weitz B. The use of pledges to build and sustain commitments in distribution channels. J Mark Res 1992;24:18–34.

Armstrong JS, Overton TS. Estimating non-response bias in mail surveys. J Mark Res 1977;14:396–402.

Buchanan L. Vertical trade relationships: the role of dependence and symmetry in attaining organizational goals. J Mark Res 1992;29:65–75.

Bucklin L. Postponement, speculation and the structure of distribution channels. J Mark Res 1965;2:26–31.

Bucklin L. Competition and Evolution in the Distributive Trades. New Jersey: Prentice-Hall, 1973.

Buvik A. The effect of manufacturing technology matter on purchase contracts. Int J Purchasing Mater Manage 1998;34:21–7.

Churchill GA. A paradigm for developing better measures of marketing constructs. J Mark Res 1979;16:64–73.

Droozdowski T. At BOC they start with the product. Purchasing. 1986;13(62B):5–11.

Dwyer R, Oh S. Output sector munificence effects on the internal political economy of marketing channels. J Mark Res 1987;24:347–58.

Frazier GL, Spekman RE, O'Neal CR. Just-in-time exchange relationships in industrial markets. J Mark 1988;52:52–67.

Heide JB. Explaining 'Closeness' in Industrial Purchasing Relationships: The Effects of Dependence Symmetry on Iter-Organizational Coordination Patterns. PhD dissertation, University of Wisconsin-Madison, 1987.

Heide JB. Inter-organizational governance in marketing channels. Theoretical perspectives on forms and antecedents. J Mark 1994;58:71–85.

Heide JB, John G. The role of dependence balancing in safeguarding transaction-specific assets in conventional channels. J Mark 1988;52:20–35.

Heide JB, John G. Alliances in industrial purchasing. The determinants of joint action in buyer–supplier relationships. J Mark Res 1990;27:24–36.

Heide JB, John G. Do norms matter in marketing relationships? J Mark 1992;56:32–44.

Hickson DJ, Pugh DS, Pheysey DC. Operations technology and organization structure. An empirical reappraisal. Administrative Sci Q 1969;14:378–97.

Johanson J. Production technology and user–supplier interaction. In: Haakansson H, editor. International Marketing and Purchasing of Industrial Goods. New York: Wiley, 1982.

John G. An empirical investigation of some antecedents of opportunism in a marketing channel. J Mark Res 1984;21:278–89.

John G, Reve T. The reliability and validity of key informant data from dyadic relationships in marketing channels. J Mark Res 1982;19:517–24.

Johnston WJ, Bonoma TW. The buying center. Structure and interaction patterns. J Mark 1981;45:143–56.

Masten SE, JrMeehan JW, Snyder EE. The cost of organization. J Law, Econ Organization 1991;7:1–25.

Milgrom P, Roberts J. Economics, Organization and Management. New Jersey: Prentice-Hall, 1992.

Noordewier TG, John G, Nevin JR. Performance outcomes of purchasing arrangements in industrial buyer–vendor relationships. J Mark 1990;54:80–93.

Palay T. Avoiding regulatory constraints: contractual safeguards and the role of informal agreements. J Leg Stud 1984;13:265–87.

Parkhe A. Strategic alliance structuring: a game theoretic and transaction cost examination of interfirm cooperation. Acad Manage J 1993;36:794–829.

Reve T. The firm as a nexus of internal and external contracts. In: Aoki M, Gustafsson B, Williamson O, editors. The Firm as a Nexus of Treaties. London: SAGE Publications, 1990.

Reve T, Stern LW. The relationship between inter-organizational form, transaction climate, and economic performance in vertical interfirm dyads. In: Pellgrini L, Teddy S, editors. Marketing Channels. Relationships and Performance. Lexington, MA: Lexington Books, 1986. pp. 75–102.

Richardson GB. The organization of industry. Econ J 1972;82(September):883–96.

Rubin P. Managing Business Transactions: Controlling the Costs of Coordination Communication, and Decision Making. New York: The Free Press, 1990.

Schonberger R, Gilbert JP. Just-in-time purchasing. A challenge for U.S. industry. Calif Manage Rev 1983;26(1):54–68.

Spekman RE. Strategic supplier selection. Understanding long-term buyer relationships. Bus Horiz 1988;31:75–81.

Stern LW, Reve T. Distribution channels as political economies. A framework for comparative analysis. J Mark 1980;44:52–64.

Stinchcombe AL. Contracts as hierarchical documents. In: Stinchcombe C, Heimer C, editors. Organization Theory and Project Management. Bergen: Norwegian Univ. Press, 1985. pp. 121–71.

Stump RL, Heide JB. Controlling supplier opportunism in industrial relationships. J Mark Res 1996;33:431–41.

Thompson J. Organizations in Action New York: McGraw-Hill, 1967.

Williamson OE. Markets and Hierarchies. Analysis and Antitrust Implications. New York: The Free Press, 1975.

Williamson OE. The economics of organization. The transaction cost approach. Am J Sociol 1981;87:548–77.

Williamson OE. Credible commitments: using hostages to support exchange. Am Econ Rev 1983;73:519–66.

Williamson OE. The Economic Institutions of Capitalism. New York, NY: The Free Press, 1985.

Williamson OE. Comparative economic organization. The analysis of discrete structural alternatives. Administrative Sci Q 1991a;36:269–96.

Williamson OE. Strategizing, economizing, and economic organization. Strategic Manage J 1991b;12:75–94.

Woodward J. Industrial Organization: Theory and Practice. Oxford: Oxford Univ. Press, 1965.