

THE IMPACT OF EMPIRICAL TESTS OF TRANSACTION COST ECONOMICS ON THE DEBATE ON THE NATURE OF THE FIRM

RICHARD CARTER¹ and GEOFFREY M. HODGSON^{2*}

¹ Independent business consultant, London, U.K.

² The Business School, University of Hertfordshire, Hatfield, Hertfordshire, U.K.

Transaction cost economics (TCE), as developed and operationalized by Oliver Williamson, is one of the most prominent and influential developments in the social sciences. In recent years, on the basis of many empirical studies, it has been claimed that the evidence has corroborated TCE. If so, this would have major implications for the debate between TCE and other approaches to understanding the nature of the firm. In this paper we submit the most prominent TCE empirical work to critical scrutiny, on the basis of the standards and predictions in Williamson's own writings. We find a much more mixed picture, with few studies giving unambiguous support to Williamson's TCE. Furthermore, a significant number of the studies can be reinterpreted in terms of a competence or capabilities approach. We conclude that the empirical evidence does not decisively support Williamson's TCE and we stress the importance of an empirical program of joint testing of rival theoretical approaches. Copyright © 2006 John Wiley & Sons, Ltd.

INTRODUCTION

Among others, Carroll and Teece (1999: 3) have claimed that transaction cost economics (TCE) 'is perhaps the single most influential theory found in the social sciences.' Oliver Williamson has been instrumental in its rise to prominence, not least for operationalizing TCE by identifying the key dimensions through which a transaction could be mapped onto an appropriate form of governance (Masten, 1996). Williamson (1999) has emphasized the crucial importance of the process of operationalization and has underlined the success of TCE when exposed to empirical testing:

The transaction cost approach to the study of integration yields numerous refutable implications,

Keywords: transaction cost economics; Oliver Williamson; firms; asset specificity; competences; capabilities

* Correspondence to: Geoffrey M. Hodgson, The Business School, University of Hertfordshire, Hatfield, AL10 9AB, U.K.
E-mail: g.m.hodgson@herts.ac.uk

many of which are unique to this approach. The cumulative evidence, which includes mundane, forward, lateral, and backward integration, is broadly corroborative. (Williamson, 1985: 130)

To be sure, transaction cost economics, like everything else, will benefit from more and better empirical work. I have no hesitation, however, in declaring that transaction cost economics is an empirical success story. (Williamson, 1999: 1092)

TCE is an empirical success story ... research has been broadly corroborative of the predictions of transaction cost economics. (Williamson, 2000: 605–607)

These are very important and significant claims. If valid, they would suggest that transaction cost approaches have triumphed over rival explanations of the nature of the firm, particularly over competence-based approaches.¹ This article aims

¹ This refers to a broad collection of related ideas, including competence, capabilities, dynamic capabilities, knowledge-based, resource-based, and evolutionary approaches (Penrose,

to assess whether the branch of TCE developed by Oliver Williamson really is an empirical success story, and what claims can legitimately be made for TCE on the basis of the most prominent empirical studies.² Following previous work on this topic (Carter, 2002), this article assesses the empirical work against standards that emanate from TCE itself.

A systematic evaluation by David and Han (2004) of 304 statistical tests of Williamson's TCE framework found in 63 journal articles reached the conclusion that the results were 'mixed.' Here we adopt a different methodology and focus on a smaller number of the most influential and highly cited studies. This permits a slightly more detailed discussion of the empirical tests and their interpretation. We concur with the 'mixed' verdict of David and Han, but we go further and argue that the results of tests of the role of asset specificity, which seem to be among the more successful for TCE in empirical terms, are also consistent with the competence approach.

After some necessary preliminaries in the following section, the section after that outlines the method of choice of studies for review. Two subsequent sections contain the central assessment of the most influential empirical studies. The penultimate section considers two possible alternative interpretations of the results from the empirical studies. The concluding section considers what claims can legitimately be made for Williamson's TCE framework on the basis of the most prominent empirical work.

SOME NECESSARY PRELIMINARIES

Our first task is to outline the predictions of Williamson's TCE approach. Williamson identifies three groups of parameters or dimensions: behavioral assumptions, transaction dimensions, and governance mechanisms, which provide the explanatory power for his contracting framework.

1959; Nelson and Winter, 1982; Rumelt, 1984; Foss, 1993; Foss and Knudsen, 1996; Hodgson, 1998; Nootboom, 2004).

² There have been many TCE empirical review studies, including Anderson (1996), Boerner and Macher (2003), Crocker and Masten (1996), David and Han (2004), Joskow (1988, 1991), Masten (1996), Masten and Saussier (2000), Rindfleisch and Heide (1997), Shelanski (1991), Shelanski and Klein (1995), Sobrero and Schrader (1998), and Williamson (1985). The largest is Boerner and Macher (2003), which addresses more than 600 publications.

In particular, the introduction and elaboration of the concept of asset specificity—involving transaction-specific investments—marks a major development in his reasoning. Williamson (1979: 245) clearly reveals his position:

the three critical dimensions for characterizing transactions are (1) uncertainty, (2) the frequency with which transactions recur, and (3) the degree to which durable transaction-specific investments are incurred. Of these three, uncertainty is widely conceded to be a critical attribute; and that frequency matters is at least plausible. The governance ramifications of neither, however, have been fully developed—nor can they be until joined with the third critical dimension: transaction-specific assets.

Williamson (1975, 1985) takes markets as the original state of affairs and considers circumstances where deviation from market transactions will economize on transaction costs. Vertical integration lies at the other extreme from a market arrangement. Williamson (1979) argues that vertical integration will be relatively more efficient with recurrent transactions, and when either investments are idiosyncratic (high asset specificity) and uncertainty is either high or medium, or when investments are mixed (medium asset specificity) and uncertainty is high.

Williamson's (1979) contracting framework also addresses governance mechanisms lying between the two extremes of market contracting and vertical integration, often referred to as hybrid relationships. His framework predicts that: (1) trilateral governance mechanisms (or 'neoclassical' contracting) will be efficient for transactions that are occasional, have intermediate levels of uncertainty and have either idiosyncratic or mixed investment characteristics; and (2) bilateral governance mechanisms (or obligational contracting) will be efficient for transactions that are recurrent, have intermediate levels of uncertainty, and mixed investment characteristics.

The definitive feature of the trilateral ('neoclassical') contract is the inclusion of a third party, or arbitrator, to deal with disputes arising from changes in trading circumstances. The key element of the bilateral, obligational, contract appears to be its emphasis on the continuity of the relationship and the need, therefore, for adaptability to changing circumstances, the focus being on quantity rather than price adjustments.

Williamson's (1983, 1985) discussion of credible commitments suggests some specialized governance features to support these long-term contractual arrangements, including balancing investments in specific assets, hostages, take-or-pay procurement clauses, and reciprocity arrangements. Hybrid relationships are identified primarily as formal contractual arrangements. In his writings on hybrid governance mechanisms, Williamson (1991: 280) emphasizes the need for the support of formal 'contractual safeguards and administrative apparatus (information disclosure, dispute-settlement machinery).'

The preceding discussion does not assume that Williamson's TCE framework is the only legitimate form of TCE. Williamson (1985) has clearly distinguished his governance approach from what he refers to as the measurement branch of TCE, as exemplified by Alchian and Demsetz (1972). A further distinct branch of TCE, referred to as the internalization approach, has also emerged (Buckley and Casson, 1976; Hennart 1982, 1988). Alongside these broader theoretical developments numerous researchers have proposed specific refinements to Williamson's transaction cost reasoning, not least in terms of the role of uncertainty. These have been a feature of empirical research as the discussion below reveals (Balakrishnan and Wernerfelt, 1986; Klein, Frazier, and Roth, 1990; Walker and Weber, 1984). However, in this review we confine our attentions to Williamson's TCE framework and to assessments of its key theoretical predictions against the empirical evidence.

DETERMINING THE SAMPLE OF STUDIES FOR REVIEW

Christopher Boerner and Jeffrey Macher (2003) claim that there are over 600 empirical studies of TCE, exceeding a figure of 400 claimed earlier by Williamson (1999).³ However, many of these studies do not consider the application of Williamson's framework in relation to the nature of the firm debate, which is the focus of this essay. There is a trade-off between the number of articles included in a review and the depth

of critical analysis offered. It would be relatively easy, by an impressionistic method, to peruse these many studies and garner literally hundreds of claims of 'verification' or 'corroboration' of TCE. However, such an impressionistic method would pay little heed, to (a) the impact of each study on the scientific community and (b) the actual or perceived scientific rigor and weight of the study in question.

From the hundreds of identified empirical articles in TCE, we used two selection criteria to create a smaller sample of studies that were influential in the academic debate and were aligned with the focus of this review. With all their imperfections, citations still provide the best and most widely accepted indirect measure of the influence that a work attains in the academic community. Generally, the more an article has been cited the greater the role it has played in the academic debate. Significantly, Carroll and Teece (1999) justify their opinion that Williamson bears much of the responsibility for the widespread influence and popularity of TCE by referring to the very high level of citations of his work.

Authors cite the works of others for a variety of reasons, including establishing credibility with their audience, as well as building on previous work (Cronin, 1984; Gilbert, 1977; Klamer and Van Dalen, 2002). A study can be cited in criticism or in concordance. However, we found no study above our threshold citation level (explained below) that was cited principally because of its alleged defects. Hence our citations methodology identifies a set of studies that (a) have had a significant impact and (b) are deemed by others to have sufficient scientific caliber to be cited.

We used an average citation level, over several years, of citations in the ISI Social Science Citation Index (SSCI) database. A number of different averages were tested to determine how sensitive the sample would be to the chosen figure: the effect was only marginal. We used a 5-year average citation figure, for the years from 1998 to 2002 inclusive. A minimum average citation level of five per year was used to create the sample. This figure created an initial sample of 54 TCE studies.

This sample was then further refined. Any study that did not employ an empirical model that was based at least in part on Williamson's TCE framework in a core application relevant to the nature of the firm debate was eliminated.

³ Boerner and Macher (2003) caution that their 600 identified studies 'differ widely in quality.' David and Han (2004) searched journal articles only.

For example, Hennart (1991) was excluded as it makes no reference to Williamson's TCE analysis; its empirical model is based on the internalization TCE approach. Overall, 27 studies were eliminated, giving a final sample of 27 studies, 12 of which dealt with vertical integration and 15 with hybrid relationships. Although citation objects in the SSCI are not confined to journals, all of our 27 studies were in prominent academic journals.

It could be objected that our limited sample may omit less-cited studies that provide robust empirical support (or disconfirmation) for Williamson's TCE. Clearly, any robust and decisive empirical test warrants consideration, although one may wonder why any omitted study with these qualities is not cited more often. Other empirical studies may contain important results, but at least by the measure of citations they have not (yet) impacted significantly on the literature. The citations approach, however, has an important advantage for this review, which provides a more critical assessment of the TCE empirical work. By focusing on those studies that are central to the academic debate, it protects against any charge that the sample has been created specifically to generate a less positive assessment.

As well as referring to the broader and systematic study of David and Han (2004)—which covers 63 journal articles—we welcome any wider scrutiny of the TCE empirical work. Nevertheless, in the restricted space available, our strategy is to spotlight the more prominent and influential works. Instead of systematic review of all the evidence available, we offer a comprehensive analysis of the more influential empirical tests of Williamson's TCE framework.

Even with a relatively small sample of 27 studies we can only probe the details so far. For instance, the results of any empirical study rely crucially on the process of empirical operationalization of the researchers: how the variables have been defined, how the data have been collected, and what methods of testing have been employed. However, in a review of 27 studies it is possible neither to criticize the statistical methods employed by the researchers, nor to consider the appropriateness of particular proxies or data sets. To go into such deeper details would drastically limit the number of studies that can be assessed in a single journal article.

Nevertheless, our strategy of focusing on the more influential studies pays an additional premium (as the analysis in the two following sections demonstrates). We point to the studies that are most likely to have influenced the claims of TCE corroboration and show, *even taking the empirical tests at face value*, that the results are more mixed than the more upbeat claims would suggest. Furthermore, *even taking claims of significant statistical correlation as they stand*, we show that sometimes these results can be interpreted in a different way, and may even support theories that are seen as rivals to Williamson's TCE.

THE VERTICAL INTEGRATION STUDIES

Williamson's theory predicts vertical integration when asset specificity is high, uncertainty is at least of intermediate degree, and the transaction is recurrent, or when there is an intermediate level of asset specificity, and uncertainty becomes sufficiently high and again the transaction is recurrent. We categorize empirical tests as being fully consistent, partly consistent, partly consistent and partly inconsistent, or strictly inconsistent with Williamson's TCE framework, or inconclusive. The relevant results of these 12 studies are summarized in Table 1.

It is striking that all 12 of the vertical integration studies found support for the role of asset specificity in the vertical integration decision, with nine of the studies finding support specifically for a human asset specificity variable. This conclusion concurs with David and Han (2004: 52), who found that asset specificity fared best as a significant independent variable in their sample of studies. The significance of this is addressed later in this paper, where an alternative interpretation of human asset specificity and the empirical results concerning vertical integration are discussed. It is also significant that none of the vertical integration studies tested the rival competence approach alongside TCE.

To expand the summary evaluation in Table 1, what follows is a discussion of those studies that require further comment, grouped according to the evaluative categories outlined above.

Table 1. Vertical integration studies

Study	Dependent variable	Asset specificity	Uncertainty	Transaction frequency	Results
Anderson (1985)	Internal sales force or independent sales representatives	<i>Human</i>	Environmental interaction, environmental, behavioral	Transaction frequency	Partly consistent and partly inconsistent with TCE
Anderson and Coughlan (1987)	Internal sales force or independent sales representatives	Human	No uncertainty variable	No transaction frequency variable	Partly consistent with TCE
Anderson and Schmittlein (1984)	Internal sales force or independent sales representatives	Human	Environmental interaction, behavioral interaction, environmental, behavioral	Transaction frequency	Partly consistent and partly inconsistent with TCE
Balakrishnan and Wernerfelt (1986)	Degree of integration	General	<i>External (technological)</i>	No transaction frequency variable	Partly consistent and partly inconsistent with TCE
Erramilli and Rao (1993)	Full control or shared control entry mode	Human, physical	External interaction, internal interaction, external, internal	No transaction frequency variable	Partly consistent and partly inconsistent with TCE
Gatignon and Anderson (1988)	Wholly owned subsidiary or partnership	Human, brand name	External interaction, <i>external, internal</i>	No transaction frequency variable	Partly consistent and partly inconsistent with TCE

(continued overleaf)

Table 1. (Continued)

Study	Dependent variable	Asset specificity	Uncertainty	Transaction frequency	Results
John and Weitz (1988)	Percentage of sales through a direct channel	Human	Environmental, behavioral	No transaction frequency variable	Inconclusive
Klein <i>et al.</i> (1990)	Degree of channel integration	Human, physical	External interaction, external (volatility) , <i>external (diversity)</i>	No transaction frequency variable	Partly consistent and partly inconsistent with TCE
Masten (1984)	Internal production or external procurement	General (design) , site	External (complexity)	No transaction frequency variable	Partly consistent with TCE
Masten <i>et al.</i> (1991)	Internal production or external procurement	Human , physical, temporal	External (complexity)	No transaction frequency variable	Partly consistent with TCE
Monteverde and Teece (1982)	Majority internal production or external procurement	Human, general (component)	No uncertainty variable	No transaction frequency variable	Partly consistent with TCE
Walker and Weber (1984)	Internal production or external procurement	General	External (volume) , external (technological)	No transaction frequency variable	Partly consistent with TCE

The evaluations in Table 1 are made according to Williamson's standard TCE model and not according to the expectations of the researchers, whatever these may be. The table records both the TCE variables employed in the individual studies and whether they were found to be in accord with TCE predictions. Where a word appears in **bold** it indicates a positive result. Where it is in *bold italics* it indicates that the results for this variable are mixed but that some are positive. Where the word appears in a normal typeface it means that the variable was not found to have any statistically significant relationship with the dependent variable. Where the word appears in *italics* it indicates that the opposite relationship to that predicted by TCE is found. In the uncertainty column, the term 'interaction' refers to a test of an interaction effect between asset specificity and uncertainty. John and Weitz (1988) and Klein *et al.* (1990) explicitly reject the need to test for transaction frequency. Walker and Weber (1984) explicitly reject the need to test for an interaction effect between asset specificity and external uncertainty. Anderson (1985) and Anderson and Schmittlein (1984) perform different tests on the same dataset, and due compensation should be made for this.

Fully consistent: *To be classified as fully consistent with Williamson's TCE an empirical study must (1) test all three of the transaction dimensions of Williamson's TCE framework (asset specificity; uncertainty; transaction frequency) and (2) produce results for the three dimensions that are all concurrent with the relevant predictions of this framework.*

The definition employed in this analysis requires that researchers actually test for each of the dimensions of Williamson's framework. Hence, strictly, no study is fully consistent with Williamson's TCE as none tests successfully for all three of Williamson's dimensions.

Partly consistent: *A study is classified as being partly consistent with Williamson's analysis where it tests only a part of his complete framework, has some dimensional results that are consistent, and no dimensional result that is inconsistent, with Williamson's predictions.*

Five of the 12 studies are partly consistent with Williamson's TCE. None of these studies tests for transaction frequency, and without this the best possible verdict is that the results are partly consistent with Williamson's framework. Transaction frequency is not the only omission: neither Anderson and Coughlan (1987) nor Monteverde and Teece (1982) test for uncertainty.

Masten, Meehan, and Snyder (1991) is extremely significant as it provides results from two stages of modeling. The first stage, on which the categorization here is based, involves a standard approach to testing the TCE framework. The second stage, however, is designed specifically to overcome some fundamental problems identified by the researchers with the standard empirical model. This provides a very different set of results, which challenge Williamson's TCE model. This issue is discussed further in the penultimate section of this paper.

Walker and Weber (1984) find a positive relationship between both asset specificity and external (volume) uncertainty and internal production. Interestingly, they find a negative but statistically insignificant correlation between technological uncertainty and internal production. However, what is important in assessing the results is that at least one of the forms of uncertainty tested has the correct relationship and none of the others has

a statistically significant relationship that conflicts with the predictions of Williamson's TCE. Had the negative finding on technological uncertainty been statistically significant this would have made their results partly consistent and partly inconsistent with Williamson's TCE.

Partly consistent and partly inconsistent: *A study is classified as being partly consistent and partly inconsistent with Williamson's TCE framework where it has some dimensional results that are consistent, and at least one dimensional result that is inconsistent, with Williamson's predictions.*

Six out of the 12 studies are categorized as partly consistent and partly inconsistent. The uncertainty variable provides the most frequent reason for a study being characterized as partly inconsistent. Indeed, a number of studies find conflicting results for uncertainty, depending on the form and definition of uncertainty and the way that it is operationalized.

Anderson (1985) and Anderson and Schmitlein (1984) are assessed here as partly consistent and partly inconsistent with the predictions of Williamson's TCE framework. Only these two out of the 12 vertical integration studies test for transaction frequency and neither find support for the predicted relationship. Interestingly, although they use the same dataset, their results for the external interaction variable are different.

Balakrishnan and Wernerfelt's (1986) results show a correlation between asset specificity (albeit measured very indirectly) and vertical integration. However, they also contain a very interesting finding on uncertainty. They test for what they define as technological uncertainty and find that it is negatively related to vertical integration. Williamson's model, by contrast, argues that uncertainty is positively correlated with vertical integration.

The study of foreign market entry by Erramilli and Rao (1993) has mixed results for uncertainty. The researchers view uncertainty as having a moderating effect on asset specificity and test for a particular type of interaction effect between asset specificity and uncertainty. They find support for an external interaction and although this is difficult to interpret, it can be viewed as being consistent with Williamson's TCE framework. By contrast, they find no support for an internal uncertainty interaction. They also test for uncertainty effects

directly and find no correlation between external uncertainty and the form of entry mode. However, they find a negative relationship between internal uncertainty and full control entry mode, which appears inconsistent with Williamson's analysis. Given these conflicting results, the most reasonable categorization of this study is as partly consistent and partly inconsistent with Williamson's TCE. Significantly, Erramilli and Rao (1993: 33) argue that strategic considerations come into play alongside transaction costs, thus explaining why 'many service firms establish full-control modes, even in low asset specificity situations.'

Gatignon and Anderson's (1988) study of foreign market entry finds that the asset specificity variable taken alone is positively correlated with vertical integration. However, again the study contains mixed findings on uncertainty, with external uncertainty being found to have an inverse relationship with vertical integration. Also, and consistent with Erramilli and Rao (1993), Gatignon and Anderson note that, even at low levels of asset specificity, integration seems to be the preferred option.

Klein *et al.* argue that their study 'raises more questions than it answers' (Klein *et al.*, 1990: 205–206). They find support for asset specificity but have mixed results for uncertainty. They test for two forms of uncertainty and find that one of these (volatility) is in accordance with Williamson's TCE, but the other (diversity) has an uncharacteristically negative relationship with vertical integration.

Inconsistent: *A study is classified as being inconsistent with Williamson's TCE framework where it has no dimensional result that is consistent, and at least one dimensional result that is inconsistent, with Williamson's predictions.*

No vertical integration study fits this classification.

Inconclusive: *A study is categorized as inconclusive if it tests Williamson's TCE framework with no empirical result that contradicts or supports its predictions, in part or whole.*

The dependent variable in John and Weitz's (1988) empirical model is defined in a way that differs from Williamson's model and comparable empirical studies reviewed here. Their definition of 'direct channel' includes the use of both an

internal sales force and independent sales representatives. The latter are not employees of the company and hence it is reasonable to place them outside a hierarchical governance mechanism. Given this problem it is best to categorize the results of the study as inconclusive.

THE HYBRID RELATIONSHIP STUDIES

Concerning hybrid relationships Williamson's (1979, 1985) model predicts that: (1) bilateral governance mechanisms (or obligational contracting) will be relatively efficient for transactions that are recurrent, have intermediate levels of uncertainty and mixed investment characteristics; and (2) trilateral governance mechanisms (or 'neoclassical' contracting) will be relatively efficient for transactions that are occasional, have intermediate levels of uncertainty, and have either idiosyncratic or mixed investment characteristics.

Compared with vertical integration, there is less of a consensus over the nature and causes of hybrid relationships. Many empirical researchers regard the understanding of hybrid relationships as a major challenge, and propose that Williamson's TCE framework is inadequate to this task. Many different phenomena are described as hybrids, and what exactly constitutes a hybrid relationship is open to dispute (Hodgson, 2002; Ménard, 2004). Given these basic problems, it is not surprising that the empirical work on hybrid forms involves a highly eclectic range of studies, with less emphasis on directly testing the predictions of Williamson's TCE framework. This is a major contrast to the vertical integration empirical studies.

We highlight three features of the empirical tests. First, as already suggested, many of the empirical studies take as a starting point the view that Williamson's treatment of hybrids is inadequate; the initial concern is to develop his theoretical framework and then submit it to empirical test. Heide and John (1990, 1992) illuminate the type of stance adopted by researchers in this category. The prevailing emphasis is on the need for the development of the basic TCE model:

Unfortunately, Williamson does not identify operational dimensions of governance structures. Researchers readily accept the notion that governance is a multidimensional phenomenon ...

but there is little consensus as to the dimensions that characterize the construct. (Heide and John, 1990: 24–25)

Of particular significance is the inability of the conventional wisdom in transaction cost analysis to account for complex nonmarket governance modes between nominally independent firms. It does not suffice to place markets and hierarchies at the ends of a continuum and interpolate between them. The underpinnings of such quasimarket modes differ fundamentally from both markets and hierarchies, and we see that the normative structure is one aspect that must be attended to more closely in

analyzing such cases. (Heide and John, 1992: 40–41)

Many of these models do not correspond directly to Williamson’s TCE framework, and require some interpretation to identify any implications for Williamson’s theory. The theoretical developments made by the researchers are not of foremost interest to us here, as our central aim is to assess the empirical results in relation to Williamson’s own predictions.

Second, as Table 2 shows, the results of 10 out of the 15 studies are inconclusive. Third, as in

Table 2. The hybrid relationship studies

Study	Characteristics of the relationship	Circumstances of the relationship	Results
Anderson and Weitz (1992)	Relationship commitment	General asset specificity	Inconclusive
Bucklin and Sengupta (1993)	Power imbalance	General asset specificity, transaction frequency, behavioral uncertainty	Partly consistent with TCE
Dyer (1996)	Relationship safeguards	Numerous measures of asset specificity	Partly consistent and partly inconsistent with TCE
Eccles (1981)	Quasi-firm	N/A—see discussion in main text	Inconclusive
Heide and John (1988)	Dependence balancing	Human asset specificity	Inconclusive
Heide and John (1990)	Joint action	General asset specificity, internal uncertainty, technological uncertainty, environmental uncertainty	Inconclusive
Heide and John (1992)	Relational norms	General asset specificity	Inconclusive
Joskow (1985)	Contract terms	General asset specificity	Partly consistent with TCE
Joskow (1987)	Contract terms	General asset specificity	Inconclusive
Noordewier <i>et al.</i> (1990)	Relational elements	Environmental uncertainty	Inconclusive
Nooteboom <i>et al.</i> (1997)	Relational risk	General asset specificity	Partly consistent with TCE
Osborn and Baughn (1990)	Informal arrangements, contractual agreements	Technological uncertainty	Inconclusive
Parkhe (1993)	Relationship context	General asset specificity	Inconclusive
Stump and Heide (1996)	Supplier opportunism	General asset specificity, technological uncertainty	Partly consistent and partly inconsistent with TCE
Zaheer and Venkatraman (1995)	Quasi-integration, joint action	General asset specificity, behavioral uncertainty	Inconclusive

The evaluations in Table 2 are made according to Williamson’s standard TCE model (where relevant and hence possible). The table records both the TCE variables employed in the individual studies and whether they were found to be in accord with TCE predictions. Where a word appears in **bold** it indicates a positive result. Where it is in **bold italics** it indicates that the results for this variable are mixed but that some are positive. Where the word appears in a normal typeface it means that the variable was not found to have any statistically significant relationship with the dependent variable. Where the word appears in *italics* it indicates that the opposite relationship to that predicted by TCE is found. Joskow (1985) makes an explicit assumption about the presence of uncertainty and arguably an implicit assumption about the transaction being recurrent. Noordewier *et al.* (1990) explicitly reject the need to test for either asset specificity or transaction frequency.

the case of the vertical integration studies, none of the hybrid relationship studies test the rival competence approach alongside TCE.

Given the developmental nature of many of the empirical studies, it is necessary to provide some further discussion below. We adopt the same evaluative terms as defined earlier in this paper.

Partly consistent

Bucklin and Sengupta (1993) consider hybrid relationships from the perspective of power imbalances between partners. It is difficult to draw direct conclusions from the results of their two-stage empirical modeling process, but a categorization of partly consistent with Williamson's TCE framework appears most reasonable. The most directly relevant finding appears to be the support for an interaction effect between expected transaction specific investments and contractual governance terms in reducing power imbalance in the relationship. This suggests, albeit in a rather indirect way, that contractual terms are an appropriate governance mechanism when asset specificity is present in an alliance. Although the researchers test for expected asset specificity, expected transaction frequency, and expected uncertainty, they do so in relation to their impact on the power imbalance in the alliance, but without considering any form of governance mechanism. This is not a direct test of Williamson's analysis. Hence the lack of empirical support for Bucklin and Sengupta's uncertainty construct is not deemed inconsistent with Williamson's predictions.

Joskow (1985) employs a very indirect methodology for identifying asset specificity, but from his detailed qualitative assessment of transactions between electric utilities and coal suppliers, he concludes that in cases of transaction specific investments both price and non-price contractual safeguards will be employed by the two parties. Although Joskow makes an explicit assumption about uncertainty and arguably makes an implicit assumption about transaction frequency, in the absence of actual tests the study must be categorized as partly consistent with Williamson's TCE framework. However, Joskow is unable to discriminate between the use of long-term contracts and vertical integration.

Nooteboom, Berger, and Noorderhaven (1997) incorporate trust into an extended TCE model. Their empirical model separates out the impact

of asset specificity on the size of potential loss from an inter-firm relationship and the probability of that loss occurring. The results of the study are best interpreted as being partly consistent with Williamson's TCE: asset specificity does create a governance concern, albeit in relation to the size of the loss as opposed to the probability of loss, and private and legal ordering act to decrease the probability of loss from a relationship. However, the researchers also find a significant correlation between asset specificity and the restraint of a trading partner's opportunism, which, they suggest, makes the net effect of specific investments ambiguous.

Partly consistent and partly inconsistent

Dyer (1996) poses a particular challenge in categorizing its results, as it has conflicting findings in terms of the governance mechanism. The results show that investments in specific assets are made in hybrid relationships in the Japanese automotive industry. These investments in the relationship are protected by a variety of mechanisms. There is support for the role of financial hostages, which can be seen as a form of credible commitment. However, there is no support for the role of formal contracts. A reasonable interpretation of Williamson's framework would be that the credible commitment would be made in conjunction with a formal contract. Hence, the results can be viewed as being partly consistent and partly inconsistent with Williamson's TCE model.

Stump and Heide (1996) find that there is a correlation between specific investments by the buyer and balancing specific investments by the supplier. Such a credible commitment by the supplier would be an appropriate mechanism for ensuring that the transaction could be governed efficiently in a contractual relationship. However, they also find that technological uncertainty is negatively associated with balancing specific investments by the supplier. This appears to be contrary to Williamson's TCE framework, which suggests that uncertainty in the environment will necessitate a specialist governance mechanism, such as balancing specific investments.

Inconclusive

As already highlighted, 10 out of the 15 studies are categorized as inconclusive. A common feature of

many of these studies is that they test a governance mechanism that does not fit within Williamson's classification of governance forms.

Anderson and Weitz (1992) draw closely from Williamson's TCE model in developing a model of relationship commitment. The main focus of the study, however, is on understanding what creates commitment to a relationship rather than understanding the circumstances in which such a relationship would be the efficient governance structure. Anderson and Weitz (1992: 28) make it clear that they do not address the question of 'when is it advisable to develop a quasivertically integrated arrangement.' Nevertheless, their work is interesting for the perspective it takes on asset specificity. Rather than seeing idiosyncratic investments as exposing the distributor to potential opportunistic behavior by the manufacturer (or vice versa), instead the investments are viewed as providing a pledge and hence a signal to the other party that they are committed to the relationship. Their results show support for this view. However, as the model does not offer any obvious direct test of Williamson's TCE predictions the results can only really be categorized as inconclusive.

Eccles (1981) develops a model of what he refers to as the quasi-firm, which he locates within Williamson's TCE contracting framework. However, in attempting to test this model his empirical analysis actually focuses only on the general nature of the contracting relationships. He demonstrates their longevity and stability but he does not demonstrate the specific contractual elements that facilitate this and he does not attempt to map them on to particular transaction dimensions. When he moves to a lower level of analysis he provides no specific detail of the governance or transaction dimensions of the five different categories of subcontractor relations. As such, his empirical work does not provide an adequate test of the predictions of Williamson's TCE model and hence the results are inconclusive.

Heide and John (1988) find that where sales agencies make specific investments in their relationship with a manufacturer they also make offsetting specific investments in their relationships with their customers and in so doing bond themselves to their customers and thus make it harder for manufacturers to change agencies and still retain access to these customers. This is not a form of credible commitment as envisaged by Williamson (1983), as the same contracting partner makes

both investments. It appears then that the agency has an arm's-length market relationship with the manufacturer, yet is able to protect its specific investments. Although the researchers comment that long-term contractual safeguards, as envisaged by Williamson's framework, are not present in the environment they study, importantly they do not test this proposition. Accordingly, in the absence of an actual test of a specific Williamson TCE governance mechanism it is not possible to make any definitive claim about the study. Additionally, Williamson's framework does not rule out the possibility that specific investments can be governed by a market relationship; Williamson (1979) argues that in the absence of uncertainty any governance mechanism could be employed. Significantly, Heide and John (1988) do not test for uncertainty or transaction frequency.

The results of Heide and John (1990) are also best categorized as inconclusive as the work does not identify a specific Williamson TCE governance mode. The researchers find support for their proposition that specific investments made by both manufacturers and suppliers significantly increase the level of joint action in the relationship and that this joint action acts as a safeguard for the specific investments. They recognize that an alternative interpretation could be that specific investments from each side interact, in the manner of credible commitments (Williamson, 1983), to attenuate the need for safeguards like joint action. However, Heide and John (1990) test and reject this proposition.

Heide and John (1992) highlight the importance of relational norms in allowing the investing firm to achieve a degree of control over a supplier's decisions. They find that informal, non-contractual, relational norms are used to protect idiosyncratic investments, but they provide no empirical detail on uncertainty or transaction frequency. Given that again they test a hybrid governance mechanism outside Williamson's taxonomy, the results are also best categorized as inconclusive.

Joskow (1987) finds a correlation between contract length and asset specificity. It is not obvious, however, that contract length accurately reflects Williamson's view of the hybrid relationship being governed by contract terms that facilitate adaptability. Joskow explains that his database shows little variation in factors such as contractual methods for determining price and quantity adjustments, which do feature in Williamson's analysis

of hybrids. The analysis does not deal with either the level of uncertainty or the frequency of the transaction. Given that Joskow (1987) identifies a governance mechanism that is a form of hybrid relationship but which does not accurately reflect Williamson's perspective on hybrid forms of governance and maps this onto asset specificity alone, it seems most reasonable to categorize the study as inconclusive.

Noordewier, John, and Nevin (1990) chose to focus on uncertainty only, making assumptions about both asset specificity and transaction frequency. Their results suggest that the problem of uncertainty can be attenuated by informal relational structures rather than through formal contract terms. However, given that they focus on a non-Williamson governance mechanism and given the lack of a test of asset specificity and transaction frequency it is appropriate to categorize the results of the Noordewier *et al.* study as inconclusive.

Osborn and Baughn's (1990) empirical model draws on Williamson's TCE framework, but focuses specifically on the role of technological uncertainty in determining whether an agreement or a joint venture would be the appropriate means for governing an alliance. They find that uncertainty is positively correlated with the use of agreements. Their definition of agreement, however, incorporates a range of different governance mechanisms: informal arrangements, cooperative ties, developmental assistance programs, licensing arrangements and marketing and supply arrangements. Some of these appear to be closest to Williamson's idea of a market governance mechanism, while others appear to be more like formal contractual mechanisms. Given this and the lack of a test for asset specificity and transaction frequency, the results are best judged inconclusive. It is also the case that although Williamson (1991) has discussed joint ventures, he has not outlined in what circumstance they would be favored over formal contractual arrangements.

Parkhe's (1993) empirical model draws very clearly on Williamson's TCE framework though the research hypotheses are developed in an eclectic manner. Parkhe's treatment of asset specificity differs from Williamson's approach: he finds that the level of commitment of non-recoverable investments is negatively related to the perception of opportunistic behavior. His results suggest that potential opportunism is a

crucial decision variable, rather than a fundamental constant. Parkhe also finds some support for the proposition that there will be a positive relationship between the level of contractual safeguards in a relationship and the extent of the perception of opportunistic behavior. However, although these elements of Williamson's framework appear in Parkhe's (1993) research hypotheses, they do so in a disjointed way and hence the results are best regarded as inconclusive.

Zaheer and Venkatraman (1995) test a governance structure that they refer to as quasi-integration. They find a positive correlation between quasi-integration and asset specificity, but they find no correlation with behavioral uncertainty. They also find that quasi-integration and joint action are positively correlated. However, by employing a non-Williamson TCE governance mechanism, the results again can only be described as inconclusive.

ALTERNATIVE INTERPRETATIONS OF THE EMPIRICAL STUDIES

The assessment undertaken above found only mixed support for Williamson's predictions on vertical integration and very limited corroboration of his predictions for hybrid relationships. This section shows that even when the results are ostensibly positive for TCE, many of the studies in our sample are open to interpretation from an alternative theoretical perspective.

The important advance made by Williamson in operationalizing TCE was to focus on variables such as asset specificity, rather than transaction costs directly, and thus to establish the basis of a reduced form model. As Masten *et al.* (1991: 17) argue: 'Because of difficulties in observing and measuring transaction costs, analysts have had to rely on estimations of reduced-form relationships between observed characteristics and organizational forms.' But as they rightly suggest, the important development of this reduced-form approach itself brings interpretative problems, because 'such indirect tests are unable to distinguish whether observed patterns of organization resulted from systematic, but as yet unexplored, variations in the costs incurred organizing production internally.' Generally, in any empirical study, more than one type of theoretical explanation could

be consistent with the data. In particular, and especially in the absence of direct measures of transaction costs, a non-transaction cost explanation might be viable (Masten, 1996).

Masten *et al.* (1991) not only argue that another explanation could be consistent with their results, but also through further testing they identify a more compelling alternative explanation. They find that human specific assets reduce the internal costs of organization as opposed to increasing the market transaction costs as predicted by Williamson. Masten *et al.* (1991) also suggests that the results of Monteverde and Teece (1982) and Masten, Meehan, and Snyder (1989) could be reinterpreted in this manner.

This issue is developed by Monteverde (1995a, 1995b). He reinterprets TCE empirical studies from a resource-based perspective, arguing that the human asset specificity construct should be reinterpreted as a set of firm-specific communication codes (or competences). Monteverde (1995b) constructs his empirical model to account for the openness of the human asset specificity concept to alternative interpretations and finds empirical support for his resource-based hypotheses. He argues that the findings of Monteverde and Teece (1982), Masten *et al.* (1991), and Anderson and Schmittlein (1984) can all be reinterpreted in this way. This can be taken further. Of the 12 vertical integration studies assessed above, 11 employed Williamson's reduced form model and nine of those studies found support for a separate human asset specificity variable. Hence no less than nine of these 12 studies could be reinterpreted as being consistent with a competence or resource-based perspective.

Another alternative interpretation of the results is suggested by Masten (1996: 51–52), who noted that 'reduced-form estimates do not disclose the magnitude of transaction costs' and consequently that 'without additional information, the magnitude of transaction cost differentials and the effects of organizational form on performance cannot be inferred from standard empirical tests of transaction cost hypotheses.' In simple terms, even if empirical results are consistent with the predictions of Williamson's model, this does not in itself demonstrate that transaction costs are being minimized. This concern has been raised by a number of empirical researchers (Heide and John, 1990, 1992; Noordewier *et al.*, 1990, and Osbourn and Baughn, 1990). Indeed Heide and John (1990) take the issue further by arguing that

the observed governance form could have been chosen for strategic, as opposed to transaction cost economizing reasons.

Given the plausibility of alternative interpretations of even the positive results in favor of Williamson's TCE, there is an obvious need for tests that can discriminate between these rival (or possibly complementary) interpretations.

CONCLUSIONS

We have assessed the most prominent TCE empirical studies against the predictions provided by Williamson's contracting framework. On this basis the results from the vertical integration studies are mixed. No study is fully consistent with the framework, five are partly consistent with the framework, six are partly consistent and partly inconsistent, and one is inconclusive. If we exclude one of the two studies (Anderson, 1985; Anderson and Schmittlein, 1984) that are based on the same dataset, then this leaves five studies that are partly consistent and partly inconsistent with Williamson's TCE framework. This overall picture of partial and qualified consistency with Williamson's framework contrasts with more upbeat and categorical claims found in some previous surveys of TCE empirical work. The analysis also reveals that there is a need to achieve greater clarity about the role and treatment of uncertainty in Williamson's TCE framework.

The results of the hybrid relationship studies provide relatively less support for TCE. An overwhelming theme in these studies is that Williamson provides insufficient detail on the characteristics of hybrid relationships as governance mechanisms. Accordingly, many of the empirical studies focused primarily on developing the detail of the relationship characteristics and only to a limited degree on testing the predictions of the contracting framework. The results of 10 of the 15 studies are inconclusive, three are partly consistent with Williamson's TCE framework, and two are partly consistent and partly inconsistent with Williamson's framework.

Crucially, however, it is possible to reinterpret the empirical results. In particular, measures of human asset specificity fit readily into both a TCE and a competence approach. Masten *et al.* (1991) and Monteverde (1995a, 1995b) argue that

a broad competence or resource-based explanation of vertical integration is more consistent with the empirical data. Another serious concern is the lack of direct measures of transaction costs. In their absence, even where the results from the studies are consistent with the predictions of TCE, it would not demonstrate that the outcomes are necessarily associated with transaction cost minimizing behavior. The identified correlations could actually be consistent with an alternative theoretical explanation.

None of the 27 studies discussed here tested rival theories. A number of more recent empirical studies have, however, attempted to test TCE jointly with other explanations (Argyres, 1996; Poppo and Zenger, 1998; Combs and Ketchen, 1999; Whinston, 2003). A prominent conclusion in these studies is that an integration of TCE and competence-based explanations represents perhaps the most productive area for development. Instead of premature declarations of scientific victory, innovative theoretical development and careful conceptual refinement, leading to more thorough joint testing, is the best approach for the future.

Williamson (1985, 1999, 2000) has claimed that the 'cumulative evidence ... is broadly corroborative' of TCE, and it is 'an empirical success story.' We do not wish to undermine Williamson's genuine achievements, but our analysis has cast some further doubt on this triumphalist verdict. There is some significant empirical evidence in support of aspects of TCE, but taking Williamson's analysis and the evidence as a whole, the picture is rather mixed. As yet there are inadequate empirical grounds to declare victory over rival approaches.

ACKNOWLEDGEMENTS

We gratefully acknowledge the comments of Bart Nooteboom, Claude Ménard, and anonymous referees on earlier drafts of this paper.

REFERENCES

- Alchian A, Demsetz H. 1972. Production, information costs, and economic organization. *American Economic Review* **62**(December): 777–795.
- Anderson E. 1985. The sales person as outside agent or employee: a transaction cost analysis. *Marketing Science* **4**(3): 234–254.
- Anderson E. 1996. Transaction cost analysis and marketing. In *Transaction Cost Economics and Beyond*, Groenewegen J (ed). Kluwer: Boston, MA; 65–83.
- Anderson E, Coughlan AT. 1987. International market entry and expansion via independent or integrated channels of distribution. *Journal of Marketing* **51**(January): 71–82.
- Anderson E, Schmittlein DC. 1984. Integration of the sales force: an empirical examination. *RAND Journal of Economics* **15**(Autumn): 385–395.
- Anderson E, Weitz B. 1992. The use of pledges to build and sustain commitment in distribution channels. *Journal of Marketing Research* **29**(February): 18–34.
- Argyres NS. 1996. Evidence on the role of firm capabilities in vertical integration decisions. *Strategic Management Journal* **17**(1): 129–150.
- Balakrishnan S, Wernerfelt B. 1986. Technical change, competition and vertical integration. *Strategic Management Journal* **7**(4): 347–359.
- Boerner CS, Macher JT. 2003. Transaction cost economics: an assessment of empirical work in the social sciences. Working paper, Georgetown University.
- Buckley P, Casson M. 1976. *The Future of Multinational Enterprise*. Macmillan: London.
- Bucklin LP, Sengupta S. 1993. Organizing successful co-marketing alliances. *Journal of Marketing* **57**(April): 32–46.
- Carroll GR, Teece DJ. 1999. Firms, markets, and hierarchies: introduction and overview. In *Firms, Markets, and Hierarchies: The Transaction Cost Economics Perspective*, Carroll GR, Teece DJ (eds). Oxford University Press: London; 3–13.
- Carter R. 2002. Empirical work in transaction cost economics: critical assessments and alternative interpretations. PhD dissertation, Cambridge University, Cambridge, U.K.
- Combs JG, Ketchen DJ Jr. 1999. Explaining interfirm cooperation and performance: toward a reconciliation of predictions from the resource-based view and organizational economics. *Strategic Management Journal* **20**(9): 867–888.
- Crocker KJ, Masten SE. 1996. Regulation and administered contracts revisited: lessons from transaction-cost economics for public utility regulation. *Journal of Regulatory Economics* **9**: 5–39.
- Cronin B. 1984. *The Citation Process: The Role and Significance of Citations in Scientific Communication*. Taylor Graham: London.
- David RJ, Han S-K. 2004. A systematic assessment of the empirical support for transaction cost economics. *Strategic Management Journal* **25**(1): 39–58.
- Dyer JH. 1996. Does governance matter? Keiretsu alliances and asset specificity as sources of Japanese competitive advantage. *Organization Science* **7**(6): 649–656.
- Eccles RG. 1981. The quasifirm in the construction industry. *Journal of Economic Behavior and Organization* **2**: 335–357.
- Erramilli MK, Rao CP. 1993. Service firms' international entry-mode choice: a modified transaction-cost

- analysis approach. *Journal of Marketing* 57(July): 19–38.
- Foss NJ. 1993. Theories of the firm: contractual and competence perspectives. *Journal of Evolutionary Economics* 3(2): 127–144.
- Foss NJ, Knudsen C (eds). 1996. *Towards a Competence Theory of the Firm*. Routledge: London.
- Gatignon H, Anderson E. 1988. The multinational corporation's degree of control over foreign subsidiaries: an empirical test of a transaction cost explanation. *Journal of Law, Economics, and Organization* 4(2): 305–336.
- Gilbert GN. 1977. Referencing as persuasion. *Social Studies of Science* 7: 113–122.
- Heide JB, John G. 1988. The role of dependence balancing in safeguarding transaction-specific assets in conventional channels. *Journal of Marketing* 52(January): 20–35.
- Heide JB, John G. 1990. Alliances in industrial purchasing: the determinants of joint action in buyer–supplier relationships. *Journal of Marketing Research* 27(February): 24–36.
- Heide JB, John G. 1992. Do norms matter in marketing relationships? *Journal of Marketing* 56(April): 32–44.
- Hennart J-F. 1982. *A Theory of Multinational Enterprise*. University of Michigan Press: Ann Arbor, MI.
- Hennart J-F. 1988. A transaction costs theory of equity joint ventures. *Strategic Management Journal* 9(4): 361–374.
- Hennart J-F. 1991. A transaction costs theory of joint ventures: an empirical study of Japanese subsidiaries in the United States. *Management Science* 37(4): 483–497.
- Hodgson GM. 1998. Evolutionary and competence-based theories of the firm. *Journal of Economic Studies* 25(1): 25–56.
- Hodgson GM. 2002. The legal nature of the firm and the myth of the firm–market hybrid. *International Journal of the Economics of Business* 9(1): 37–60.
- John G, Weitz BA. 1988. Forward integration into distribution: an empirical test of transaction cost analysis. *Journal of Law, Economics, and Organization* 4(2): 337–355.
- Joskow PL. 1985. Vertical integration and long-term contracts: the case of coal-burning electric generating plants. *Journal of Law, Economics, and Organization* 1(1): 33–80.
- Joskow PL. 1987. Contract duration and relationship-specific investments: empirical evidence from coal markets. *American Economic Review* 77(1): 168–185.
- Joskow PL. 1988. Asset specificity and the structure of vertical relationships: empirical evidence. *Journal of Law, Economics, and Organization* 4(1): 95–117.
- Joskow PL. 1991. The role of transaction cost economics in antitrust and public utility regulatory policies. *Journal of Law, Economics, and Organization* 7(September): 53–83.
- Klamer A, Van Dalen HP. 2002. Attention and the art of scientific publishing. *Journal of Economic Methodology* 9(3): 289–315.
- Klein S, Frazier GL, Roth VJ. 1990. A transaction cost analysis model of channel integration in international markets. *Journal of Marketing Research* 27(May): 196–208.
- Masten SE. 1984. The organization of production: evidence from the aerospace industry. *Journal of Law and Economics* 27(October): 403–417.
- Masten SE. 1996. Empirical research in transaction cost economics: challenges, progress, directions. In *Transaction Cost Economics and Beyond*, Groenewegen J (ed). Kluwer: Boston, MA; 43–64.
- Masten SE, Meehan JW Jr, Snyder EA. 1989. Vertical integration in the U.S. auto industry. *Journal of Economic Behavior and Organization* 12: 265–273.
- Masten SE, Meehan JW Jr, Snyder EA. 1991. The costs of organization. *Journal of Law, Economics, and Organization* 7(1): 1–25.
- Masten SE, Saussier S. 2000. Economics of contracts: an assessment of developments in the empirical literature on contracting. *Revue d'économie industrielle* 92(2/3): 215–236.
- Ménard C. 2004. The economics of hybrid organizations. *Journal of Institutional and Theoretical Economics* 160(3): 345–376.
- Monteverde K. 1995a. Applying resource-based strategic analysis: making the model more accessible to practitioners. Working paper 95-1, College of Business and Administration, Saint Joseph's University, Philadelphia.
- Monteverde K. 1995b. Technical dialog as an incentive for vertical integration in the semiconductor industry. *Management Science* 41(10): 1624–1638.
- Monteverde K, Teece DJ. 1982. Supplier switching costs and vertical integration in the automobile industry. *Bell Journal of Economics* 13: 206–213.
- Nelson RR, Winter SG. 1982. *An Evolutionary Theory of Economic Change*. Harvard University Press: Cambridge, MA.
- Noordewier TG, John G, Nevin JR. 1990. Performance outcomes of purchasing arrangements in industrial buyer–vendor relationships. *Journal of Marketing* 54(October): 80–93.
- Nooteboom B. 2004. Governance and competence: how can they be combined? *Cambridge Journal of Economics* 28(4): 505–525.
- Nooteboom B, Berger H, Noorderhaven NG. 1997. Effects of trust and governance on relational risk. *Academy of Management Journal* 40(2): 308–338.
- Osborn RN, Baughn CC. 1990. Forms of interorganizational governance for multinational alliances. *Academy of Management Journal* 33(3): 503–519.
- Parkhe A. 1993. Strategic alliance structuring: a game theoretic and transaction cost examination of interfirm cooperation. *Academy of Management Journal* 36(4): 794–829.
- Penrose ET. 1959. *The Theory of the Growth of the Firm*. Basil Blackwell: Oxford.
- Poppo L, Zenger T. 1998. Testing alternative theories of the firm: transaction cost, knowledge-based, and measurement explanations for make-or-buy decisions in information services. *Strategic Management Journal* 19(9): 853–877.

- Rindfleisch A, Heide JB. 1997. Transaction cost analysis: past, present, and future applications. *Journal of Marketing* **61**(October): 30–54.
- Rumelt RP. 1984. Towards a strategic theory of the firm. In *Competitive Strategic Management*, Lamb RB. (ed). Prentice-Hall: Englewood Cliffs, NJ; 56–70.
- Shelanski HA. 1991. A survey of empirical work in transaction cost economics. Working paper, University of California, Berkeley.
- Shelanski HA, Klein PG. 1995. Empirical research in transaction cost economics. *Journal of Law, Economics, and Organization* **11**(2): 335–361.
- Sobrero M, Schrader S. 1998. Structuring inter-firm relationships: a meta-analytic approach. *Organization Studies* **19**(4): 585–615.
- Stump RL, Heide JB. 1996. Controlling supplier opportunism in industrial relationships. *Journal of Marketing Research* **33**(November): 431–441.
- Walker G, Weber D. 1984. A transaction cost approach to make-or-buy decisions. *Administrative Science Quarterly* **29**(September): 373–391.
- Whinston MD. 2003. On the transaction cost determinants of vertical integration. *Journal of Law, Economics and Organization* **19**(1): 1–23.
- Williamson OE. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. Free Press: New York.
- Williamson OE. 1979. Transaction cost economics: the governance of contractual relations. *Journal of Law and Economics* **22**(October): 233–261.
- Williamson OE. 1983. Credible commitments: using hostages to support exchange. *American Economic Review* **73**(4): 519–540.
- Williamson OE. 1985. *The Economic Institutions of Capitalism*. Free Press: New York.
- Williamson OE. 1991. Comparative economic organization: the analysis of discrete structural alternatives. *Administrative Science Quarterly* **36**(June): 269–296.
- Williamson OE. 1999. Strategy research: governance and competence perspectives. *Strategic Management Journal* **20**(12): 1087–1108.
- Williamson OE. 2000. The new institutional economics: taking stock, looking ahead. *Journal of Economic Literature* **38**(3): 595–613.
- Zaheer A, Venkatraman N. 1995. Relational governance as an interorganizational strategy: an empirical test of the role of trust in economic exchange. *Strategic Management Journal* **16**(5): 373–392.