Organization Science
Vol. 17, No. 6, November–December 2006, pp. 724–740
ISSN 1047-7039 | EISSN 1526-5455 | 06 | 1706 | 0724
DOI 10.1287/orsc.1060.0213

The Antecedents and Performance Implications of Cooperative Exchange Norms

Janet Bercovitz
College of Business, University of Illinois at Urbana-Champaign, 1206 South Sixth Street, Champaign, Illinois 61820, jbercov@uiuc.edu

Sandy D. Jap
Goizueta Business School, Emory University, 1300 Clifton Road, Atlanta, Georgia 30322, sandy_jap@bus.emory.edu

Jack A. Nickerson
Olin School of Business, Washington University in St. Louis, Campus Box 1133, 1 Brookings Road, St. Louis, Missouri 63130, nickerson@wustl.edu

Our study investigates the antecedents and performance implications of cooperative exchange norms. We argue that, in early relationships, the level of expected cooperative norms in an exchange is the result of a calculative process facilitated by transaction attributes: joint transaction-specific investments and observability. The greater the level of these two exchange attributes, the greater the level of cooperative exchange norms, all else being equal. We further argue that the realized level of cooperative exchange norms can deviate from the expected level because the development of such norms is the result of social processes that management cannot directly and fully control. This gap between realized and expected norms affects exchange performance. Performance suffers when the realized level of cooperative exchange norms falls below the expected level, but overshooting expectations lays a critical groundwork for repeat transactions. The analysis of a survey of 182 collaborative R&D alliances provides initial support for our theory.

Key words: exchange norms; R&D alliances; interorganizational relationship management

1. Introduction

There is growing consensus that formal structure, contract law regime, and cooperative exchange norms form the three main building blocks of governance (e.g., Williamson 1991, Macneil 1980). While important advances have been made in understanding the governance implications of formal structure and contract law regime, the governance role of cooperative exchange norms remains in dispute and underdeveloped. For instance, significant uncertainty exists as to the performance effects of cooperative norms. Several empirical studies provide support for the contention that, given the need for adaptation, the presence of cooperative norms can increase performance in interorganizational exchanges (e.g., Artz and Brush 2000, Cannon et al. 2000, Noordewier et al. 1990). Recent theoretical research, on the other hand, argues that established norms may, in certain circumstances, actually be harmful to performance (Eggertsson 2000). For instance, a strong commitment to cooperation as a means to ensure the continuance of a relationship may lead transacting parties to favor noncontentious, but less than optimal, solutions (Jeffries and Reed 2000). Both perspectives, however, assume that performance is driven by the absolute level of cooperative norms.

In this paper, we inform this debate by arguing that it is not the level of cooperative norms that drives performance, but rather the match or the deviation between the realized and expected norms in an exchange. While management can put incentives and directives in place to develop cooperative norms, these norms are the result of complex social processes that management cannot completely control. Hence, there is randomness in the development of human relationships that gives rise to unanticipated variation around the expected level of cooperation and, in this sense, the development process has a stochastic element. As Gibbons (1999, p. 146) suggests, outcomes "will be a mess but not a mystery." Therefore, controlling for exchange attributes, we predict that realized cooperative norms that fall below an expected level of norms correspond to lower exchange performance; and that realized norms that rise above do not harm and may even provide added benefit to exchange performance, all else being equal.

A second and more fundamental issue is understanding the factors that underlie the emergence of cooperative exchange norms. Some analysts associate the emergence of cooperative norms directly with exchange attributes (Klein 1980, Heide and John 1992). Others downplay the link with transaction attributes, arguing instead that cooperative norms evolve over time as a function of the previous transacting experience of the exchange partners (Granovetter 1985, Gulati 1995, Gulati and Nickerson 2006, Ring and Van de Ven 1992, Zaheer and Venkatraman 1995). Drawing on transaction cost economics (Williamson 1985, 1991, 1996),

relational contracting (Macneil 1978, 1980), and self-enforcing agreement frameworks (Klein 1995, 1996), we consider how the exchange attributes selected drive the development of cooperative exchange norms. Specifically, we argue that the expected (or desired) level of cooperative norms for a particular transaction will be positively related to two exchange attributes: (1) the level of joint transaction-specific investments—that is, the idiosyncratic investments made by both parties to the transaction—underlying the exchange, and (2) the observability of effort.

We empirically examine the hypotheses by taking advantage of a primary data set consisting of a survey of 182 participants of Cooperative Research and Development Agreements (CRDAs) involving a federal laboratory and a nonfederal party. These agreements offer a unique setting in which to explore the antecedents, emergence, and performance implications of cooperative exchange norms because the formal structure and contract law regime under which CRDAs operate are administratively specified—that is, the contractual features of the CRDA cannot be altered. This leaves cooperative exchange norms as the one building block of governance that can be readily varied by the exchange partners. Moreover, because CRDAs were a relatively recent phenomenon at the time of data collection, few exchange partners had a history of prior exchange experience, allowing us to eliminate preexisting relationships and previous exchange experience as a source of cooperative exchange norms. Thus, the empirical context presents a unique opportunity for us to more clearly and more simply evaluate the link between exchange attributes, cooperative exchange norms, and exchange performance without the added complexities of additional dimensions of governance and the concern that norms arise from past interactions. Because our theory indicates that transaction attributes are both antecedents to the emergence of cooperative norms and directly influence performance, a two-stage instrumental variable regression model is employed to unpack the norms-performance relationship.

Our empirical analysis reveals that transaction attributes act as levers in the emergence of cooperative norms. Specifically, we find that the level of cooperative norms increases with joint-specific investments and observability of effort. Controlling for asset specificity and observability, perceived exchange performance deteriorates when the realized level of cooperative norms is lower than the expected levels. We also find that realized cooperative norms that exceed the expected level deliver perceived performance improvements in terms of satisfaction with the other party's performance and willingness to collaborate in the future. The magnitude of the effect on performance is asymmetric, however. Overshooting expectations has a smaller effect on performance than undershooting and failing to meet expectations. Interestingly, norms above expected levels do not enhance the overall evaluation of the performance of the transacting partner. In a separate analysis of the formation of repeat collaborations, we find that the partners' stated willingness to collaborate in the future corresponds to their subsequent actions. This finding provides insight into the iterative process described by those who argue that cooperative norms evolve over time as a function of the previous transacting experience of the exchange partners (Gulati 1995, Williamson 1996).

The paper proceeds as follows. Section 2 sets forth the conceptual framework through which hypotheses are distilled that relate key exchange attributes—observability and joint-specific investments—to the emergence of cooperative norms as an element of governance. Pushing further, hypotheses are proposed that link transaction attributes and realized cooperative norms to performance. Section 3 describes the data and outlines the two-stage methodology that is used to test these hypotheses. Section 4 presents the results and §5 discusses the results and introduces several additional results to evaluate potential methodological concerns.

2. Conceptual Framework and Hypotheses

2.1. The Role of Cooperative Norms in Interorganizational Exchange

Exchange norms are shared expectations of how transacting individuals will and should behave (Macneil 1980, Axelrod 1986, Macaulay 1963).[1] Based on a set of 10 common contract norms, Macneil (2001, p. 154) argues that there are gradations of these norms that support either discrete exchanges or relational exchanges.[2] At the discrete end of the spectrum, norms support exchanges that are "clean in and clean out" by setting expectations that partners will *autonomously adapt*, which means that partners expect that each will make decisions based entirely on self-interest. In other words, with discrete norms, partners adjust terms of trade through bargaining before entering short-term exchange arrangements (Macneil 1978, 1980). On the other hand, at the relational end of the spectrum norms support cooperative adaptation by stressing behaviors that will preserve and continue the relationship even when pure self-interest might suggest otherwise (Macneil 1980). We use the terms *relational and cooperative exchange norms* interchangeably to describe this latter set of norms.

Following the previous literature, we focus on three of the elemental norms typically used to empirically measure the extent of relational norms: flexibility, solidarity, and participation (Heide and John 1992, Jap and Ganesan 2000). Classical arms-length exchanges occur within an internal context of constrained flexibility, weak solidarity, and limited participation. A change in degree of any of these norms shifts the exchange toward the relational end of the continuum. Increased flexibility

provides for within-relationship adaptation through the modification of agreement terms or agreement focus in response to unforeseen events and changing circumstances (Macneil 1980, Boyle et al. 1991, Noordewier et al. 1990). The norm of flexibility in our context could be seen in the adjustment of project plans in response to new information rather than having the parties hold tightly to the specific details of the original statement of work (SOW). Enhanced solidarity, which rests on the belief that interdependence is desirable, promotes a bilateral approach to problem solving and supports mutual adjustments within the exchange relationship (Macneil 1980, Poppo and Zenger 2002). Solidarity manifests as an interest in the welfare of the other exchange participants and behaviors (activities) directed toward relationship maintenance (Macneil 1980, Heide and John 1992). Greater mutual participation—the expectation as well as the realization of joint decision making—facilitates collaborative exchange. Participation norms are evidenced in the formation of active cross-organization R&D teams that marshal contributions, promote knowledge sharing, and manage the joint technical effort. The intensification of these three norms fosters an exchange environment conducive to cooperative adaptation that supports an ongoing exchange.

Cooperative exchange norms may play an important governance role when exchange partners face contractual hazards (Heide and John 1992). In particular, managers may select cooperative norms as a governance form when uncertainty is high (Bradach and Eccles 1989, Jones et al. 1997, Poppo and Zenger 2002). Recognizing that potential value of relational exchange norms is one thing; setting up an incentive structure to encourage their formation is another, about which little is known. To respond to this lacuna, we appeal to the self-enforcing agreement literature to develop an understanding of the relationship between economic incentives and the formation of cooperative norms.

2.2. Joint-Specific Investment, Observability, and the Emergence of Cooperative Exchange Norms

The assertion that "opportunistic behavior [can be] prevented by the threat of termination of the business relationship" forms the cornerstone of the self-enforcing agreement literature (Klein 1980, p. 358). This literature argues that one can catalyze cooperation (and thus encourage the emergence of cooperative norms) if the long-term gains from maintaining the trading relationship outweigh the short-term gains from cheating (Klein 1980, Klein and Leffler 1981, Tesler 1981, Williamson 1985).[3] Operationally, three key levers exist in the self-enforcing framework: (1) the level of the private sanction—a loss that can be imposed on exchange partners if and when the relationship is terminated (Klein 1996); (2) the level of cheating-related rents—gains that (undiscovered) noncooperative behavior yields; and (3) the degree of transparency—the probability that noncooperative behavior will be discovered and subsequently punished (Klein 1995). In combination, these factors determine the self-enforcing range for interorganizational exchange. The predictions regarding the emergence of cooperative norms build on the relationship of the exchange attributes of joint transaction-specific investments and observability of effort to the first and third levers in this self-enforcing mechanism.

Consider first the concept of private sanctions. The future loss that private sanction can impose on exchange partners is a function of specific investments made in support of the exchange. Specific investments are those investments that are less productive if employed outside the relationship by alternate users or for alternative uses (Klein et al. 1978; Williamson 1985, 1996). At a minimum, in such cases, each partner stands to lose an amount of investment equal to the discounted value of the quasi rents accruing to his specific investments if the exchange relationship is prematurely terminated (Klein 1996). Whenever this potential loss exceeds the anticipated gains from breach (or noncooperative behavior), the partners will find it in their best interest to adopt cooperative exchange norms that support within-relationship adaptation and relationship continuation. Given the need to keep both parties cooperating, one would expect that joint, or bilateral, specific investments would be instrumental in the emergence of relational exchange norms.

When investments are bilateral, the development of credible commitments through reciprocal exposure effectively creates a "mutual reliance relationship" (Williamson 1983, p. 528). Having "tied their hands" (p. 519) in this respect, cooperation becomes the rational course of action. In sum, it is the bonding effect of joint- or bilateral-specific investments that provides the incentives for both parties to develop relational norms that promote cooperative adaptation. This cooperative adaptation is key to minimizing transaction costs arising from specialized assets. Gundlach et al. (1995) provide initial empirical support for this argument by finding a positive association between bilateral idiosyncratic investments and the development of cooperative norms. Thus, the following hypothesis:

HYPOTHESIS 1 (H1). *The level of cooperative norms characterizing the exchange increases with the level of joint transaction-specific investments underlying the exchange, ceteris paribus.*

Another way to extend the self-enforcing range of an interorganizational exchange is to reduce the expected gains from noncooperative behavior. In general, such rents from cheating can be minimized if the transaction has high transparency, because then partners can easily and quickly observe noncooperative behavior and

act to punish the cheater. With greater observability, the window for collecting cheating rents shortens as it becomes easier for the exchange partner to identify and respond to such behavior (Klein 1995). In short, increased observability strengthens the self-enforcing mechanism, and thus makes it easier to elicit and sustain cooperative exchange norms (Kandori 1992). Axelrod (1984, p. 140), in discussing the evolution of cooperation, draws the same conclusion, noting

> the ability to recognize defection when it occurs is not the only requirement for successful cooperation to emerge, but it certainly is an important one. Therefore, the scope of sustainable cooperation can be expanded by any improvements in the players' ability to . . . be confident about the prior actions that have actually been taken.

Thus, we hypothesize,

HYPOTHESIS 2 (H2). *The level of cooperative norms characterizing the relationship increases with the degree of observability associated with the exchange, ceteris paribus.*

With these two core antecedents to the exchange norms established, we now turn our attention to their performance implications.

2.3. Cooperative Exchange Norms and Interorganizational Performance

The research to date examining the impact of cooperative exchange norms tends to take a more-is-better approach. In other words, the main effect of norms on performance is argued to be positive. For example, in an empirical study of original equipment manufacturers (OEMs) and their component suppliers, Artz and Brush (2000) find evidence that relational norms reduce ex post negotiation costs in these exchange relationships. Similarly, Cannon et al. (2000) show that overall performance in buyer-supplier relationships improves with increasing levels of cooperative norms.

The traditional practice of regressing absolute levels of norms on performance can be misleading, however. Such a perspective fails to take into account both the costs and benefits of generating cooperative norms. Following standard economic logic, the benefits of cooperative norms may accrue at a diminishing rate, while the cost of achieving such norms may accrue at an increasing rate. If so, then at some level of norms the marginal cost exceeds the marginal benefit of a higher level of cooperative norms. Such logic would imply a type of optimal expected level of norms, which is counter to the more-is-better approach. Moreover, while farsighted exchange partners can select among transactions and choose formal governance mechanisms with varying incentives ex ante (as predicted in H1 and H2), they cannot fully control how informal governance components such as cooperative norms will develop ex post (Nickerson and Zenger 2002, Zenger and Lazarini 2002). For instance, while managers can try to direct subordinates to create relationships with those from other organizations, the formation of relationships can not readily be commanded. While the initial incentives and directives can set the stage for norm development, the outcome will be a product of a complex social process.[4] The transacting parties seemingly control the expected level of cooperative norms, but the ex post realized level of cooperative norms contains an element not controllable by management, which we refer to as a stochastic element; it is the deviation between the expected and realized levels of cooperative norms that we argue produces important performance implications. Thus, we argue below that one achieves a discriminating alignment (or fit) when the realized level of cooperative norms matches the expected level of norms that correspond to transaction attributes.

When realized norms fall below their expected levels, exchange performance, whether measured by economic outcome or perceptual measures, is likely to suffer for two reasons. First, a deficiency in cooperative norms effectively leaves the exchange undersafeguarded. This vulnerability represents a misalignment in the traditional TCE sense, where economic performance can suffer due to hazard-related losses, or maladaptation costs associated with insufficient adaptation capabilities, or both (Williamson 1985, Silverman et al. 1997). Second, underrealization of cooperative norms can spur disenchantment and perhaps costly retaliation, as exchange partners are viewed as having violated behavioral expectations (Blau 1964). Ultimately, these arguments suggest that a violation of preestablished expectations translates into a perception and most likely an economic reality of lower exchange performance. As such, we anticipate the following:

HYPOTHESIS 3 (H3). *Exchange performance declines the more that the realized level of cooperative exchange norms falls below the expected level of cooperative exchange norms, ceteris paribus.*

We further argue that overrealization of cooperative norms either does not affect exchange performance or increases it. At first glance, this prediction appears to contradict the traditional transaction cost economics (TCE) discriminating alignment logic utilized in the development of the previous hypothesis, but this is because the overrealization of cooperative norms is more likely to result from a complex and haphazard social process than from the deliberate adoption of a more costly governance structure. In other words, ex ante, the parties invest in self-enforcing mechanisms with the goal of eliciting the expected level of cooperative norms; overshooting this expected level does not change the cost of the underlying formal incentives implemented to create such norms. Thus, the partners seemingly acquire the excess portion of the realized cooperative norms for

no additional cost. Some authors have argued that an oversupply of cooperative norms may lead to suboptimization as exchange partners err on the side of accommodation. Rather than make the tough calls that create conflict, partners "go along to get along" (Jeffries and Reed 2000). For the most part, however, it is argued that an excess portion of realized norms may encourage more integrative problem solving or synergistic interactions that yield a higher level of solutions and discussion (e.g., Dyer and Singh 1998, Madhok and Tallman 1998). Given that many observers suggest that benefits accrue to cooperative exchange norms—increased within-relationship adaptability, smoother coordination, reduced opportunism, greater effort by the transacting parties—we expect the net economic performance benefit of an overrealization of cooperative norms to be positive (Artz and Brush 2000, Noordewier et al. 1990, Zaheer et al. 1998) or at least nonnegative. Thus, the following hypothesis:

HYPOTHESIS 4 (H4). *Exchange performance does not decline, and may increase, the more that the realized level of cooperative exchange norms exceeds the expected level of cooperative exchange norms, ceteris paribus.*

It is worth noting that our notion of fit in this study is different from the growing literature on the drivers of misaligned transactions (e.g., Argyres 1996, Argyres and Liebeskind 1999, Leiblein and Miller 2003, Leiblein et al. 2002, Silverman et al. 1997, Shaver 1998). The factors put forth—preexisting contractual commitments, related firm-specific experiences, industry dynamics—clearly have value for explaining stickiness of *formal* governance, the focus of the majority of these studies. However, we believe these factors provide limited insight in our unique context. Our focus is on *informal* governance—cooperative exchange norms that emerge in a new (for the period of study) type of project—a CRDA between two transacting partners lacking prior transaction history. Additionally, the literature on misalignment often views misalignment with respect to a single transaction, whereas our unit of analysis is a collaborative project.

3. Method

3.1. Sample and Data Collection

3.1.1. Research Setting. We empirically explore our hypotheses in the context of collaborative R&D agreements between federal laboratories and a nonfederal organization. These CRDAs involve a range of activities, from explorations in science and technology, to directing programs of activities that develop practical competencies, to developing applied projects aimed at specific tasks. A common goal is the development and spinning of technologies in or out of the private sector.[5]Collectively, the range of tasks in these CRDAs enhance the generalizability of our conclusions. These exchanges are not procurement transactions—the organizations are not allowed to contribute monetary funds—hence, the agreements were mutual endeavors that required joint effort. As such, CRDAs provide a useful setting to examine the development and consequences of cooperative norms, because these exchanges are typically bilateral and noncompetitive[6] in nature, with both parties contributing personnel, expertise, facilities, or services to the exchange. The unit of analysis in our paper is the CRDA.

3.1.2. Sample Characteristics. We approached staff at a federal research laboratory for participation in the study and offered them a report of the overall results and customized analyses for their internal purposes. This laboratory provided us with the names of 324 federal and nonfederal contacts that participated in CRDAs from 1993–1998. We mailed these individuals a questionnaire, a postage-paid envelope, and a cover letter explaining that the purpose of the study was to better understand the nature of collaborative exchanges. The respondents were guaranteed anonymity of their responses and were offered a summary report in exchange for their participation.

Two hundred and twenty-nine individuals responded to the survey, of which 41% were from government agencies. After omitting those surveys with incorrect addresses or incomplete or unusable responses, our sample totaled 182, giving us an effective response rate of 56%. The CRDAs in our sample last approximately 1.9 years, on average, but in extreme cases could last as many as eight years. The mix of respondents include 38% managers, 25% scientists, 34% engineers, and 3% staff. We provided respondents with the name of a specific CRDA project that they had worked on, and asked them to complete all items with respect to the specific CRDA. Hence, each survey equates to a single CRDA, which is our unit of analysis.

The respondents' knowledge of key aspects of the exchange was assessed via a battery of specific items at the conclusion of the survey. Respondents were asked to indicate how knowledgeable they were about the intended goals and purpose of the collaboration, each organization's resources committed to the collaboration, the overall success of the collaboration, and the outputs of the collaboration. They marked their response using a seven-point rating scale (1 = hardly knowledgeable, 7 = very knowledgeable). The mean response to these items fell between 6.25 and 6.5, with standard deviations ranging from 0.76 to 0.93.

We considered nonresponse bias by comparing early (first 75%) to late (last 25%) responses (Armstrong and Overton 1977). T-tests of all constructs in the conceptual model indicate no significant differences between

the early or late responses. Additionally, no differences emerge in the type of collaboration reported on or the duration of these collaborations. Collectively, these findings suggest that no fundamental differences existed in the responses or nature of the collaboration between early or late respondents.

3.2. Empirical Approach and Measures

Our survey instrument was created based on in-depth interviews with the administrators of the CRDA program and nonfederal participants. This instrument incorporates the language of the informants, drawing on their experience to elicit responses that accurately reflect the organization's viewpoint (Campbell 1955). All of the constructs are measured with multiple item, seven-point rating scales, according to the recommendations of Nunnally (1978). The joint-specificity scale is based on Anderson and Weitz (1992). The cooperative norm scales are drawn from the work of Heide and John (1992) and Jap and Ganesan (2000). All other scales are designed specifically for this research. The anchors for all items are 1 = strongly disagree to 7 = strongly agree.

3.3. Dependent Variables

The empirical approach involves two sets of dependent variables. First, we examine the effect of joint-specific investments and observability on the development of cooperative norms in each exchange. Cooperative norms, or *Norms*, constitute the first dependent variable. Second, we assume that the predicted level of cooperative norms equates to the expected level, and we examine the effect of deviations from the expected level of cooperative norms, controlling joint-specific investments, observability, and the other covariates, on exchange performance. Thus, exchange performance constitutes the second dependent variable.

3.3.1. Cooperative Norms. While Macneil identifies 10 elemental norms underlying cooperative exchange norms, the empirical literature (e.g., Heide and John 1992, Jap and Ganesan 2000) typically measures only three: flexibility, solidarity, and participation. Measuring only three of the 10 elemental norms may limit our identification of cooperative exchange norms if each norm is empirically differentiated. This identification concern is greatly diminished if the elemental norms load on to only a single common factor, *Norms*, which we evaluate below.

Three items are used to identify each specific elemental norm. The first three items, which identify the norm of flexibility, include (1) The organizations are flexible in responding to requests for changes. (2) The parties are willing to make adjustments when circumstances change. (3) When an unexpected situation arises, the parties adapt easily. The next three items identify the norm of solidarity: (1) Problems that arise are treated by the organizations as joint rather than individual responsibilities. (2) Both organizations are open to improvements that may benefit the collaboration as a whole, not only the individual parties. (3) Both parties are concerned about their shared welfare, not just individual gains. The last three items identify the norm of participation: (1) The organizations play an active role in various decisions regarding the collaboration. (2) The organizations consult each other when setting goals. (3) Both parties seek and consider the other's opinions and suggestions regarding how to accomplish various tasks. Cronbach's alpha is estimated (Nunnally 1978) for the battery of nine items, which yielded a scale reliability coefficient of 0.88.

3.3.2. Exchange Performance. The empirical context involves the transfer of technology for which precise economic measures of exchange performance are generally unavailable. Performance is a complex construct, often idiosyncratic to the firm and setting; success for one company may constitute failure for another. For instance, accurate assessment of the amount or quality of knowledge transferred during a CRDA exchange is costly, if not impossible, to quantify (Ham and Mowery 1998). Moreover, it is often impossible to establish a common definition or fixed reference points across firms. Thus, evaluating the economic effect of alignment or misalignment is typically unavailable to the parties of the exchange or to researchers.

This measurement difficulty largely limits performance measures for exchange participants to qualitative perceptual measures. Using qualitative perceptual measures, we are able to capture the evaluation of the partner's performance over the course of the project. While such perceptual measures do not afford economic evaluation of exchange performance, they nonetheless are useful as a reference point for perceived success and failure. Perceptual measures also are important because they often serve as a starting point for decision making.

We construct three performance measures. The first performance construct, *Evaluation*, measures the other party's performance identified in two items: (1) Their performance leaves a lot to be desired from an overall standpoint ((R) indicates reverse coding). (2) Taking all the different factors into account, their performance has been excellent. The Cronbach's alpha scale reliability coefficient is 0.82.

The second performance construct, *Satisfaction*, measures overall satisfaction with outcomes and is captured by three items: (1) We are satisfied with the outcomes from this collaboration. (2) Our collaboration with them has been a successful one. (3) Our collaboration with them has more than fulfilled our expectations. Calculating Cronbach's alpha for this battery of three items yields a scale reliability coefficient of 0.91.

The third performance construct, *Future*, measures willingness to collaborate in the future, which is captured by three items: (1) We would be willing to collaborate with them again, should the opportunity arise. (2) We would welcome the possibility of additional collaboration in the future. (3) We would be willing to work with them again in the future. Calculating Cronbach's alpha for this battery of three items yields a scale reliability coefficient of 0.96. All three scale-reliability coefficients indicate a high level of reliability and led us to use *Evaluation, Satisfaction*, and *Future* as measures of exchange performance.

3.4. Independent Variables

For the first stage of the analysis, the primary covariates are proxies for joint-specific investments and observability of effort within the exchange. A battery of four items assesses joint transaction-specific investments (*Joint TSI*): (1) If the collaboration were to end, both organizations would waste a lot of knowledge that is tailored to their relationship. (2) If either organization were to switch to a competitive buyer or vendor, it would lose a lot of the investments made in the present relationship. (3) Both organizations have made investments that are unique to this relationship. (4) Both organizations have made investments that would be lost if the relationship were prematurely terminated. The scale reliability coefficient for this battery is 0.77.

Observability (*Observability*) is identified by a battery of three items: (1) It is difficult for us to observe their activities (R). (2) We can easily observe their actions. (3) It is easy for us to observe their efforts. The scale reliability for this battery is 0.89. Both scales are of sufficient reliability to use as proxies for our primary covariates.

3.5. Norm Deviations

For the second stage of the analysis, the deviations from the expected level of cooperative norms are the theoretically important independent variables. Following Anderson (1988), Leiblein et al. (2002), Nickerson and Silverman (2003), and Silverman et al. (1997), the residuals from the first-stage analysis are used to measure the degree to which collaborations have achieved unanticipated high or low levels of cooperative norms. Low and high levels of norms are operationalized through two continuous variables: $Low_i = |\varepsilon_{1i}|$ if $\varepsilon_{1i} < 0$, else 0 and $High_i = \varepsilon_{1i}$ if $\varepsilon_{1i} > 0$, else 0. These two variables not only allow the estimation of the performance implications of unanticipated low or high levels of cooperative norms, but also control for potential endogeneity concerns because they are constructed from the predicted level of norms.

3.6. Control Variables

To ensure the robustness of our results and to identify our regression models, we include a variety of control variables that may affect the development of cooperative norms, exchange performance, or both. These are the extent to which each party's inputs are separable, demand-related factors, research development stage, intangible factors, and an instrumental variable. *Separability* identifies the extent to which each party's inputs are distinct and traceable. The more separable the inputs, the lower the need for cooperation and the lower the likelihood of conflict (Nickerson and Zenger 2004). However, separability may enhance observability, which we argued above expands the self-enforcing range and increases the likelihood that cooperative exchange norms form. Given these two alternatives, we leave the sign of the coefficient as an empirical question. In either event, separable inputs may make it easier to accomplish the collaboration's goals and thus those inputs may enhance performance. Thus, *Separability* may affect both the level of cooperative norms and performance. We identify *Separability* through a battery of three items: (1) It is difficult to trace each party's contributions to the task (R). (2) Each party's inputs into the task are easily separated. (3) Each party's contributions to the task are distinct. The scale reliability for this battery is 0.634. While reliability is not high, we nonetheless employ the scale because it functions primarily as a control.

Demand identifies the extent to which demand-related factors might affect either the level of cooperative norms, or performance. High levels of demand for an organization's products may create competing demands for a partner's effort, which may lead to lower levels of cooperative norms or greater difficulty in achieving high performance. Two items measure demand: (1) The demand for my organization's products is high. (2) Many units or organizations demand our outputs. The scale reliability for this battery is 0.674. As with the prior scale, this value does not indicate high reliability. Nonetheless, we use this scale as a control.

Collaborations may involve research at different stages or tiers of development (Hauser 1998), which might affect the ease or difficulty of developing cooperative norms and achieving high performance. A common way to account for these different stages of development in collaborations is to use a dummy variable for each type of activity (e.g., Oxley 1997, Heiman and Nickerson 2004). To control for this possibility, dummy variables are included for basic research (*Tier* 0), long-term explorations in science or technology, or both (*Tier* 1), directed programs of activities to develop practical competencies (*Tier* 2), applied projects aimed at specific tasks (*Tier* 3), routine engineering for continuous improvement of products and processes (*Tier* 4), and other (*Tier* 5). Some collaborations may span multiple tiers and thus may include multiple dummies. *Tier* 0 is the omitted category.

3.6.1. Instrumental Variable. We develop an instrument for econometric purposes that we assume affects the level of cooperative norms formed, but that exerts little impact on exchange performance after controlling for our other covariates. Our instrument represents an understanding of the other's transformation process from inputs to outputs. We assert that understanding a collaborator's transformation process encourages the development of cooperative norms because it helps to shape the domain over which cooperation is needed. Understanding this domain improves coordination by limiting the scope of tasks over which cooperation is needed. We maintain, however, that such an understanding does not directly affect performance. Understanding the transformation process could affect performance if it improved observability of the collaborators' actions; however, this observability is measured as a separate variable. Thus, we anticipate that *Transform* exerts no direct effect on performance.

We measure understanding of the transformation process through a battery of three items: (1) We understand well what the role of the other organization is in completing this task. (2) We know the processes and actions that the other party must do to complete this task. (3) We can comprehend what the other party must do to accomplish his share of the task. This battery yields a scale reliability coefficient of 0.820. The resulting scale is labeled *Transform*.

Table 1 displays summary statistics and correlation coefficients for each of the variables. Except for the three performance measures, no correlation is high enough to pose estimation problems. We address the correlation among the three performance measures through our empirical methodology.

3.7. Confirmatory Factor Analysis

To assess the unidimensionality and discriminant validity of our measured constructs, a measurement model of nine first-order latent factors stemming from (i) the theoretical model (i.e., cooperative norms, evaluation of the other party's performance, overall satisfaction, willingness to collaborate in the future, joint transaction-specific investments, observability), (ii) control variables (i.e., separability, demand), and (iii) the instrumental variable (i.e., understanding of the transformation process) is estimated. The factor loadings, measurement errors, and correlations between the factors were estimated using a maximum-likelihood process via LISREL 8.54 (Jöreskog and Sörbom 1993).

The overall chi-square for the model is 862.72 (df = 428). The comparative fit index and incremental fit index is 0.96 and the Tucker-Lewis index is 0.95, collectively indicating a good fit of the model to the data. Because high fit indices can also give the false impression that the model explains much when it really is the result of freeing more parameters to be estimated from the data, a useful index is the root mean square error of approximation (RMSEA), a parsimony measure that accounts for potential artificial inflation due to the estimation of many parameters. Values of 0.08 and below (with a bound of zero) are indicative of a satisfactory fit of the model in relation to its degrees of freedom (Steiger 1980, Steiger and Lind 1980). The RMSEA for our model was 0.071.

All the factor loadings and measurement errors are in acceptable ranges and significant at $\alpha = 0.01$, providing evidence of convergent validity. Discriminant validity among the constructs is examined using the procedure recommended by Fornell and Larcker (1981). This

Table 1 Correlation and Summary Statistics ($N = 182$)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 *Norms*	1														
2 *Evaluation*	0.59	1													
3 *Satisfaction*	0.63	0.76	1												
4 *Future*	0.57	0.68	0.71	1											
5 *Joint TSI*	0.49	0.36	0.50	0.47	1										
6 *Observability*	0.45	0.36	0.33	0.28	0.21	1									
7 *Separability*	0.38	0.27	0.29	0.34	0.19	0.19	1								
8 *Demand*	0.11	−0.02	0.13	0.06	0.25	0.23	0.12	1							
9 *Transform*	0.39	0.17	0.18	0.14	0.26	0.26	0.50	0.07	1						
10 *Tier* 0	0.10	0.12	0.18	0.13	0.16	0.01	−0.06	0.01	0.17	1					
11 *Tier* 1	0.01	0.06	−0.03	0.06	−0.06	−0.11	−0.07	0.02	−0.15	−0.09	1				
12 *Tier* 2	−0.07	−0.09	−0.12	−0.06	−0.04	0.07	0.04	0.07	−0.04	−0.16	−0.17	1			
13 *Tier* 3	0.12	0.10	0.03	0.03	0.04	0.07	0.06	−0.12	0.10	−0.28	−0.29	−0.45	1		
14 *Tier* 4	−0.15	−0.13	0.02	−0.09	−0.04	−0.10	0.00	0.05	−0.07	−0.13	−0.13	−0.23	−0.39	1	
15 *Tier* 5	0.06	0.11	0.16	0.06	−0.03	0.03	0.08	0.01	0.03	0.01	0.00	0.03	0.00	0.09	1
Mean	0	0	0	0	0	0	0	0.00	0.00	0.08	0.09	0.23	0.46	0.15	0.06
Std. dev.	0.72	0.92	0.92	0.96	0.77	0.90	0.76	0.87	0.86	0.28	0.28	0.42	0.50	0.36	0.24
Min	−2.62	−2.79	−2.63	−3.60	−2.06	−1.72	−2.41	−2.80	−2.81	0	0	0	0	0	0
Max	1.33	1.07	1.29	0.84	1.32	1.60	1.04	1.31	1.03	1	1	1	1	1	1

Note. $p < 0.05$ for $|\rho| > 0.12$.

involves calculating the variance explained by each set of indicators, taking into account the relative size of the factor loadings and measurement error. This is a more stringent test than the common examination of whether the correlation between two constructs is equal to unity. Discriminant validity is demonstrated for every possible pair of factors.

3.8. Analysis

We develop a model to assess the relationship between joint-specific investment, observability, the level of cooperative norms, and exchange performance. We employ a two-stage model because joint-specific investment and observability can affect both cooperative norms and exchange performance, and because we expect exchange performance to be a function of the difference between expected and actual cooperative norms. To account for these relationships, we develop a first-stage model to predict the level of cooperative exchange norms as a function of antecedents that should have been identifiable at the beginning of the exchange, along with an instrumental variable that helps to identify the equation.[7] Our first-stage model took the form:

$$\begin{aligned} Norms_i = {} & \alpha_0 + \alpha_1 \cdot Joint\ TSI + \alpha_2 \cdot Observability \\ & + \alpha_3 \cdot Separability + \alpha_4 \cdot Demand \\ & + \alpha_5 \cdot Tier\ 1 + \alpha_6 \cdot Tier\ 2 + \alpha_7 \cdot Tier\ 3 \\ & + \alpha_8 \cdot Tier\ 4 + \alpha_9 \cdot Tier\ 5 \\ & + \alpha_{10} \cdot Transform + \varepsilon_{1i}, \end{aligned} \quad (1)$$

where ε_{1i} is a random error term. Because survey respondents come from either government agencies or nongovernment firms, we control for the possibility of correlation among the responses from each type of respondent using a clustering option in STATA, which implements a Huber-White sandwich estimator of variance. Clustering affects the estimated standard errors and the variance-covariance matrix of the estimators but does not affect the estimated coefficients.

Before presenting our second stage, we describe how we construct our measure of the difference between expected and actual cooperative exchange norms. We assume that the predicted level of exchange norms estimated from Equation (1) equates, on average, to the exchange norms that would be expected based on the antecedents that could be identified at the beginning of the exchange. We construct the difference between the expected and actual norms by using the residuals of the first equation because these residuals, based on our assumptions, are continuous measures of the degree to which collaborations have achieved unanticipated high or low levels of cooperative norms. We operationalize low and high levels of norms through two variables:

$Low_i = |\varepsilon_{1i}|$ if $\varepsilon_{1i} < 0$, else 0 and

$High_i = \varepsilon_{1i}$ if $\varepsilon_{1i} > 0$, else 0.

These two variables not only allow us to estimate the performance implications of unanticipated low or high levels of cooperative norms, but also allow us to separate out the direct impact of our primary covariates on performance. We include our primary covariates in the second equation because we anticipate that higher levels of joint transaction-specific investment and that observability may directly increase exchange performance by creating more value (e.g., Dyer 1996, Jap 1999) or lowering governance costs (e.g., Anderson 1988). Our instrument (*Transform*) is omitted from this second equation to econometrically identify the first equation. The second-stage model took the form

$$\begin{aligned} Y_{ij} = {} & \beta_0 + \beta_1 \cdot Low + \beta_2 \cdot High + \beta_3 \cdot Joint\ TSI \\ & + \beta_4 Observability + \beta_5 \cdot Separability \\ & + \beta_6 \cdot Demand + \beta_7 \cdot Tier\ 1 + \beta_8 \cdot Tier\ 2 \\ & + \beta_9 \cdot Tier\ 3 + \beta_{10} \cdot Tier\ 4 + \beta_{11} \cdot Tier\ 5 + \varepsilon_{2ij}, \end{aligned} \quad (2)$$

where ε_{2ij} is a random error term and $Y_j = \{Evaluation, Satisfaction, Future\}$. Equation (2) represents three different performance equations, one for each performance construct Y_j. Because of the potential for correlation among the errors for these three equations (the three dependent variables are highly correlated), the three regressions are estimated using a seemingly unrelated regression technique (Zellner 1962).

It is not uncommon to find analyses in the extant literature that model performance directly as a function of cooperative norms. These models would be incorrectly specified when both norms and transaction-specific investments or observability are included as covariates because of the possibility of correlation among these covariates. As a point of comparison with these prior models, we estimate another set of models that is a modified version of Equation (2). This modified version replaces the covariates *Low* and *High* with *Norms*, which is similar to the types of models found in the literature. This comparison model takes the form

$$\begin{aligned} Y_{ij} = {} & \beta_0 + \beta_1 Norms + \beta_2 \cdot Joint\ TSI \\ & + \beta_3 \cdot Observability + \beta_4 \cdot Separability \\ & + \beta_5 \cdot Demand + \beta_6 \cdot Tier\ 0 + \beta_7 \cdot Tier\ 1 \\ & + \beta_8 \cdot Tier\ 2 + \beta_9 \cdot Tier\ 3 + \beta_{10} \cdot Tier\ 4 \\ & + \beta_{11} \cdot Tier\ 5 + \varepsilon_{2ij}, \end{aligned} \quad (3)$$

where ε_{2ij} is a random error term and $Y_j = \{Evaluation, Satisfaction, Future\}$.

4. Results

In Table 2, Models 1 and 2 display the set of two nested models through which we analyzed the level of expected

Table 2 Two-Stage Analysis of Cooperative Norms and Performance

	Norms Model 1	Norms Model 2	Evaluation Model 3A	Satisfaction Model 3B	Future Model 3C
Low (H3)			−0.76** (0.18)	−0.77** (0.16)	−0.37* (0.19)
High (H4)			0.32 (0.21)	0.35+ (0.20)	0.66** (0.22)
Joint TSI		0.35* (0.03)	0.36** (0.07)	0.51** (0.07)	0.52** (0.08)
Observability		0.26+ (0.03)	0.30** (0.06)	0.23** (0.06)	0.20** (0.06)
Separability	0.24 (0.07)	0.20+ (0.02)	0.22** (0.07)	0.21** (0.07)	0.32** (0.07)
Demand	0.06* (0.00)	−0.07+ (0.01)	−0.18** (0.06)	−0.05 (0.06)	−0.14* (0.07)
Transform	0.20+ (0.02)	0.09+ (0.01)			
Tier 1	0.00 (0.03)	0.15 (0.13)	0.21 (0.25)	−0.20 (0.23)	0.16 (0.26)
Tier 2	−0.24 (0.20)	−0.17 (0.27)	−0.33+ (0.20)	−0.47** (0.18)	−0.33 (0.21)
Tier 3	−0.06 (0.03)	−0.03 (0.16)	−0.15 (0.19)	−0.32+ (0.17)	−0.24 (0.19)
Tier 4	−0.39+ (0.03)	−0.24 (0.16)	−0.38+ (0.22)	−0.20 (0.21)	−0.35 (0.23)
Tier 5	0.17 (0.23)	0.17 (0.09)	0.40+ (0.22)	0.58** (0.21)	0.29 (0.23)
Constant	0.13 (0.06)	0.06 (0.13)	0.25 (0.18)	0.35* (0.17)	0.15 (0.19)
χ^2			134.16**	183.65**	131.25**
R^2	0.24	0.47	0.42	0.50	0.42

$^+p < 0.10$, $^*p < 0.05$, $^{**}p < 0.01$.

cooperative norms in the exchange. Model 1 includes all control variables. The coefficient for *Demand* is positive and statistically significant ($p < 0.05$), which indicates the greater demand-related factors are, the higher the level of cooperative norms will be. The coefficient for *Transform* is positive and weakly significant ($p < 0.10$), which implies that greater understanding of the transformation process increases the level of cooperative exchange norms and is consistent with our expectation. The coefficient for *Tier* 4 is weakly significant ($p < 0.10$) and negative, indicating that CRDAs involving routine engineering for continuous improvement of products and processes engenders lower levels of cooperative norms compared to those engendered by basic research.

Model 2 incorporates our two primary covariates: *Joint TSI* and *Observability*. Adding these two covariates substantially increases R^2 to 0.47 from 0.24. Also, an F statistic indicates that Model 2 is statistically different ($p < 0.05$) from Model 1.[8] In this model, none of the *Tier* coefficients are significant. The coefficient for *Transform* remains weakly significant ($p < 0.10$) and positive, but is half as large as in Model 1. We find that the coefficient for *Transform* supports the view that understanding the transformation process increases cooperative norms and indicates that the variable is a useful instrument for the next stage. The coefficient for *Demand* is now weakly significant ($p < 0.10$) and negative, indicating that once the level of joint transaction-specific investment and observability are accounted for, demand-related factors decrease the level of cooperative norms. The coefficient for *Separability* is positive and weakly significant in Model 2, although it was insignificant in Model 1. The more separable are the tasks, the higher the level of cooperation achieved. Separability may enable observability and expand the range of self-enforcing contracting.

Turning to our primary covariates, we find that the coefficient for *Joint TSI* is positive and significant ($p < 0.05$). This result provides support for H1 because we find higher levels of joint transaction-specific investment correspond to higher levels of cooperative norms. Consistent with H2, the coefficient for observability is also positive and weakly significant ($p < 0.10$), indicating that greater transparency is associated with higher levels of cooperative norms. In sum, the first stage of the analysis supports the predicted links between transaction attributes and the emergence of cooperative exchange norms.

Models 3A, 3B, and 3C in Table 2 display parameter estimates from our seemingly unrelated regression (SUR) that estimate our three models of exchange performance. R^2 for the *Evaluation*, *Satisfaction*, and *Future* models are 0.42, 0.50, and 0.42, respectively. The χ^2 statistic is statistically significant ($p < 0.01$) for each model. We begin by reporting coefficient estimates associated with our *Tier* variables. Coefficients for *Tier* 1 are insignificant in all three models. The coefficients for *Tier* 2 are negative and significant for *Evaluation* ($p < 0.10$) and *Satisfaction* ($p < 0.05$), but insignificant for *Future*. These estimates suggest that programs for activities to develop practical competencies yield lower *Evaluation* and *Satisfaction* than activities associated with basic research. The coefficients for *Tier* 3, which capture applied projects aimed at specific tasks, are negative, but only significant for *Satisfaction* ($p < 0.10$). The coefficients for *Tier* 4 are negative, but only significant for *Evaluation* ($p < 0.10$). Finally, the coefficients for *Tier* 5 are positive, but only significant for *Evaluation* ($p < 0.10$) and *Satisfaction* ($p < 0.01$). Collectively, the coefficients have the broadest results for *Tier* 2 and *Tier* 5.

The coefficients for *Demand* are negative and statistically significant for *Evaluation* and *Future*. Thus, the greater the demand-related factor, the lower the evaluation of the other party's performance and his willingness to collaborate in the future. The coefficients for *Separability* are positive and highly significant ($p < 0.01$) in all three models of performance. The more separable

inputs, are the higher the level of the evaluation of the other party's performance, overall satisfaction with outcomes, and willingness to collaborate in the future. We find similar results for both *Joint TSI* and *Observability*. Coefficients for these variables are all positive and highly significant ($p < 0.01$) across all three models of performance. The higher is the level of joint transaction-specific investment or observability, the higher will be the evaluation of the other party's performance, overall satisfaction with outcomes, and willingness to collaborate in the future.

Across Models 3A, 3B, and 3C, the coefficients for *Low* are negative and significant ($p < 0.01$ in the case of *Evaluation* and *Satisfaction* and $p < 0.05$ for *Future*). As H3 predicts, exchange performance suffers when cooperative norms are unexpectedly low, regardless of the expected level of norms. It is worth noting that the coefficient for *Low* is about half the size in Model 3C compared to the prior models, which implies that unexpectedly low cooperative norms have less of an impact on the willingness to enter into future exchanges than it does on performance and satisfaction of the current exchange. Note that the coefficient for *Future* is statistically different ($p > 0.01$) from coefficients for both *Evaluation* and *Satisfaction*. The parameter estimates for *High* are positive in all three models, but with varying degrees of statistical significance and magnitude. The coefficient is insignificant for *Evaluation*, weakly significant ($p < 0.10$) for *Satisfaction*, and highly significant ($p < 0.01$) for *Future*. The coefficient for *Future* is statistically different ($p > 0.01$) from coefficients for both *Evaluation* and *Satisfaction*. Unexpectedly high levels of realized cooperative norms appear not to affect *Evaluation.* While unexpectedly high levels of cooperative norms positively affect *Satisfaction*, the impact is asymmetric with respect to unexpectedly low levels of cooperative norms. Only with respect to the willingness of partners to collaborate in the future do we find a large and highly significant increase in response to unexpectedly high levels of cooperative norms. We return to these asymmetric findings in the discussion section, but for now we conclude that these findings offer support for H4.

4.1. Robustness

While the analysis provides preliminary support for our hypotheses, there are several limitations to both our theory and empirical analysis. An alternative explanation for the findings arises from the embeddedness literature. Granovetter (1985), for instance, might argue that cooperative norms drive the level of transaction-specific investment and transparency, the reverse of our theory. Or, perhaps, transaction-specific investment was unanticipated ex ante and coevolves with cooperate exchange norms. Unfortunately, the cross-sectional nature of the data and analysis does not allow us to directly assess these competing explanations. However, several aspects of the context and data suggest that an embeddedness or coevolution argument has little currency here. First, Granovetter (1985) stresses the role of "concrete relations and structures of such relations" (p. 490) that are ongoing. Given the short history of the CRDA program, which was first legislated in 1986, the number of CRDAs prior to our observation window is relatively small. Prior to the window of this study, the federal research lab we surveyed had been involved in fewer than 250 CRDAs. Furthermore, in the context of the data set, few dyads of which we are aware had ongoing relations. Although we do not have precise information about the number of dyads that engaged in exchanges prior to those in our survey, knowledgeable informants suggest the numbers were quite small; most CRDAs started with a clean slate unburdened by past exchange relationships. Thus, this context allows us to capture exchange relationships at a point in which the norms we observe are not confounded with norms developed from previous relationships or a preexisting history.

In addition to prior relations, another concern might be expectations of continuance or the horizon of the exchange relationship. At the time of our data collection, the vast majority of cooperative research and development contract agreements were administratively specified ex ante to last two years with no promises of continuance, so we expect that expectations of continuance may have been minimal. This is consistent with the data. On average, the cooperative research and development agreements surveyed in this research were two years old (s.d. $=1.6$ years), and 68% of them were ongoing at the time of the survey. We also constructed a covariate that measured the length of time over which the exchange had taken place. Unfortunately, only 110 observations are available with this data. We reran our estimation of cooperative exchange norms including this covariate. The covariate was not statistically significant. We also reestimated the model with a dummy variable set equal to one if the exchange partners did engage in a follow-on CRDA. This coefficient was insignificant.

Second, as mentioned in our introduction, SOWs were formalized in CRDAs and suggest that exchange attributes were largely foreseen when the CRDA was formalized. These work statements, the lack of prior interactions, and the contract length specifications imply that, consistent with our theory, exchange partners were farsighted about the attributes of the exchange and the cooperative exchange norms emerged as an endogenous response to these attributes. If transaction attributes did coevolve with cooperative norms during the transaction, then we would not expect the coefficients for our *High* and *Low* to yield statistical significance in Models 3A, 3B, or 3C, because the error term for the first stage indeed should be random.

Nonetheless, the limitations of the analysis and the empirical setting must appropriately temper these findings. Our unique empirical context allows us to treat the three building blocks of governance—formal structure, contract law regime, and cooperative exchange norms—as if they were independent. However, in many contexts these building blocks are selected simultaneously and may jointly affect performance. There is, thus, a need for more work that considers these building blocks in concert.

Another overarching concern is that the survey methodology might have created common method variance, particularly if the respondents were providing socially acceptable responses—e.g., willingness to collaborate and cooperative exchange norms. However, the cover letter did not divulge the theoretical issues of interest, nor were any of the respondents in the pretest efforts able to guess the nature and purpose of the study. Moreover, all the construct items were separated and mixed such that no respondent would be able to detect which items were affecting which factors. Thus, we believe that we minimized the biasing possibilities of common method variance.

A more specific concern underlies the analysis of the norms-performance link. The econometric model makes the important assumption that, after controlling for covariates, all exchanges in our data set are statistically equivalent. That is, we assume that important explanatory variables are not omitted in estimating our cooperative exchange norms equation. This assumption allows us to construct the *Low* and *High* variables needed to analyze how the difference between the expected and realized level of cooperative norms affect performance. If exchanges are not equivalent, then unobserved heterogeneity could potentially drive these differences or directly affect performance, or both. Rejecting this possibility becomes difficult with only cross-sectional data; thus, our results need to be interpreted with the important caveat that we cannot guarantee the absence of omitted variable bias. Three factors, however, may mitigate this concern. First, the narrow empirical scope of our analysis—CRDAs—while limiting from a standpoint of generalizability, is beneficial in terms of unobserved heterogeneity in that the narrow scope potentially limits the sources of unobserved heterogeneity. Second, several control variables and our instrumental variable are included in the models. As such, we believe that potential omitted variable bias is low. Finally—perhaps most encouragingly—the empirical findings indicate an asymmetrical relationship between the deviations below the expected level of cooperative norms and performance from those above the expected level. We believe it is unlikely that omitted variable bias would induce such a pattern.

Another empirical limitation is the fact that survey responses exist from only one dyad partner. Hence, our data do not tell a complete story for any particular dyad. However, government lab personnel filled out some surveys while industry personnel filled out other surveys. While our empirical analysis accounts for this difference by clustering on the type of respondent, we conducted an additional sensitivity analysis. We reran our analysis and included in each model a dummy variable indicating that the respondent was from industry and did not employ the cluster option. This dummy variable was insignificant in all but one regression (Model 3C) and parameter estimates of all other variables remained essentially unchanged in sign, magnitude, and statistical significance. In Model 3C the estimated coefficient was positive and significant, which suggests that industry personnel are more willing than government personnel to engage in future collaborations. This is consistent with the context, as technology transfers from the government are typically used by firms to aid in the development of new products and other revenue-enhancing endeavors. While this analysis does not provide complete information on any dyad, it suggests that no systematic bias between industry and government respondents is present.

As a related robustness check, we reran all of our analyses with dummy variables for the position of the respondent. Positions included management, scientist, engineer, and staff. The omitted position was "other." None of our coefficient estimates was affected by including these dummy variables, and all coefficient estimates for these dummy variables were statistically insignificant. Hence, we conclude that the position of the respondent did not affect our empirical results.

Finally, there is the possibility that an expectation of future exchange contributes to the level of norms developed. That is, cooperation may be induced by the partner's belief that she is involved in a repeated game scenario. However, the results in the first-stage analysis predicting norms remain unchanged with the inclusion of a dummy variable for those partnerships that do go on to have subsequent collaborations. Furthermore, the coefficient on this dummy variable is not statistically significant. Although the correlation between expectation and occurrences may be imperfect, this robustness test gives us confidence that expectation of future collaborations is not the key driver of our results.

4.2. Contrast Analysis to Prior Research

Table 3 reports a set of results that we use for comparison purposes to demonstrate the econometric impact of our model and method. Models 4A, 4B, and 4C replicate Models 3A, 3B, and 3C, with two important differences, to contrast the typical view of norms with our view of norm fit. First, we omit the covariates *Low* and *High*. Second, we include our measure of *Norms*. As mentioned earlier, we offer this model as a point of comparison even though, based on our theory, the model is erroneous because *Norms* depends on the level of joint

Table 3 Performance as a Function of Cooperative Norms

	Evaluation Model 4A	Satisfaction Model 4B	Future Model 4C
Norms	0.54**	0.56**	0.45**
	(0.10)	(0.09)	(0.10)
Joint TSI	0.17*	0.31**	0.35**
	(0.08)	(0.08)	(0.08)
Observability	0.17**	0.09	0.07
	(0.07)	(0.06)	(0.07)
Separability	0.08	0.07	0.21**
	(0.08)	(0.07)	(0.08)
Demand	−0.15*	−0.02	−0.10
	(0.06)	(0.06)	(0.07)
Tier 1	0.14	−0.26	0.13
	(0.25)	(0.23)	(0.26)
Tier 2	−0.24	−0.38*	−0.22
	(0.20)	(0.19)	(0.21)
Tier 3	−0.12	−0.29	−0.22
	(0.19)	(0.17)	(0.20)
Tier 4	−0.23	−0.04	−0.22
	(0.23)	(0.21)	(0.24)
Tier 5	0.36	0.53*	0.17
	(0.22)	(0.21)	(0.23)
Constant	0.11	0.22	0.16
	(0.17)	(0.16)	(0.18)
χ^2	126.93	173.45	124.55
R^2	0.41	0.49	0.41

*$p < 0.05$, **$p < 0.01$.

transaction-specific investment and the degree of observability. As a point of comparison, both R^2 and χ^2 statistics for Models 4A, 4B, and 4C are similar to Models 3A, 3B, and 3C even though the former models are less theoretically appealing. As one might expect, the coefficients for *Norms* are positive and highly statistically significant ($p < 0.01$) for *Evaluation* (Model 4A), *Satisfaction* (Model 4B), and *Future* (Model 4C). These coefficients imply that higher levels of cooperative norms always increase perceptions of performance, satisfaction, and the willingness to engage in future exchanges—more norms are always better for performance. However, these coefficients obfuscate the asymmetry of the relationship between unanticipated levels of social norms and performance that we identified in Models 3A, 3B, and 3C. Differences in other coefficient estimates also arise. For instance, the coefficients for *Joint TSI* are positive and significant across Models 4A, 4B, and 4C, but the magnitude of these coefficients is substantially lower than those reported in Models 3A, 3B, and 3C. Whereas the coefficients for *Observability* are positive and highly significant in Models 3A, 3B, and 3C, they are much smaller and only significant in Model 4A. Similarly, the coefficients for *Separability* are positive in all three models, but only significant in Model 4C, compared to being positive and significant in Models 3A, 3B, and 3C. The stronger effects of *Joint TSI, Observability,* and *Separability* in Models 3A, 3B, and 3C reflects the performance-enhancing effects of these variables independent of the norms that are facilitated by these variables. Other differences among coefficient estimates can be found in the remainder of our covariates, but we do not discuss them here because the differences have little impact on our comparison, which we discuss below.

4.3. Additional Analysis on Willingness to Collaborate in the Future

The results above suggest that overshooting expected norm levels has a positive effect on willingness to collaborate in the future. Perhaps a higher-than-expected level of norms reduces uncertainty about anticipated transaction costs with the partner. Given this expectation of lower costs, one would expect that a willingness to collaborate will indeed increase the likelihood that repeat interactions occur with these cooperative partners. Our conjecture, if correct, is consistent with those who argue that cooperative norms evolve as a function of a prior history of exchange.

As an initial test of this conjecture, we returned to our empirical setting and collected additional information to identify collaborators that had entered into new CRDAs with each other after the survey was administered. We found that over the course of the next four years, 11% of the collaborations had developed new CRDAs together. We undertook a probit analysis consisting of a dependent variable set equal to one if the collaborators entered into another collaboration after our survey. For independent variables, we included our five *Tier* variables and our predicted willingness-to-collaborate (from Model 3C). Parameter estimates show that the predicted willingness-to-collaborate significantly increases the probability ($p < 0.01$) that a subsequent interaction between a specific set of partners will occur.

5. Discussion

The findings of this study are consistent with the use of a self-enforcing agreement framework to identify key antecedents of cooperative exchange norms. Transaction attributes can act as levers of self-enforcing agreements, and as such have currency in explaining the emergence of cooperative norms. Specifically, joint-specific investments create the means to impose private sanctions, while observability provides transparency that enhances the chance that noncooperative behavior will be discovered and punished. Increase in the strength of either lever expands the self-enforcing range and raises the level of cooperative exchange norms supported. The empirical findings provide broad support for this framework. As hypothesized, we find the realized level of cooperative exchange norms to be positively and statistically related to both joint transaction-specific investments and observability. Moreover, adding these theoretically driven independent variables to our base model

substantially increases the model's explanatory power, indicating that these antecedents do indeed exert an important effect on the realized level of cooperative exchange norms. Our finding that norms are related to, and coexist with, transaction-specific assets is consistent with recent thinking in the literature on complementarity (Poppo and Zenger 2002). In fact, there is a stream of literature in marketing that empirically examines the simultaneous and complementary use of governance mechanisms and demonstrates that this approach has systematic effects on interorganizational performance (Jap and Anderson 2003, Jap and Ganesan 2000, Stump and Heide 1996).

The study also illuminates the link between cooperative exchange norms and exchange performance. Our approach represents an important departure from the traditional practice of regressing absolute levels of norms on performance to explore how deviation from the expected level of norms may drive performance. The undershooting or overshooting of norms moves the transaction away from achieving a discriminating alignment. Consistent with the hypotheses, we found that exchange performance suffered when the realized level of cooperative exchange norms fell below the expected level of cooperative norms. The failure of cooperative norms to materialize as expected (given the transaction attributes in place) leaves the exchange inadequately safeguarded, and thus susceptible to hazard-related or maladaptation-related losses. In such cases, the respondents expressed dissatisfaction with partner contribution and transaction outcomes, as well as unwillingness to "repeat their mistake" by collaborating with this partner in the future.

The findings associated with the overrealization of cooperative norms, while supportive of our predictions, also provide new insight into collaboration dynamics. Given that the assessment of economic performance proves difficult because of the nature of the exchange, the analysis shows that realized levels of cooperative exchange norms above the expected level produce no effect on evaluation of partner performance, a weakly positive relationship with satisfaction with current exchange outcomes, and a strong positive link with willingness to collaborate in the future. Following the self-enforcing logic, we see that performance ultimately corresponds to the achievement of goals—in this case, the transfer of technology. Farsighted collaborators structure the transaction to provide the expected level of cooperative norms needed to achieve the goal. Norms that exceed the expected level also facilitate meeting the goal of the exchange, but are not evaluated any more highly. From the perspective of goal achievement, as in Simon's (1947) satisficing assumption, higher levels of realized cooperative norms provide little additional value in the current transaction once the goal is achieved. Going above and beyond what is specified provides little added benefit in the current exchange, but creates a favorable impression.

This favorable impression appears to manifest, however, as a stated willingness to engage in follow-on exchanges. When the expected level of norms is overshot, the players, in effect, learn that it is feasible (and perhaps easier than they anticipate) to induce cooperation with their partner. This revelation that their partner is the cooperative type may reduce behavioral uncertainty. This revelation, in turn, may reduce the anticipated transaction costs associated with future interactions with this partner, by enabling lower-cost governance through a lower transparency requirement or the reduced need for joint-specific investments, or both. Given the expectation of lower costs, those partners identified as being cooperative will be preferentially selected for subsequent projects (Hill 1990), for which we found empirical support. This result provides an explanation for the iterative process described by those who argue that cooperative norms evolve over time as a function of the previous transacting experience of the exchange partners.

It is interesting to note the differences in the magnitude of underrealization and overrealization effects. When assessing the current relationship—in terms of satisfaction and evaluation—the cost of underrealization is approximately double the gains of overrealization. This finding is in line with theories of loss aversion. The above indicates that future research may need to also consider how the cognitive biases of exchange participants influence transaction activity. Our findings can also be interpreted through the lens of Cyert and March's (1963) *Behavioral Theory of the Firm*. This theory argues that, in situations where performance is below aspirations, organizations will engage in problemistic search. Conversely, when performance is above aspirations, organizations will continue with their current behavior—in this case, repeat interactions with the same partner.

The findings yield several implications for the ongoing theoretical debates regarding the antecedents and performance ramifications of cooperative norms. The findings lend strong support to the view that the emergence of cooperative norms can be a function of the attributes of the exchange and, in this respect, the emergence of norms can be calculative. However, we also find some evidence that current exchange experience influences future collaborative choices. Namely, positive experiences increase willingness to engage in future exchanges. In essence, this study provides insight into the process by which the combination of exchange attributes and partner selection catalyze cooperative behavior (Jap 1999). This mechanism may evolve over time as a function of the previous transacting experience of the exchange partners, which has been asserted

by many other scholars (Dwyer et al. 1987, Granovetter 1985, Gulati 1995, Gulati and Nickerson 2006, Ring and Van de Ven 1992, Zaheer and Venkatraman 1995). More research building on the existing work of psychologists and sociologists is needed to gain better understanding of the specific processes associated with the under- and overrealization of norms.

Our theory also unpacks the question of when cooperative exchange norms benefit performance. The findings generally support those researchers who argue that exchange performance increases with the level of exchange norms. However, this relationship is more nuanced than scholars have previously argued. Our theory suggests that the greater the level of realized exchange norms, the greater the performance controlling for the expected level of cooperative norms. In other words, the degree of fit achieved is a key determinant of performance. The importance of fit suggests that gaining a better understanding of the social processes associated with the under- and overrealization of norms is a necessary and worthwhile endeavor. A future study that considers how exchange-partner attributes such as similarity, propensity to trust, or commitment influence the development of norms and thus contribute to informal governance alignment or misalignment could provide valuable insights into partner selection decisions.

Acknowledgments

All authors contributed equally. This research was supported by grants from the International Center for Research on the Management of Technology, Lean Aerospace Initiative, and Center for Innovation in Product Development at the Massachusetts Institute of Technology. The authors wish to thank the cooperative research and development agreements administrators and participants as well as Benito Arrunada, Zeynep Hansen, Will Mitchell, and Stuart Bunderson for comments on earlier drafts. All errors remain the authors'.

Endnotes

[1]Macneil (1980, p. 38) further defines norms as "a principle of right action binding upon the members of a group and serving to guide, control, or regulate proper and acceptable behavior."

[2]The 10 common contract norms include (1) role integrity, (2) reciprocity, (3) implementation of planning (participation), (4) effectuation of consent, (5) flexibility, (6) contractual solidarity, (7) the linking norms—restitution, reliance, and expectation interests, (8) creation and restraint of power, (9) propriety of means, and (10) harmonization with the social matrix (Macneil 2001, p. 153).

[3]Klein's self-enforcing agreement argument, although slightly broader, is in line with to Axelrod's (1984) discussion of cooperation in repeated prisoner's dilemma games.

[4]Although psychologists and sociologists have done much to increase our understanding of the social laws of human nature, this understanding remains incomplete.

[5]When technology is transferred (sometimes referred to as "spun out") to the private sector, there is an expectation that the technology will be applied in material and product development efforts that provide value to society in enhanced products and services that may subsequently be procured back into the government sector. In this manner, organizations play a critical role in creating new knowledge for both the federal and private sectors through specialized innovation (Teece 1998).

[6]This is because the parties compete in different markets—federal and nonfederal.

[7]A concern is the possibility of response bias, whereby both independent and dependent variables are derived from a single subject (Podsakoff and Organ 1986, Salancik and Pfeffer 1977). However, other findings challenge the validity of general condemnations of self-report methods (Crampton and Wagner 1994). Also, Doty and Glick (1998) have found that while there is much common method variance in organizational research, its effect is a positive inflation of results, but does not necessarily cause that much bias; in fact, the conclusions of most (57%) of the research are still valid.

[8]Statistical significance is evaluated by convention using a two-tailed test. Because all hypotheses are directional in nature, a one-tailed test is more appropriate. If this latter evaluation metric is applied, all hypothesis variables, except the coefficient for *High* in Model 3A, would be considered statistically significant.

References

Anderson, E. 1988. Selling efficiency and choice of integrated or independent sales forces: A test of Darwinian economics. *Management Sci.* **34**(May) 599–618.

Anderson, E., B. Weitz. 1992. The use of pledges to build and sustain commitment in distribution channels. *J. Marketing Res.* **29** 18–34.

Argyres, N. S. 1996. Capabilities, technological diversification and divisionalization. *Strategic Management Rev.* **17** 395–410.

Argyres, N. S., J. P. Liebeskind. 1999. Contractual commitments, bargaining power, and governance inseparability: Incorporating history into transaction cost theory. *Acad. Management Rev.* **24**(1) 49–63.

Armstrong, J. S., T. S. Overton. 1977. Estimating nonresponse bias in mail surveys. *J. Marketing Res.* **14**(August) 396–402.

Artz, K. W., T. H. Brush. 2000. Asset specificity, uncertainty, and relational norms: An examination of coordination costs in collaborative strategic alliances. *J. Econom. Behav. Organ.* **41** 337–362.

Axelrod, R. 1984. *The Evolution of Cooperation*. Basic Books, New York.

Axelrod, R. 1986. An evolutionary approach to norms. *Amer. Political Sci. Rev.* **80**(4) 1095–1111.

Blau, P. 1964. *Exchange and Power in Social Life*. John Wiley & Sons, New York.

Boyle, B., R. Dwyer, R. Robicheaux, J. Simpson. 1991. Influence strategies in marketing channels: Measures and use in different relationship structures. *J. Marketing Res.* **29** 462–473.

Bradach, J. L., R. G. Ecccles. 1989. Price, authority, and trust: From ideal types to plural forms. *Annual Rev. Sociol.* **15** 97–118.

Campbell, D. T. 1955. The informant in quantitative research. *Amer. J. Sociol.* **60**(1) 339–342.

Cannon, J. P., R. S. Achrol, G. T. Gundlach. 2000. Contracts, norms, and plural form governance. *J. Acad. Marketing Sci.* **28**(2) 180–194.

Crampton, S. M., J. A. Wagner. 1994. Percept-percept inflation in microorganizational research: An investigation of prevalence and effect. *J. Appl. Psych.* **79**(1) 67–77.

Cyert, R. M., J. G. March. 1963. *A Behavioral Theory of the Firm*, 2nd ed. Blackwell Publishers, Inc., Malden, MA.

Doty, D. H., W. H. Glick. 1998. Common methods bias: Does common methods variance really bias results? *Organ. Res. Methods* **1**(2) 374–406.

Dwyer, F. R., P. H. Schurr, S. Oh. 1987. Developing buyer-seller relationships. *J. Marketing* **51**(April) 11–27.

Dyer, J. H. 1996. Specialized supplier networks as a source of competitive advantage: Evidence from the auto industry. *Strategic Management J.* **17** 271–291.

Dyer, J., H. Singh. 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Acad. Management Rev.* **23** 660–679.

Eggertsson, T. 2001. Norms in economics—with special reference to economic development. Michael Hechter, Karl-Dieter Opp, eds. *Social Norms*. Russell Sage Foundation, New York.

Fornell, C., D. F. Larcker. 1981. Evaluating structural equation models with unobservable variables and measurement error. *J. Marketting Res.* **18** 39–50.

Gibbons, Robert. 1999. Taking Coase seriously. *Admin. Sci. Quart.* **44**(1) 145–157.

Granovetter, M. 1985. Economic action and social structure: The problem of embeddedness. *Amer. J. Sociol.* **91** 481–510.

Gulati, R. 1995. Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Acad. Management J.* **38**(1) 85–112.

Gulati, R., J. A. Nickerson. 2006. Interorganizational-trust, governance choice, and exchange performance. Working paper, Olin School of Business, Washington University, St. Louis, MO.

Gundlach, G., R. Achrol, J. Mentzer. 1995. The structure of commitment in exchange. *J. Marketing* **59** 78–92.

Ham, R. M., D. Mowery. 1998. Improving the effectiveness of public-private R&D collaboration: Case studies at a U.S. weapons laboratory. *Res. Policy* **26** 661–675.

Hauser, J. R. 1998. Research, development and engineering metrics. *Management Sci.* **44**(12) 1670–1689.

Heide, J. B., G. John. 1992. Do norms matter in marketing relationships? *J. Marketing* **56**(April) 32–44.

Heiman, B., J. A. Nickerson. 2004. Empirical evidence regarding the tension between knowledge sharing and knowledge expropriation in collaborations. *Managerial Decision Econom.* **25** 401–420.

Hill, C. W. L. 1990. Cooperation, opportunism, and the invisible hand: Implications for transaction cost theory. *Acad. Management Rev.* **15**(3) 500–513.

Jap, S. D. 1999. "Pie-expansion" efforts: Collaboration processes in buyer-supplier relationships. *J. Marketing Res.* **36**(4) 461–475.

Jap, S. D., E. Anderson. 2003. Safeguarding interorganizational performance and continuity under ex post opportunism. *Management Sci.* **49**(12) 1684–1701.

Jap, S. D., S. Ganesan. 2000. Control mechanisms and the relationship lifecycle: Implications for safeguarding specific investments and developing commitment. *J. Marketing Res.* **37**(2) 227–245.

Jeffries, F., R. Reed. 2000. Trust and adaptation in relational contracting. *Acad. Management Rev.* **25** 873–882.

Jones, C., W. S. Hesterly, S. P. Borgatti. 1997. A general theory of network governance: Exchange conditions and social mechanisms. *Acad. Management Rev.* **22**(4) 911–945.

Jöreskog, K. G., D. Sörbom. 1993. *LISREL 8: Structural Equation Modeling with the SIMPLIS Command Language*. Lawrence Erlbaum Associates, Hillsdale, NJ.

Kandori, M. 1992. The use of information in repeated games with imperfect monitoring. *Rev. Econom. Stud.* **59** 581–593.

Klein, B. 1980. Transaction cost determinants of "unfair" contractual arrangements. *Amer. Econom. Rev.* **70** 356–362.

Klein, B. 1995. The economics of franchise contracts. *J. Corporate Finance* **2** 9–37.

Klein, B. 1996. Why hold-ups occur: The self-enforcing range of contractual relationships. *Econom. Inquiry* **34** 444–463.

Klein, B., K. Leffler. 1981. The role of market forces in assuring contractual performance. *J. Political Econom.* **89** 615–641.

Klein, B., R. Crawford, A. Alchian. 1978. Vertical integration, appropriable rents and competitive contracting process. *J. Law Econom.* **21**(2) 297–326.

Leiblein, M. J., D. J. Miller. 2003. An empirical examination of transaction- and firm-level influences on the vertical boundaries of the firm. *Strategic Management Journal* **24**(9) 839–859.

Leiblein, M. J., J. J. Reuer, F. Dalsace. 2002. Do make or buy decisions matter? The influence of governance on technological performance. *Strategic Management J.* **23** 817–833.

Macaulay, S. 1963. Non-contractual relations in business: A preliminary study. *Amer. Sociol. Rev.* **28** 55–70.

Macneil, I. R. 1978. Contracts: Adjustment of long-term economic relations under classical, neoclassical, and relational contract law. *Northwestern Univ. Law Rev.* **72**(6) 854–901.

Macneil, I. R. 1980. *The New Social Contract: An Inquiry into Modern Contractual Relations*. Yale University Press, New Haven, CT, and London, UK.

Macneil, I. R. 2001. *The Relational Theory of Contract: Selected Works of Ian Macneil*. David Campbell, ed. Sweet & Maxwell Limited, London, UK.

Madhok, A., S. Tallman. 1998. Resources, transactions, and rents: Managing value through interfirm collaborative relationships. *Organ. Sci.* **9**(3) 326–339.

Nickerson, J. A., B. S. Silverman. 2003. Why firms want to organize efficiently and what keeps them from doing so: Inappropriate governance, performance, and adaptation in a deregulated industry. *Admin. Sci. Quart.* **48**(3) 433–465.

Nickerson, J. A., T. R. Zenger. 2002. Being efficiently fickle: A dynamic theory of organizational choice. *Organ. Sci.* **13**(5) 547–566.

Nickerson, J. A., T. R. Zenger. 2004. A knowledge-based theory of the firm—The problem-solving perspective. *Organ. Sci.* Forthcoming.

Noordewier, T., G. John, J. Nevin. 1990. Performance outcomes of purchasing arrangements in industrial buyer-vendor relationships. *J. Marketing* **54** 80–93.

Nunnally, J. C. 1978. *Psychometric Theory*. McGraw-Hill, New York.

Oxley, J. 1997. Appropriability hazards and governance in strategic alliances: A transaction cost approach. *J. Law, Econom. Organ.* **13**(2) 387–409.

Podsakoff, P. M., D. W. Organ. 1986. Self-reports in organizational research: Problems and prospects. *J. Management*, **12**(4) 531–545.

Poppo, L., T. R. Zenger. 2002. Do formal contracts and relational governance function as substitutes or complements? *Strategic Management J.* **23**(8) 707–725.

Ring, P. S., A. H. Van de Ven. 1994. Developmental processes of cooperative interorganizational relationships. *Acad. Management Rev.* **19**(1) 90–118.

Salancik, G. R., J. Pfeffer. 1977. An examination of need-satisfaction models of job attitudes. *Admin. Sci. Quart.* **22** 427–456.

Shaver, J. M. 1998. Accounting for endogeneity when assessing strategy performance: Does entry mode choice effect FDI survival. *Management Sci.* **44**(4) 571–585.

Silverman, B. S., J. A. Nickerson, J. Freeman. 1997. Profitability, transactional alignment, and organizational mortality in the U.S. trucking industry. *Strategic Management J.* **18** 31–52.

Simon, H. 1947. *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization*. The Free Press, New York.

Steiger, J. H. 1980. Tests for comparing elements of a correlation matrix. *Psych. Bull.* **87**(2) 245–251.

Steiger, J. H., J. C. Lind. 1980. Statistically-based tests for the number of common factor. *Annual Spring Meeting Psychometric Soc.*, Iowa City, IA.

Stump, R. L., J. B. Heide. 1996. Controlling supplier opportunism in industrial relations. *J. Marketing Res.* **33**(November) 431–441.

Teece, D. 1998. Capturing value from knowledge assets: The new economy, markets for know-how, and intangible assets. *California Management Rev.* **40**(3) 55–73.

Tesler, L. 1981. A theory of self-enforcing agreements. *J. Bus.* **53** 27–44.

Williamson, O. E. 1983. Credible commitments: Using hostages to support exchange. *Amer. Econom. Rev.* **73** 519–540.

Williamson, O. E. 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. The Free Press, New York.

Williamson, O. E. 1991. Comparative economic organization: The analysis of discrete structural alternatives. *Admin. Sci. Quart.* **36**(June) 269–296.

Williamson, O . E. 1996. *The Mechanisms of Governance*. Oxford University Press, New York and Oxford, UK.

Zaheer, A., N. Venkatraman. 1995. Relational governance as an interorganizational strategy: An empirical test of the role of trust in economic exchange. *Strategic Management J.* **16** 373–392.

Zaheer, A., B. McEvily, V. Perrone. 1998. Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organ. Sci.* **9** 141–159.

Zellner, A. 1962. An efficient method for estimating seemingly unrelated regressions and test of aggregation bias. *J. Amer. Statist. Assoc.* **57** 500–509.

Zenger, T. R., S. Lazarini. 2002. The strength of churning ties: A dynamic theory of interorganizational relations. Working paper, Olin School of Business, Washington University in St. Louis, MO.