

Assessing the Property Rights and Transaction-Cost Theories of Firm Scope

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In his path-breaking 1937 article, Ronald Coase first identified the determinants of a firm's scope as an important research question. Although Coase's question initially attracted little attention, it has emerged over the last 25 years as a central issue in industrial organization.

Much of the literature on firm scope since Coase uses the transaction-cost economics approach (henceforth, the TCE) pioneered by Oliver Williamson (1975, 1979, 1985) and Benjamin Klein et al. (1978). The TCE starts with the assumption that market transactions are plagued by incomplete contracts and the development of lock-in among trading partners. Lock-in leads the value of the relationship to exceed the value of the trading partners' outside alternatives creating what Klein et al. called "quasi-rents." Contractual incompleteness gives contracting parties the ability to engage in opportunistic behavior to increase their share of these quasi-rents, leading to efficiency losses in market transactions. Internal procurement, on the other hand, involves its own inefficiencies, most notably the costs of bureaucracy and low-powered incentives. According to the TCE, the optimal organizational form is found by comparing the efficiencies of these distinct transactional modes. Its primary prediction is that, as market transactions become characterized by increasing levels of quasi-rents and incompleteness in contracts, the likelihood of integration should increase.

More recently, a great deal of attention has focused on an alternative theory of firm scope, the property-rights theory (henceforth, the PRT), pioneered by Sanford Grossman and Oliver Hart (1986) and Hart and John Moore (1990) (see also Hart, 1995). Like the TCE, the PRT starts with the assumption that contracts are incomplete and that lock-in often develops among trading partners. It then focuses on how ownership of physical assets, which confers residual rights of control over the assets, alters the efficiency of trading relations. In the process of doing so, the PRT produces a theory that differs from the TCE in three ways. The first is methodological rather than substantive: the PRT is substantially more formal than the (largely verbal) TCE. Second, the PRT focuses on distortions in *ex ante* investments, in contrast to the *ex post* haggling costs that are a major focus of the TCE.¹ Third, the PRT assumes that efficiency losses are of the same nature in all ownership structures. That is, ownership of physical assets affects the parties' abilities to engage in opportunistic behavior not only in market transactions, but also within the firm.

A very large empirical literature exists lending support to the TCE (for one survey, see Howard A. Shelanski and Peter G. Klein [1995]). In a typical study, some measure of lock-in, such as the specificity of the product procured or investments made, is related to the choice of whether to integrate. The strong association that this literature has found between specificity and integration has made the TCE

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¹ The PRT's focus on *ex ante* investments seems mostly a matter of modeling convenience, since residual rights of control over assets could also affect the efficiency of bargaining. It should also be noted that the TCE literature does recognize that *ex ante* investment distortions are a potential cost of *ex post* opportunism (see e.g., Klein et al., 1978 p. 301).

one of the great success stories in industrial organization over the last 25 years.

Because of the similar nature of their initial assumptions, it is sometimes also thought that this literature lends support to the PRT. In fact, however, this is not so. In Whinston (2000) I examine the PRT's predictions and show that these differ in significant ways from those of the TCE. Moreover, I argue that the literature empirically testing the TCE is not very useful for assessing the PRT. I summarize these arguments below. Then, I discuss how this analysis suggests not only how one might test the PRT, but also how one may conduct more stringent tests of the TCE than those that have been performed so far.²

I. Predictions of the Property-Rights Theory

In Whinston (2000) I examine a simple linear-quadratic property-rights model in which a buyer B and a seller S may trade. I consider a setting in which the buyer may decide to integrate vertically, acquiring the upstream asset. In what follows, I let $A_B = 1$ denote buyer integration and $A_B = 0$ denote nonintegration. Following the PRT literature cited above, I assume that it is impossible *ex ante* to write a contract governing future trade, so that all trade involves *ex post* bargaining and, for simplicity, that this bargaining involves a 50/50 split of the renegotiation surplus. Each party j ($j = B, S$) may make a non-contractible *ex ante* investment $i_j \in \mathbb{R}$ at cost $c_j(i_j)$. The joint payoff if the parties trade is $\pi(i_B, i_S|A_B)$ while the disagreement payoffs (which depend on asset ownership) are $w_B(i_B, i_S|A_B)$ and $w_S(i_B, i_S|A_B)$ for B and S, respectively. (Observe that I allow j 's disagreement payoff to depend on party $i \neq j$'s investment.) Specifically, let

$$\pi(i_B, i_S) = \alpha_0 + \alpha_B i_B + \alpha_S i_S$$

$$w_B(i_B, i_S|A_B) = [\beta_0 + \beta_{B0} i_B + \beta_{S0} i_S](1 - A_B) + [\beta_1 + \beta_{B1} i_B + \beta_{S1} i_S]A_B$$

² The PRT and TCE are not the only theories of firm scope: integration to avoid double marginalization, to foreclose rivals, and to expand a manager's empire are all possible motives. Here, however, I maintain a narrower focus on the PRT and TCE.

$$w_S(i_B, i_S|A_B) = [\sigma_0 + \sigma_{B0} i_B + \sigma_{S0} i_S](1 - A_B) + [\sigma_1 + \sigma_{B1} i_B + \sigma_{S1} i_S]A_B$$

$$c_j(i_j) = (i_j)^2/2 \quad j = B, S.$$

Assume that trade between B and S is always optimal, so that the first-best investments are $(i_B^{**}, i_S^{**}) = (\alpha_B, \alpha_S)$. In contrast, equilibrium behavior under ownership structure A_B involves investments for each party j of

$$i_j^*(A_B; \alpha, \beta, \sigma) = \frac{1}{2}[\alpha_j + (\beta_{j0} - \sigma_{j0})(1 - A_B) + (\beta_{j1} - \sigma_{j1})A_B].$$

Note that these equilibrium investments depend on disagreement payoffs (because these affect bargaining positions); this creates the mechanism through which asset ownership can matter.

To derive comparative-static predictions regarding ownership, let the equilibrium welfare under asset ownership structure A_B be given by $W(A_B; \alpha, \beta, \sigma) + \tilde{\varepsilon}_{A_B}$, where

$$W(A_B; \alpha, \beta, \sigma) = \pi(i_B^*(A_B; \alpha, \beta, \sigma), i_S^*(A_B; \alpha, \beta, \sigma)) - \sum_{j=B,S} c_j(i_j^*(A_B; \alpha, \beta, \sigma))$$

and the random term $\tilde{\varepsilon}_{A_B}$ represents unobserved factors outside of the model (such as taxes or other organizational costs). Integration will be observed if and only if

$$\Delta(\alpha, \beta, \sigma) \equiv W(1; \alpha, \beta, \sigma) - W(0; \alpha, \beta, \sigma) \geq \varepsilon_0 - \varepsilon_1.$$

A first observation is that $\alpha_0, \beta_0, \beta_1, \sigma_0$, and σ_1 have no effect on the probability of integration here; that is, in the PRT, only *marginal* returns to investments matter for the integration decision. This stands in contrast to the TCE, in which it is *levels* of quasi-rents that matter for integration decisions.

TABLE 1—EFFECTS OF INCREASES IN DISAGREEMENT-PAYOFF MARGINAL RETURNS ON THE PROBABILITY OF INTEGRATION (UNDERINVESTMENT CASE)

A. <i>Self-Investment Returns:</i>		
Investment by:	Under:	
	Nonintegration	Integration
B	$-(d\beta_{B0} > 0)$	$+(d\beta_{B1} > 0)$
S	$-(d\sigma_{S0} > 0)$	$+(d\sigma_{S1} > 0)$

B. <i>Cooperative-Investment Returns:</i>		
Investment by:	Under:	
	Nonintegration	Integration
B	$+(d\sigma_{B0} > 0)$	$-(d\sigma_{B1} > 0)$
S	$+(d\beta_{S0} > 0)$	$-(d\beta_{S1} > 0)$

More generally, the effects of changes in marginal returns on the likelihood of integration in the PRT depend upon the nature of the investments, who is making them, and under which ownership structure the changes occur. As one illustration, Table 1 summarizes the effect on the probability of integration of increases in various disagreement-payoff marginal returns to investment when equilibrium investments are below the first-best level. The table distinguishes between effects arising from “self-investment” and “cooperative-investment” returns (the former raise the disagreement payoff of the investing party; the latter raise the payoff of the investing party’s trading partner).

As can be seen in Table 1, increases in the marginal disagreement-payoff return to investment under a given ownership structure increase the probability of observing that structure with a self-investment return, but reduce it for a cooperative-investment return. (The parameter being changed is indicated in parentheses in each case in Table 1, while the sign of the effect on the probability of integration is indicated with a “+” or a “-”.) To see why, observe that, in the former (latter) case, the increase in marginal return raises (lowers) the level of investment. Since the situation is one of underinvestment, this raises (lowers) the welfare measure $W(\cdot)$ under that structure. As this reasoning also suggests, the results in Table 1 would reverse in an overinvestment situation.

II. An Example

It is instructive to consider what inferences one might draw about the PRT from the findings of the existing literature on the TCE. As one example, here I consider Paul Joskow’s (1985) study of integration decisions by electric utilities. Joskow shows that “mine-mouth” plants (those located next to a coal mine) are much more likely to own their coal source than are utilities that are not co-located. His interpretation, in line with the TCE, is that co-location increases quasi-rents and thereby raises the likelihood of integration.

To what extent is this evidence supportive of or contradictory to the PRT? To fix ideas, imagine that mines S and \hat{S} are at two distinct locations. Assume, as above, that it is always efficient for the utility to procure from S . However, the utility may be located either near S (henceforth, location N) or equidistant between S and \hat{S} (henceforth, location F). Location alters the costs of transporting coal from each mine to the utility plant.

For assessing the PRT, one wants to know how this locational choice alters marginal returns to noncontractible investments. At first glance, it may appear that location has no effect on marginal returns, since transportation costs should alter payoffs by a fixed amount. In fact, however, the location decision can alter disagreement-payoff marginal returns by changing the identity of the utility’s next-best alternative in the event that it cannot reach an agreement with the manager/owner of S . This can alter the likelihood of integration under the PRT. The following four scenarios illustrate the sensitivity of the PRT’s predictions to the nature of the investments being made:³

Scenario 1: Suppose that the utility’s next-best alternative in the event that it does not procure from S is independent of its location. Then it follows immediately that the likelihood of integration is unaffected by co-location.

Scenario 2: Suppose that the utility invests (non-contractibly) in improving its efficiency of using S ’s

³ The discussion that follows concerns the theoretical effects of co-location; I ignore inference issues caused by endogeneity of the utility’s location.

coal and that this has no effect on its efficiency of using \hat{S} 's coal. Suppose, moreover, that its next-best alternative in the event of a disagreement, if it is at F or if it is at N and does not own the mine, is to procure from \hat{S} , but that it is to engage in self-production (by hiring another manager for S) if it is at N and owns S. In this case, co-location increases the probability of integration, since it raises the marginal return to investment for the utility's disagreement payoff under integration.

Scenario 3: Suppose that the manager of S invests (noncontractibly) in quality improvements that are specific to the utility and embodied in the mine (i.e., they raise S's coal quality even if a new manager is brought in to run S). The utility's next-best alternatives are the same as in Scenario 2. Then co-location lowers the probability of integration, since it raises the marginal return to S's investment for the utility's disagreement payoff when the utility owns the mine.

Scenario 4: Suppose that the utility invests (noncontractibly) in improving its ability to use \hat{S} 's coal, but that this has no effect on its ability to use S's coal. The utility's next-best alternatives are the same as in Scenario 2. In this case, the utility overinvests relative to the first-best. Locating at N reduces the marginal return to this investment for the utility's disagreement payoff under integration. Thus, co-location increases the probability of integration.

The lesson from these examples is that, without more specific information about how co-location alters marginal returns to noncontractible investments, little can be said about whether the PRT's predictions are consistent with observed behavior.

III. Testing the PRT (and the TCE)

The discussion above suggests that the PRT offers a rich set of predictions that should lend themselves to testing.⁴ One can imagine two

⁴ Note, however, that the discussion above sidesteps one important issue by assuming that any observed integration is buyer integration. When this is not clear a priori, the PRT's predictions may differ from those above and will depend on whether the type of integration (buyer vs. seller) is observable. (A separate theoretical issue is how this distinction is relevant in large corporations.)

different approaches to this task. One is a "natural experiment" approach in which one identifies some variation whose effect on marginal returns to investments in various ownership structures seems very clear a priori. This approach is much like that followed in essentially all of the empirical work testing the TCE, in which some measure of specificity (e.g., product specificity, investment specificity, or co-location) is taken as a proxy for the level of quasi-rents in the relationship. Like the literature testing the TCE, such an approach faces the challenge of finding convincing natural experiments (i.e., ones that clearly affect marginal returns in particular ways and are exogenous sources of variation).⁵ One example of this approach is recent work by George Baker and Thomas Hubbard (1999) on trucking, in which the introduction of on-board computers is taken to have altered marginal returns to noncontractible driver care in particular ways (by making care contractible).

It is worth noting that good natural experiments for testing the PRT may also provide more stringent tests of the TCE. For example, increases in disagreement-payoff marginal returns to cooperative-investments under nonintegration raise the likelihood of integration in the PRT (see Table 1), but since such changes reduce quasi-rents, they would be predicted to reduce integration in the TCE. In fact, there are reasons to suspect that the relation between quasi-rents and integration may not be as clear as suggested by the current empirical literature on the TCE. Indeed, it appears that trading partners sometimes deliberately increase the extent of lock-in in their relationship by, for example, writing exclusive contracts or agreeing to joint ventures requiring unanimity. This suggests that firms may not always find such lock-in undesirable and so may not always integrate to avoid it, in contrast to the predictions of the TCE (but explainable with the PRT).

The second possible approach is more structural in nature. In particular, one might consider using data on outcomes to measure the marginal returns to investments, and then testing the PRT given these observed returns. But this approach

⁵ It may be harder, however, to find cases that have clear effects on marginal returns than ones that have clear effects on the level of quasi-rents.

encounters two serious difficulties. First, how can one measure investments that are assumed to be noncontractible in the theory? Second, how can one measure the effects of investments on disagreement payoffs when in the theory these payoffs are never observed? Overcoming these conceptual challenges seems essential for any structural effort to test the PRT.

Although existing empirical work on the TCE may not shed much light on the applicability of the PRT, the time seems right to do so, and also to subject the TCE to more stringent tests. This would go far toward advancing Coase's original agenda.

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