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ASSET SPECIFICITY AND ECONOMIC ORGANIZATION*

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This paper examines the optimization problem of firm and market organization in which both production cost and transaction cost differences are expressed as a function of asset specificity. In general, markets enjoy advantages by aggregating the demands of many buyers, thereby realizing economies of scale or scope. Such production cost savings need to be assessed in relation to the transaction cost advantages that internal organization sometimes enjoys over markets in adapting to changed circumstances. As it turns out, both production cost economies and the transaction cost differences between firm and market organization vary systematically with the characteristics of the investments. This paper employs a unified framework to assess the choice of organization form. The condition of asset specificity is featured.

1. Introduction

Transaction cost economics regards the transaction as the basic unit of analysis and holds that the organization of economic activity is largely to be understood in transaction cost economizing terms. Such economies are realized by aligning governance structures (of which firms and markets are the leading types) with the attributes of transactions in a discriminating way.

Technological features of economic organization are thus relegated to a secondary role by this approach. Given that successive stages of economic activity are technologically separable, how ought the trading interface to be organized? Vertical integration – or, in more mundane terms, the 'make-or-buy' decision – is the paradigm problem. Transaction cost economics maintains that the resolution of this issue turns on the attributes of the

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transaction, of which the condition of asset specificity is the most important.[1] A variety of related and some rather distant contractual relations turns out to be variations on this same underlying theme.[2] This is gratifying since, as Friedrich Hayek (1967, p. 50) observed, 'whenever the capacity of recognizing an abstract rule which the arrangement of these attributes follows has been acquired in one field, the same master mould will apply when the signs for those abstract attributes are evoked by altogether different elements'.

Although this transaction cost approach to contracting has been gaining wider acceptance,[3] it is not now and does not threaten to become the new orthodoxy. Even, moreover, among those who are persuaded that a transaction cost orientation is needed to get at the core issues of comparative economic organization, there is some discomfit with the apparent disjunction between neoclassical and transaction cost modes of economic analysis where the former emphasizes production costs and views the firm as a production function, while the latter focuses on transaction costs and regards the firm as a governance structure.

Both approaches, however, maintain an economizing orientation. And plainly production and transaction costs both need to be taken into account in any effort to realize a broadly conceived economizing result. This paper is an effort to pull these two cost categories together in a common framework. It is highly preliminary, in that we (1) deal only with polar alternatives, namely neoclassical markets and hierarchical firms of very stylized kinds, (2) look at only one transaction at a time, and (3) employ a reduced form type of analysis, in that we ascribe rather than derive the basic production and governance cost competencies of firms and markets.[4]

The paper mainly confirms implications that have been advanced earlier using more heuristic arguments. In this sense, there are few surprises – though this may be a surprise to those who hold different priors. Surprises or

[1]The argument is advanced and assessed in the theoretical, empirical, and public policy literatures in which transaction cost economics is featured. The theory is set out in Williamson (1971, 1975, 1979, 1983, 1985), Klein et al. (1978), Masten (1982), and Alchian (1984). Corroborating evidence is developed in Stuckey (1983), Monteverde and Teece (1982), Palay (1984, 1985), Masten (1984), Walker and Weber (1984), Anderson and Schmittlein (1984), and Joskow (1985). Applications to public policy include Williamson (1976, 1982), and Joskow and Schmalensee (1983).

[2]Variations on the basic transaction cost economizing theme include applications to labor market organization, vertical restrictions of various kinds, franchising, reciprocal trading (including product exchange agreements), regulation, corporate governance, and even family organization. This last is treated by Ben-Porath (1980) and Pollak (1985). The others are discussed in Williamson (1985).

[3]Alchian, who once held otherwise, now agrees that asset specificity is the key condition on which the study of firm and market organization turns (1984, pp. 38–39). The recent treatment of vertical integration by Grossman and Hart (1984) also assumes a condition of asset specificity.

[4]It is thus akin to Masten's earlier treatment of these matters (1982). While our analysis is more expansive, his treatment and ours both employ reduced form expressions.

not, the spirit of the analysis is consonant with that of economics quite generally: use more general modes of analysis as a check on the limitations that inform more specialized types of reasoning. This paper employs a unified framework to make a modest step in the direction of formalization. While we remain somewhat agnostic – believing, as we do, that there are both costs and benefits to formalization – it is in the spirit of Kenneth Arrow's recent remarks that new theories of economic organization take on greater 'analytic usefulness when these are founded on more directly neoclassical lines' [Arrow (1985, p. 303)].

The heuristic model and the factors responsible for cost differences among firm and market modes are sketched in section 2. The main model, in which asset specificity has only cost but no demand effects, is then set out in section 3. Demand features are the object of analysis in section 4. Concluding remarks follow.

2. The heuristic model

2.1. Asset specificity

Transaction cost economics maintains that the principal factor that is responsible for transaction cost differences among transactions is variations in asset specificity. Transactions that are supported by non-specific (redeployable) investments are ones for which neoclassical analysis is well-suited to deal. As a condition of asset specificity becomes more important, however, exchange relations take on a progressively stronger bilateral trading character. The reason is that parties to such trades have a stake in preserving the continuity of the relationship. Simultaneously, however, problems of adapting bilateral contracts to changing circumstances predictably arise. Autonomous market contracting is thus supplanted by more complex forms of governance as asset specificity deepens. New forms of dispute settlement (such as arbitration) may be created. Some transactions may be removed from the market and organized internally instead. The heuristic model gives content to this firm or market (make or buy) orientation.

2.2. Governance costs

Transaction cost economics maintains that complex, bilateral contracts are invariably incomplete. Contingencies will thus arise for which the appropriate adaptations have not been expressly agreed upon ex ante. Although it is always in the mutual interest of the parties to adapt efficiently, the disposition of the gain must be resolved. As compared with unified ownership of the two stages, autonomous ownership normally gives rise to more intensive, self-interested bargaining over the allocation of the adaptive gains.

Added contract execution costs thereby result. Autonomous ownership may therefore forego some potentially beneficial adaptations altogether. The upshot is that internal organization enjoys a progressive governance cost advantage over market organization as the condition of asset specificity deepens.

These differential costs of adaptation (expressed as a function of asset specificity) are not, however, the only transaction costs that distinguish firm and market. Also important, though less well developed, are the differential incentive and bureaucratic costs of firm and market organization. As developed elsewhere [Williamson (1985, ch. 6)], markets are extraordinary institutions for delivering high-powered incentives. Best efforts to preserve market-like incentives (e.g., transfer pricing and appropriability rules) within unified ownership notwithstanding, internal organization unavoidably experiences incentive degradation. Also, internal organization experiences a series of bureaucratic distortions (management excesses, investment renewal biases, and the like) as compared with market organization. Both of these incentive and bureaucratic effects, moreover, are relatively independent of the condition of asset specificity.

Accordingly, whereas internal organization is at a transaction cost disadvantage to the market where asset specificity is slight, this disadvantage decreases and is eventually reversed as the condition of asset specificity deepens. This is shown in fig. 1 by the curve (ΔG), which shows the transaction cost difference between firm and market organization as asset specificity increases (for a given level of output). The intercept (β_0) is positive and the curve has a negative slope throughout.

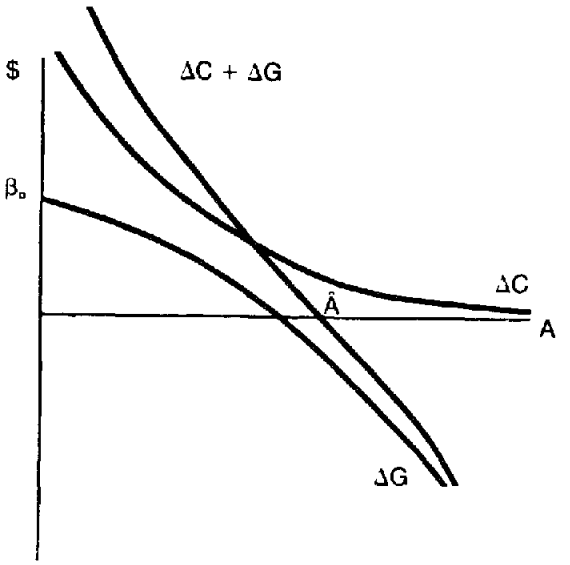

Fig. 1. Heuristic model.

2.3. Production costs

It can be and has been argued that firm and market are identical in production cost respects. To be sure, outside procurement might appear to be favored if a firm's needs for a good or service are not sufficient to support a plant of minimum efficient scale. The same would appear to be true for items that experience economies of scope. But since the firm can always realize the same scale or scope economies as an outside supplier, by selling product that exceeds its own needs on the market, the firm need not and presumably will not experience production cost diseconomies of either kind.

This argument assumes, however, that a firm can sell to others, including, often, its rivals, as effectively as can an independent supplier. It also ignores the possibility that the incentive and bureaucratic costs referred to above have cumulative features. Upon making allowance for these, the firm would appear to be at a production cost disadvantage in relation to the market.

These production cost diseconomies, however, are also a function of asset specificity. The diseconomies are arguably great where asset specificity is slight, since the outside supplier here can produce to the needs of a wide variety of buyers using the very same (large scale) production technology. As asset specificity increases, however, the outside supplier specializes his investment in relation to the buyer. This is the meaning of non-redeployability. As these assets become highly unique, moreover, the firm can essentially replicate the investments of an outside supplier without penalty. The firm and market production technology thus become indistinguishable at this stage.

Production cost differences between firm and market, whereby the firm experiences a production cost penalty when asset specificity is slight but these cost differences asymptotically approach zero as asset specificity becomes great, are shown by the curve ΔC in fig 1. As with the ΔG curve, the ΔC curve is drawn for a fixed level of output.

2.4. Combined effects

Total cost differences of firm and market organization are given by the vertical sum, $\Delta C + \Delta G$. This curve is positive initially but has a negative slope throughout and becomes zero at $\hat{A}$. The heuristic model of firm and market organization thus supports the following general conclusions: (1) market organization is the least cost mode if the optimal value of asset specificity is small; (2) internal organization is the least cost mode if the optimal value of asset specificity is great; and (3) neither mode enjoys a significant advantage (that is, it doesn't matter much which mode is chosen) for asset specificity values in the neighborhood of $\hat{A}$.

These results are obtained, however, by assuming that both modes produce the same level of output and that the optimal level of asset

specificity is the same for each. What happens when these simplifying assumptions are relaxed? More generally, what happens when the above relations of firm and market organization are digested in a maximizing framework of the more familiar neoclassical kind?

3. The main model

The cost differences discussed above are responsible for the reduced form geometry shown in fig. 1. The main model examined here is in the same spirit. The resulting models are somewhat more general, however. We examine their first-order maximizing and comparative statics properties. It will facilitate the argument to assume initially that firm and market have the identical production cost technology. This assumption will be relaxed in section 5.1. Demand features of asset specificity are reserved for section 4.

3.1. Common production technology

Revenue is given by $R=R(X)$, and production costs of market and internal procurement are assumed to be given by the relation

$$C=C(X,A;\alpha), \qquad C_X>0, \quad C_A<0, \quad C_{XA}<0,$$

where the parameter α is a shift parameter, a higher value of α yielding greater cost reducing consequences to asset specificity,

$$C_{A\alpha}<0, \qquad C_{X\alpha}<0.$$

Asset specificity is assumed to be available at the constant per unit cost of γ. The neoclassical profit expression corresponding to this statement of revenue and production costs is given by

$$\pi^*(X,A;\alpha)=R(X)-C(X,A;\alpha)-\gamma A.$$

Governance costs are conspiciously omitted from this profit relation, there being no provision for such costs in the neoclassical statement of the problem.

We assume that this function is globally concave. At an interior maximum the decision variables X^*, A^* are determined from the zero marginal profit conditions

$$\pi_X^*(X,A;\alpha)=0, \qquad \pi_A^*(X,A;\alpha)=0.$$

Consider now the governance costs of internal and market organization.

Let the superscripts i denote internal and m denote market organization. Governance cost expressions congruent with the cost differences described above are given by

$$G^{\mathrm{i}}=\beta+V(A), \qquad \beta>0, \quad V_A>0,$$

$$G^{\mathrm{m}}=W(A), \qquad W_A>0,$$

where $W_A>V_A$, evaluated at common A.

The corresponding profit expressions for internal market procurement in the face of positive governance costs are

$$\pi^{\mathrm{i}}=R(X)-C(X,A;\alpha)-\gamma A-(\beta+V(A)),$$

$$\pi^{\mathrm{m}}=R(X)-C(X,A;\alpha)-\gamma A-W(A).$$

The zero marginal profit conditions for internal procurement are

$$\pi^{\mathrm{i}}_X=R_X-C_X=0, \qquad \pi^{\mathrm{i}}_A=-C_A-\gamma-V_A=0.$$

Those for market procurement are

$$\pi^{\mathrm{m}}_X=R_X-C_X=0, \qquad \pi^{\mathrm{m}}_A=-C_A-\gamma-W_A=0.$$

In each instance, therefore, optimal output, given asset specificity, is obtained by setting marginal revenue equal to the marginal costs of production, while optimal asset specificity, given output, is chosen to minimize the sum of production and governance costs.

Given that $\pi^*_{XA}=-C_{XA}>0$, the neoclassical locus of optimal output given asset specificity and the corresponding locus of optimal asset specificity given output will bear the relations shown by $\pi^*_X=0$ and $\pi^*_A=0$ in fig. 2. The corresponding loci for internal and market organization are also shown. Inasmuch as the zero marginal profit expressions for output for all three statements of the maximand are identical, the loci $\pi^{\mathrm{i}}_X=0$ and $\pi^{\mathrm{m}}_X=0$ track $\pi^*=0$ exactly. The zero marginal profit expressions for asset specificity, however, differ. Given that $W_A>V_A>0$, the locus $\pi^{\mathrm{m}}_A=0$ is everywhere below $\pi^{\mathrm{i}}_A=0$, which in turn is below $\pi^*_A=0$. Accordingly, we observe that profit maximizing values of X and A for these three statements of the optimization problem bear the following relation to each other: $X^*>X^{\mathrm{i}}>X^{\mathrm{m}}$ and $A^*>A^{\mathrm{i}}>A^{\mathrm{m}}$. The output effects are indirect or induced effects, attributable to shifts in the zero marginal profit asset specificity loci.

Of course, the X^* and A^* choices are purely hypothetical since, in reality, a zero transaction cost condition is not a member of the feasible set. The

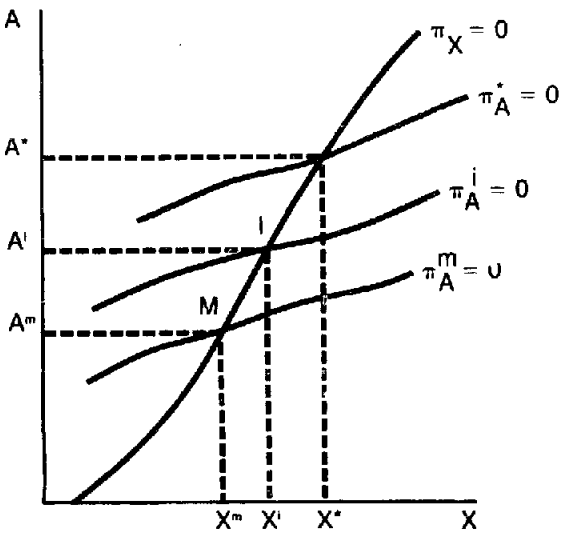

Fig. 2. For $\pi_{XA} > 0$.

relevant choices thus reduce to using input combinations I under internal procurement or M under market procurement. An immediate implication is that if the firm were operating in two identical markets and was constrained to buy in one and to make in the other, it would sell more goods of a more distinctive kind in the region where it produced to its own needs.

Ordinarily, however, the firm will not be so constrained but will choose to make or buy according to which mode offers the greatest profit in each region. Fig. 3 shows profit as a function of asset specificity, the choice of output assumed to be optimal for each value of A. Whereas there is a family of π^i curves, one for each value of the bureaucratic cost parameter β, there is

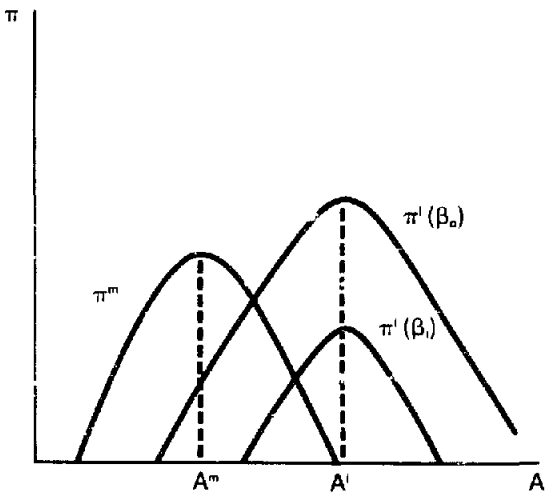

Fig. 3

only a single π^m curve. Which mode is favored depends on which has the highest peak. This is the internal mode for $\beta=\beta_0$ but the market mode for $\beta=\beta_1$, where $\beta_1>\beta_0$. The optimal value of A and X depends only on the mode selected and not on β, however, since β does not influence the marginal conditions.

The comparative statics ramifications of the production cost parameter α are more central to our interests. Applications of the envelope theorem reveal that

$$\pi^m_\alpha = -C_\alpha(X^m, A^m; \alpha), \qquad \pi^i_\alpha = -C_\alpha(X^i, A^i; \alpha).$$

Inasmuch as $X^i > X^m$ and $A^i > A^m$, it follows from our earlier production cost assumptions that $\pi^i_\alpha > \pi^m_\alpha$. In other words, as asset specificity has greater cost reducing impact, internal organization is progressively favored.

3.2. Production cost differences

Consider now the case, to which we referred earlier and is arguably the more realistic, where the firm is unable to aggregate demands and sell product that exceeds its own demands without penalty. Let $H(X, A)$ denote the production cost disadvantage per unit of output associated with internal organization. The production costs of the two modes then are

$$C^m = C(X, A; \alpha), \qquad C^i = C(X, A; \alpha) + H(X, A)X.$$

Assume that $H_X<0$ and $H_A<0$ but that $H(X, A)X$ is positive and asymptotically approaches zero as X and A approach infinity. Denote the marginal production cost disadvantage by $M(X, A)=H_X(X, A)X+H(X, A)$.

The analysis depends on the way in which the total production cost disadvantage experienced by internal organization changes for outputs within the relevant range. At low levels of output, decreasing unit cost disadvantages will normally be attended by an increasing total cost, whence $M(X, A)>0$. Beyond some threshold level of output, however, the total production cost disadvantage of internal organization will begin to decline. Indeed, as the firm progressively increases in relation to the size of the market, the production cost disadvantage presumably approaches zero – since firm and market have access to identical economies of scale as a monopoly condition evolves. Accordingly, $M(X, A)<0$ once this threshold is crossed.

Our main results are strengthened within the (large output) range where $M(X, A)<'$ $X^m<X^i$; $A^m<A^i$; and $\pi^i_\alpha>\pi^m_\alpha$. Within the (small output) range, however, where $M_X>0$, the marginal production cost disadvantage of internal organization and the marginal governance cost disadvantage of

market procurement operate in opposite directions. An unambiguous ordering of optimal output and asset specificity is not possible in terms of the above-described qualitative features of the problem in this instance. An anomaly thus arises that was not evident in the heuristic presentation in section 2.

4. Demand effects

Another possibility is that asset specificity yields design benefits but has no direct effect on production costs. Thus suppose that a die can be shaped to produce a very special effect (a tailfin on an automobile), a semi-special effect (in that the die can be redeployed, albeit at reduced value), or a standard product. Production cost differences may be (and will be assumed to be) insubstantial. The main effects take the form of demand shifts and governance cost changes.

The three profit expressions corresponding to this statement of the problem are

$$\pi^* = R(X, A; \delta) - C(X) - \gamma A,$$

$$\pi^m = R(X, A; \delta) - C(X) - \gamma A - W(A),$$

$$\pi^i = R(X, A; \delta) - C(X) - \gamma A - (\beta + V(A)),$$

where $R_A > 0$, $R_{XA} > 0$, $R_{A\delta} > 0$, $R_{X\delta} > 0$ and δ is a demand shift parameter.

Again, the locus of optimal X given A will be identical for each of these profit expressions, while the locus of optimal A given X will move progressively down from neoclassical to internal to market in that order. The output and asset specificity relations reported under the main model are thus preserved. Increases in the demand enhancement parameter δ, moreover, have the expected effect: internal organization is relatively favored over market organization as the demand enhancement effects of added specificity increase. The differential advantage of internal organization is explained by the respective marginal governance cost penalties that accrue to asset specificity under firm and market modes.

5. Conclusions

The foregoing demonstrates that conventional demand and production cost analysis can be augmented to include governance cost features. The comparative institutional ramifications of the two can then be explored. The apparent gap between the orthodox theory of the firm and the transaction cost economics approach to the study of firm and market structures is thus narrowed as a consequence.

Extensions to this approach are, moreover, possible. A progressive operationalization of the economics of transaction costs will thereby result. A high priority for further research should be an assessment of comparative transaction costs within more specific models of organizational choice.

With reference to consumer welfare, the main implication of the argument is this: firms that decide for profitability reasons to integrate (produce to their own needs) will produce more and realize lower costs than if they were constrained by public policy to procure from the market. Note in this connection that we treat all costs – production and governance, market and internal – as social costs. Market governance costs do not therefore reflect rents but rather are added costs due to maladaption [being off the 'shifting contract curve', in the language of Masahiko Aoki (1984)] and haggling costs. These are real costs for which full social cost valuation is warranted.

The models and the above welfare argument make *no provision*, however, *for strategic behavior*. Strategic incentives to integrate intrude where integration by a firm that is large in relation to the market, and for which integration promises little in the way of cost savings, nevertheless disadvantage actual and potential rivals – because the remaining market is too small to support competitive supply and rivals experience cost penalties should they produce to their own needs [Williamson (1974)]. In circumstances, therefore, where the preconditions for strategic behavior are satisfied – namely, in dominant firms or highly concentrated industries where the condition of entry is difficult – decisions to integrate cannot be accepted with equanimity but need also to be assessed with reference to their strategic consequences. The difficult cases, of course, are those where vertical integration economies and entry impediments are both non-trivial. Integration, however, that gives rise to negligible economies (maybe even, in consideration of the adverse incentive and bureaucratic cost consequences of internal organization, diseconomies) and is responsible for severe entry impediments is plainly problematic if not outright antisocial.

Note that we treat asset specificity as being all of a kind. In fact, asset specificity takes at least four different forms: site, physical, human, and dedicated assets [Williamson (1983)]. These different forms of asset specificity, moreover, have somewhat different ramifications for the economics of organization. The empirical tests discussed below do not make these distinctions and thus can be further refined.

The crude argument is instructive nevertheless. It predicts that vertical integration will be more common where (1) cost savings that accrue to asset specificity are great, (2) design features deter asset redeployment to alternative uses, (3a) economies of scale are small or, (3b) as among firms of different sizes, that larger firms will be more integrated than smaller, and (4) bureaucratic cost consequences of internal organization are less severe. These are all plausible propositions and appear to be consonant with the data –

although these matters have only recently come under review and the data need much more systematic development. We nevertheless submit that corroborative support for each of the propositions can be found – and in some cases is bountiful. The following are illustrative:

(1) Forward integration out of manufacturing into distribution is much more common for durable products that require idiosyncratic knowledge of product attributes, in order effectively to sell and service an item, than it is for products which lack these features. Human asset specificity in sales and service thus favors forward integration out of manufacturing into distribution. American experience at the turn of the century appears to correspond with this prediction [Porter and Livesay (1971), Chandler (1977), Williamson (1985, ch. 5)].

(2) Rolling stock that is easily redeployable among shippers is owned by carriers while that which is specialized to shipper needs and cannot be redeployed except at great sacrifice is owned by shippers [Palay (1984)]. This is also consonant with the hypothesis.

(3) Casual observation suggests, though the data, to our knowledge, are not very well developed in this respect, that larger firms are more integrated than smaller rivals. [See Monteverde and Teece (1982) for support in the automobile industry.]

(4) Social scientists have not given a great deal of attention to bureaucratic costs. Comparative assessments are especially few, which is especially regrettable.[5] Alfred Chandler has nevertheless interpreted the shift from the functional (or U-form) to the multidivisional (or M-form) organization as being driven in part by the bureaucratic distortions in the former that are alleviated by the latter. This is responsible for the M-form hypothesis: '*the organization and operation of the large enterprise along the lines of the M-form favors goal pursuit and least-cost behavior more nearly associated with the neoclassical profit maximization hypothesis than does the U-form organizational alternative*' [Williamson (1970, p. 134)]. Although the evidence is not extensive, it appears again to be broadly corroborative [Armour and Teece (1978), Steer and Cable (1978)].

We conclude with a caveat: the argument throughout has emphasized polar firm and market choices. This facilitates the analysis, but it ignores an important class of hybrid modes of organization – of which joint ventures, franchising, and a variety of complex forms of 'relational contracting' are examples. Recent studies of economic organization disclose that these hybrid modes are much more important than had hitherto been realized [MacNeil

[5]The sociology literature often documents managerial discretion, but rarely in a comparative institutional way. [An example is Dalton (1959).] Thus if all forms of organization are subject to identical distortions in relation to a hypothetical ideal, then none afford relief. Distortions that are irremediable lack comparative institutional significance.

(1974), Goldberg (1976), Klein (1980), Joskow (1985), Williamson (1985)]. Future descriptive, theoretical, and empirical studies of economic organization will presumably make more adequate provision for these hybrid modes.

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