Capabilities and Coherence in Firms and Markets

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Production requires human beings and machines to undertake various particular tasks within a coordinated division of labor. When — and why — such activities are undertaken within organizations called firms rather than coordinated through markets is a question that has drawn considerable attention in the last 20 years or so, in both economics and the literature of corporate strategy. Few writers who have attempted an answer to this question have seen fit to take the precaution of defining thoughtfully what they mean by a "firm" or a "market"; most have preferred instead the familiar appeal to tacit knowledge: I know one when I see one. There is some merit to this position, and this paper will certainly not provide the kind of careful philosophical study the task of definition would require. Nonetheless, it is my premise here that a more careful attention to the *nature* of firm and market — to use Coase's almost essentialist term — would well repay the effort and would help to shed light on the question of the boundaries between those two institutional forms.

Strategic factors: contestable and non-contestable.

It was of course Coase's famous answer to the "why are there firms?" question that set the tone for most of subsequent theory. The firm exists, Coase argued, because there is a cost to using the price system. And "a firm will tend to expand until the costs of organizing an extra transaction within the firm become equal to the costs of carrying out the same transaction by means of an exchange in the open market or the costs of organizing in another firm" (Coase 1937, p. 395). Inspired by Coase, a school of transaction-cost economics sprung up in which peculiarities in the process of exchange — that

is to say, the costs of contracting — explain the firm. Costs of production figure in very little, and the process of production even less (Winter 1988).

More recently, however, an alternative approach has begun to coalesce in which production figures prominently and contracting costs take a back seat. Inspired by Edith Penrose's (1959) theory of the growth of firms, some economists and students of business strategy have come to stress the importance of the distinctive productive and organizational knowledge that firms possess.[1] In an early and important, albeit strangely neglected, contribution, G. B. Richardson (1972) coined the term *capabilities* to refer to the distinctive knowledge and abilities a firm possesses. Those capabilities determine which activities a particular firm can undertake effectively. To the extent that a firm undertakes more than one activity, it will tend to stick to activities that are *similar*, that is, activities that draw on more-or-less the same capabilities. The chain of production, however, requires a sequence of activities that are *complementary* but not necessarily similar. For example, a firm producing ink may have capabilities similar to those needed for producing clothing dyes but not at all similar to those needed for activities — like paper-making, printing, or manuscript acquisition — that are complementary to ink in the chain of book production.

None of this denies the importance of transaction costs in determining the boundaries of the firm. In fact, in articles that parallel Richardson quite closely, David Teece (1980, 1982) has argued that production-cost concerns alone do not determine whether complementary activities will take place

[1] For a more careful discussion of the various approaches here, see Foss, Knudsen, and Montgomery (1993).

under joint ownership and control, even when there are technological indivisibilities or so-called economies of scope in the production function. And, indeed, Richardson points out that even dissimilar activities may require joint ownership and control when they are closely complementary — an implicit argument from transaction costs. Nonetheless, Richardson believes that, in a world of complementary activities requiring dissimilar capabilities, we will tend to see a pattern of (what would nowadays be called) strategic alliances among firms each of which is fundamentally limited in its scope. As Brian Loasby (1991, p. 81) rightly observes, this has the effect of standing on its head the principal presumption of transaction-cost theorists: that such contractual relationships among firms must generate the hazard of opportunism and thus lead to vertical integration. Richardson's vision is one in which the difficulties of managing dissimilar activities outweigh contractual hazards on the whole and militate in favor of widespread disintegration.[2]

How does this "capabilities" approach fit with the Coasean dictum that firms exist because of the costs of using the price system? True to its neoclassical roots, transaction-cost economics starts from the unarticulated presumption that all factors of production are readily available on "the

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[2] A number of writers have made the argument that distinctive productive competences tend to outweigh transaction-cost consideration in the explanation of integration. For example, Paul Hallwood (1994) has made this case in the context of the multinational. And Bruce Kogut and Udo Zander (1992, p. 394) argue more generally that "opportunism is not a necessary condition to explain why technology is transferred within the firm instead of the market. Rather, the issue becomes why and when are the costs of transfer of technology lower inside the firm than alternatives in the market, independent of contractual hazards. The relevant comparison, in this sense, are the efficiencies of other firms. ... [T]he most important variable is the indicator of differential firm capabilities, that is whether the firm or supplier has the lower production costs. Transaction-cost considerations matter but are subsidiary to whether a firm or other suppliers are more efficient in the production of the component."

market." Sometimes the outputs of some activities wouldn't be worth buying, in the sense that it would be cheaper to produce them internally. But one could in principle buy the output of any activity one wishes. By contrast, it is a theme in the capabilities literature that some activities can be undertaken *only* within the firm. This implies that the outputs of certain activities are not only more costly if acquired on the market but may even be unobtainable in principle. One way in which this might occur is if the capabilities the firm possesses to engage in a specific set of activities are distinctive (that is, not possessed by others) and *inimitable*.[3] For example, Mahoney and Pandian (1992) distinguish between "contestable synergy" and "idiosyncratic synergy."[4] When factors or resources — terms I will use interchangeably to refer to the outputs of activities that are part of the production process — are contestable, there is "a combination of resources that create value but are competitively available" (Mahoney and Pandian 1992, p. 368). Idiosyncratic synergy, on the other hand, occurs when the outcome is specific to the particular resources that are being combined and substitutes are not available.

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3 Dierickx and Cool (1989), for example, argue that the firm possesses certain critical or strategic asset stocks that are nontradable, nonimitable, and nonsubstitutable. The last of these presumably means that a rival firm cannot produce the same output using an alternative set of capabilities.

4 Mahoney and Pandian actually refer to "idiosyncratic bilateral synergy," which they define as "the enhanced value that is idiosyncratic to the combined resources of the acquiring and target firms" (1992, p. 368). As I am interested in the broader context of the boundaries of the firm — which may involve any number of activities sharing idiosyncratic synergy — I will simply talk about contestable and non-contestable activities.

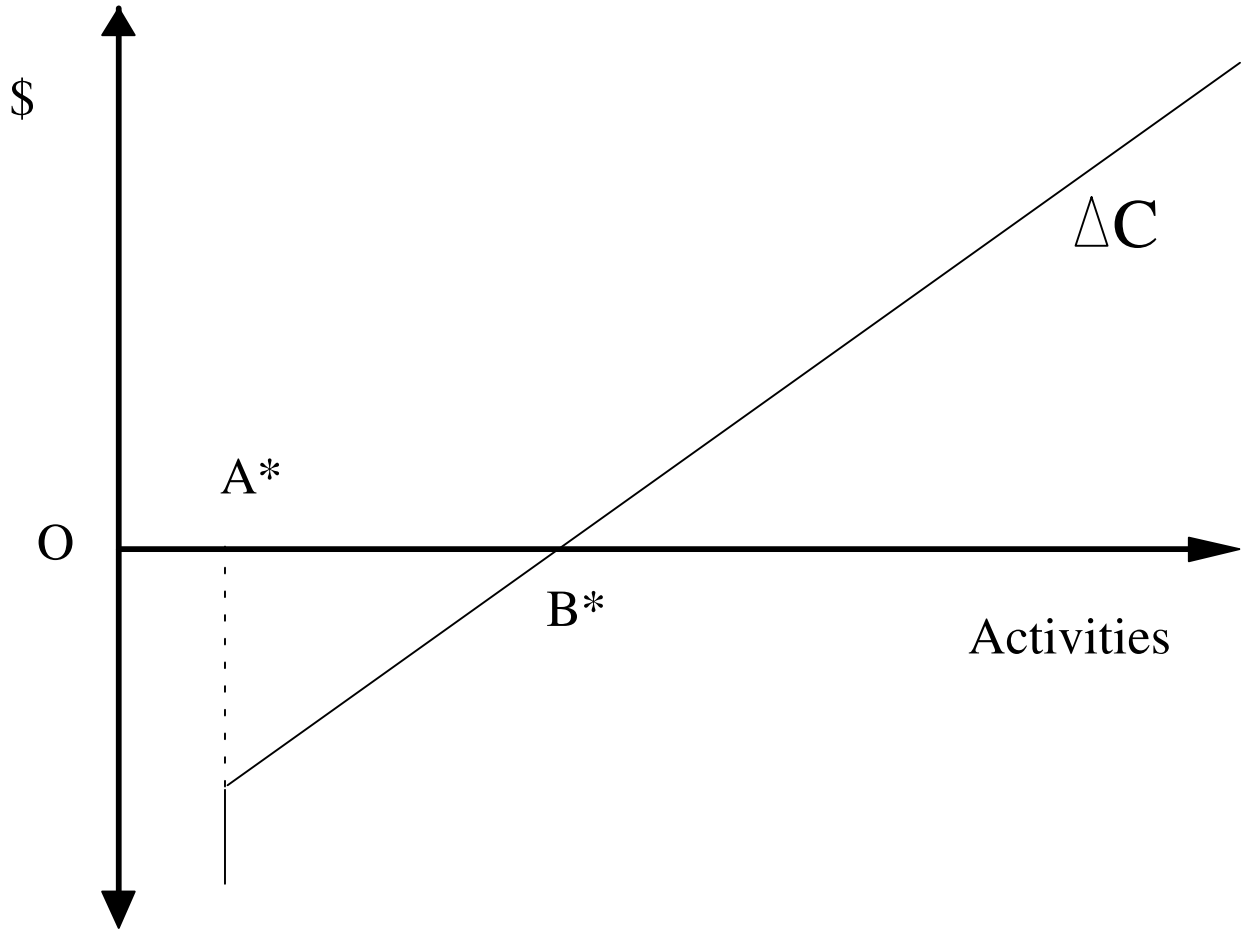

Figure 1

Consider figure 1. On the X-axis we can array activities or stages of production in order of increasing cost of internal production. Specifically, ΔC graphs the normalized per-unit cost premium the firm must pay for the output of a particular activity if it integrates into that activity, measured relative to the per-unit cost it would incur by obtaining the output on contract from a distinct firm. Whenever this premium is negative, there is a cost advantage to internal organization. And, as Coase suggested, the firm will acquire additional activities until the premium is zero, in this case at B*. Activities in the range OB* are within the boundaries of the firm; the rest are left to the market. If, because of idiosyncratic synergy and lack of imitability,

the outputs of certain activities are not separately available in the market (over some specified "run"), then the cost advantage to internal organization is effectively infinite. These activities constitute what we can call the "core" of the firm. In figure 1, the core consists of those activities in the range OA*.

Although it may not be the only way to look at the matter, this Coasean formulation is helpful in a number of respects. Notice, for example, that "the market" is always the benchmark. But what is "the market"? Is the relevant benchmark an ideal market or an actually existing market? "Market failure" is everywhere a loaded and misleading term. But there is nonetheless a difference between saying that firms exist because a specific actually existing market "failed" and saying that firms exist because markets always (or at their best) "fail," i.e., that firms can do what markets can never do. I want to make the case that firms are superior to hypothetical markets (markets at their best)[5] only in a very specific and limited sense. In order to make this case, let us look in detail at the reasons why ΔC might be negative, that is, why firms might find themselves undertaking certain activities internally rather than procuring the outputs of those activities externally.

We can consider two logically distinct categories: *contestable factors* and *non-contestable factors.* In the first category, the complementary factors necessary for production are available from other firms (that is, available from "the market") at least as cheaply as they can be produced internally. (By "at least as cheaply" I mean to include only production costs in the traditional sense and to exclude transaction costs and other as-yet-

5 As I will make clearer below, my ideal of a market at its best is not the neoclassical picture of atomistic, timeless, anonymous, spot-contract exchange.

unidentified costs.) The second category encompasses the situation in which the necessary complementary resources are not available as cheaply elsewhere. This obviously includes (a) the case in which the resources are in fact available on the market but the firm is able to produce more cheaply internally and (b) the case in which the resources are simply unavailable elsewhere.

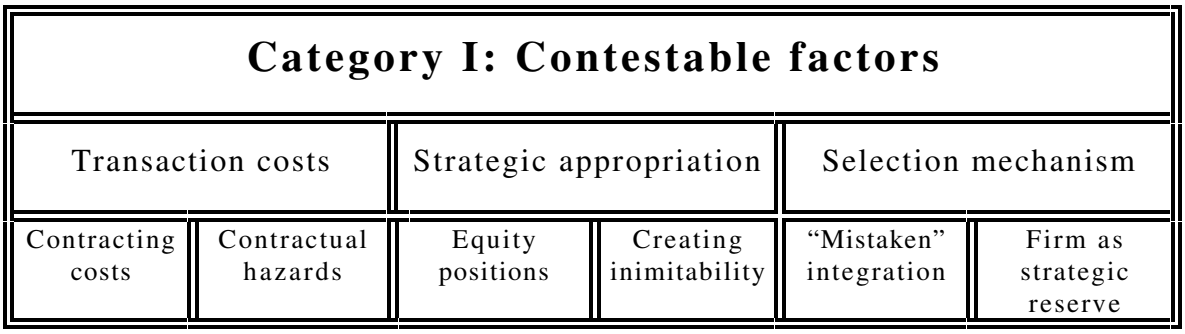

Figure 2

Contestable resources.

If all resources are contestable, production costs do not explain the extent of the firm — the market can always do at least as well as the firm. Thus, there must be other reasons for the existence of the firm. (See figure 2.) Here, of course, we find the traditional bailiwick of transaction-cost economics. Although Williamson (1985), for example, is clear that he seeks to explain organizational forms as minimizing the sum of production costs and transaction costs,[6] his analytical interest lies unmistakably with the case in which production-cost differences are not crucial.[7]

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6 On the functionalist character of this kind of explanation, see Langlois (1984, 1986). I will touch on this issue presently in a slightly different guise.

Transaction costs.

There are a number of ways to decorticate the transaction-cost onion. For present purposes I will list only contracting costs and contractual hazards. The former are principal among the possibilities Coase had in mind: a firm-like organization might be superior if it is costly constantly to renegotiate contracts in a market. The standard parable is that of the secretary. It would be costly to consummate a separate piece-rate contract each time one wanted a letter typed or a phone answered. It is thus a better idea to hire the secretary under an employment contract, which delimits possible tasks only in broad outline and allows the employer to specify more precisely as needed.[8] The second category is that of contractual hazards, which arise because of "opportunism." Following Alchian and Woodward (1988), we can split these hazards further into cases of opportunism caused by asset specificity and instances of opportunism driven by moral hazard. The first case arises when one or both parties have invested in assets highly specific to a particular transaction; in view of these specific assets, one party may try to "hold up" the other in an attempt redistribute the rents of production in his or her favor. The possibility of such opportunism *ex post* is a cost of contracting *ex ante.* Moral Hazard arises whenever there is enough

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7 A point with which Williamson (1988, p. 361) himself agrees.

8 This example is in many ways more subtle and interesting than the contractual-hazards view of transaction costs. The costs of contracting here are in many ways a response to uncertainty — one cannot predict ahead of time which tasks will be required at any particular time, which calls for a form of organization that is adaptable. (For an excellent development of this idea of task uncertainty, see Stinchcombe (1990), chapter 2.) In this sense, Coase's conception of the nature of the firm is not far from the idea of the firm as a strategic reserve against uncertainty or, indeed, the Knightian theory of the firm (both of which I develop below).

"plasticity"[9] in a transacting relationship to allow one party to attempt to pursue his or her own interests at the expense of the other party. This too is obviously an *ex ante* cost of contracting.

Indeed, phrased this way, the two kinds of opportunism are not very different. Carl Dahlman (1979) long ago pointed out that all transaction costs are at base information costs. More specifically, opportunism and moral hazard both produce costs because and to the extent that the writers of contracts do not have the information (or knowledge) necessary to specify all possible contingencies in advance or to determine whether all parties are in fact adhering to the terms of the contract. Therefore, as I have argued elsewhere (Langlois 1992b), all traditional transaction costs (whether Coasean costs of contracting or costs that arise from contractual hazards) are essentially short-run phenomena. They occur only in the true Marshallian short run, which is the time before major uncertainties have resolved themselves and before production has settled into routine. In a (hypothetical) long-run world in which change has ceased,[10] routine (or, rather, *routines* in the sense of Nelson and Winter (1982)) attenuate any problem of writing repeated contracts; plasticity vanishes; and various external social institutions arise to mitigate any residual tendency to opportunism or moral hazard.

The relevant point here is that, if a short-run of change and uncertainty accounts for the kinds of transaction costs that preoccupy the

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9 A term from Alchian and Woodward (1988).

10 This concept of the long run is essentially equivalent to Schumpeter's (1934) notion of the circular flow of economic life. For an argument that it is also Marshallian, see Currie and Steedman (1990).

literature, then perhaps we ought to look not at transaction costs *per se* but at their source: change and uncertainty. As may perhaps be obvious, but as I will argue anyway, change and uncertainty arguably offer us explanations for the existence of firms that go beyond traditional transaction-cost explanations.

Strategic appropriation.

As figure 2 suggests, another class of explanations focuses on problems of appropriability. David Teece (1986), for example, has suggested that one might want to internalize certain complementary activities in order to profit from the appreciation of assets associated with those activities. Of course, appropriation of this sort may require nothing more than an equity interest (Casson 1982, pp. 206-8). At least in principle, an investor at the turn of the twentieth century needed only go short on buggy whips and go long on automobile parts in order to profit from a perception that automobiles would come rapidly to replace buggies.[11] Suppose, on the other hand, that the investor needs to *create* the possibility of appreciation by innovating, that is, by deliberately altering the existing chain of complementary activities in some way.[12] If there are no effective patent barriers to imitation, the entrepreneur might be motivated internalize the activities into an

[11] And, in fact, General Motors, unlike Ford, started out as little more than a holding company. But, as I will suggest below, even Billy Durant, GM's founder, had actually to coordinate production in order to reap the benefits he sought.

[12] This does not violate the assumption that the firm does not have superior production costs: in the more-or-less neoclassical world of figure 2, imitation is costless, so other firms could in fact produce just as cheaply. In the terminology of Barney (1991), strategic factor markets are perfectly competitive.

organization like a firm in order to throw up, as it were, homemade barriers to imitation.[13] The more general case, of course, is one in which knowledge is not instantly and costlessly transferred; and one might well wonder whether the ubiquity of inherent difficulties in imitation does not call into question the importance of the appropriability argument (the artificial creation of barriers to imitation) as a rationale for internal organization.

Selection mechanism.

A key assumption of the Coasean approach to explaining the boundaries of the firm is that the organizational forms we observe reflect (and therefore may be explained in terms of) the minimizing of production and transaction costs. This is a somewhat problematical assumption.[14] If we transport out of the neoclassical world into a more evolutionary space, we might well wonder whether selection pressure is always strong enough to weed out inefficient forms right away.[15] John Jewkes (1930) long ago suggested, for example, that vertical integration may be prevalent during periods of rapid growth because the excess demand during such periods permitted the existence of highly integrated structures that would otherwise have been revealed to be inefficient. In a boom period, the personal peculiarities of particular

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[13] Aren't I forgetting other kinds of "barriers to entry" that might lead to integration? Demsetz (1982) has effectively demonstrated that the only sensible meaning of a barrier to entry is a property right — like a legal monopoly, a patent, or even a simple title to assets, which includes the right to prevent or limit access in order to create inimitability. It is significant that Rumelt (1987, p. 145) uses the term "quasi-rights" to refer to the various "lags, information asymmetries, and frictions" that slow imitation.

[14] Again, see Langlois (1984, 1986) for a more detailed development.

[15] See Levinthal (1992) for a discussion of many of the issues involved.

entrepreneurs may be vital, especially when one or more of the leading firms is controlled by an empire builder who instinctively favors integration. And even Williamson (1985, p. 119) allows of the possibility of "mistaken" integration, citing as an example the empire Henry Ford built on the Rouge.

Brian Loasby (1991, p.32) puts an intriguing twist on this argument. Like the institution of money, an institution like a firm can function as a "strategic reserve" against an unknown future.[16] Even when one can purchase resources as or more cheaply on the market, one may prefer to produce internally in order to maintain within the organization a set of capabilities that could not otherwise be as easily redeployed in the face of changed circumstances.[17] Thus, rather than being "mistaken," integration that looks inefficient (that is, high cost) from the perspective of a moment in time may actually be more efficient than nonintegration over the longer haul. I will return to these ideas below. Notice, however, that this argument reinforces the point I made above: organizational forms may arise because of uncertainty and the lack of knowledge about the future — in a sense more general than is implied in standard transaction-cost arguments.[18]

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16 This argument goes back, in spirit at least, to Loasby (1976). See also Loasby (1993, 1994).

17 Obviously a thorough analysis of this idea would require modeling of how various institutional forms survive under various regimes of institutional change. This is an intriguing research agenda for the future.

18 Williamson (1991, pp. 292-293) does mention the idea that firms may possess greater adaptability than contracting. But he does not make this in any way a central organizing principle in his work.

Non-contestable factors.

Consider now the second — and arguably more important — category: situations in which strategic resources are not contestable, that is, situations in which the outputs of some activities are not available on the market at production costs less than or equal to those of internal organization. As figure 3 suggests, there are two alternatives. Either the outputs are inherently unavailable on the market or they are unavailable temporarily. In the first case, the possessor of the required capabilities can never be imitated: even a market at its best can never do what the firm can do. In the second case, the firm's distinctive capabilities give it access for a time to certain strategic factors that the market — other firms — cannot match; eventually, however, those capabilities diffuse into the market so that, *ceteris paribus*, the firm loses its production-cost advantage.[19] In the second case, then, firms are superior not to markets at their best but to actually existing markets, which may ultimately get better.

Category II: Non-contestable factors			
Inherently non-contractible		Temporarily non-contractible	
Judgment	Entrepreneurship	Schumpeterian integration	Penrosean growth

Figure 3

[19] Actually, the firm's own capabilities do not have to diffuse. All that is required is that others in the economy learn to produce the same outputs at equal or lower cost. Those outsiders may in fact learn to produce the same results using entirely different kinds of capabilities.

If one is to make the argument that firms exist because they are inherently superior to markets — because firms can do certain things inherently better than markets, even markets at their best — then one has to specify why markets cannot do whatever it is one thinks firms do better. And the answer has to be that some factor is inherently non-contractible: because of its very nature, some factor can never be sold on the market, and therefore its production must necessarily be undertaken together with one or more other activities. We can imagine a number of activities whose outputs are perhaps inherently *costly* to exchange through markets. The results of research and development is an oft-cited example (Caves, Crookell, and Killing 1983). But costly is not impossible.

Judgment and entrepreneurship.

Two candidates for inherently non-contractible activities are judgment and entrepreneurship.[20] These are closely related, and may even be two words for the same thing. By "judgment" I have in mind a function that Frank Knight (1921) saw as central to explaining the existence of firms. Knight's theory is much controverted and misunderstood; but what I view as a correct reading would go something like this (Langlois and Cosgel 1993). Because of the non-mechanical nature of economic life, novel possibilities are always emerging, and these cannot be easily categorized in an intersubjective way as

[20] To the extent that one wishes to view the production of certain kinds of knowledge, including perhaps some kinds of R&D, as inherently non-contractible, it is arguably because that production actually partakes of judgment or entrepreneurship.

repeatable instances. To deal with this ("Knightian") uncertainty, one must rely on judgment, that is, on an ability to process complex and incomplete information usefully in an intuitive way.[21] Such judgment will be one of the skills in which people specialize, yielding the usual Smithian economies. Moreover, some will specialize in the judgment of other people's judgment, which leads to the hierarchical relationship we know as a firm. Notice that this idea is related to, if perhaps a bit more general than, Coase's idea of task uncertainty. It is also obviously related to the idea of the firm as a strategic reserve against the future.

In precisely what sense, however, is judgment non-contractible? If one specialty in a world of novel possibilities is to judge the judgment of others, why cannot the judgment of others, once judged, be hired on contract? More precisely, why cannot one hire judgment through a type of contract other than the employment contract, which, in some eyes, defines the firm? The answer must be that, because one can judge the judgment of another only at an abstract level — that is, because one by definition cannot predict in detail how the hired judgment will be exercised[22] — the buyer of judgment cannot write a fully specified contract with the seller of judgment.

The result of this non-contractibility (or imperfect contractibility) need not always be a firm. In many cases, contracting parties of various sorts are able to function with ongoing open-ended contracts (Ben-Porath 1980).

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[21] On this point see Eliasson (1990), pp. 282-283. Also see Schumpeter's (1934) famous discussion of the intuitive character of entrepreneurship.

[22] See Minkler (1993) for a discussion of the case in which the knowledge of agents differs qualitatively from that of principals, who therefore cannot monitor agents even when information (in the sense of traditional principal-agent models) is costless.

Nonetheless, a number of writers have argued, in a rather Knightian spirit, that in the end the exercise of judgment must be linked to another activity, which we can call responsibility or control. The recent literature on incomplete contracts (Grossman and Hart 1986; Hart 1988, 1989; Moore 1992) distinguishes between two types of rights one might possess under a contract: specific rights and residual rights. Specific rights are those spelled out, as it were, in black and white; residual rights are whatever rights are "left over," that is, rights to decide or to have one's way under circumstances not specified in the contract. The possession of residual rights is the possession of control or responsibility. If the acquisition of another's judgment implies contractual incompleteness, and if contractual incompleteness implies the existence of residual rights, then the individual who exercises judgment in the acquisition of another's judgment must also necessarily undertake the activity of responsibility or control. The exercise of judgment thus logically implies vertical integration.[23]

We might well wonder, of course, whether this kind of integration explains very much about the firms we observe in the world. In the hands of the present-day theorists of incomplete contracts, non-contracibility has

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[23] The possibility of contractual incompleteness resulting in an ongoing open-ended contract rather than an employer-employee relationship is not a counterexample. Even in open-ended contracts there have to be residual rights. Often those rights are specified de facto or by convention. In the mostly defunct traditional marriage contract, for example, the husband and wife each had spheres of decision-making assigned to them by convention — the wife in areas of internal household management, the husband in areas of external relations. In such a case, we can say that the functions of responsibility and control are partitioned. It is also conceivable, however, that residual rights are so poorly specified that neither party exercises them. Of course, restraint from exercising one's rights of control may in some cases have the external benefit of helping the long-run functioning of the organization. But poorly specified rights of control that can never be exercised arguably lead to inefficiency. The complaint that no one is in charge or no one takes responsibility is a familiar one in organizations, and its implications are well known.

strong implications for the boundaries of the firm (and, indeed, the definition of the firm). For these authors, the Knightian function of judgment is necessarily integrated not only with responsibility and control but also with the *ownership of assets.* For example, Grossman and Hart (1986, p. 694) "virtually define ownership as the power to exercise control." That is, they hold not only that contractual incompleteness implies rights to control but also that rights to control imply ownership of assets. This is not a nonsensical position. Responsibility and the right to control are surely rights that owners possess under at least some meanings of ownership. If we accept the identification of responsibility and control with ownership, then contractual incompleteness has implication for the ownership of assets. Consider two assets that cooperate in production. If unforeseen contingencies call for a reorientation of the productive process and a reworking of the contractual relationship, the two separate owners would have to agree on a course of action. Because of differences in knowledge and bargaining power, that reorientation could proceed inefficiently — for example, if the owner whose asset contributed relatively little to the joint rents of production were the one with the greater portion of control, that owner might choose a course of action that maximizes his or her return at the expense of the total joint rents. The prediction of incomplete-contracts theory is thus that the owner whose contribution is significantly more important to the joint rents will tend to exercise all the residual rights of control by buying out the other asset owner, possibly hiring him or her as an employee to operate or manage the asset.[24] The extent of asset ownership also serves as a definition of the extent of the firm.

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[24]Yoram Barzel (1987) tells a strikingly similar story from the perspective of moral-hazard

Notice, however, that this link between control and ownership of assets depends on the possibility of opportunism, which returns us to the "contractual hazards" box in figure 2. As I argued in that context, opportunism is not an inherent problem of markets but is a short-run problem, a problem of certain actually existing markets. Can we assert that ownership of assets is inherently inseparable from responsibility, control, or the exercise of judgment? One author who thinks otherwise is Israel Kirzner (1973). In his theory of entrepreneurship, as in that of Knight, entrepreneurship arises as a consequence of the possibility of novelty. For Kirzner, entrepreneurship consists in the alertness to or noticing of new and superior means-ends relationships. Rather than merely doing the best one can with given alternatives, entrepreneurship involves discovering new alternatives. Kirzner (1973, p. 83) agrees with Knight that entrepreneurship is inseparable from responsibility and control. But he also insists, with Schumpeter,[25] that the entrepreneur is never an asset owner. "Purely entrepreneurial decisions are by definition reserved for decision-makers who own nothing at all" (p. 47). Owners are just suppliers of factors. And what they earn is not profit: if they are lenders of capital, they earn interest, and if they are asset owners, they earn quasirents (p. 55). Only entrepreneurs earn profits, the pure return to noticing new alternatives.

Louis Putterman (1988) has raised some of the same issues, albeit in different language. He points out that, in much of the literature, there is an

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theory.

25 In Kirzner's view (1973, p. 81), Schumpeter's notion of the entrepreneur as someone who "carries out new combinations" (Schumpeter 1934, p. 66) is a special case of Kirzner's own more general and abstract conception.

implicit or explicit assertion that "the party that *controls* the firm, or chooses its production program, is also the party that has contractual rights to dispose of the residual income of the firm" (p. 247, emphasis original). In this interpretation, then, control means "choosing the production program," which is arguably an entrepreneurial function. And the entrepreneurial control function is linked not to ownership of assets but to ownership of the bundle of residual rights. It is this bundle of rights that gets bought and sold as the commodity called the firm.

Do responsibility and control imply ownership? And if so, ownership of what? This is an intriguing question, but one best left for another place. The important question here is this: can we say that the function of judgment (or entrepreneurship), made necessary by a world of novel possibilities, logically implies a firm-like organization? To put it another way: does the necessity of judgment imply an area in which firms are inherently superior to markets, even "markets at their best"? Consider Massimo Egidi's assertion "that organizations perform a more complex function than the market; i.e, they take on the function of designing the division of labor and the function of coordinating the tasks so divided, while the market limits itself to coordinating the activities of its agents within a structure of the division of labor that has already been established" (Egidi 1992, p. 148). But does one need "an organization" to accomplish this more complex function? Can an entrepreneur effect change in the existing division of labor simply by persuading other independent economic agents to change their production plans and enter into a new pattern of contracts?[26]

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[26] Consider, for example, the case of Steven Jobs and Stephen Wozniak redesigning the division of labor at Apple Computer in the late 1970s. In the beginning, they had very

I have spent so much time on this seemingly recondite issue for one simple reason. It is important, I believe, to understand that the rationale for the firm does not obviously lie in the superiority of firms over markets in some ideal or absolute sense. Rather, the rationale for the firm lies in the superiority of that organizational form over *actually existing markets at particular points in history.* In an important sense, Egidi is right that organizations can often reorient production and redesign the division of labor when markets cannot. But, as I will suggest below, it is also true that markets can sometimes redesign the division of labor when firms cannot.

The argument becomes clearer when we move to the lower right of figure 3. Here internal production has a cost advantage because the firm possesses certain capabilities that other firms cannot immediately imitate or substitute for. These capabilities are the sorts of strategic resources that the resource-based approach to strategy urges firms to seek out (Wernerfelt 1984; Dierickx and Cool 1989; Rumelt 1984, 1987). There are, however, two basic patterns according to which firms might possess hard-to-replicate capabilities superior to those available in the market. These patterns, which I label Schumpeterian integration and Penrosean growth, correspond respectively to demand-side effects and supply-side effects.

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few employees, preferring instead to subcontract almost all functions, including assembly. Only as the developing industry matured did Apple integrate significantly: that is, the company was *more* integrated once the new division of labor was in place than while they were redesigning it (Langlois 1992a).

Schumpeterian integration.

Schumpeterian integration occurs when an entrepreneur (who may or may not control an existing firm) perceives a profit opportunity for the taking if the existing chain of activities could be reorganized. In order to reap this profit opportunity without integration, the entrepreneur would have to inform and persuade those with the relevant capabilities to reorient their activities into a new chain of complementary activities. This may prove costly.[27] If Nelson and Winter (1982) are right, then production is a matter of carrying out routines. And the downside of routine behavior is that it is refractory to change when change is desirable.[28] As Schumpeter (1934) emphasized, a significant part of the entrepreneurial function involves overcoming the resistance of entrenched convention and vested interests.

Morris Silver (1984) tells the story, perhaps more usefully, in informational terms. For reasons that have to do — significantly — with limited capabilities, the entrepreneur would like very much to "carry out new combinations" through the market. But it may prove far more costly to inform and persuade those with the necessary capabilities than to do it oneself, that is, to integrate, albeit reluctantly, into the necessary complementary activities. Integration might take place either through the creation of a new organization and new facilities or through the acquisition of

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[27] Morris Adelman (1955) was one of the first writers to associate vertical integration with economic change. In a rapidly growing industry, he argued, suppliers of intermediate goods may not be able to expand quickly enough to meet the needs of the producer of final goods, thus motivating that producer to integrate backwards. He also hinted at such effects as informational difficulties and potential hold-up problems.

[28] And, of course, the upside of routines is also that the are refractory to change — when change is undesirable.

existing organization and assets. When he was rebuffed by rail car manufacturers, who refused to invest in facilities to produce the refrigerated cars he needed for an innovative meat-packing scheme, Gustavus Swift (reluctantly) bought himself a car maker (Chandler 1977, pp. 299-302). He was then able to exercise control and "direct the production program" of the acquired firm. Langlois and Robertson (1989) argue that something similar explains the much-controverted case of General Motors' acquisition of Fisher Body in 1926: Fisher failed to share GM's entrepreneurial vision of the growth of closed-body vehicles, and GM needed control to see its vision through. As Coase (1988, pp 42-46) also argues about the Fisher Body case, highly specific assets were not the issue.

The extent of integration, then, depends on the costs of informing and persuading outside suppliers, an aspect of what I have called dynamic transaction costs[29] (Langlois 1992b). These costs depend on the nature of the innovation involved;[30] but they also depend on the existing level and configuration of "external" capabilities (Langlois 1992a) in the economy. One would thus expect less integration in an economy with highly developed capabilities than in a more "primitive" economy.[31] In significant part, the rise of the large vertically integrated firm in the United States in the late nineteenth and early twentieth centuries (Chandler 1977) was a response to

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[29] Loosely put, dynamic transaction costs — or, more generally, dynamic governance costs — are the costs of not having the capabilities you need when you need them. This is obviously related to what Dierickx and Cool (1989) call "time-compression diseconomies."

[30] In particular, dynamic transaction costs depend on the extent to which innovation is *systemic* or *autonomous.* On these issues see Langlois (1992b) and Langlois and Robertson (1992).

[31] A point not unknown in the literature of economic development. In addition to Silver (1984), see especially Dahmén (1971) and Leff (1978).

the inability of the existing decentralized system of capabilities in the economy to respond to the possibilities for systemic reorganization and mass-production attendant on rapid population growth and lower transport and communication costs. That is to say, the superiority of such large integrated enterprises was arguably a historically contingent one.

In a sense, of course, the level of external capabilities in an economy is a relative rather than an absolute matter. In 1908, for example, the Detroit region contained a high level of general-purpose machining and metal-working capabilities.[32] It was indeed these "external economies" that had shaped the development of the early American automobile industry as a regional agglomeration of small firms. Even the major manufacturers were actually assemblers, drawing on a wealth of local parts suppliers and other services, including local bank finance. But even those relatively sophisticated capabilities could become obsolete in the face of a Schumpeterian innovation. Henry Ford's entrepreneurial vision of mass producing an undifferentiated low-cost vehicle led him eventually to the moving assembly line and related techniques, which could make parts more cheaply than could existing outside suppliers. It was this innovation — not transaction costs in any standard sense — that led Ford to integrate vertically. That is, he integrated because his distinctive capabilities gave him a production-cost advantage over those who relied on resources available through contract. If transaction costs were involved, they were the dynamic transaction costs of teaching outside suppliers the Ford techniques — an unfolding body of partly tacit knowledge — and persuading them to use those

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[32] This paragraph draws on Langlois and Robertson (1989).

techniques. Far from trying to appropriate this innovation through secrecy, Ford actively abetted the spread of his ideas, which did eventually diffuse to outside suppliers, making it less necessary for competitors like General Motors to integrate production.[33]

This story of Schumpeterian integration would seem to support Egidi's assertion that the firm can "perform a more complex function than the market" because it is able to "design the division of labor." It is certainly true that designing (or redesigning) the division of labor often requires some kind of coherent central vision.[34] But it is far too easy a leap to the conclusion that a firm-like organization has an advantage in, or is even necessary for, implementing such a vision. As I have already hinted, what is necessary to effect an entrepreneurial redesign of the division of labor is responsibility and control. This is clearly a kind of "authority." But it is a mistake, I believe, to identify responsibility and control with the so-called authority relation of a managerial hierarchy. In a bureaucratic hierarchy, especially a complex and long-established one, the holders of nominal power are tightly constrained by rules and routines and have very little actual power to

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[33] Indeed, if anyone in the industry could be said to have had a pure motive of rent appropriation, it was Billy Durant, the founder of GM. He ran the organization as a holding company, and was forced into (a relatively minimal) coordination function only by the dynamic state of the industry and the lack of sophisticated financial markets. In fact, the first appearance of automotive stock on the New York exchange was the sale of General Motors voting trust certificates in 1911 (Pound 1934, p. 113).

[34] It is not clear, however, that such a centralized vision is always necessary. Like social institutions more broadly (Langlois 1896), the division labor in the economy can in many ways be the result of the unintended consequences of the activities many individuals — it can be the result of human action but not of human design. Indeed, one might say that, from the perspective of the economy as a whole, the division of labor is *always* the result of such "spontaneous order" (Hayek 1967). It is the various subsystems of the overall division of labor — sometimes small, sometimes extensive — that are each the result of a coherent entrepreneurial vision.

redirect the production program (Crozier 1964). Moreover, responsibility and control often do not require an organization: an entrepreneur can sometimes redirect the division of labor through contract and persuasion.

Indeed, there is a sense in which "the market" can sometimes redesign the division of labor more effectively than existing firms. In the computer industry, for example, a network of small vertically and laterally specialized firms is at the moment redesigning the division of labor to the detriment of the large, vertically integrated firms like IBM, DEC, and Fujitsu (Langlois 1992a; Ferguson and Morris 1993).

Penrosean growth.

The main characteristic of what I have called Schumpeterian integration is that it is driven by the demand side, that is, by the entrepreneur's demand for the capabilities necessary to bring about a redesign of the chain of complementary activities. As a consequence, Schumpeterian innovation normally involves integration into dissimilar activities that the entrepreneur would have preferred to leave to others (Silver 1984). By contrast, Edith Penrose's theory of the growth of the firm is essentially supply driven. The firm grows in order to take advantage of excess capacity, notably in managerial and technical capabilities, that arise because resources often come in indivisible bundles (Penrose 1959; Teece 1980, 1982). In this story, integration is a matter of gradual diversification into more-or-less similar activities. Thus, the pattern of activities within a firm is driven by what the firm can do, not by what (an entrepreneur thinks) the market needs.

In an important recent paper, Teece, Rumelt, Dosi, and Winter (1992) have outlined a theory of the boundaries of the firm that builds on the Penrosean approach. The main components of the theory are (1) the regime of learning; (2) the nature of path dependency; and (3) the effectiveness of the selection mechanism. The regime of learning seems to mean the rate at which learning takes place, and includes the extent of exogenous and endogenous technological opportunity. The authors do not spell any of this out in much detail, however, and they do not distinguish between intra-organizational learning and the general rate of diffusion of capabilities in the economy. By path dependency they mean the Penrosean idea that a firm builds on what it already knows. History matters because a firm does not have a neoclassical menu of technological alternatives: what it chooses to do (or know) in the future depends on what it chose to do (what it knew) in the past. Apparently, path dependency can vary, presumably according to the contours of technological (and perhaps other kinds) of knowledge. If technologies are generic and converging,[35] firms can skip relatively easily across wide distances in the production space. But if path dependencies are "tight" or "high," the firm is rigidly constrained to stay close to its past. The selection mechanism also matters, for reasons akin to those I discussed under a similar heading above. If the selection mechanism is loose, firms may without penalty roam far from what they had done in the past, and indeed far from their "core competencies." (Conglomerates, they seem to think, are manifestations of a weak selection environment.) If, however, the selection mechanism is tight, "the boundaries of the corporation are likely to be drawn 'close in' to core competencies" (Teece *et al.* 1992, p. 26).

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[35] In the sense of Rosenberg (1976).

Notice that Schumpeterian innovation is missing from this schema. In the case of Schumpeterian integration, an organization can be integrated into dissimilar activities even when the selection mechanism is tight and path dependencies are high.[36] Of course, one might well expect an organization that integrated for Schumpeterian reasons to divest itself eventually of the most dissimilar activities, especially if the selection mechanism is indeed tight. But this is to say no more than that integration motivated by transaction costs — even dynamic transaction costs — is a short-run phenomenon. By contrast, the patterns of integration Teece and his coauthors discuss are relatively longer-run (if not necessarily long-run) phenomena. In the economics of organization as in traditional price theory, supply-side explanations are of a longer-run nature than demand-side explanations (Langlois 1992b).

Learning in Firm and Market.

Adding Schumpeterian integration to the story of Penrosean growth through diversification suggests the possibility of path dependency in sense somewhat

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[36] In part, this may depend on one's understanding of "the selection mechanism." Teece *et al.* (1992, p. 25) lay great stress on the internal cash position of the firm as a buffer against selection. In this sense, a Schumpeterian innovation can provide a buffer against selection because, by creating value and satisfying wants in a superior way, it generates the cash necessary for integration into dissimilar activities. In a deeper sense, however, it is not so much that the selection mechanism is weak as that the innovation is a superior adaptation to the existing environment, which may have been a rigorous and demanding one from the point of view of the prior economic structures. It is probably true that Henry Ford's excesses in the 1920s — which went beyond the highly integrated River Rouge plant to iron and coal mining; lumbering; limestone; silica sand; Brazilian rubber; and railroad and shipping — were probably "mistaken integration" permitted by the cash he had amassed. But his early pattern of integration — which also went far beyond his starting competences and which was supported by retained earnings — was a successful innovation that *created* the cash flow in the first place.

different from that of Teece and his coauthors. The pattern of organization we observe at any time may depend not only on what firms knew in the past but on how they were organized in the past (Langlois 1984, 1988).[37] The importance of this kind of path dependency may depend on the extent selection pressure, which is to say, competition. If competitive pressures are strong enough, the past may not matter, and observed levels of integration may depend only on factors in operation at the moment of observation. But in general, however, the organizational past may matter.

Henry Ford's early acquisition of the J. R. Keim Mills affords one example (Langlois and Robertson 1989). Keim was a supplier to Ford; but, because largely of labor unrest, Keim threatened to become a bottleneck to Ford production. So, for what were ordinary reasons of "hold up" costs, Ford bought Keim and eventually moved its equipment from New York State to Highland Park. Once the equipment was in the Ford plant, Ford engineers noticed ways to improve the technology and integrate it better into the rest of Ford's internal production system. This had the effect on the margin of biasing technological change in a systemic direction and further reinforcing Ford's trend toward vertical integration. An opposite example may be the microcomputer (Langlois 1992a). Here IBM's decision to modularize the PC and outsource its construction had the (largely unintended) effect of reinforcing the autonomous character of innovation and setting the American industry on a market-based organizational trajectory (Langlois and Robertson 1992). This stands in contrast to the ecologically protected

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[37] These two notions are obviously related, in that the structure of a firm (or, as we will see, of a market) is closely related to what it "knows." In many ways, knowledge *is* structure (Langlois 1983). But Teece *et al.* focus on the historical dependence of a firm's capabilities on its past capabilities.

Japanese industry, which developed competing incompatible proprietary platforms (Cottrell 1993). In this case, however, selection pressure may be exerting itself and forcing the Japanese belatedly in the direction of the American organizational structure.

Indeed, we can unpack the idea of the "selection mechanism" a bit by thinking of it in terms of the relative rates of intra-organizational and market learning. A firm experiencing tight selection keeps "close in" to core competencies because markets — other firms — can acquire slightly dissimilar capabilities faster and more easily than the firm. Obviously, this ability of markets to learn quickly depends on the existing level and pattern of "external" capabilities. Like firms, markets must have the "absorptive capacity" (Cohen and Levinthal 1990) to learn, which means they must already possess capabilities similar to those needed for the innovation in question. The capabilities of the Detroit region in 1908 were highly developed but unable to absorb the moving assembly line, at least as fast as Ford could develop it internally. But the international network of electronics suppliers and software developers in the 1980s was far better able to absorb the innovation of the microcomputer than were the internal capabilities of IBM, DEC, and other large firms (Langlois 1992a).

What, then, are "markets"? They are not, nor should they be, the neoclassical ideal of fully informed, atomistic, price-mediated spot contracting. Rather, markets are bodies of productive capabilities. As Brian Loasby (1990, p. 120) notes, Marshall understood that both firms and markets "are structures for promoting the growth of knowledge, and both require conscious organization." That is to say, markets as well as firms use

non-price information, and both involve institution building. Ken-ichi Imai puts it this way.

> Needless to say, a market is a place where information is translated into prices and where the adjustment of economic activity takes place. We also receive nonprice information in the market, and this information, too, plays an important role in the adjustment process. The entrepreneur is the one who implements such nonprice adjustments, and he is able to bring about such an adjustment because he has formed a new context in the market. For instance, it is sometimes difficult to predict trends in future demand, and this in turn makes investment decisions difficult. ... If one is able to persuade the suppliers of hardware and software to reach some sort of commitment prior to going to the market, then one has created a context in the market that is separate from prices. If, as a result, one can supply good quality items at relatively low prices in the future and the undertaking succeeds, then it may appear as if prices had determined the situation. In actuality, however, the ex ante coordination was performed by an entrepreneur creating a new context, and the price adjustment, assuming such entrepreneurial activity as a prerequisite, appears only as its result (Imai 1990, p. 188).

This is not the neoclassical picture of a market. In this picture, however, markets, like firms, are institutional structures. Markets thus come in many configurations; they develop over time; and they can learn. As a historical matter, moreover, firms do not always, or perhaps even typically, supersede markets, as is virtually taken for granted in the transaction-cost literature. As I hinted above, firms — especially those that arise out of Schumpeterian integration — can form as a response to a lack of (the right kind of) market; and markets then *supersede firms.*

Teece *et al.* (1992) discuss the issue of *corporate* coherence. They seek to determine why firms "hang together," why their production draws on a relatively restricted set of capabilities. This is an important question,

especially coming from a perspective of corporate strategy, where the appropriate focus is on firms and their survival. Economic theory — in its neoclassical as well as its evolutionary guise — is concerned, however, with the aggregate or market level. This implies a focus at the level of population. Normally, this is interpreted to mean the population of firms. But there is an even more fundamental unit of analysis: capabilities themselves. These can sometimes survive and reconfigure themselves even when the corporation that created them ceases to exist. Teece and his coauthors devote a good deal of attention to an issue that has attracted much attention of late: the "hollow corporation." This is a corporation that relies on arm's-length contract for almost all the activities it comprises, including fundamental technological activities like manufacturing.[38] The authors sensibly assert that, by relying on competitively available strategic resources, such a corporation is unlikely to survive long, since even its "core competencies" can be easily imitated. I would like to go a step further and suggest an even more abstractly organized form: *the non-corporation.* Without any central corporate governance at all, the Lancashire cotton textile industry of the nineteenth century performed all the functions that the Boston Associates in the United States performed within their Waltham and Lowell mills — and did so with greater success (Temin 1988). Similarly, the American microcomputer industry performs in a similarly headless fashion the functions that IBM, DEC, NEC and others have tried and failed to perform within a corporate

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[38] Teece *et al.* refer to such a firm as merely a "nexus of contracts." This is a meaning of the term different from that found in the transaction-cost literature. In authors like Cheung (1983), the term is taken to mean that all firms — even those with inimitable technological core competencies — are only nexuses of contracts. The contracts involved may be employment contracts or other long-term arrangements. But they are still just contracts.

structure. Perhaps these are variants of what Teece *et al.* call *network firms.* But perhaps another term for a network firm is a market.

References.

Adelman, Morris. 1955. "Concept and Statistical Measurement of Vertical Integration," in *Business Concentration and Price Policy*. Princeton: Princeton University Press, pp. 318-320.

Alchian, Armen, and Susan Woodward 1988. "The Firm Is Dead; Long Live the Firm: A Review of Oliver E. Williamson's *The Economic Institutions of Capitalism*," *Journal of Economic Literature* **26**(1): 65-79 (March).

Barney, Jay B. 1991. "Firm Resources and Sustained Competitive Advantage," *Journal of Management* **17:** 99-120.

Ben-Porath, Yoram. 1980. "The F-Connection: Families, Friends, and Firms in the Organization of Exchange," *Population and Development Review* **6**(1): 1-30.

Casson, Mark. 1982. *The Entrepreneur: An Economic Theory*. Totowa, N.J.: Barnes and Noble Books.

Caves, Richard, Harold Crookell, and Peter J. Killing. 1983. "The Imperfect Market for Technology Licenses," *Oxford Bulletin of Economic Statistics* **45**(3): 249-267.

Chandler, Alfred D., Jr. 1977. *The Visible Hand: the Managerial Revolution in American Business.* Cambridge: the Belknap Press of Harvard University Press.

Cheung, Steven N. S. .1983. "The Contractual Nature of the Firm," *Journal of Law and Economics* **26:** 386-405 (April).

Coase, Ronald H. 1937. "The Nature of the Firm," *Economica* (N.S.) **4**: 386-405 (November).

Coase, Ronald H. 1988. "The Nature of the Firm: Influence," *Journal of Law, Economics, and Organization* **4**(1): 33-47 (Spring).

Cohen, Wesley M., and Daniel A. Levinthal. 1990. "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly* **35**: 128-152.

Cottrell, Tom. 1993. "Japanese Microcomputer Software: Standards Compatibility and Competitiveness," *Research Policy*, forthcoming.

Crozier, Michel. 1964. *The Bureaucratic Phenomenon.* Chicago: University of Chicago Press.

Currie, Martin, and Ian Steedman. 1990. *Wrestling with Time: Problems in Economic Theory.* Ann Arbor: University of Michigan Press.

Dahlman, Carl. 1979. "The Problem of Externality," *Journal of Law and Economics* **22**: 141-162.

Dahmén, Erik. 1971. *Entrepreneurial Activity and the Development of Swedish Industry, 1919-1939.* Homewood, Ill.: Richard D. Irwin.

Demsetz, Harold. 1982. "Barriers to Entry," *American Economic Review* **72**(1): 47-57.

Dierickx, Ingemar, and Karel Cool. 1989. "Asset Stock Accumulation and Sustainability of Competitive Advantage," *Management Science* **35**(12): 1504-1511

Egidi, Massimo. 1992. "Organizational Learning, Problem Solving, and the Division of Labor," in Herbert Simon *et al.*, eds., *Economics, Bounded Rationality, and and the Cognitive Revolution.* Aldershot: Edward Elgar.

Eliasson, Gunnar. 1990. "The Firm as a Competent Team," *Journal of Economic Behavior and Organization* **13:** 275-298.

Ferguson, Charles H., and Charles R. Morris. 1993. *Computer Wars: How the West Can Win in a Post-IBM World.* New York: Times Books.

Foss, Nicolai Juul, Christian Knudsen, and Cynthia A. Montgomery. 1993. "Towards a Synthesis of Evolutionary and Resource-based Approaches: Some Topics for Discussion," manuscript, January.

Grossman, Sanford, and Oliver Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical Integration," *Journal of Political Economy* **94:** 691-719

Hallwood, C. Paul. 1994. "An Observation on the Theory of the Multinational Firm," *Journal of Institutional and Theoretical Economics*, forthcoming.

Hart, Oliver D. 1988. "Incomplete Contracts and the Theory of the Firm," *Journal of Law, Economics, and Organization* **4**(1): 119-140 (Spring).

Hart, Oliver D. 1989. "An Economist's Perspective on the Theory of the Firm," *Columbia Law Review* **89**(7): 1757-1774.

Hayek, F. A. 1967. *Studies in Philosophy, Politics, and Economics.* Chicago: University of Chicago Press.

Imai, Ken-ichi. 1990. "Patterns of Innovation and Entrepreneurship in Japan," in Arnold Heertje and Mark Perlman, eds., *Evolving Technology and Market Structure.* Ann Arbor: University of Michigan Press, pp.187-201.

Jewkes, John. 1930. "Factors in Industrial Integration," *Quarterly Journal of Economics* **44:** 633-635.

Kirzner, Israel. 1973. *Competition and Entrepreneurship.* Chicago: University of Chicago Press.

Knight, Frank H. 1921. *Risk, Uncertainty, and Profit.* Boston: Houghton Mifflin.

Kogut, Bruce, and Udo Zander. 1992. "Knowledge and the Firm: Combinative Capabilities and the Replication of Technology," *Organizational Science* **3**(3): 383-97 (August).

Langlois, Richard N. 1983. "Systems Theory, Knowledge, and the Social Sciences," in Fritz Machlup and Úna Mansfield, eds., *The Study of Information: Interdisciplinary Messages*, New York: John Wiley, pp. 581-600.

Langlois, Richard N. 1984. "Internal Organization in a Dynamic Context: Some Theoretical Considerations," in M. Jussawalla and H. Ebenfield, eds., *Communication and Information Economics: New Perspectives.* Amsterdam: North-Holland, pp. 23-49.

Langlois, Richard N. 1986. "Rationality, Institutions, and Explanation," in R. N. Langlois, ed., *Economics as a Process: Essays in the New Institutional Economics.* New York: Cambridge University Press, pp. 225-55.

Langlois, Richard N. 1988. "Economic Change and the Boundaries of the Firm," *Journal of Institutional and Theoretical Economics* **144**(4): 635-657, reprinted in Bo Carlsson, ed., *Industrial Dynamics: Technological, Organizational, and Structural Changes in Industries and Firms.* Dordrecht: Kluwer Academic Publishers, 1989, pp. 85-107.

Langlois, Richard N. 1992a. "External Economies and Economic Progress: The Case of the Microcomputer Industry," *Business History Review* **66**(1): 1-52 (Spring).

Langlois, Richard N. 1992b. "Transaction-cost Economics in Real Time," *Industrial and Corporate Change* **1**(1): 99-127.

Langlois, Richard N., and Metin M. Cosgel. 1993. "Frank Knight on Risk, Uncertainty, and the Firm: A New Interpretation," *Economic Inquiry* **31:** 456-465 (July).

Langlois, Richard N, and Paul L. Robertson. 1989. "Explaining Vertical Integration: Lessons from the American Automobile Industry," *Journal of Economic History* **49**(2): 361-375 (June).

Langlois, Richard N., and Paul L. Robertson. 1992. "Networks and Innovation in a Modular System: Lessons from the Microcomputer and Stereo Component Industries," *Research Policy* **21**(4): 297-313.

Leff, Nathaniel. 1978. "Industrial Organization and Entrepreneurship in the Developing Countries: The Economic Groups," *Economic Development and Cultural Change* **26**(4): 661-675 (July).

Levinthal, Daniel. 1992. "Surviving Schumpeterian Environments: An Evolutionary Perspective," *Industrial and Corporate Change* **1**(3): 427-443.

Loasby, Brian J. 1976. *Choice, Complexity, and Ignorance.* Cambridge: Cambridge University Press.

Loasby, Brian J. 1989. "Knowledge and Organization: Marshall's Theory of Economic Progress and Coordination," in Loasby, *The Mind and Method of the Economist.* Aldershot: Edward Elgar.

Loasby, Brian J. 1990. "Firms, Markets, and the Principle of Continuity," in J. K. Whitaker, ed., *Centenary Essays on Alfred Marshall.* Cambridge: Cambridge University Press.

Loasby, Brian J. 1991. *Equilibrium and Evolution: An Exploration of Connecting Principles in Economics.* Manchester: Manchester University Press.

Loasby, Brian J. 1993. "The Organisation of Industry," manuscript.

Loasby, Brian J. 1994. "Organisational Capabilities and Interfirm Relations," *Metroeconomica*, forthcoming.

Mahoney, Joseph T., and J. Rajendran Pandian. 1992. “The Resource-based View Within the Conversation of Stratetic Management,” *Strategic Management Journal* **13**(5): 363-380 (June).

Minkler, Alanson P. 1993. “Knowledge and Internal Organization,” *Journal of Economic Behavior and Organization* **21**: 17-30.

Moore, John. 1992. “The Firm as a Collection of Assets,” *European Economic Review* **36**: 493-507.

Penrose, Edith T. 1959. *The Theory of the Growth of the Firm.* Oxford: Basil Blackwell.

Pound, Arthur. 1934. *The Turning Wheel: The Story of General Motors through Twenty-five Years, 1908-1933.* Garden City: Doubleday, Doran.

Putterman, Louis. 1988. “The Firm as Association versus the Firm as Commodity: Efficiency, Rights, and Ownership,” *Economics and Philosophy* **4**(2): 243-66 (October).

Richardson, G. B. 1972. “The Organisation of Industry,” *Economic Journal* **82**: 883-96.

Rosenberg, Nathan. 1976. *Perspectives on Technology.* New York: Cambridge University Press.

Rumelt, Richard P. 1984. "Towards a Strategic Theory of the Firm," in Robert Boyden Lamb, ed., *Competitive Strategic Management.* Englewood Cliffs: Prentice-Hall.

Rumelt, Richard P. 1987. “Theory, Strategy, and Entrepreneurship,” in David J. Teece, ed., *The Competitive Challenge: Strategies for Industrial Innovation and Renewal.* Cambridge: Ballinger.

Schumpeter, Joseph A. 1934: *The Theory of Economic Development.* Cambridge: Harvard University Press.

Silver, Morris. 1984. *Enterprise and the Scope of the Firm.* London: Martin Robertson.

Stinchcombe, Arthur L. 1990. *Information and Organizations.* Berkeley: University of California Press.

Teece, David J. 1980. “Economies of Scope and the Scope of the Enterprise,” *Journal of Economic Behavior and Organization* **1**(3): 223-247.

Teece, David J. 1982. "Towards an Economic Theory of the Multiproduct Firm," *Journal of Economic Behavior and Organization* **3**: 39-63.

Teece, David J. 1986. "Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing, and Public Policy," *Research Policy* **15**: 285-305.

Teece, David J., Richard P. Rumelt, Giovanni Dosi, and Sidney G. Winter. 1992. "Understanding Corporate Coherence: Theory and Evidence," Working Paper 92-6, Consortium on Competitiveness and Cooperation, Center for Research in Management, University of California, Berkeley.

Temin, Peter. 1988. "Product Quality and Vertical Integration in the Early Cotton Textile Industry," *Journal of Economic History* **48:** 891-907 (December).

Wernerfelt, Birger. 1984. "A Resource-based View of the Firm," *Strategic Management Journal* **5**: 171-180.

Williamson, Oliver E. 1985. *The Economic Institutions of Capitalism.* New York: The Free Press.

Williamson, Oliver E. 1988. "Technology and Transaction Cost Economics: A Reply," *Journal of Economic Behavior and Organization* **10***:* 355-363.

Williamson, Oliver E. 1991. "Comparative Economic Organization: The Analysis of Discrete Structural Alternatives," *Administrative Science Quarterly* **36:** 269-296.

Winter, Sidney G. 1988. "On Coase, Competence, and the Corporation," *Journal of Law, Economics, and Organization* **4**(1): 163-180 (Spring)