The Nature of the Firm

Origins, Evolution, and Development

Edited by

OLIVER E. WILLIAMSON

SIDNEY G. WINTER

New York Oxford
OXFORD UNIVERSITY PRESS 1993

Oxford University Press

Oxford New York Toronto
Delhi Bombay Calcutta Madras Karachi
Kuala Lumpur Singapore Hong Kong Tokyo
Nairobi Dar es Salaam Cape Town
Melbourne Auckland Madrid

and associated companies in
Berlin Ibadan

First issued as an Oxford University Press paperback, 1993

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Library of Congress Cataloging-in-Publication Data
The Nature of the firm : origins, evolution, and development
edited by Oliver E. Williamson, Sidney G. Winter.
p. cm. Includes bibliographical references and index.
ISBN 0-19-508356-3 (pbk.)
1. Industrial organization (Economic theory)
I. Williamson, Oliver E.
II. Winter, Sidney G.
HD2326.N38 1993
338.5—dc20 92-38007

9 8 7 6

Printed in the United States of America
on acid-free paper

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On Coase, Competence, and the Corporation

SIDNEY G. WINTER

Ronald Coase observed in his first lecture that his contribution to the theory of the firm did not appear to him to be in any sense foreordained, but rather was the result of a conjunction of circumstances in his life that resulted in his exposure to a particular set of influences and facts.[1] These influences and facts he fashioned into an absorbing intellectual puzzle that he then undertook to solve.

I will argue that the broader history of the theory of the firm also reveals the major shaping role of conjunctions of circumstances that are accidental at least in the sense that they do not reflect the internal logic of the subject matter. The legacy of these accidents along the historical track is visible in the present state of the subject. Without demeaning the contributions that any of us have made, I think we must acknowledge that the present state is one of incoherence. If we ask, "What does economics have to say about the role of the business firm in a market economy?" the response will be silence followed by an excited babble of significantly conflicting answers—an interesting babble, but a babble nonetheless.

To develop this thesis, I will first review in the following section the orthodox statement of the theory of the firm and summarize four major critiques of that orthodoxy. In section 2, I attempt to discover order in the present theoretical chaos by arraying and contrasting four contemporary paradigms in the theory of the firm—of which one is the transaction cost paradigm founded by Ronald Coase. Section 3 takes note of some of the conflicts and complementarities between the transaction cost paradigm and the evolutionary approach to economic theory. The principal issue addressed is whether the transaction cost approach provides an adequate basis for understanding the collections of capabilities that particular large firms display—this is the issue of "competence and the corporation" referenced in my title.

1. TEXTBOOK ORTHODOXY: FOUR CRITIQUES

In our book, Nelson and I treat with some care the question of whether it is useful to speak of an "orthodox" viewpoint in economic theory, and if (as we claim) it is,

what that orthodoxy amounts to (1982:6–11). I will omit discussion of the first question and give only the short-form answer to the second: "Orthodox economic theory is the theoretical view that dominates the leading textbooks of intermediate microeconomics, together with the extensions and elaborations of that basic viewpoint found in more advanced work." In the case of the theory of the firm, the orthodox view is set out in the textbook chapters variously titled "Theory of the Firm," "Production and Cost," "Competitive Supply," "Monopoly," and so forth.

The basic elements of that orthodox view are as follows. Firms are characterized by the technological transformations of which they are capable – formally, by production sets or production functions. Like consumers, firms are unitary actors and are economically rational; more specifically, they maximize profit or present value. They deal in markets for homogeneous commodities; in almost all cases these appear to be contemporaneous spot markets for inputs and outputs. Contractual arrangements and other institutional supports for the functioning of the business firm are, one infers, assumed to be sufficiently close to being flawless and costless so as to justify the virtually total absence of discussion of these topics. (*Look for "contract" in the index; you will probably find "contract curve."*) The discussion focuses on how firms, guided by market forces, make the production decisions that form a part of the answer to the overall social resource allocation problem. It is about inputs and outputs and how they relate to the given technology, to each other, and to market forces.

This constellation of assumptions and concerns is also focal for the treatment of the firm in the advanced texts. And in general equilibrium theory, its outline stands out even more starkly than in intermediate price theory.[2] Standard treatments of the modern theory present firms as production sets with profit motives attached. The profit motive may be rationalized as reflecting the stockholders' (unanimous) interests under the prevailing assumptions of complete markets, atomistic competition, and perfect contracts. No such rationalization is provided for the firms per se. Like consumers, they are logical primitives of the theoretical system.[3]

This same general view of the business firm and the contexts in which it functions is pervasive in contemporary economic theory. Particular contributions may explore the consequences of modifying one assumption or another, but basic elements of the structure remain intact. Research in theoretical industrial organization economics has been transformed by the application of more powerful mathematical techniques in the past quarter century, and recently by careful attention to information-theoretic and game-theoretic details of the interactions among firms, or between firms and consumers. But in almost all of this work, firms are what they are in the intermediate microeconomics texts.

Roam on through public finance and labor economics; examine almost any paper in applied econometrics that involves firm behavior, and you will find much the same situation. In short, on this question as on most others, the intermediate texts provide a bare-bones but generally accurate account of what the economics discipline is up to. What they present as *the theory of the firm is the orthodox* theory of the firm – or more precisely, it is what the orthodox theory of the firm

has been. I call it "textbook orthodoxy" to distinguish it from the recent work of otherwise orthodox theorists who have concerned themselves with questions relating to the nature of the firm. Textbook orthodoxy today defines the theory of the firm for essentially all economists except those who are working on the theory of the firm.

1.1. First Critique: Conflict with Methodological Individualism

Textbook orthodoxy on the theory of the firm has one characteristic that seems quite bizarre when assessed against the broad background of Western economic thought: it involves a blatant affront to the principle of methodological individualism. This principle disallows, or at least warns against, the practice of grounding theories on assumptions about the behavior of social groups, organizations, or institutions. A careful and restrained explication of the principle is the following:

> Although in modern economics, collections of individuals are sometimes treated as "entities" for analytical purposes (examples of "the household," "the firm," and even occasionally "the state" spring to mind) the *ultimate* unit of analysis is always the individual; more aggregative analysis must be regarded as only provisionally legitimate. In other words, the economist is always sensitive to the possibility that the holistic treatment of groups of individuals may mislead greatly, or involve overlooking dimensions of reality that are extremely important (Brennan and Tullock: 225).

It is interesting to note that, in fact, the textbooks typically prefer the affront to reality involved in the abstraction of the isolated "consumer" over the complexities and the affront to individualism involved in discussing the demand behavior of "the household." In the case of the firm, however, the opposite choice is made and often with little or no apology.[4] Economists can be quite caustic when presented with an argument that speaks of "the public interest." They know (or think they know) that a "public" is not the sort of thing that has an "interest," except perhaps for the interest in a Pareto efficient outcome. They are similarly quick to correct what they consider obvious error when students intuitively recognize an "industry interest" and hence find it difficult to accept the notion that competitive firms routinely engage in mutually disadvantageous behavior, driving price to marginal cost. This dedication to methodological individualism—and, relatedly, to the study of noncooperative equilibria—is abruptly suspended when the workings of the firm itself are discussed. There, fully cooperative relations among the diverse economic interests organized in the firm are routinely, though implicitly, assumed to be easily achieved through voluntary exchange.

This aberration is a nice example of how an adaptive or evolutionary process can yield a result that is quite puzzling until one examines the path along which it emerged. In classical economics, individualism reigned supreme in the theory of the firm as it did elsewhere. The dominant view of the firm, reflecting the historical

context, was that of the small enterprise organized as a sole proprietorship – or, if not that, at least in a form in which "the firm" is no more problematic in its relation to individualism than is "the household." As much care was taken in uncovering the different economic roles that might be combined in "the entrepreneur" as in discussing the problems that arise if the roles are divided among many individuals.[5] Indeed, as regards the "separation of ownership and control," it seems that there was so much skepticism regarding the viability of such arrangements as to make detailed discussion of them unnecessary. Thus, for example, J. S. Mill:

> Management, however, by hired servants, who have no interest in the result but that of preserving their salaries, is proverbially inefficient, unless they act under the inspecting eye, if not the controlling hand, of the person chiefly interested: and prudence almost always recommends giving to a manager not thus controlled a remuneration partly dependent on the profits; which virtually reduces the case to that of a sleeping partner (J. S. Mill: 390).

Note that it is the owner who becomes the "sleeping partner," and the enterprise itself is thus associated directly with the individualistic interests of the hired management.[6]

No major technical difficulty stands in the way of developing the theory of the firm explicitly as a theory about individual entrepreneurs. There are a few unfamiliar issues to be dealt with – such as how the idea of "profit maximization" is to be adapted to allow for the income-leisure tradeoff of a utility-maximizing consumer whose work is running his business.[7] Minor modifications to the familiar structure of general equilibrium theory would be required. Production sets would enter the theory associated with consumers; presumably there would be an axiom denying the possibility of output without an input of some of the consumer's own time – that is, without a positive level of "entrepreneurial activity" by that consumer. Among other advantages, this approach would rationalize the upward sloping portion of the U-shaped long run average cost curve of Marshallian theory; in fact, with a slight strengthening of the axiom just stated, one could derive the proposition that average costs must ultimately increase. The question of which consumers were also entrepreneurs would simply be among the many questions subsumed in the concept of "an allocation."[8]

This development of the theory of the firm would be consonant with methodological individualism – not to speak of the nonmethodological aspects of economic theory's association with individualism. Why is this not the standard development of the subject? I will propose an answer to this question in introducing the fourth critique.

1.2. Second Critique: Failure to Explain Economic Organization

It is hardly necessary to observe here that Ronald Coase (1937) provided a profound critique of textbook orthodoxy well before that orthodoxy was fully developed. Orthodox theory recognizes two aspects of the problem of coordinating economic

activity, the interfirm aspect and the intrafirm aspect. Markets are shown to be the answer to the interfirm aspect. What the answer to the intrafirm aspect may be is not explicitly addressed, but presumably it is the contractually based authority of the "entrepreneur." However, since both the functioning markets and the firms-qua-production sets are given data of the theory, there is no opportunity for an analysis of the division of labor between these two coordination modes. Hence, as Coase observed, there is no answer to the question of why markets do not do the coordinating that firms do, and no answer to the obverse question of why one big firm would not work as well as a market economy. In short, textbook orthodoxy provides no basis for explaining the organization of economic activity. This is more than a mere embarrassment concerning the logical structure of the theory, since the organization of activity is in continuing flux. Markets appear and disappear; firms expand in scope and then turn back toward specialization; quasi-firms and quasi-markets proliferate. Why and according to what principles do these things happen?

1.3. Third Critique: Lack of "Realism"

Discussion of the merits of the orthodox theory of the firm has long been a feature of the methodological controversy over "realism of assumptions." From the tangle of issues involved in that controversy, I pull out the following thread of related questions: Is observation of the internal workings of business firms (1) a legitimate area of economic inquiry? (2) a potential source of fruitful hypotheses about firm behavior? (3) a potential source of data with which to test competing hypotheses about firm behavior? Defenders of orthodoxy have been known to claim, among other things, that the correct answers to these questions are no, no, and no. Those who have complained of the lack of "realism" in orthodox theory have argued, among other things, that the correct answers are yes, yes, and yes.[9]

Coase's lectures in this volume clearly place him in the latter camp. In the period of his 1931–1932 visit to the United States, during which he gradually achieved a clear formulation of the question addressed in his article, he spent most of his time "visiting businesses and industrial plants." The contrasting examples of the acquisition of Fisher Body by General Motors and the successful long-term contractual relationship of GM with A. O. Smith and Co. were particularly important to him. His discussions with businessmen led him first to recognition of the hazards of opportunism involved in long-term contracting, and subsequently to the realization that these problems could sometimes be controlled by suitable contract provisions (for example, the customer's ownership of transaction-specific assets employed by the supplier), and are mitigated by the incentives to continue a mutually advantageous relationship. These latter considerations led him to reject then (and apparently lead him to reject now) the proposition that opportunism hazards in long-term contracting where asset specificity is involved are a quantitatively important motive for vertical integration. Whatever the final verdict on that particular issue, Coase's methodological stand on the relevance of evidence about actual business behavior is clear.[10]

It is hardly a surprise that Coase takes this stand in relation to the third

critique, given his association with the second. If the boundaries of the firm—or, more broadly, the roles of different modes of governance of transactions—are to be endogenously determined in economic theory, then it is hard to understand how the inner workings of firms could possibly be declared "off limits" to the discipline. But, collectively and individually, economists seem to be of two or more minds on this issue. On the one hand, there is today little vigorous support for the "off limits" view as put forward by, in particular, Fritz Machlup.[11] On the other hand, I doubt that a dissertation prospectus outlining the sort of research program Coase conducted in 1931–1932 would pass muster in most economics departments today. Indeed, even a much more structured plan of inquiry into actual business practice would be likely to confront great skepticism regarding the value of such research. And certainly the reason is not that we have accumulated so many good observations about how firms work that we do not need any more. Quite the opposite is the case (see Simon).

1.4. Fourth Critique: Simplistic Treatment of Its Focal Concern

The strong point of textbook orthodoxy is its concern with the role of firms as repositories of productive knowledge.[12] This, I propose, is the significant benefit that has motivated acceptance of the "opportunity cost" of methodological individualism foregone—and it is this tradeoff that makes the concept "everyone is a potential entrepreneur" unappealing as an approach to the theory of the firm. The clash of these two considerations was nicely framed by J. de V. Graaf in a (once) well-known exposition of welfare economics:

> When we try to construct a transformation function for society as a whole from those facing the individual firms comprising it, a fundamental difficulty confronts us. There is, from a welfare point of view, nothing special about the firms actually existing in an economy at a given moment of time. The firm is in no sense a "natural unit." Only the individual members of the economy can lay claim to that distinction. All are potential entrepreneurs. It seems, therefore, that the natural thing to do is to build up from the transformation functions of the men, rather than the firms, constituting an economy.
>
> If we are interested in eventual empirical determination, this is extremely inconvenient. But it has conceptual advantages. The ultimate repositories of technological knowledge in any society are the men comprising it, and it is just this knowledge which is effectively summarized in the form of a transformation function. In itself a firm possesses no knowledge. That which is available to it belongs to the men associated with it. Its production function is really built up in exactly the same way, and from the same basic ingredients, as society's (1957:16).

What Graff calls the "conceptual advantages" of the approach he describes I would call the philosophical advantages—specifically, the straightforward conformity

with methodological individualism. Where he says that it is an "extremely inconvenient" approach empirically I would say that it is false. At least, it is false that "the ultimate repositories of technological knowledge in any society are the men comprising it" and that "in itself a firm possesses no knowledge," although it is true enough that individuals are *among* the ultimate repositories of technological knowledge.

Examine the top of the Fortune 500; you will typically find companies that have existed for large percentages of the time since the invention of the ancestors of their principal product lines, or which antedate those inventions and became active in the ancestral product lines at an early stage. Thus, for example, IBM antedates the first electronic computer (ENIAC, 1945) and introduced the IBM 650, the "Model T of computers," in 1954. By this very conservative determination of IBM's date of entry to this very modern line of business, IBM has been involved for 78.5 percent of the elapsed time since the product was invented.[13] Other examples, such as General Motors, Ford, AT&T, Boeing, and the oil companies are much more extreme in this regard, and the time spans involved are much larger compared to human lifetimes. It seems undeniable that these large corporations are, *as organizations*, among society's most significant repositories of the productive knowledge that they exercise, and not merely an economic contrivance of the individuals currently associated with them. Thus, "the textbooks are closer (than Graaf) to being right—it is the firms, not the people who work for the firms, that know how to make gasoline, automobiles, and computers" (*Winter, 1982:76*).

Although founded on the defensible claim that the central characteristic of the business firm is its role as a repository of productive knowledge, textbook orthodoxy falls far short in its account of that role. It suffers in this regard from defects analogous to those that make it inadequate as an approach to economic organization. By taking production sets or functions as given, it fails to provide a framework for explaining why society's capabilities should be packaged at a particular time in one particular way and not some other way. By treating the storage of productive knowledge as costless—the analogue in this context of the assumption of costless and perfect contracts—it forecloses to economic analysis the performance of the very role that it claims is central.

Most important, textbook orthodoxy fails to provide a basis for understanding the incentives and processes in business firms that produce technological and organizational change. This failure is closely related to its inadequacy in accounting for the boundaries of the firm—or, more broadly, for the diverse array of means by which rent-streams are protected and transactions organized in relation to productive knowledge of diverse types (Teece, 1982, 1987). It is also closely related to orthodoxy's utter neglect of the problem of how firms actually perform the task of storing the knowledge that underlies productive competence; to acknowledge that maintaining competence may not be a straightforward matter is to see that static competence may be an exceptional case arising only when the forces making for advance happen to balance those making for regression.

There are other major problems with the orthodox framework as a starting point for understanding economic change—but since Richard Nelson and I have

written at considerable length about these issues, I will forgo further discussion here. (See Nelson and Winter, 1982 [esp. ch. 3]; Nelson, 1980; Winter, 1982).

2. CONTEMPORARY PARADIGMS IN THE THEORY OF THE FIRM

As I have suggested, textbook orthodoxy provides the theory of the firm mainly for economists who are not much interested in the theory of the firm per se. Those who are interested are generally seeking to remedy the deficiencies noted in one or more of the four critiques set forth above. The critiques thus provide one sort of taxonomic structure for contemporary research on the theory of the firm—one can ask which critique(s) the researcher appears to take seriously. In this section I propose a different taxonomic structure, identifying and relating four research "paradigms."

Textbook orthodoxy on the theory of the firm has been adequately characterized above. "*Working paper orthodoxy*" is the term I will use to refer to recent research (much of which has been published, of course—but "article orthodoxy" does not carry the needed connotation of recency) by theorists who work in an optimization framework and are concerned primarily with the structure of relationships among the actors involved in the firm. The substantive issues addressed include those of incentives, information, and control as between owners and managers or between managers and workers. Much of this research is in the principal-agent framework; noncooperative equilibria and outcomes that are "second-best" optimal because of the imperfect enforceability of contracts are its hallmarks. But I also include under this rubric other studies of optimal organization, including team theory.

Transaction cost economics is the paradigm founded by Ronald Coase in the article honored at this conference and extensively developed by a number of participants here, and in particular by my colleague and coorganizer, Oliver Williamson. As Coase succinctly puts it at the end of his first lecture, this approach "succeeded in linking up organization with cost." More specifically, it recognizes that there are different ways of organizing transactions (or different "modes of governance" for transactions), that these differ in costs, and that the costs are likely to differ in systematic ways depending on observable characteristics of the transactions in question. Much progress has been made in strengthening the operational content of models in this paradigm, that is, in rebutting the charge that transaction costs can explain anything. An interesting methodological point is that this progress has been achieved not by the development of techniques for measuring transaction costs directly but by the development of operationalizing hypotheses to suggest where transactional difficulties are likely to be severe. As compared with working paper orthodoxy, the scope of transaction cost economics tends to be broader, and the alternative modes of organization it is concerned with tend to be modeled closely on those observed in the world rather than hypothetical ones suggested by a formal structure.

Evolutionary economics relates to Armen Alchian's classic paper, "Uncertain-

ty, Evolution, and Economic Theory," in much the same way that transaction cost economics relates to Coase and "The Nature of the Firm." It emphasizes the inevitability of mistaken decisions in an uncertain world, and the active, observable role of the economic environment in defining "mistakes" and suppressing the mistakes it defines. Relatedly, the sort of explanation it offers for states of affairs is evolutionary explanation—some antecedent condition existed, and the state of affairs now observed reflects the cumulative effect of the laws of change operating on that antecedent condition. In other words, the focus of explanatory effort is on dynamics. Like transaction cost economics, evolutionary economics tends to direct attention to observed economic behavior rather than hypothetical sets of alternatives. Like evolutionary biology, it is much concerned with how patterns are reproduced through time in the face of continuing turnover in the population of individuals displaying the pattern. Finally, it regards understanding of the ongoing, interrelated processes of change in technology and organization as the central intellectual problem to be confronted by a theory of the firm.

Figure 11.1 is a bold attempt at placing these four paradigms in understandable relation to one another. At the risk (no, at the *cost*) of oversimplification, it proposes contrasts along two dimensions—dimensions whose nature has been only partly foreshadowed in the discussion thus far.

The columns of the two-by-two array are distinguished according to the emphasis placed on *production* versus *exchange*. It will be objected immediately that any theory of the firm has to deal with both: textbook orthodoxy, for example, starts with a production set but immediately turns that concept to the analysis of behavior in the markets for inputs and outputs. This is quite true, and analogous remarks apply in the other three cases. On the other hand, one certainly would gather from the textbooks that the choice of input proportions is quite interesting, while the choice of contract terms is not. There is not, in other words, an evinced concern with the *structuring of deals*, and it is in that sense that exchange is not a focal concern of textbook orthodoxy.

In evolutionary economics, the specifics of the ways firms relate to owners, customers, and input suppliers are subsumed under the heading of organizational routines. These relationships are aspects of the productive performance as a whole, and what matters is whether the performance as a whole is profitable at any

		Focal concern	
		Production	*Exchange*
Rationality viewed as	*Unbounded*	Textbook orthodoxy	Working paper orthodoxy
	Bounded	Evolutionary economics	Transaction cost economics

Figure 11.1 Four Contemporary Paradigms in the Theory of the Firm

particular time and likely to improve over time. Thus, in the same sense as in the case of textbook orthodoxy, exchange is not a focal concern of evolutionary economics.

The fact that working paper orthodoxy and transaction cost economics place deal-structuring at center stage, and cast the economics of production and cost in a supporting role, requires little argument.

What may be more controversial is my claim that transaction cost economics is fundamentally associated with the view that economic rationality is bounded. I am pleased to be able to invoke the authority of my esteemed colleague Oliver Williamson in support of this position.

> Bounded rationality is the cognitive assumption on which transaction cost economics relies (1985:45).
>
> Confronted with the realities of bounded rationality, the costs of planning, adapting and monitoring transactions need expressly to be considered. Which governance structures are more efficacious for which types of transactions? *Ceteris paribus*, modes that make large demands on cognitive competence are relatively disfavored (1985:46).

Ronald Coase, on the other hand, makes it clear that among the fundamental propositions he learned from Arnold Plant was that firms maximize profits—in fact, that the notion of a shortfall from such profit maximization was "bilge." Other major contributors to the transaction cost paradigm no doubt share this view.

Although there are important theoretical issues at stake here, I suspect that there is less to this Coase-Williamson conflict than meets the eye. Coase would probably reject the following reformulation of his pro-profit maximization position: "The costs of planning, adapting and monitoring transactions are always negligible and should be ignored." In fact, he might reject as absurd the suggestion that the idea of profit maximization could be rendered in this way. He would be justified in this reaction to the extent that, for him, "profit maximization" means something little different from what I would call "profit seeking." When the implications of the idea of profit maximization are explored primarily with ordinary language, the distinction between "seeking" and "maximizing" is frequently elided—and often, as in Coase's work, to fruitful effect. When, however, theoretical argument about profit maximization is expressed in terms of the mathematics of optimization, the costs associated with the cognitive operations of the optimization itself inevitably disappear from the analysis. The costs lost from view in this way may include those of planning, adapting, and monitoring transactions. Even if some attempt is made to treat these costs explicitly, it remains true that they are not realistically very different from the information processing costs of optimization per se. Then the question arises, if the information processing used in optimization is available for free, why isn't all of it free? Isn't it the value of the marginal unit that sets the shadow price?

Williamson, following Herbert Simon, stresses the point that recognition of economic behavior as *intendedly* rational suffices to provide an "economizing orientation" for the analysis of economic institutions (1985:45). Similarly, in evolutionary models, firms are typically represented as profit-*seeking* organizations. Sometimes, of course, these assumptions may be conveniently expressed in an optimization framework; few if any advocates of transaction cost or evolutionary economics have sworn to abstain entirely from optimization calculations. The significant issue is whether it is worth great effort to adhere to a theoretical aesthetic of strict formal optimization, given the inescapable fact that there is nothing "strict" about the treatment of information processing costs in that sort of analysis. For example, to assume that there is some degree of myopia in the profit-seeking process of a firm may be a more balanced way of representing behavioral response to all of the relevant scarcities (including cognitive limitations) than is strict optimization.

It is not actually up to me to establish the qualifications for membership in the transaction cost club, so I will not pursue this issue further. I do want to make it clear that Ronald Coase remains eligible according to my characterization of the club, his remarks about profit maximization notwithstanding. His dedication to English prose as a mode of theoretical expression largely immunizes him from the dangers of that idea.

If figure 11.1 is accepted as reasonably descriptive of important differences among the four schools of thought, some interesting patterns of row and column-wise alliance and conflict are implied. In particular, note that evolutionary economics stands with textbook orthodoxy, and in opposition to transaction cost economics, in having production as its focal concern. This observation provides the theme for the following section.

3. EVOLUTIONARY VS. TRANSACTION COST PERSPECTIVES ON THE FIRM

Fundamentally, business firms are organizations that know how to do things. Profitability is the imperfect signal that market economies employ to tell firms how useful their activities are to society, and whether more or less of the same is wanted. The scope of a firm's productive knowledge may be broad or narrow; even if it is narrow it may be reflected in the firm's output markets by a long list of quite different products. As Teece has observed, "a firm's capability lies upstream from the end product—it lies in a generalizable capability which might find a variety of final product applications" (1982:45). Even very large and highly diversified firms, however, are typically active in a very small fraction of the total number of output markets in the economy. It is not difficult to identify and distinguish the areas of competence of most of the largest corporations.

The foregoing is a basic, though partial, account of how business firms appear to the eye of an evolutionary theorist. As far as it goes, it is not blatantly in conflict with textbook orthodoxy—although it is somewhat closer in spirit to activity analy-

sis than to the single-product production function treatment that is most common in the intermediate texts. Firms are repositories of productive knowledge. In fact, though this is not much emphasized in the textbooks, a particular firm at a particular time is a repository for a quite specific range of productive knowledge, a range that often involves idiosyncratic features that distinguish it even from superficially similar firms in the same line(s) of business.

As was noted in section 1, although textbook orthodoxy has the virtue of focusing on the important role of the firm as a repository of knowledge, it is open to serious objections both in its treatment of that role and in other respects. In our book, Nelson and I put forward an alternative view that responds in a significant way to each of the four critiques of orthodoxy – but still regards firms as, fundamentally, organizations that know how to do things. For example, to address the conflict with methodological individualism it is necessary to unpack the metaphorical statement that "organizations know how to do things" into an account of the processes by which productive knowledge is preserved in an organization while individual human members come and go. Whether our account would be fully satisfying to a hard-core methodological individualist is unclear; we believe that it at least gives the concept of organizational knowledge something more than the provisional legitimacy to which Brennan and Tullock refer – and which is clearly all that textbook orthodoxy can claim.

What is of greatest interest in the present context is the nature of our response to the second critique, and the relationship of that response to the transaction cost analysis of the same issues. In the evolutionary view the question of how the boundaries of a firm are determined is akin to the question of how the boundaries of a tropical rain forest – or a population of house mice – are determined. The thing "knows" (metaphorically speaking) how to reproduce itself. It *must* reproduce itself through time to continue to exist, and the processes that are involved in reproduction through time are the basis of growth in spatial or other dimensions. Give it the appropriate environment and it will grow. Encroach upon it by some method; it will tend to grow back. The rain forest metaphor is particularly appropriate because the "competencies" of the forest are diverse; it can exploit many differentiated environments in differentiated ways – but as a whole it is a collection of competencies quite different from those exhibited by a deciduous forest of the temperate zone.

Putting aside the metaphor:

> The point emphasized by evolutionary theory is that a firm with an established routine possesses resources on which it can draw very helpfully in the difficult task of attempting to apply that routine on a larger scale. . . . *The replication* assumption in evolutionary models is intended to reflect the advantages that favor the going concern attempting to do more of the same, as contrasted with the difficulties that it would encounter in doing something else or that others would encounter in trying to copy its success" (Nelson and Winter: 119).

Of course, when a firm grows by vertical integration, it is not just a question of "more of the same." But it is more of something closely related, something about

which the firm already has some degree of relevant knowledge. The evolutionary view suggests that this "degree" is probably an important determinant of where integration takes place and where it does not.

What is the relationship between this evolutionary view and the transaction cost approach to the same issues? This is quite a complicated question, with many levels and facets. At a very basic level, it is not clear whether transaction cost economics aspires to a historico-evolutionary mode of explanation or, instead, to something more like the timeless, abstract deduction from presumed "data" that characterizes general equilibrium theory. The frequent use of historical evidence in the transaction cost paradigm is consistent with the former, and not the latter, interpretation of its explanatory program.[14] On this interpretation, transaction cost economics is fully compatible with evolutionary thinking. Transaction costs shape economic organization over time because organizational innovations occur that permit previously experienced transactional difficulties to be circumvented. Firms that make such innovations prosper and grow at the expense of their rivals, except perhaps those that are quick to imitate the innovation. This is the evolutionary view of how "cost minimization"—whether of transaction costs or production costs—really works. Something is tried, some problems are encountered: something else is tried and may be found to work better.

However, if this is the style of explanation, the axiom that "the transaction is the basic unit of analysis" seems troublesome. Firms perform their function as repositories of knowledge largely by virtue of the extension in time of the association of inputs, especially human service inputs, with the firm. At any particular time, the costs and benefits of adjustments in governance modes for particular classes of transactions are substantially influenced by the network of transacting patterns already in place. Thus, the process of change in a firm's way of doing things most typically involves incremental adjustment in a complex, interdependent system. Such a process may well produce progress, but it does not produce an "answer" to any well-specified question or list of questions about how activity should be organized.

Relatedly, it is the interdependent system as a whole that is subject to the most significant informational feedback the market provides to the firm—its overall profitability. Of course, individual organizational problems, like individual technical problems, can be the object of "intendedly rational" problem-solving efforts by firm participants. Experience, learning, and adaptation can bring about improvement, or even an approximate local optimization, with respect to performance of a particular production task or the determination of the firm's boundaries at the micro level of a make-or-buy decision. But since it is the performance of the system as a whole to which the most important feedback relates, it is quite possible that a very good solution to one part of the system problem can carry, at least for a time, the cost burdens of a number of blunders in other areas. In that case, the profit incentives and evolutionary mechanisms favoring the replication of overall success can lead to the replication of the blunders along with the competitive advantages of the total system.

Given complex interdependence of sub-problems, given the size of the problem space generated by the need to specify one of M_i alternative solutions to each of N

sub-problems (with M_i's and N typically large), and given the economies of replicating routines of known effectiveness to achieve timely expansion of profitable activity, it seems unreasonable to expect in general that observed sub-problem solutions can be shown to be subtly responsive to contemporary features of their individual contexts. Rather, one should expect that many of the micro level "solutions" observable today may be understandable as "satisficing" choices, as adaptive responses to conditions that prevailed in the past, or as the consequences (for some reason durable) of past chance events.

Related observations apply to the question of the boundaries of the firm at the macro level, the overall size of the firm. In the evolutionary view—perhaps in contrast to the transaction cost view[15]—the size of a large firm at a particular time is not to be understood as the solution to some organizational problem. General Motors does not sit atop the Fortune 500 (at over $100 billion in 1986 sales) because some set of contemporary cost minimization imperatives (technological or organizational) require a certain chunk of the U.S. economy to be organized in this way. Its position at the top reflects the cumulative effect of a long string of happenings stretching back into the past, *among which* were the achievement of relatively good solutions to various technological and organizational problems,[16] the success of its ancestral companies in establishing strong positions in a young market that turned out to be a big one, and of course the creation by merger of the company itself. In short, a position atop the league standings is not a "great play." It may express the cumulative effect of many great plays; it does not exclude the possibility that there were also several not-so-great plays.

With respect to narrower issues, it seems that evolutionary economics and transaction cost economics typically offer refinements to the categories of the other approach. For example, the transaction cost approach urges attention to the organization of transactions across the boundaries of the firm as part of the problem that organizational "routines" must solve. This in turn suggests the need to characterize different transacting environments in ways that provide a basis for analyzing what sorts of transacting routines will prove viable in different environments. Transaction cost economics obviously offers a great deal of useful guidance to this effort.

Evolutionary economics suggests that the concept of human asset specificity is central to understanding the functioning of the firm as a repository of knowledge. For understanding to progress, however, the idea of "specificity" must be refined and linked to the broader context in which quasi-rents to various sorts of productive knowledge are determined. Thus, for example, the "hazards of opportunism" faced by an innovating firm include the possibility that several key employees will simultaneously quit and found a rival firm. Considered one by one, these employees may be strongly bound by human asset specificity to transacting with the original innovator. Considered as a coalition, however, the group's freedom of action may be much greater than the one-by-one analysis would suggest. The "specificity" of the investments involved is not really to the transaction pattern per se (that is, to transacting with the original innovator), but rather to the context that the innovator provided. If enough of the context can be moved simultaneously, the innovator may be left behind.

In sum, there are conflicts and complementarities between the transaction cost and evolutionary paradigms. Both provide opportunities for fruitful inquiry to advance understanding of the nature of the firm.

4. CONCLUDING COMMENT

In the past half-century, it has been clearly demonstrated that the economy is much better at changing itself than economists are at changing their minds. These divergent growth trends are grounds for dismay. But, after wasting at least a third of a century by not taking "The Nature of the Firm" seriously, the discipline now shows signs of a notable acceleration of progress. Perhaps the gap between our understanding and an increasingly complex reality is at last beginning to close.

NOTES

Financial support from the Sloan Foundation is gratefully acknowledged.

1. Instances of multiple independent discoveries of the same invention or scientific principle are frequently cited in support of the view that advances are "foreordained" in the sense that their elements are introduced to the intellectual environment by previous advances, and once they are there any number of investigators may perform the crucial juxtaposition of these elements to produce the advance in question (Merton). By this standard, Coase has a strong claim to having made an advance that was far from foreordained when he made it. Not only was there no codiscoverer, but decades passed before the discipline was ready to make use of the contribution. And one thing that happened during those decades was that Coase wrote another classic article—"The Problem of Social Cost"—that employed some of the same basic ideas in the context of a different problem.

2. An even more dramatic decline in institutional content and plausibility occurs between the elementary and intermediate levels. As Martin Shubik once observed, "The more elementary the textbook is, the more likely there will be information on different organizational forms. However, as soon as our study becomes 'advanced,' we do not bother to differentiate between General Motors and the local candy store" (413).

3. See Debreu, and Arrow and Hahn.

4. Walter Nicholson's distinguished text provides an example of a relatively high level of attention to these problems (ch. 10).

5. See J. S. Mill (1848: v. 1, book II, ch. XV).

6. Similarly, Adam Smith's comments on joint stock companies reflect a negative assessment of arrangements that empower directors who have little or none of their own capital at stake: "Like the stewards of a rich man, they are apt to consider attention to small matters as not for their master's honour, and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company" (1776:700).

7. It is interesting to note that this problem is the subject of an article by Scitovsky that follows "The Nature of the Firm" in the AEA *Readings in Price Theory*.

8. Special-purpose general equilibrium models that address the question of who becomes an entrepreneur include those of Lucas, and Kihlstrom and Laffont. In the former case, entrepreneurial status goes with high managerial ability, which in turn corresponds to a

Hicks-neutral productivity factor modifying the given technology. In the latter case, everyone has equal access to the same technology and entrepreneurs are distinguished by their low risk aversion.

9. They sometimes proceed to engage in the testing activity endorsed by the third yes and then frequently come to the conclusion that the orthodox theory of the firm stands refuted. This empirical conclusion is obviously quite distinct from, and not entailed by, the yes-yes-yes methodological view. See Blaug (ch. 4 and 7) for an overview of the methodological controversy.

10. In lecture 2, Coase addresses the irrelevance-of-assumptions thesis directly and indicates his disagreement with it.

11. When I gave this issue serious attention in a recent paper (1986), noting in particular the opposition between Coase (1937) and Machlup, my discussant politely intimated that I was flogging a dead horse.

12. I use the term "productive knowledge" rather than, for example, "technology" because I view technology and organization as inseparable constituents of the ability to do things.

13. Actually, IBM developed a one-of-a-kind computer, the Selective Sequence Electronic Calculator (SSEC), over the period 1944–1947. Thomas J. Watson, Sr., felt that the one SSEC machine "could solve all the important scientific problems in the world involving scientific calculations." IBM sold specialized computers to the armed services and produced and leased a limited number of the "Defense Calculator" machine, later renamed the IBM 701, before producing the IBM 650. Thus, it could well be argued that IBM was in the industry from the start, though not as vigorously as some of its early rivals, particularly Remington Rand (Katz and Phillips: 169, 171, 177–78).

14. For a penetrating discussion of this and other methodological issues relating to the transaction cost paradigm, see Dow.

15. I will not take up the considerable challenge of describing where Coase, Williamson, and other transaction cost theories stand on the question of the determination of firm size. It is interesting to note that Williamson (1975: ch. 11) is quite consistent with the evolutionary view.

16. Of course, among the various problem solutions on the string are some that have provided recurring themes in transaction cost economics – for example, the invention of the M-form and the acquisition of Fisher Body. It may well be the case that *but* for these solutions and others, GM would not be atop the Fortune 500.

REFERENCES

Alchian, A. 1950. "Uncertainty, Evolution and Economic Theory," 58 *Journal of Political Economy* 211–21.

Arrow, K. J., and F. H. Hahn. 1971. *General Competitive Analysis*. San Francisco: Holden-Day.

Blaug, M. 1980. *The Methodology of Economics, or How Economists Explain*. Cambridge: Cambridge University Press.

Brennan, G., and G. Tullock. 1982. "An Economic Theory of Military Tactics: Methodological Individualism at War," 3 *Journal of Economic Behavior and Organization* 225–42.

Coase, R. H. 1937. "The Nature of the Firm," 4 *Economica* n.s. 386–405.

_____. 1960. "The Problem of Social Cost," 3 *Journal of Law and Economics* 1–44.

Debreu, G. 1959. *Theory of Value*. New York: John Wiley & Sons.

Dow, G. K. 1987. "The Function of Authority in Transaction Cost Economics," 8 *Journal of Economic Behavior and Organization* 13–38.

Graaf, J. de V. 1957. *Theoretical Welfare Economics*. Cambridge: Cambridge University Press.

Katz, B. G., and A. Phillips. 1982. "The Computer Industry." In R. R. Nelson, ed., *Government and Technical Progress: A Cross-Industry Analysis*. New York: Pergamon Press.

Kihlstrom, R. E., and J.-J. Laffont. 1959. "A General Equilibrium Entrepreneurial Theory of Firm Formation Based on Risk Aversion," 87 *Journal of Political Economy* 719–48.

Lucas, R. E., Jr. 1978. "On the Size Distribution of Business Firms," 9 *Bell Journal of Economics* 508–23.

Machlup, F. 1974. "Situational Determinism in Economics," 25 *British Journal for the Philosophy of Science* 271–84.

Merton, R. K. 1961. "Singletons and Multiples in Science." In N. W. Storer, ed., *The Sociology of Science: Theoretical and Empirical Investigations*. Chicago: University of Chicago Press.

Mill, J. S. [1848] 1899. *Principles of Political Economy*, v. 1. New York: The Colonial Press.

Nelson, R. R. 1980. "Production Sets, Technological Knowledge and R and D: Fragile and Overworked Constructs for Analysis of Productivity Growth?," 70 *American Economic Review* 62–67.

_____, and S. G. Winter. 1982. *An Evolutionary Theory of Economic Change*. Cambridge: Belknap Press of Harvard University Press.

Nicholson, W. 1972. *Microeconomic Theory: Basic Principles and Extensions*. Hinsdale, Ill.: Dryden Press.

Scitovsky, T. 1943. "A Note on Profit Maximization and Its Implications." Repr. (1952) in G. Stigler and K. Boulding, eds., *AEA Readings in Price Theory*. Homewood, Ill.: R. D. Irwin.

Shubik, M. 1970. "A Curmudgeon's Guide to Microeconomics," 8 *Journal of Economic Literature* 405–34.

Simon, H. A. 1984. "On the Behavioral and Rational Foundations of Economic Dynamics," 5 *Journal of Economic Behavior and Organization* 35–55.

Smith, A. [1776] 1937. *An Inquiry into the Nature and Causes of the Wealth of Nations*. New York: The Modern Library.

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

_____. 1986. "Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy," 15 *Research Policy* 285–305.

Williamson, O. E. 1975. *Markets and Hierarchies*. New York: Free Press.

_____. 1985. *The Economic Institutions of Capitalism*. New York: Free Press.

Winter, S. G. 1982. "An Essay on the Theory of Production." In S. H. Hymans, ed., *Economics and the World around It*. Ann Arbor: University of Michigan Press.

_____. 1986. "The Research Program of the Behavioral Theory of the Firm: Orthodox Critique and Evolutionary Perspective." In B. Gilad and S. Kaish, eds., *Handbook of Behavioral Economics*, v. A (Behavioral Microeconomics), Greenwich, Conn.: JAI Press.