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What Firms Do?

Coordination, Identity, and Learning

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Abstract

Firms are organizations that represent social knowledge of coordination and learning. But why should their boundaries demarcate quantitative shifts in the knowledge and capability of their members? Should not knowledge reside also in a network of interacting firms?

This line of questioning presents the challenge to state an alternative view to the “theory of the firm,” a theory that has moved from Coase’s early treatment of what firms do to a concern with ownership, incentives, and self-interest. We return to Coase’s original insight in understanding the cost and benefits of a firm but based on a view that individuals are characterized by an “unsocial sociality.” Does the perception of opportunism generate the need to integrate market transactions into the firm, or do boundaries of the firm lead to the attribution of opportunism?

This basic dichotomy between self-interest and the longing to belong is the behavioral underpinning to the superiority of firms over markets in resolving a fundamental dilemma: productivity grows with the division of labor but specialization increases the costs of communication and coordination. The knowledge of the firm has an economic value over market transactions when identity leads to social knowledge that supports coordination and communication. Through identification, procedural rules are learned, and coordination and communication are facilitated across individuals and groups of diverse specialized competence.

A firm is distinct from a market because coordination, communication, and learning are situated not only physically in locality, but also mentally in an identity. Since identity implies a moral order as well as rules of exclusion, there are limitations and costs to relying upon a firm for exchange as opposed to the market. These costs are not necessarily those traditionally assigned to the category of decreasing returns to hierarchy. For example, an identity implies that some practices, and businesses, may be notionally *inconsistent* with each other. Norms of procedural justice that are identified with a firm imply that not all technically feasible complements are permissible within the logic of a shared identity. There is consequently a cost to an identity that offsets the benefits. Because the assemblage of elements that compose

an organization are subject to requirements of consistency, identities rule out potentially interesting avenues of innovation and creativity.

We illustrate these ideas by returning to the original prisoners’ dilemma game and by an analysis of the coherence of a firm as a search for complements that are consistent with norms of procedural justice. We argue that the underlying dynamic of a prisoners’ dilemma game reveals the problems of coordination, communication, and conflicts in norms of justice when players are deprived of social knowledge and shared identity. Similarly, the determination of a firm’s coherence arises out of the demand for a moral and notional consistency in the “categorization” of its activities, as opposed to a technological necessity. These ideas are illustrated through an empirical examination of logical complements in high performance work systems.

(Knowledge; Identity; Coordination; Complementarities)

At the turn of the last century, the French economist Léon Walras stylized a competitive economy by a system of equations that relied upon the notion of a *tatonnement*, or of iterative bidding, by which quantities are cleared. This notion of an exchange economy is fundamental, not only in identifying the meaning of equilibrium, but also in suggesting that economic agents learn collectively the correct prices through a pursuit of self-interested bidding. In a more modern time in which computers trade automatically, Walras’s vision of a *tatonnement* has been realized in the electronic markets of nonhuman actors. If ever there was a vision of a brain in a vat, it is the evolution of electronic trading in financial markets.

It is amusing, and yet insightful, to note that the modern firm seems bizarrely resistant to these advances. No where is this resistance so obvious than in Mintzberg’s (1973) observation on how much talking managers do. Organizations have a process of *tatonnement*, but the *tatonnement* is not that of market

clearing, but of procedural coordination and learning. These issues were not neglected by Frederick Hayek, although his 1945 essay on the role of prices as information is considered as one of the most eloquent statements on the superiority of the market to planning. In a lesser known article on tacit knowledge, Hayek noted that "... even decisions which have been carefully considered will in part be determined by rules of which the acting person is not aware" (Hayek 1962; p. 335).

To investigate these issues, we proposed that a firm be understood as a social community specializing in the speed and efficiency in the creation and transfer of knowledge.¹ This knowledge could be understood as consisting of know-how and information, concepts that correspond to the procedural and declarative distinction made in cognitive sciences. Through the recombination of this knowledge, firms evolve, partly by the generative logic of their capabilities but also by the opportunities and influences of the external environment. In our empirical work, we tested a pair of central hypotheses that, if disconfirmed, would provide strong falsification of these ideas. The results indicated reasonable support for the proposition that more tacit knowledge is slower to be transferred and that firms tend to transfer tacit knowledge within the firm instead of through the market. To summarize these findings, we stress the costs of communication, coordination, and new combinations, not those of transactions, as the primary metric that influences the boundary decisions of firms.

The price of a good or service quoted in a market is related, in some way, to the costs of its provision. By implication, firms face different opportunities in the market and address these opportunities with varying costs (and speed) of transformation. It is not transaction costs, but the social knowledge embedded in the competence of individuals and the organizing principles of work that explains what firms are on the basis of what they know how to do.

The comment by Juul Foss on our argument poses an important question. Why is there more knowledge, he asks, inside the firm than outside? He argues that the answer to this question requires coupling knowledge of the firm to the capabilities of hierarchy to resolve agency and transaction cost dilemmas. He allows for differences in communication costs to determine firm boundaries, but then notes that communication cost differences beg the larger question, why they should be lower. His causal reasoning runs from hierarchy to the control of opportunism, allowing for the emergence of trust and, consequently, superior perfor-

mance. This perspective is conventional and echoes Williamson's (1975) notion of a quasi-morality and the reduction in transactions costs for trade inside the firm. Because the gains do not flow to the employees, there is less incentive to behave opportunistically.

The question why there is "more of it" inside the firm points to an omission in our paper. Our implicit causal reasoning runs from identity of the individual with a group to the dynamics by which coordination and learning are facilitated and, consequently, to the superior performance of firms. Higher-order principles are the organizing knowledge that establishes the context of discourse and coordination among individuals with disparate expertise and that replicates the organization over time in correspondence to the changing expectations and identity of its members. We propose that the boundaries of firms demarcate qualitative changes in the reservoir of social knowledge available to economic agents (i.e., people) because coordination and learning are developed within the organizational context of shared identities. This shared identity does not only lower the costs of communication, but establishes explicit and tacit rules of coordination and influences the direction of search and learning.

Our efforts to make explicit a theory of the firm based on a wider notion of human motivation is not alien to the spirit of Coase's seminal contribution. As Coase (1991) himself acknowledged, market failure due to self-interest is not necessary to an argument that a firm organizes those activities in which it is economically favored relative to a market. This insight of Coase is open to interpretation, because the mechanism by which a firm is better at doing certain activities is not addressed. We wish to preserve the spirit of Coase's inquiry by isolating factors that lead a firm to be advantaged, as well as those factors that limit its growth and diversity.

Firms provide a sense of community by which discourse, coordination, and learning are structured by identity. However, identity also generates a cost on limiting the search for new avenues of exploration and on imposing existing procedural rules suboptimally on new activities. People hold multiple identities, and hence discourse and learning occurs in many settings, including market exchange. We start, therefore, with a sociological and historical presumption, that one of the most important identities in modern society is bound with the employment relationship and its location. Indeed, as Bendix (1956) described, the genesis of the modern firm is intrinsically tied to the historical competition over the loyalty of workers and employees between the enterprise and class. Through membership

in a social community called the firm, identity is developed that changes the character and quality of human discourse and behavior. From this, the rest of the argument follows.

1. Identity and the Division of Labor²

To avoid false debates, let us be clear that we acknowledge that incentive problems exist and that these problems are sensitive to the appropriate design of governance mechanisms. Firms, because they are also economic entities, necessarily entail a legal definition by which to sort out claims to cash flows. Some governance mechanisms are less efficient because the resolution to achieving compatible incentives may conflict with the optimal design of ownership claims. The classic case is the conflict between the economic advantages of dispersing ownership in order to allow individuals to diversify and the moral hazard of allocating authority to managers who are not owners.

That people respond to incentives is so patently obvious, by virtue of observation or of introspection, that it hardly can be a point of contention. It is not a telling counterfactual to the argument we propose. Any extant treatment of behavior within and among organizations has to address implications of self-interested behavior, and the resolution of resulting conflicts through ownership.

But self-interested behavior is only one aspect of human motivation. There are emotions, such as those associated with friendship, empathy, and loyalty, and abstract values such as notions of good, beauty, and truth. It is odd that Adam Smith's rhetorical device of accepting the charge of conservative opponents to liberal change by arguing for the virtue of capitalism on the basis of self-interest should be taken not as the limiting but the modal case of human motivation. Smith employed other presumptive reasoning in his other writings, particularly in his analysis of sympathy in his work on moral sentiments. This conflicting view of human motivation was crystallized in the debate in Germany on what was called "das Adam Smith Problem." His near contemporary Immanuel Kant noted in his essay "Idea for a Universal History" that:

The means by which nature employs to bring about the development of innate capacities is that of antagonism within society, in so far as this antagonism becomes in the long run the cause of a law-governed social order. By antagonism, I mean in this context the *unsocial sociability* of men, that is, their tendency to come together in society, coupled, however with a continual resistance which constantly threatens to

break this society up. This propensity is obviously rooted in human nature. Man has an inclination to live in society, since he feels in this state more like a man, that is, he feels able to develop his natural capacities. But he also has a great tendency to live as an individual, to isolate himself, since he also encounters in himself the unsocial characteristic of wanting to direct everything in accordance with his own ideas.

The distinction that Kant drew has important implications for understanding the division of labor and the firm. The primary dilemma facing the economic treatment of the division of labor is to account for the transition from the pursuit of self-interest at the individual level to cooperation within the firm. For as Adam Smith noted, the gains to specialization is what generates the foundations of capitalism, namely, comparative advantage that leads to mutual benefit in trade.

More than a half-century later, Charles Babbage extended Smith's observations in important directions (1835). He understood the critical role in matching task to ability. It would be inefficient, he notes, to pay high wages to a skilled worker for doing an unskilled task. The division of labor requires a link between skill and pay gradation. By arguing that the implied hierarchy in physical labor can also be applied to mental labor, Babbage motivated an explanation for why there should be a vertical hierarchy and managers in the firm.

Between Smith and Babbage, a theory for the vertical and horizontal division of labor was developed. This theory accounted for the horizontal division of labor by noting that such a division gives rise to increasing returns to specialization. The vertical division economizes on scarcity wages paid to skilled workers by matching task to skill and allowing for wage gradations. Suggested by Babbage is also that supervision of less skilled task would be assigned to the scarcer skilled labor. Unlike Smith, Babbage implies that variations in the endowments of individuals leads to a hierarchical structuring of authority.

It was Durkheim who recognized the transformation in identity as a consequence of the industrial revolution and, more perceptibly, of the division of labor. Durkheim argued that the traditional societies were held together by a mechanistic solidarity. The division of labor required a different kind of moral order, one based on an organic solidarity in which the individual identifies with society. He saw the division of labor as evolving out of the interplay of the rule towards specialization and that towards the emulation of the collective type. A contribution of Durkheim was to link this evolutionary view of the division of labor as arising

out of competition to the establishment of a new moral order consistent with individual choice. In societies sufficiently populated, competition leads to specialization, which in turn engenders a sense of cooperation independent of notions of family, race, or country:

As we advance in the evolutionary scale, the ties which bind the individual to his family, to his native soil, to traditions which the past has given to him, to collective group usages, become loose . . . as intelligence becomes richer, activity more varied, in order for morality to remain constant, that is to say, in order for the individual to remain attached to the group with a force equal to that of yesterday, the ties which bind him to it must become stronger and more numerous. Through it, the individual becomes cognizant of his dependence upon society; from it comes the forces which keep him in check and restrain him. In short, since the division of labor becomes the chief source of social solidarity, it becomes, at the same time, the foundation of the moral order (Durkheim 1893; p. 259).

The sociological tradition established by Durkheim is based on the observation of both sides of Kant's idea of the unsocial sociability of the individual. Durkheim's brilliance was to see that the division of labor increased the individual's longing to belong to a moral order, whose character is neither good nor bad in an abstract sense but represents the perception of justice and identity in an historical context. Yet, because moral order is contextually understood, Durkheim and Marx could agree on this point, while preserving radically different views whether this identification is to class or to society.

Or could it be to the enterprise? It was Weber, living in a more regulated Germany and during a time of the growing dominance of many of the largest German firms, who most clearly recognized that the modern organization could replace the loyalty to the leader by the routinization of rationality.³ The division of labor creates a classification of status and occupation that competes with the solidarity to class.

If in the first century of industrial capitalism, the ideologies of authority wavered between the view of the firm as the family with a paternal owner and that of the firm as a disciplinary agent, the current century introduced the notion of the firm as a place of career (Bendix 1956). To Weber, the division of labor leads to an increasing differentiation of bureaucratic work within large enterprises. In fact, his treatment of the division of labor consists largely of the enumeration of the various kinds of job classifications in modern society (Weber 1968, p. 114ff.). It is this Weberian picture of the loyal bureaucrat who conforms to routinized instructions that is the target of later critics as W. Whyte (1956). It is also a statement of the transfor-

mation of identities from family, region, and craft to membership in an industrial organization.

2. Identity: Behavioral Foundations

The division of labor varies widely over time and space. A system that organizes work into serial standardized tasks is the foundation of mass production. Alternatively, work can be organized into cells involving the use of skilled labor in interdependent and discretionary tasks, e.g., in Volvo's experimental Uddevalla plant. Division of labor implies organizing principles that structure work and define the task specialization of individuals. More abstractly, the division of labor is the encoding of social knowledge into a structure that defines and coordinates individual behavior.

In this differentiation lies the roots of economic progress: we are all endowed with increasing organizational capital, much like we are endowed with more technology and more physical capital. Yet, the evolving complexity in the division of labor is a reduction in the proportion of social knowledge controlled by an individual, because it transforms a more elemental social structure into one which is differentiated and loosely coupled. In his essay on cognition in organizations, Jacques Girin (1995) notes:

No matter what kind of interviews (are made) in a large organization and even often in a small one, one is struck by the degree to which each person ignores what the others do. It is not rare to note that the superior does not know much what the subordinate really does, and reciprocally. When one asks persons of one service what the others do in a nearby service, the situation is even more dramatic. And when one moves on from these immediate relationships to move on to questions such as "What do you know of the people of level N . . . of what the people of $N + 2$ do", one knows practically nothing.

If individuals are less informed, then how is the system more intelligent? Part of the answer is traditional, that a division of labor results in gains to specialization, and specialization implies a division of labor based on competence. More importantly, as Smith noted, specialization creates competence as individuals explore locally around their assigned tasks. Since Smith, this tendency has become formalized through the divisionalization of education along skill and professional lines. Consequently, the division of labor generates a learning dynamic in which people increasingly become more competent in their specialization. The expansion of lower-order knowledge held by individuals is driven by adaptive behavior organized by a division of labor.

The process by which specialization drives competence implies, though, the problem of coordination. The common practice of two career ladders for managers and scientists points to the difficulty of comparing apples and oranges inside the same firm, and the problems of communication across competences. One does not need to add incentive problems, which surely exist, to identify the costs of coordination.

How then are we to understand the comparative merits of firms? Knowledge, as we have emphasized, is surprisingly tangible, whether it be observed in accounting rules or in nonformalized relational patterns. The concepts of routines, procedures, recipes, and conventions point to feasible empirical inquiry by which to understand coordination. Because we are talking about economic institutions, it is attractive to create a metric by which to evaluate the costs of communication, coordination, and learning. In this sense, the notion of knowledge lends itself to comparable measurement suggested by Coase, Arrow, or Hurwicz on communication.

However, these similarities in metrics hide profound differences in understanding firms as social communities as opposed to efficient communication nets. For, to return to Foss's question, a communication net is qualitatively unaffected by boundaries. A network of firms, wired electronically, is technologically equivalent to the communication capability within a firm. The authority relationship written into a contract can be similarly replicated among independent agents. So what else do firms provide, other than legal mechanisms by which to account for the ownership rights to economic gains or as solutions to incentive problems?

Identity and Attribution

Firms provide the normative territory to which members identify. This identification has two implications. First, it defines the conventions and rules by which individuals coordinate their behavior and decision making. Much like the boys in Piaget's town of Neuchatel who knew they had to change the rules of their game from one neighborhood to the next, people are skilled in shifting their routine behavior from their recognition of the social context (see Piore 1995; pp. 107–108). Second, identification sets out the process by which learning is developed socially through the formation of values and convergent expectations.

It is the inherent dilemma in achieving communication and coordination among individuals with diverse competencies that puts into relief the role of identity in supporting higher organizing principles of a firm. In-

trospection and observation on world events tell us that identity with a group is associated with a normative implication. Ethnic conflict is often expressed through statements of good and evil. Members are faced with the cognitive dissonance between their normative attachment to an identity and evidence that the group, or other members, have not behaved appropriately. The tendency to rationalize behavior by members to conform to a notion of good is an important mechanism by which a positive identity is maintained.

The act of identifying has important implications for the shared cognitive schemas and moral values that people apply to how others are categorized.⁴ Albert and Whetten (1985) have noted that organizational identity provides a sense of a shared central character and also of distinctiveness. Identity does more than provide a definition of membership; it also influences the attribution of self-interested behavior.

Tajfel, Billig, Bundy, and Flament (1971) tested whether the simple fact of belonging to a group was enough to affect one's judgment. They assigned English schoolboys randomly to two groups on the basis of a test that supposedly measured artistic preferences. No boy knew which others had been assigned to the same group as himself. They were asked to allot rewards to one member of their own group and one member of the other group, choosing pairs of rewards. The average allocations indicated that the subjects were trying to maximize the difference between their group's rewards and the other group's rewards. Simply being told that one belongs to a particular category causes one to discriminate in favor of that category. In this context, it could be posited that behavior that is commonly interpreted as opportunistic also could be seen as loyalty to the group to which an individual belongs.

Studies of behavior of "insiders" and "outsiders" to organizations suggest that potential cognitive dissonance between loyalty and opportunism can be resolved through attribution. Interestingly, some studies show that the mere fact of group membership can completely reverse the patterns of attributions made to an individual's behavior. Taylor and Jaggi (1974) asked 30 Hindu clerks in India to evaluate a series of desirable and undesirable events: for example, a shopkeeper who either cheated customers or was generous. The actions presented to subjects were said to have been performed either by a fellow Hindu or by an out-group Muslim. It was found that the positive behaviors performed by members of one's own group were believed to arise from internal dispositions, while the negative behaviors were seen as the result of external forces.⁵

The attribution that people belonging to the same group are less self-interested has reinforcing consequences. Expected cooperation induces cooperative behavior. To a nontrivial extent, this dynamic is driven by the confidence held in the common knowledge that both parties to an exchange have the intention to cooperate. The recursive calculation "that I know that you know that I know" is resolved through signaling this intent. It is logical to move from this recognition to an argument that members to a club desire to cooperate as long as detection leads to penalties in excess of rewards. If this is the argument, then we have returned to a breakdown in collective action due to unenlightened self-interest.

But we wish to pose a more radical argument, namely, that identity improves coordination, communication, and learning. Let's turn to each serially.

Coordination

Of the many implications of identity, the role played by procedures in resolving coordination problems is the most tangible. It is telling that in the market approach to transactions, the canonical model is the prisoner's dilemma. In attempts to understand coordination, the principal analytical engine are focal rules, a concept introduced by Schelling (1960). By eliminating incentive effects through an analysis of "pure coordination games," Schelling shows that coordination is nevertheless difficult in the absence of rules. Incentive problems are replaced by a comparison of risk if coordination is not achieved. Consider the difficulties of driving once people having abandoned conventions that dictate cars should drive on the left or right.

A focal rule is an outcome of "convergent expectations" that solves for the problem of coordinating (see Knez and Camerer 1994). The critical quality of a focal rule is the recognition of its arbitrariness. Schelling writes:

A focal point for agreement often owes its focal character to the fact that small concessions would be impossible, that small encroachments would lead to more and larger ones. One draws a line at some conspicuous boundary or rests his case on some conspicuous principle that is supported mainly by the rhetorical question, "If not here, where?"... We are dealing here with the players' shared appreciations, preoccupations, obsessions, and sensitivities to suggestion, not with the resources that they can draw on when necessary (Schelling 1960, pp. 111-114).

What Schelling is referring to is the notion of a category error in failing to distinguish between "know-

ing that" and "knowing how." The intellectual heritage of this distinction is long, but is clearly stated, as Foss notes, by Gilbert Ryle in his classic *The Concept of Mind*. Ryle ridiculed the belief, or what he called the "intellectualist legend," that a theory of decision is consciously known to actors prior to action. He notes:

Champions of this legend are apt to try to reassimilate knowing *how* to knowing *that* by arguing that intelligent performance involves the observance of rules, or the application of criteria.... It follows that the operation which is characterized as intelligent must be preceded by an intellectual acknowledgment of these rules or criteria; that is, the agent must first go through the internal process of avowing to himself certain propositions about what is to be done ('maxims', 'imperatives' or 'regulative propositions' as they are sometimes called) only then can he execute his performance in accordance with those dictates. He must preach to himself before he can practice. The chef must recite his recipes to himself before he can cook according to them; the hero must lend his inner ear to some appropriate moral imperative before swimming out to save the drowning man; the chess-player must run over in his head all the relevant rules and tactical maxims of the game before he can make correct and skillful moves.... (Ryle 1949; p. 29).

In this philosophical protest lies a startling different implication for understanding firms and their growth. Simon (1962) has made an important contribution in his contrast of economic logic based on "substantive" reasoning as opposed to a decision logic that is essentially "procedural." This distinction between the substantive and procedural, or the declarative and procedural, lies at the foundation of the distinction we drew between know-how and know-what. As Nelson and Winter (1982) have argued in their seminal work, procedural knowledge represents a dividing line between rational choice theory and behavioral approaches. Firm behavior reflects the enactment of learned skills and routines grounded in the acquisition of procedural knowledge.

Part of the appeal of understanding focal rules as based on learned behaviors is the complementary evidence concerning the physiology of perception, categorization, and knowledge (see the extended discussion in Lakoff 1987; pp. 24ff.). There is substantial evidence that much learning and skill are based on procedural knowledge, with associated neural physical processes. One definition of declarative knowledge is memory that is accessible to conscious recollection (Squire 1987). Procedural memory is contained within learned skills or nondivisible cognitive operations. That procedural and declarative memory is stored in different

areas of the brain is revealed by studies on amnesia patients. Amnesia tends to eradicate declarative, not procedural knowledge. Amnesic patients show intact learning and retention of a variety of motor, perceptual, and cognitive skills, despite poor memory for the actual learning experiences. Such patients also respond to priming effects, even when the stimulus is forgotten. For example, brain-damaged people often have trouble recalling recent events. Yet, they respond to priming effects. That is, if they are exposed to gray, they are likely to detect gray subsequently, even though they forgot the original exposure event (i.e., their exposure to gray).

Several studies have shown that priming stimuli are able to evoke the latter recall of procedural memory better than declarative. Reber (1993) has taken to heart that much that is known is implicit knowledge and only tacitly known. Implicit knowledge tends to be veridical but partial isomorphisms of the environment. Reber reports that experiments on transferability across modalities (e.g., audible, visual), show that unconscious knowledge is retrievable but is surprisingly insensitive to stimuli different than the original priming. For conscious knowledge, activation can occur by modality (e.g., speech) other than how it was first stored (e.g., vision), while when the knowledge is implicit, the same mode of initial priming seems required. These results have important implications for understanding not only the transfer of knowledge, but also why geographic proximity, such as a Silicon Valley, appears to be associated with rich contextual environments for the spawning of new innovations.

Procedural knowledge provides the conceptual underpinning to understanding the generation of routines as arising out of sustained interactions. In this regard, Cohen and Bacdayan (1995) carried out an interesting experiment. They designed a very simple card game, or what we can call a coordination game, between two players. The goal was to have two cards of a particular nature match, and the number of cards was quite small, in the order of six. Players derived particular heuristics, or procedures, that were run off like "chunks" used in the studies on representation and production systems. They found that procedural rules were remembered better than declarative knowledge, speeded cooperation, but were subject to suboptimality and negative transfer. Cohen and Bacdayan posit that dual priming is the basis for procedural action, with individuals triggering coordinated action by their interactions. When the game changed, these same rules were used. In other words, the players established a set of procedures that were transported to new settings.

Cohen and Bacdayan found that players also exhibited "negative learning"; they transported learned procedures to wrong situations.

Similar results on the dominance of procedural rules over declarative knowledge when optimal decisions are not known have been found in other studies. In a setting far from the laboratory, Bowman (1963) found that managers' decisions were better on average when using regression coefficients derived from data on their previous decisions than their actual decisions. Consistent behavior performed better than the search for optimal decisions. Trying to respond to environmental cues, concludes Bowman, explains why managers deviate from consistent behavior. Lewis and Anderson found that nonoptimal behavior persisted unless past a certain threshold; in these cases, negative transfer persists, otherwise replaced or weeded out (see the discussion in Singley and Anderson 1989). Because procedural rules are more likely to be suboptimal than incorrect in some formal sense, they are plausibly more prone to persistent use unless discovered. Reber (1993) reported similar findings on the use of suboptimal rules.

The problem of coordination at the individual level also exists at the organizational. While there is a large body of work on procedural learning and transfer at the individual level, there is little systematic evidence on the use of higher order principles, such as the divisionalization of work. If we think of the division of labor as the coding of how work among groups should be organized, then observations on the inert character of structural change (such as the slow diffusion of the divisional structure) suggests that the extension of organizing principles is most likely to be characterized by suboptimal transfer. It is easier to replicate existing routines than to design optimally. Routines enacted at the organizational level may be even more prone to such error, because the manipulation of such routines is rarely open to individual discretion.

Yet, while the transfer of organizational structure is also a source of error, structure itself provides the important property of robustness. The experiment by Rao and Argote (1995) is particularly interesting, for the design highlighted the roles of specialization and coordination in the division of labor. They experimented with the effects of turnover and structure, and found that turnover was more damaging in cases in which work was not well structured. For the particular production system used in the experiment, the knowledge encoded in the structuring of the work made the overall system robust against turnover. It is the inert quality of the coding of knowledge in structure that

provides the robustness against the loss of individuals. It is also the source of error.

Discourse

The difficulty in the transmission of social knowledge is how to communicate from highly specialized bases of expertise to provide instructions and tools that are employable by large numbers of people. In our earlier article (Kogut and Zander 1992), we relied upon the metaphor of the shells of software (e.g., machine language, compiler, operating system) that are employed to allow many users to access some of the functions of a computer. We neglected the critical role played by language and discourse, symbol and interpretation in the operation of higher organizing principles that bind the organization. Identity is not only critical for supporting coordination, but also in creating a dialogue by which information and solutions are discovered.

The superiority of coding and decoding within the firm has been claimed periodically, but rarely explained. Frequently, the work of Shannon and Weaver (1949) is cited as a basis for a theory of communication as reliability of encoding information. In his essay introducing a popularized version by Shannon of his theory of communication, Weaver suggests that "the concept of information... leads directly to a study of the statistical structure of language.... The idea of utilizing the powerful body of theory concerning Markoff processes seems particularly promising for semantic studies, since this theory is specifically adapted to handle one of the most significant but difficult aspects of meaning, namely the influence of context" (Shannon and Weaver 1949).

Though this approach has not been frequently used in organizational studies, it has been important in cognitive sciences. It is not hard to see its applicability to understanding communication as the problem of people knowing the commands and sharing common notions of coding, of the costs and reliability of various channels, and of the actual information content (i.e., the entropic measure of the percentage of words that reflect discretionary choice—letterheads do not count). The view of communication as the transmission of symbolically encoded meanings is especially appealing in an age in which machine manipulation of symbols has proven to be such a powerful aid to human intelligence. The salience of this metaphor is revealed in the application of cybernetic thinking—memory, retrieval, action, feedback—to organizations and institutions. In fact, the algorithmic nature of procedural learning leads easily to computational simulation by symbolic manipulation.⁶

This line of inquiry is useful, but it can also be misleading. Take, for example, the role played by categories in the symbolic representation of knowledge. In a stunning analysis, Lakoff (1987) notes that people hold ideal cognitive models that inform their understanding of their world. The foundation to these models is the classifications imposed on the perception of reality. Whereas logic may apply to the manipulation of symbols within a schema, the reference of these symbols to an external reality is influenced by bodily properties (e.g., color perception) and imaginative processes (e.g., metaphor and metonymy). Borrowing Eleanor Rosch's theory of classification, Lakoff notes that primitives tend to be classified by prototypic effects, i.e., best examples. One of Lakoff's examples is that an "unmarried man" is a possible prototype for bachelor; priests and men with three wives when four are allowed would be poor best examples.

To adumbrate the implications of this thinking, consider the notion of "best practices." Many firms may claim to have installed Japanese production methods; the Toyota system is, however, a best example. Other systems belong to this category, but the prototype is Toyota. The transfer of this system across firms and countries is difficult for many reasons, but a principle reason is that a prototype is not a fixed template. The transfer of JIT systems, by argument of metonymy—a part representing a whole—might lead to the classification of adopters as implementing Japanese systems. Moreover, understanding Toyotism or Taylorism as a philosophy leads to the implementation of the spirit of the system, metaphorically. It is not surprising that transfer usually entails innovation, and disagreement whether it occurred. But because categorization is imprecise, the reliance on imperfect rules entails error and costs.

Organizational identification is frequently described as a process of self-categorization characterized by distinctive, central, and enduring attributes (Dutton, Dukerich, and Harquail 1995). Individuals, of course, may deviate from such behavior, but certain individuals are often cited as best examples of what it means to be a member. Social stereotyping and membership are intrinsically related, even though few individuals may qualify as prototypic "bachelors".

Communication is, in its contextual interpretation, better understood as discourse. Through identities, individuals share ideal cognitive models of the world, based upon similar categories. But interpretation of the world is influenced by discourse. Rarely do we see people capable of changing radically their fundamental beliefs, but they do change their interpretations. Dis-

course, by creating metaphoric extensions based on prior experience, allows the typing of objects and people to be altered.

We can go further than this. Leadership is the act of persuasion, or what Lakoff would call motivation. It is easier to learn new lessons that are motivated by current understanding than by something that appears as arbitrary (Lakoff 1987; p. 346). Discourse among people who share cognitive models is fruitful because new learning is motivated by existing categories.

To clarify the implications of this perspective for an understanding of what firms do, consider examples of leadership and incentives. In his book on cognition in economic behavior, Piore (1995) observes that the relational interdependency of agent and activity in communities is the basis for meaning and knowing. Unlike the view of a leader by rational choice theory who resolves conflicts through optimal choices, Piore (1995; p. 134) proposes that "in a hermeneutic process, the leader is orchestrating a series of conversations." He notes that in a time in which bridging across different groups is important, a leader becomes a mediator by which new categories are developed and to help in the translation and interpretation between languages.

This perspective on discourse and motivation places a radically different interpretation of incentives that are found in the principal-agent literature. Sabel (1993) makes an intriguing observation that inverts the usual thinking about monitoring. To Sabel, monitoring is more than the way a principal evaluates an agent. It also establishes, much like Piore's emphasis on hermeneutics, a context for discovery and discussion. Monitoring becomes an occasion for learning. Incentives in a firm are not only a way to motivate work and effort; incentives are also symbolic statements that provide the occasion to guide action and to share learning and experience.

Learning

Social interaction in groups facilitates not only communication and coordination, but also learning. It is through learning that coordination and communication are facilitated through identity. Both convergent expectations around procedural behavior and discourse based on shared categorization are acquired through social learning. Identity is critical to this process.

An important finding in experimental psychology is that learning through identifying is more powerful than attempts to "teach" individuals via incentives and propaganda. Bandura and Walters (1963) argue that very little social behavior would ever be learned if we had to depend on someone going through a detailed, demand-

ing, and tedious process of conditioning successive approximations to the desired behavior. In an experiment, Bandura and McDonald (1963) showed that the behavior of a role model was a more powerful influence in the behavior of children than was reinforcement of certain behavior, which proved to be a negligible factor. The results showed that the behavior of the model influenced social learning in children more than reinforcement. Reinforcement proved to be a negligible factor. There was no significant difference in the performance of the children in the model-present condition who were reinforced and those who were not.

These studies point to the importance of how things and people are categorized and learned through identifying and behaving in the context of group membership. Recent studies have made these type of observations the foundation to new theories of learning and thinking. Learning is enhanced in firms through what Lave and Wenger (1991) call "situated learning" that relies upon "legitimate peripheral participation in communities of practice."

Learning thus implies becoming a different person with respect to the possibilities enabled by these systems of relations. To ignore this aspect of learning is to overlook the fact that learning involves the construction of identities. Viewing learning as legitimate peripheral participation means that learning is not merely a condition for membership, is itself an evolving form of membership. We conceive of identities as long-term, living relations between persons and their place and participation in communities of practice. *Thus identity, knowing, and social membership entail one another* (Lave and Wenger 1991; p. 53, our italics).

Lave and Wenger place considerable emphasis upon interpretation, or hermeneutics, linked to participation in groups. Meaning is the product of speaker's interpretative activities, and not merely as the "content" of linguistic forms. Meaning, understanding, and learning are all defined relative to action contexts, not to self-contained and abstract structures. But it is because learning is situated in an identity that it is also difficult to unlearn. Here we see again the flip side to the benefits of a firm, namely the inflexibility in changing acquired learning.

Overview

A simple proposition is that firms lower the costs of communication and coordination, and it is by this metric that the capabilities of firms can be evaluated relative to a fictional market. However, the advantage of a firm is more than just economizing on costs, but is also the creation of a context of discourse and learning

Figure 1 Comparison of Knowledge and Transactional Approaches

	Social Knowledge	Market
Coordination	Convergent Expectations	Transactional
Communication	Discursive	Information
Learning	Situated	Reputational

that promotes innovation and motivated behavior. Figure 1 summarizes the differences in what we could call the “conceptual models” of capabilities versus transactional approaches. In the market model, communication consists of the coding and decoding of information, coordination proceeds through transactions governed by prices, and learning is the revelation of cooperative or dishonest reputations. In the view of a firm as embodying social knowledge, coordination is achieved through convergent expectations, communication is characterized by discourse based on rich codes and classifications, and learning is situated.

3. Boundaries as Normative Markers

What are the limits on procedural rules or metaphors by which to structure coordination? Consider the following rule. If a worker should be seen as shirking, punish him or her to the point that the increase in labor output is equal to the marginal cost of allocating time to whipping and of the present value of the loss in permanently damaging the capital. No doubt, there is unanimity in condemning such a rule, and yet slavery was a socially-practiced regime throughout history and many cultures.

In early periods of industrialization, pay and employment were specifically influenced by norms of justice. In France through the first half of this century, men were the last fired, and men's pay were the last to be cut, especially if they had a family (Moutet 1993). In Japan, the flexibility to respond to macroeconomic shocks is built on the marginality of the female and older work force, which are hired and fired in preference to the primarily male and younger workers (Dore 1986).

In contemporary and industrialized settings, norms of equity tend to prevail. These norms influence the acceptance and usage of a rule. Studies on pay and wage dispersion have been especially explicit in documenting the relationship between norms of justice and perceived inequality. Pfeffer and Langton (1993) found, for example, that job satisfaction and research productivity fell in contexts of perceived high dispersion of

wages in academic settings. Invidious social comparisons have been especially linked to deleterious effects of wage dispersion within the same firm. Some of these effects appear to be culturally specific, as in Levine's (1993) findings that Japanese workers are likely to express dissatisfaction if they are overpaid relative to their reference group.

A useful way to distinguish between notions of equity is through the distinction of procedural and distributive justice. Procedural refers in this case to equity in process; distributive, to equity in outcome. Societies differ, obviously, in their preference for these rules. The kind of implicit social contracts to which members of a firm believe are in force tends to be sensitive to context, time, and place (Rousseau and Robinson 1994).

The importance of fairness as a consideration has persistently surprised game theoretic predictions. Studies on ultimatum bargaining (i.e., one-shot offers to take it or leave it) show that individuals are highly sensitive to fairness (see the insightful review by Guth 1995). In a study conducted in the United States, Kahneman and his colleagues (1986) find that people object to use of the market, that is to prices, as a way to ration goods during a crisis. Bies, Tripp, and Neale (1993) replicated this study, but include the experimental condition that people were informed why reliance on prices were procedurally correct. Objections to the market as a way to ration fell significantly. The counterintuitive results of Cappelli and Sherer (1990) on the satisfaction of newly-hired workers who are placed in a lower paid tier than incumbent workers also point to the role played by procedural explanations and by developing different reference groups for social comparison.

There is, of course, an alternative approach to understanding the modern organization as a resolution of agency problems through such devices as rank tournament for pay or reputations.⁷ One is particularly struck by the possibility that the liberal heritage of political economy is challenged in trying to understand non-Western firms. Aoki (1990; p. 19) poses the important question: why can Japanese workers not own the firm and capture the return to their social network? According to his analysis, “the performance of employees of the Japanese firm are evaluated and rewarded in the long run by the elaborate personnel administration system crystallized in the hierarchy of ranks, and this (*implicit long-term contract*) provides to workers the long-run security and the sense of fair treatment they desire. It does not seem obvious, however, how the egalitarian idea of the employee-controlled firm and

the centralized management of hierarchy of ranks can be made mutually compatible." Later, in trying to understand why top management does not abuse these contracts, he notes "their motives may well remain mixed and contain a carry-over from their longer careers as employees in the lower ranks." In other words, normative values are internalized.

4. The Parable of the Prisoner's Dilemma Revisited

The classic breakdown of collective action due to self-interest is represented in the parable of the prisoners' dilemma. Two prisoners are separated, and they face the choice of remaining silent or of cooperating with authorities. The best outcome is to cooperate as long as the other is silent; the worse is to remain silent when the other cooperates. The equilibrium is mutual defection. In repeated play, however, cooperation can be expected in finite settings, as long as there is some reasonable chance of cooperation in the final round.

There is another interpretation to these results that sees the prisoners' dilemma as masking a coordination problem by preventing the establishment of focal rules and depriving players of social knowledge. It is interesting to take a glance at the notes taken by players to the game during the first time it was held at the Rand Corporation in 1950. In an experiment designed by Melvin Dresher and Merrill Flood, Armen Alchian and John Williams played a noncooperative prisoner dilemma game in over 100 iterations. The payoffs to the players were not perfectly symmetric, for Williams gained more than Alchian through cooperation.

The comments written by the two are quite revealing (we rely on the entertaining book by Poundstone 1992). For example, Alchian begins by noting that "JW will play D (*defect*)—sure to win" and immediately adds after round 1 "What is he doing!!" He notes in round 68 that "He won't share." Williams, who plays a cooperative strategy of what is now called tit-for-tat, starts by noting "Hope he's bright," and adds after round 2, "He isn't but maybe he'll wise up." He clearly tries to teach his counterpart, noting "He's crazy. I'll teach him the hard way," "Let him suffer", "Maybe he'll be a good boy now," and "This is like toilet training a child—you have to be very patient." Both defected at the end of the 100 rounds. Yet, overall, mutual cooperation prevailed 60 out of the 100 times.

The striking aspect of this exchange is the exploration of both parties to communicate a set of rules. Alchian was trying to teach his opponent rules of

distributive justice using a norm of equality. Williams was operating by rules of procedural justice using a norm of equity in process.⁸ They ended up with a history of fragile yet persisting cooperation, but neither understood the other's principles. They coordinated, but communicated badly.

Such principles of coordination and communication are essentially cultural and procedural, for they are learned experientially. In his well-known essay on corporate culture, Kreps (1990) argues that the discovery and use of focal rules provide the explanation for why firms exist. Firms provide a set of implicit contracts that are enforceable even when contingencies are unforeseen, and managers will abide these contracts in order to maintain the value of the firm's reputation and, consequently, their own wealth. But Kreps notices that unforeseen contingencies pose an additional problem, for how will employees know what to do. In other words, in addition to the resolving the agency conflict, a firm might also be able to provide better rules for coordination. These rules need not be optimal, and in fact, they will not be, for their value lies in adhering to them even if conditions might suggest other and better routes.

Ponssard (1994) has observed that games of coordination make transparent the role of mathematical reasoning as a language and mechanism by which to coordinate. He considers the coordination problem of Crawford and Haller (1990) which showed that absent explicit communication and with no incentive conflicts, players converge to coordinating optimally by using precedents to solve for subgame perfect equilibrium. In this problem, two players seek to coordinate a common meeting place, knowing only their own and each other's location after each round. Ponssard takes these results to show that they point to an "interactive rationality" which stresses "the point of view of actors searching above all to structure their interaction rather than their proper mode of reasoning" (the term "interactive rationality" comes from Ponssard and Tanguy 1993). Somewhat mischievously, Ponssard concludes that common knowledge of game theory can serve as the coordinating mechanism.

It is ironic that in this most abstract stylized terrain, the capacity of perfect rationality requires a cognitive and social anchor. The very arbitrariness of an equilibrium, as Schelling noted, is what makes a focal point so powerful in games of coordination. Depuy (1989) summarizes this irony well when he notes that "the vision of perfect reflexivity hits against the principles of incompleteness." The notion of rules, or of conventions, become all the more critical for understanding coordi-

nation and collective choice under the conditions of incompleteness and long-term horizons.

But the requirements imposed by this game theoretic reasoning are too abstract. Focal rules act, as argued above, not as declarative knowledge, but as grounded in procedural knowledge that obey notions of justice. Coordination “problems” are solved daily by individuals, not through a recursive reasoning but through procedural knowledge acquired through sustained social interaction.

It is hard to understand collective action without a notion of procedural knowledge and norms of justice. In her work, Ostrom (1990) has noted that some communities have been able to resolve a problem of preserving a common resource, while others have failed. Her ethnographic studies point to the creation of institutions by which monitoring is self-organized through long-term interaction. In an experiment, Ostrom, Gardner, and Walker (1993) designed a simple problem in which groups had to invest a certain amount to exploit a common resource; too much investment led to a detriment in the social optimum. Again, we find common themes: the use of suboptimal rules and a concern with justice, even when it leads to sanctions beyond economic reason. One player argued “No, let’s fine anyone who breaks our rules. If they break our rules, then we should fine ‘em!” And yet these rules were not optimal. In effect, the experiment created a setting in which norms of behavior were developed and enforced, even when not embodying optimal solutions and even when contrary to individual incentives.

If a notion of a “collective” can emerge in such stylized settings, then no wonder it can be a powerful force in communities that have evolved rules of coordination encoded in institutions and in relationships among constituent members (Putnam 1993). Game theory experiments, though interesting for the exploration of a kind of rationality, deprive individuals of social knowledge. The location is an artificial setting; the experiments—no matter the number of repeated plays—are of short duration; the subjects know it is an experiment. Yet, behind the constraints of the experimental design, the subjects try to reinstate norms, rules of coordination, and ideas of justice.

5. Complementarities, Coherence, and Notional Consistency

Let’s consider how the concepts of knowledge, identity, and categorization can shed light on a problem of what limits the diversity of a firm’s activities. As noted by

Teece et al. (1994), the diversification of firms tends to cluster in particular industry constellations. Abstractly, this clustering suggests that firms with common industry experiences tend to face similar opportunities and constraints; or, to use a popular observation, the evolution of firms reveals evidence of path dependence.

The analysis of the basis of this path dependence faces quickly a number of important stumbling blocks. If coherence is due to limitations in extending, say, steel technology to semiconductors, then the creation of two divisions appears to be a sensible solution. If the firm were simply a device by which to resolve agency problems and create islands of trust in which communication could prosper, then a conglomerate form would, at first blush, appear as efficient as a related but diversified company. But evidence shows that, in the United States, undiversified firms are less efficient, and that diversification tends to follow consistent patterns. What are the limits to coherence when a firm has the ability to decompose itself into multiple divisions?

A plausible answer is that independence of each division is in conflict with the process of identification, social comparison, and consistency in rules that characterize organizations and firms. The well-studied phenomenon of post-acquisition integration points to the grave problems posed by trying to merge two firms with different identities and social comparisons. Similarly, organizations that try radically to revamp their pay systems run into severe problems if top managers have the option to enter an efficient labor market.⁹

The concept of cognitive dissonance suggests that the mind requires consistency when conscious of conflictual results, and yet is a resourceful and flexible instrument in resolving conflict. Identity implies similarly that social entities to which members hold their loyalty provide a logic of reliability and consistency in rules and symbolic categorization per our discussion of Lakoff. To a certain extent, technologies drive the coherence of firms, insofar that members value their membership in a *chemical firm* or in a *steel firm*. These identities may be the borders for firms, and individuals also feel a sense of belonging to a steel industry.¹⁰ Identities, as noted earlier, are rarely singular, with identity to a firm being only one. Individuals can also be members to communities of practice (Brown and Duguid 1991), occupational communities (van Maanen and Barley 1984), and guilds (Kieser 1989). With each of these communities, there is an associated view of what is knowledge; hence, the phrase of Holzner and Marx (1985) of “epistemic communities” is particularly apt.

That identity is often technological does not mean that technologies determine organizing principles, borders, or what firms do (see the comments of Foss in this issue). However, to the extent that members of a firm identify with these technologies, they influence the notion of complementarities that top managers consider within the set of alternatives, and employees understand in the context of their expectations. Indeed, it is not surprising that corporate change often occurs in conjunction with a change in name, or a change in the definition of the business. Thus, a tobacco company may say that it is no longer in tobacco, but in packaging and promotion. Or a steel company may transform its name from, say, US Steel to USX, with the last letter indicating a variable definition of its identity.

These issues suggest that complementarities and the coherence of the firm are not simply technologically determined. Certainly, chemicals and auto-making are different technologies, involving different competences. Yet, to return to an earlier point, a firm could potentially place each operation in separate businesses. What determines, in part, the coherence of the firm is the notional consistency of its businesses as understood by its members and, for that matter, outside investors and consumers.

However, it is too simple to claim that the logic of coherence is notional. To produce a car requires a different set of organizing principles than to produce chemicals; selling insurance is different than making hamburgers. They might share commonalities, but they will also differ in terms of whether they can use batch or continuous production, incentive or salary pay. The directionality is not technology to organization, or incentives to technology. Nor is the problem simply finding a match between a single element of technology and another of organization. To the contrary, the problem is finding the composed set of many potential elements, or complements.¹¹

The operating logic of what goes with what is complicated, because complementarities pose complex inter-relationships and, more importantly, consist of more than technologies. Because pay systems focus attention symbolically on different objects, they engender different avenues of exploration and establish different contexts for discourse. In a Japanese production environment, the system pushes inventories to low levels and forces workers to discover quality defects; pay is more group oriented than elsewhere.

Let's illustrate this point by looking at the data developed by Applebaum and Batt (1994). They coded data in binary form from 184 establishments according

to their performance, technology, work system, pay, and incentives. Binary data are appropriate for analysis using Boolean comparative analysis, in which logical sets of factors are found (Ragin 1987). In this analysis, both positive and negative complements are found, that is, the output consists of groupings of complements that must be together or absent.

In Figure 2, we show the results from applying this technique to pay, work organization, technology, and union variables. The criterion variable is profit. Bold means the "presence of" this factor; lower case, the "absence of" this factor. (The acronyms should be obvious, except for sts—socio-technical systems—and bonus/ps—individual bonuses.) New technology shows up in all groups, except one. The results show a few interesting patterns. In the second line, unions, group pay, and new technology are positive complements; teams, among other factors, is a negative complement. In the third line, unions is now a negative complement and teams is a positive complement. In the fourth line, both unions and teams are positive complements, but new technology and group pay systems are negative complements. These are complex results, but they suggest that, for high profits, unions do not do well in conjunction with changes in both technology and pay systems. For firms that are in industries or countries in which union representation is mandated, high performance systems are still possible, but certain profitable combinations are ruled out. Thus, the distribution of power, as well as cognition, influences the determination of the chosen set of practices.

Of course, these results are based on a limited number of variables. (The data set, in fact, includes 49 variables.) Consider that the combinatorial possibilities are given by 2^{N-1} , where N varies by k number of elements. The combination of binary variables gener-

Figure 2 Technological and Organizational Complementarities

Effects on Profits

union group pay BONUS / PS NEWTECH broadjob rotation
teams sts jit +
UNION GROUPPAY bonus / ps NEWTECH broadjob rotation
teams sts jit +
union GROUPPAY BONUS / PS NEWTECH broadjob rotation
TEAMS sts jit +
UNION group pay bonus / ps newtech broadjob ROTATION
TEAMS STS JIT +
union GROUPPAY BONUS / PS NEWTECH BROADJOB ROTATION
TEAMS sts jit

ate large numbers. What would happen if we allowed for a quantitative measure as well, along the lines of a bit more team work and bit less group pay? Or, since knowledge is embedded in social relationships, what would happen if downsizing led to the eliminations of particular individuals, or if quality circles consisted of one more or less individuals? These calculations are simply outside computational limits. The feasible set, technically, should be quite large. As a consequence, the realized set will be an outcome of identity, of inherited practice, and of the constellation of power and interest inside and outside the firm. The determination of what constitutes a firm can hardly be unique, or epiphenomenal.

If the lens is shifted from *what is a firm* to *what do firms do*, then there is a line of inquiry to discover what goes with what for specific capabilities. Consider the case where batch production and individual bonuses are coherent complements, but assembly-line production with fixed remuneration. A firm that consists of both batch and assembly processes faces a dilemma. To impose different systems of payment leads to potentially invidious social comparison. To impose the same form of payment is to suffer an efficiency loss in matching false complements. The determination of coherence and of what activities a firm carries out is neither technological, nor social; it is both.

The above results point to an important issue, namely, that there is a distinction, as Chomsky (1980) noted for grammar, between competence and performance. Firms may be capable in a set of skills, consistent and coherent, and yet unprofitable. A Boolean analysis of what complements are associated with the truth condition of quality (high equal to 1; low to 0) generates a much larger list of groupings than those that are associated with profits. So there are many more combinations that lead to high quality than to high profits. Feasible high quality complementarities are not necessarily those that correspond to the selection environment.

To return to the discussion in the previous section, nonoptimal routines are likely to persist due to the infeasibility of arriving at optimal solutions in real time. But this assessment is even then too optimistic, for the combinatorial difficulty of calculating the profit implications of n elements, when n is large, implies that nonoptimal procedures can persist with no obvious feedback that signals how to improve practice. What firms do tends to persist because knowledge is embedded in social relationships, and because the directionality of change in these relationships is usually unknown. To the cognitive limits of working out better combina-

tions, there is the problem of evolving new rules and procedures of coordination in a context that must comply both with norms of justice and with a feasible redistribution of power and authority. Identity creates more than just powerful motivations for cooperation; it also imposes the weighty costs of ruling out alternative ways to organize and to exploit new avenues of development.

Conclusions: The Constraints of Vision

Firms differ in what they can do. Some produce cars by highly flexible production lines; others mass produce. The capabilities to do one or the other is not the choice variable of classic decision theory. The limitations are not simply that incentives are too weak, or that people too selfish, to motivate changing capabilities. The roots of this inertia lie in the wiring of human cognition to acquire tacit procedural knowledge as the basis of interaction with other individuals.

We have addressed the question why this procedural knowledge should be "more" within the firm than among firms. What makes a firm's boundaries distinctive is that the rules of coordination and the process of learning are situated not only physically in locality, but also mentally in an identity. Because identity implies an adherence to a symbolic coding of values and rules, the costs and substance of discourse, coordination, and learning are influenced by normative boundaries of firms. Because identity implies a moral order as well as rules of exclusion, the assemblage of elements that compose an organization are subject to requirements of consistency; not all technically feasible complements are permissible within the logic of a shared identity.

People are bounded by what they know and by what they value, and they are sensitive to norms of what is appropriate behavior. Incentives are important symbols influencing organizational and economic behavior. Their salience and design are linked to prevailing property rights and ownership contracts. Because people are influenced by self-interest, incentives are especially powerful symbols in economic life. But they are also, in a semiotic sense, part of the litter of sign and meaning that populate the working life of individuals. As such, they are guides to determining people's (unconscious or conscious) actions.

In his seminal article, Coase (1937) noted that the advantage of firm organization is eventually offset by the costs of relying on hierarchic exchange. We have suggested an additional cost, namely, the paradox that creativity works by rules of exclusion. A conceptual

model of classification and thought rules out possible combinations and delimits the realm of exploration to what may be more promising avenues of discovery. But such models err in their signposts, and they lead to the suboptimal transfer of practices from one setting to another. Connectivity, as Weick and Roberts (1993) have argued, may be a proper description of how new structures are formed, but this connectivity is almost certain to be subject to a normative vision that constrains the possible to the envisioned.

These comments, already broad, have omitted important literatures. To move from these micro foundations to an understanding of firms in context of particular societies and competitive contexts requires a further consideration of the field of analysis and of society. The sociologies of Bourdieu, Giddens, or Habermas are more attentive to power, action, and language than what we have suggested above. But the roots are the same, a delineation of what social behavior is in terms of discourse, identity, and structure. It is in the notions of identity and the learning of procedural rules and normative boundaries that the foundations to a theory of what firms are in terms of what they do explains why there is "more of it" inside than outside.

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Endnotes

¹See Kogut and Zander (1992). Subsequently, empirical support has been published in Kogut and Zander (1993) and Zander and Kogut (1995). See also our reply to criticism in Kogut and Zander (1995). Winter (1987) was the stimulation for these papers; see Szulanski (1995) for further validation of the ideas.

²This section draws from Kogut (1995) and benefitted from comments by Annie Borzeix, Jacques Girin, and Michael Useem.

³See Chandler (1990) who notes that German corporations were frequently larger than their American counterparts, and Kocka (1988) on employees and managers in comparative perspective.

⁴For a discussion of shared schemas, see Weick and Roberts (1993). It is an important issue whether their approach of schemas is reconcilable to the hermeneutics espoused by Piore (1995) and Girin (forthcoming). See footnote 6 for a related discussion.

⁵Considerable studies point to the importance of group identity as the basis of sustained motivation. The classic study by Janowitz and Shils on the disintegration of the Wehrmacht showed the durability of small groups of German soldiers in withdrawing from the Russian front to German-occupied territory (Janowitz and Shils 1948). Schein (1956) analyzed the motives for why certain American soldiers coop-

erated with their Chinese captors; a key turning point in the efforts to indoctrinate a soldier was to break the identity of the soldier with his comrades.

⁶There is an apparent debate in cognitive sciences regarding whether situated learning implies that knowledge cannot be symbolically represented in a production schema, such as Simon advocates. The debate has relevance to organization science in elucidating potential inconsistencies between those that hold a view of the organization as mind with stable schema and those favoring organization in the generative of organizing knowledge through discourse and evolving schemata. See Simon and Vera, Clancey, Suchman and others in *Cognitive Science* in 1993.

⁷This view certainly captures a portion of the evolution in vertical authority systems. A. P. Sloan, chairman of General Motors, could write that the "corporation [is] a pyramid of opportunities from the bottom toward the top with thousands of chances for advancement" (cited in Bendix, 1956; p. 307).

⁸Conflicts over notions of equity are common in games. For example, the experiment of Roth and Schoumaker (1983) displayed two equilibria, depending on whether players used a notion of distributive or procedural justice.

⁹These problems, as witnessed in the well-publicized case of Salomon Brothers, emerge often in investment banking firms, where the conflict between an external market for talent and the corporate attempt to preserve shareholder value is especially marked. Conflicts have also been observed following the acquisition of investment banks by commercial banks (e.g., Mellon Bank's take over of a Boston investment bank) or the extension across borders from one kind of pay environment to another (e.g., Japanese investment bank operations in New York and London).

¹⁰See, for example, the study by Padioleau (1981) on the French steel industry, Spender (1989) on industry recipes, and Dumez and Jeunemaitre (1994) on the sense of industry borders in cement.

¹¹See Milgrom and Roberts (1990), Dosi and Kogut (1993), and MacDuffie (1995).

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