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An Exploratory Discussion of Austrian Economics, Property Rights, and the Firm

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Abstract
Many economists, notably Austrian economists, have argued that the market process is essentially an experimental process. We briefly try to clarify this conceptualization, and then argue that we may understand the firm in much the same light. A basic view of the firm as an experimental entity is derived, drawing on property rights insights.

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Introduction[1]

This paper aims at establishing links between market process economics (Boettke and Prychitko 1996) and the theory of economic organization, primarily the theory of the firm (Coase 1937; Williamson 1996; Hart 1995; Barzel 1997). To be sure, these links have been explored in previous contributions. For example, earlier work has assessed the contribution of Mises' (1936, 1949) analysis of economic calculation to the understanding of the efficient boundaries of the firm (Klein 1996), including issues of corporate governance (Klein and Klein 2000); the contribution to the understanding of the internal organization of firms provided by Hayek's (1945) insights in dispersed knowledge (Jensen and Meckling 1992; Cowen and Parker 1997; Foss 1999); how Austrian economics may inform the study of firm strategy (Jacobson 1992; Lewin and Phelan 2000); and how the Austrian view of the market process connects to various notions of contracting costs (Vihanto 1992). However, the perspective in the present paper is different from these contributions.

Specifically, we begin from the conceptualization of the catallaxy as not only a superior method of integrating dispersed knowledge, but also of producing new knowledge (Hayek 1968). One of the reasons for this superiority lies in the experimental nature of catallactic activity: Experiments in products, processes, organization, etc. are continuously being conducted and evaluated. Alienable property rights enable decision-makers to carry out such experiments, to a large extent without seeking anybody's approval. It is a related overall experimental view that we wish to transfer to the firm; thus, we consider a experimental activity in the context of firm organization.

Firms play a central and even dominant role in the process of economic experimenting as inventing and innovating teams. They are the basic *loci* of experiments with products, processes and modes of organization, as rich literatures on technology, innovation management, and firm strategy suggest (e.g., Rosenberg 1976; Sahal 1981; Jacobson 1992; D'Aveni 1994; Miles et al. 1997; Helper, McDuffie and Sabel 2000). However, this is hardly reflected in neither Austrian economics, nor in the mainstream economics of organization. While Austrian economists have not been particularly interested in the innovative process,[2] economists of organization have apparently taken Oliver Williamson (1985: 141) observation that "[u]nfortunately, the study of innovation is enormously complex" to imply a license to be rather complacent about the study of such issues as technical change, learning by doing, and changes in the division of labor as these relate to economic organization. In contrast,

[1] The present paper represents an attempt to develop an overall "vision" for a research program that we have pursued alone, together, and in the context of the Learning, Incentives and Knowledge Program (*LINK*; http://www.cbs.dk/link) (Foss and Foss 2000a&b, 2001, Kirsten Foss 2001; Nicolai Foss 1999, 2000, 2001). This research program may briefly be described as an attempt to extend the reach of the property rights paradigm, particularly in more dynamic directions.

[2] Unless, of course, we include Schumpeter in the ranks of the Austrians.

the basic point we develop in this paper is that a conceptualization of firms as experimenting teams not only furthers our understanding of catallactic activity by allowing for a better understanding of the *loci* of experimental activity; it also allows us to develop novel insights into economic organization.

Novel products, processes and organizational forms are launched by firms (or groups of cooperating firms), and are tested in the experimental procedure of the market process. For example, novelties may become embodied in new products and enter into the market process in the form of transactions with consumers or industrial users. However, prior to this injection into the market process, novelties have been produced inside the firm, or, perhaps, in cooperative ventures between two or more firms. These processes also involve transactions, that is, the transfer of property rights, between various agents. As a huge literature argues, the definition, exchange and enforcement of property rights is not costless, the relevant costs being transaction costs (Barzel 1997). Therefore, performing economic experiments is costly, not only in terms of direct outlays (R&D expenses, etc.), or in the form of possible parallel experimentation, but also in terms of transaction costs.

Focusing on these costs and on how they are influenced by, and in turn influence, economic experiments allows us to address issues of economic organization (see also Foss and Foss 2000a; Kirsten Foss 2001). In order to focus this perspective, we examine the mechanisms inside firms that endogenously produce change, such as learning, experimenting, and increasing division of labor, and tie this to the issue of coordination in the context of the firm. We argue that the firm may be explained as an institution that emerges in order to coordinate a complex and ongoing division of labor, where changes are caused by entrepreneurs experimenting with the division of labor so as to be able to reap benefits in terms of increased productivity. The property rights structure that characterizes the firm (particularly the authority relation) implies that the firm is a low cost institution for experimenting with such changes in the division of labor.

Our discussion contributes to at least two areas of research. First, we contribute to Austrian economics by arguing that the characteristically Austrian emphasis on catallactic activity as to a large extent experimental in nature may be used in such a way that it casts new light on firm organization. Second, we contribute to the economics of organization by incorporating issues of learning and experimentation into this body of theory.

Economic Experiments and the Market Process

A Brief Literature Review

Many scholars have, in different ways and from very different positions, suggested that the metaphor of experimentation provides an informative conceptualization of catallactic activity.[3] Thus, Nelson and Winter (1982) base their

[3] In spite of the connotations to closed-system conditions in natural science that the word carries with it (Bhaskar 1978).

evolutionary theory on the notion that "… the market system is (in part) a device for conducting and evaluating experiments in economic behavior and organization" (Nelson and Winter 1982: 277). Other scholars in economics who have elaborated broadly similar visions of the economic process include Schumpeter (1911, 1943), Mises (1936, 1949), Hayek (1946, 1978), Alchian (1950), O'Driscoll and Rizzo (1985), Pelikan (1988), Eliasson (1990), Loasby (1991), Rosenberg (1992) and Harper (1996).

A number of economic historians (e.g., Rosenberg and Birdzell 1986; North 1990), often drawing upon the above contributions from economics, have argued that "… the freedom to undertake … experiments has been the essential element accounting for the fact that industrialization has been, uniquely, a historical product of capitalist societies" (Rosenberg 1992: 181), and have drawn inspiration from the above contributions to economics in developing this argument.

In a different context, namely that of political philosophy, open'ness to experiments in rules, organization, lifestyles, etc. has been one of the traditional arguments in favor of the liberal ("great", "open") society at least since the writings of John Stuart Mill. This argument can be found, albeit in somewhat different versions, in such modern classics of political philosophy as Hayek (1973) and Nozick (1974). On the level of more practical politics, it has been argued the basic problem facing public policy is the "…design of institutional arrangements that provide incentives to encourage experimentation … without overly insulating these experiments from the ultimate test of survival" (Demsetz 1969: 19). The property rights system plays the key role here (North 1990).

However, these arguments are somewhat hampered by the fact that it is far from entirely clear what is actually meant by the suggestive notion that the market process is one of experimental activity. It is certainly tempting to think that the notion of the market process as an experimental process is little more than a handy metaphor that serves to communicate in a nutshell a deeper and more complicated process view of the market. Moreover, as a general matter, an experiment may be a completely unpredictable "voyage of exploration into the unknown" (Hayek 1946: 101) at the one extreme. Or, it may be of the completely controlled kind where the purpose of the experiment is merely to reproduce and confirm once more an already well-established conjecture (Bhaskar 1978) at the other extreme. In fact, Bayesian sampling of information may in a generous interpretation be seen as experimenting.[4] It is not immediately clear which one of these different meanings proponents of the notion that the market process is an experimental one have in mind.

Experimental Activity in the Market Process

Advance in bringing the experimental conceptualization of the market process beyond the metaphor, as well as clarifying the economic counterparts to different notions of experimental activities, may well begin from Littlechild's (1986) discussion

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[4] See Cyert and Kumar (1996) for this interpretation.

of "three types of market process". Specifically, he (1986: 27) suggests that we distinguish between "ideal type" models of the market process based on

> ... how the decision makers perceive of the world, how these perceptions change over time, how these additional information may be sought, and how the decision maker can limit his exposure to uncertainty.

This epistemic perspective allows Littlechild to identify three ideal typical models of the market process, namely what he calls the "neoclassical model" (e.g., Frydman 1982), the "Austrian model" (e.g., Kirzner 1973, 1992, 1997; High 1986) and the "radical subjectivist model" (e.g., Shackle 1972; Lachmann 1986; Loasby 1976, 1991; O'Driscoll and Rizzo 1985). All three models in principle make room for experimental activity, albeit of different varieties.

This may become clearer if we in addition to Littlechild's epistemically based taxonomy also consider Kirzner's (1997) distinction between two ways of modeling ignorance in economic analysis. First, mainstream models of the asymmetric information variety essentially posit that while agents are ignorant about certain things, they know precisely the extent of their ignorance. The standard agency model provides an example of this: the principal is ignorant about the exact effort level supplied by the agent as well as the exact realization of a stochastic variable that influences output, but he is completely informed about the agent's action set as well as the distribution function for the stochastic variable (Holmström 1979). In some models agents can take steps through search activities to remedy this ignorance. For example, an agent may conjecture that search for a certain price of a certain good in a certain geographical area is warranted in the sense that the expected benefit is larger than the expected search costs, and in equilibrium that conjecture will be confirmed by actual events. This activity may arguably be thought of as in a limited sense experimental activity. Similarly, and perhaps stretching the word too far, we might think of risk-bearing behavior as broadly experimental.[5]

Second, there is also the distinct possibility that agents are actually ignorant about what they are ignorant about. In Kirzner's work, this ignorance is seen as being remedied by spontaneous entrepreneurial discovery. This would seem to leave experimental activity out of consideration because setting up and conducting an experiment is very much a purposeful testing of a conjecture with an uncertain outcome and not a spontaneous discovery. However, we may think of experimental activity as one way in which agents reduce the ignorance that they are initially unaware of, for example, through serendipitious discoveries. Moreover, introducing uncertainty into the activities of the Kirznerian entrepreneur remedies the problem: if the entrepreneur's activities may be seen as uncertain conjectures about arbitrage

[5] A relevant consideration in this connection is whether information about a risky event is generally shared or not. Thus, risk-taking behavior when there is substantial disagreement about the probability of the occurrence of a certain event (and it is therefore hard to insure against) is more deserving of being called experimental than when there is agreement on the probability (and the event is therefore easily insurable).

possibilities (Harper 1996), then surely these activities too may be characterized as experimental.

While Kirzner's distinction clearly covers what Littlechild (1986) characterizes as the neoclassical and the Austrian model, it is less clear how it relates to the radical subjectivist model; in fact, it would seem to apply only to some extent: In the radical subjectivist model, agents are exposed to surprises (Shackle 1972), which implies that they are ignorant about their own ignorance; otherwise genuine surprises could not take place. On the other hand, the radical subjectivist model stresses imagination, the ability to construct the choice set, and the subsequent testing of choices in the market process (O'Driscoll and Rizzo 1985). It is a view that is perhaps in greater conformity with the conventional understanding of experimentation than the two other views. However, all three captures some aspects of experimental activity. We may sum up these insights in the table below.[6]

TABLE 1

Models of the market process			
	Neoclassical	**Austrian**	**Radical subjectivist**
Characterization of the future	The agent can fully characterize the vector of variables that is relevant for his actions and can fully characterize the probability distributions of these variables.	The future "… is a vector of which the agent knows some components but not others".	The future "… is not so much unknown as it is non-existent or indeterminate at the time of decision. The agent's task is not to estimate or discover, but to create"
Agents' knowledge	Agents know what they don't know. Ignorance is reduced through search.	Agents do not know what they don't know. Ignorance is reduced through spontaneous discovery.	Same as in Austrian model. Knowledge is inherently conjectural.
Economic experimentation	Reduction of known ignorance; Bayesian updating of priors; risk-bearing.	A means to foster spontaneous discovery.	A result of imagination: a test of a bold conjecture.

As the table reveals, any sort of forward-looking and risky decision-making (Mises 1949) may in principle be broadly characterized as experimental. However, in order to focus the discussion, we shall in the following associate experimental activity with choice situations characterized by a high degree of imperfection of knowledge about the future, and therefore a state of uncertainty that is deeper than

[6] The quotations in the table are from Littlechild (1986: 24).

what is normally assumed in mainstream economics (i.e., Littlechild's "neoclassical model"). Thus, the conventional search model does not in this view portray experimental behavior. In our view, agents may still very well hold subjective probabilities about the outcomes of events. However, a key point is that when we are talking about experimental activity *proper*, what is involved are events about which disseminated knowledge is not present in the market. Introducing a new product (rather than a product variant), a new process of production, or a new type of organization (e.g., Dupont's introduction of the M-form after First World War, Chandler 1962) are instances of commercial experimental activity in the sense we have in mind here. In the following sections we take steps toward integrating this view of experimental activity, derived from market process economics, with the theory of economic organization.

Building Blocks for an Experimental View of the Firm

In this section we develop building blocks an experimental view of the firm and provide a sketch of what such a theory may look like. Our argument is based on a combination of insights into the economic implications of property rights and Austrian and radical subjectivist insights into imagination and entrepreneurial discovery. On this basis, we shall seek a rationale for firm organization in the superior ability to conduct commercial experiments that firms may, under certain circumstances, have relative to markets.

Experimentation and Economic Organization

There are some – but not many – hints scattered in the economics of organization that experimentation and economic organization are related issues. However, the link between the two issues goes back to the founding contributions to the theory of economic organization. Thus, in the view of Frank Knight (1921) firm organization, profit, and the entrepreneur are closely related phenomena. In his view, these arise as, respectively, an embodiment, a result and a cause of commercial experimentation (Demsetz 1988). In Knight's view, the entrepreneur's conjectures are so much clouded by uncertainty and so much inside the his head that they cannot be communicated to other agents or insured. In order to capture profit from his commercial conjecture, the entrepreneur has to set up a firm with himself in the position of residual claimant. Thus, a combination of communication costs (Foss 1993) and moral hazard (Barzel 1987) explains both the firm and profit as a residual income category in Knight's view. This is one way of linking economic organization and commercial experimentation in the marketplace.

In his discussion of the "Nature of the Firm", Coase (1937) implicitly establishes a second link. As Coase (1937) observes, it is "... improbable that a firm would emerge without the existence of uncertainty", and it is clear from the context that he has Knightian uncertainty in mind. In an often quoted passage, Coase (1937: 21) notes that

> It may be desired to make a long-term contract for the supply of some article or service ... Now, owing to the difficulty of forecasting, the longer the period of the contract is for the supply of the commodity or service, the less possible, and indeed, the less desirable it is for the person purchasing to specify what the other contracting party is expected to do ... Therefore, the service which is being provided is expressed in general terms, the exact details being left until a later date ... When the direction of resources ... becomes dependent on the buyer in this way, that relationship which I term a "firm" may be obtained.

While there is nothing directly in Coase's paper to suggest that he had experimentation in mind, we shall develop what we see as a natural implication of his argument, namely that an important benefit of the combination of hierarchical direction with the incomplete employment contract is that this eases the conducting of experiments inside the firm. This is because the need for, and outcomes of, experiments are largely unpredictable, and, hence, cannot be contracted over on an *ex ante* basis (Foss and Foss 2000a). Given this, hierarchical direction will often be more efficient than relational contracting (Demsetz 1991; Williamson 1996; Casson 1997; Foss and Foss 2000a). "Experiments" should be understood in a wide sense, ranging all the way from fine-tuning an assembly line over changing various aspects of organizational structure to the invention and commercialization of a completely new product. In other words, experimental activity in this sense covers much of "… the main activity of a firm, running a business" (Coase 1991: 65).

In order to develop the argument that experiments are often most efficiently organized by firms, we rely on a branch of economics that also has a strong Coasian pedigree (cf. Coase 1960), namely property rights economics (e.g., Barzel 1997). Property rights have already been integrated with the theory of economic organization beginning with Alchian and Demsetz (1972). In fact, a modern branch of organizational economics is sometimes referred as the "property rights approach" (Grossman and Hart 1986; Hart and Moore 1990; Hart 1995).[7] In this view, property rights are allocated inside firms so as to maximize the bargaining power of the agent whose actions matter the most for joint surplus. Being the owner of the firm's alienable assets, this agent thus avoids being held up by other contractual parties in the face of unforeseen contingencies. Joint surplus is maximized in this manner. A completely different approach to linking property rights and economic organization was introduced by Littlechild (1986: 35) suggestion that "... ownership of a resource reduces exposure to unexpected events. Property rights are a means of reducing uncertainty without needing to know precisely what the source or nature of the future concern will be." Brian Loasby (1991) has tied this view to the capabilities theory of the firm. Our view is more related to the latter view of property rights than to the view of Hart and his

[7] This approach is different from the approach of Coase, Alchian, Demsetz and Barzel, and should not be confused with it. See Foss and Foss (2001) for a critical comparison of the two approaches.

colleagues and students, since we place more of an emphasis on the flexibility provided by ownership than on the bargaining power that it may confer.[8]

Property Rights

At first glance, the property rights approach (Alchian, 1965; Barzel, 1997; Coase, 1960; Demsetz, 1964, 1969; Eggertson, 1990; Libecap, 1989; North, 1990) seems at variance with Austrian economics. In fact, some vital parts of the approach, such as (certain interpretations of) the Coase theorem, have been criticized by Austrian economists (e.g., Kirzner 1973: 226-7; and the recent exchange between Gunning 2000 and Cordato 2000). However, what may be objectionable in the property rights approach from an Austrian point of view are not the specific analytical categories developed within this approach *per se*.[9] In fact, Austrians have for a long time devoted interest to the category of property and its economic implications. This is not the place to engage in a detailed historical exegesis, but it is worth noting that the Austrians held interesting views of property rights and ownership, views that in various ways dovetail with the Austrian process perspective.

Thus, Menger (1871) begins (conventionally) by defining property rights as economic categories, arising out of scarcity, and then moves on (unconventionally) to noting that ownership affords flexibility in the face of uncertainty. For example, he observes that fire extinguishers and medicine chests are owned precisely because of the unpredictability of the relevant states of nature (Loasby 1999). Böhm-Bawerk (1883) provides a lengthy and sophisticated discussion of the relation between the law, ownership and property rights. Mises (1936: 27) points out that ownership refers to "the power to use economic goods," and he emphatically stresses that "… the economic significance of the legal *should have* lies only in the support it lends to the acquisition, the maintenance and the regaining of the natural *having*" (emphasis in original).[10] In a later work, he noted the connection between property rights and externalities (Mises 1949: 654-655), and rationalized the emergence of various institutions of property in terms of considerations of changing scarcities (1949: 650, 678, 679).

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[8] This is not to say that the two aspects are unrelated. For example, the flexibility conferred by an authority relation in the context of an employment contract may depend on the boss having sufficient bargaining power provided by his ownership of some crucial assets (Foss 2001).

[9] The aspects that an Austrian may object to are rather the assumptions in the approach that agents always seek to maximize the value of the rights they control and that the process of exchanging rights can be represented in terms of equilibrium. Indeed, at least one writer (Eggertson 1990) characterizes the approach as "generalized neoclassical economics". But Austrians should not have problems with the basic notion that property rights are the rights people hold over assets.

[10] This is remarkably in line with Barzel's (1994: 394) definition of a property right "... as an individual's net valuation, in expected terms, of the ability to directly consume the services of the asset, or to consume it indirectly through exchange. A key word is *ability*: The definition is concerned not with what people are legally entitled to do but with what they believe they can do".

After a long neglect, the economic analysis of property rights was given a new lease on life in the nineteen-sixties. Much energy was expended on developing fine-grained distinction between various kinds of property rights and on exploring the relations between economic and legal definitions of rights. For example, theorists introduced between *use rights* that define the potential uses of an asset; i*ncome rights,* or the right to consume an asset; *rights to exclude* non-owners from access to assets; and *rights to transfer* permanently to another party all the above mentioned rights over an asset – that is to alienate or sell an assets (Alchian 1965).

The property rights approach in its modern version emerged from the insight that what is exchanged are not assets *per se*, but rather the rights to those assets (Coase 1960; Alchian 1965). A further crucial insight was that the exchange of rights is not costless. For example, often physical and human assets have different properties and may sometimes yield a number of different services depending on how the assets are used. In principle, each one of the properties and different uses of assets can be specified and be subject to negotiations between parties to a transaction. Moreover, use rights over different properties or uses of assets may be shared between individuals (Barzel 1997). To specify and to contract over the different possible uses of assets are clearly costly actions – more precisely, they involve transaction costs. In the property rights framework, transaction costs are conceptualized as the costs due to the transfer, capture and protection of rights (Barzel 1997: 2). When such costs exist, not everything will be specified in contract; they will be left incomplete (Williamson 1985, 1996; Hart 1996; Barzel 1997).

Changing Property Rights

While property rights theorists have done much to clarify the meanings and ramifications of property they have done comparatively little to clarify *why* property rights change over time, although some historical evidence has been brought to bear on this issue (Demsetz 1967; North 1990). *How* property rights change have also been a neglected issue, arguably because of the underlying comparative-static method in the property rights approach.[11] These two issues are, however, crucial to our story about firm organization and we need to deal with them.

Our response to these difficulties begins from the observation that the two issues of why and how property rights change are twin issues. Thus, from an Austrian perspective property rights change because of entrepreneurial alertness[12]; alert entrepreneurs may discover that some rearrangement of existing property

[11] In Demsetz' (1967) famous example of how property rights changed among Canadian tribes of indians, the process of change itself is thus a black box.

[12] In political economy, this process of entrepreneurs influencing the definition of property rights is of course known as "rent-seeking". The concept has also been applied to firms' internal organization (Milgrom 1988). But entrepreneurs grasping rights is a much wider concept than the concept of rent-seeking. Any attempts to capture rights that are in the public domain (Barzel 1997) may thus be seen as manifestations of entrepreneurial alertness (Foss and Foss 2000b).

rights or some capture of rights that are in the public domain increase their own utility. Clearly, this is an extension of the Kirznerian view of the entrepreneur (Kirzner 1973, 1992, 1997). Arguably, Kirzner tends to take the property rights structure as given, and inquire into the arbitrage activities that alert entrepreneurs pursue inside this structure. However, in our view the concept of entrepreneurial discovery may be broadened to also encompass discoveries related to re-definitions and capture of property rights, and not just to the exchange of these. It is this augmented entrepreneurial perspective that we apply to firms.

Firms and Changing Property Rights

In the view developed here, firms are important vehicles for entrepreneurial experimentation with products and processes because the property rights systems that characterize firms — particularly the relative concentration of decision rights in the hands of the entrepreneur implied by the authority relation — often allows this experimentation to be carried out at lower costs in firms than in markets. In particular, if the entrepreneur controls knowledge that is costly to communicate to other agents, for example, because it has strong tacit components (Hayek 1945), it may be efficient to concentrate decision rights in the hands of the entrepreneur and rely on direction rather than on consultation and bargaining between independent parties (Demsetz 1991; Foss 1993; Casson 1994).

Moreover, the property rights structures of firms also imply that they may be superior vehicles for experimentation with property rights structures *themselves*. Organizational changes — such as outsourcing, changes in organizational structure, team-based management, etc. (Cowen and Parker 1997; Miles et al. 1997; Zenger and Hesterly 1997) — are thus examples of experiments with the property rights structures of firms, since such changes may imply changes in task definitions (involving changes in use rights), payment and reward schemes (involving changes in income rights), employee ownership of the firm's stock (rights to alienate assets), etc. But so are the more mundane trials and errors involved in setting up a smoothly running production system consisting of many interdependent specialized tasks, possibly spanning several stages of production. In fact, to focus our discussion, we shall focus on exactly this kind of experimentation (see also Kirsten Foss 2001).

Complex Production Systems and Experimental Activity

Experimenting with running a production system, that is, a system of interdependent production activities (tasks), is only needed if there is uncertainty with respect to the best way of setting up and running the production systems, including how to source, organize, sequence, monitor, etc. inputs, define and sequence tasks, etc. In the world portrayed by the neoclassical theory of production, all this is fundamentally not a problem: Everything is laid out in the book of blueprints; thus, experimentation is not necessary (Nelson and Winter 1982; Langlois and Foss 1999). However, as the Austrians emphasize, production technologies are not just given: They have to be discovered, and often discovered anew, for example, when unanticipated changes in preferences, technology and

regulation make a change of the firm's capital structure necessary (Hayek 1941; Lachmann 1956). In this sort of experimenting with heterogeneous production technologies, we find a key function of the entrepreneur. As Lachmann (1956: 13, 16) stressed,

> … We are living in a world of unexpected change; hence capital combinations … will be ever changing, will be dis-solved and re-formed. In this activity, we find the real function of the entrepreneur.
>
> [T]he entrepreneur's function … is to *specify* and make decisions on the concrete form the capital resources shall have. He specifies and modifies the layout of his plant ... As long as we disregard the heterogeneity of capital, the true function of the entrepreneur must also remain hidden. In a homogenous world there is no scope for the activity of specifying.

We agree with Lachmann's points that interdependencies between assets are important for understanding the problem of organization, that unexpected contingencies upset existing combinations, that the entrepreneur task is to coordinate the uses of assets, and that most of the attendant problems would be trivialized in a homogeneous world. By a "homogenous world", Lachmann has in mind a setting where capital goods/assets are only substitutes, and not complements, and, furthermore, where all capital goods/assets (save perhaps for human capital) are perfect substitutes. In the terminology used here, a homogeneous world would be one in which the assignment of use rights to assets would be trivialized, since one asset would serve as well in production as another asset. There would be no real problems of managed coordination, although there might be problems of moral hazard related to the use of assets, possibly requiring some monitoring. In this world, it would be hard to discriminate between firms and markets, primarily because managed coordination would cease to exist. Thus, a first conclusion appears to be that the Austrian emphasis on heterogeneous capital appears to be necessary for the theory of economic organization. Moreover, the Austrian emphasis on ongoing experimentation undertaken by profit-motivated entrepreneurs (Mises 1949; Lachmann 1986; Klein and Klein 2000), which explains why heterogeneity persists (Jacobson 1992), yields further insights into economic organization. One mechanism that helps to understand ongoing, endogenous change, brought about by entrepreneurial, lies in the age-old theme of the division of labor.

Specialization and Property Rights

Virtually all contributors to the theory of economic organization (Langlois 1992 being one exception) take the costs of coordinating various tasks, as well as the extent of specialization in the economy, as given. To be sure, the costs of coordination crucially depend on the degree of specialization. However, the degree of specialization also depends on the costs of coordinating increasingly specialized tasks balanced against the (imagined) benefits (i.e., productivity increases) from specialization (Loasby 1995). This has profound implications for the theory of the firm. To see this, we need to go back to Adam Smith.

As Smith pointed out in *The Wealth of Nations,* specialization in production is a source of productivity improvements. Specifically, he ascribes productivity gains to improvements in a worker's ability to perform a task as it is repeated more often, the time that is saved from avoiding having to switch from one task to another, and an improved ability of workers to identity labor saving innovations. At least the first and third advantages of the division of labour are related to improvements in knowledge. Thus, the discovery of new knowledge is aided by the division of labor (Richardson 1975). In fact, as Loasby (1995: 302) argues:

> …the division of labour is to be thought of, not as a model of the efficient allocation of a given array of skills, but as a method of fostering the development of skills, and indeed generating other kinds of knowledge. It is a discovery process".

Many of the labor saving innovations envisaged by Adam Smith are results of workers' experiments with their own tasks in their own "circumstances of time and place" (Hayek 1945). In our perspective, the extent and character of such experimentation depends on the allocation of property rights — notably use rights but also income rights (Zenger and Hesterly 1997) — inside the firm (Kirsten Foss 2001). Thus, there is a connection between discovery and learning on the one hand and the allocation of use rights on the other hand. This connection is a consequence of the fact that learning and discovery will often require the exercise of use rights over assets. Patterns of learning depend on the allocation of use rights between different individuals over time and specialization in production may be one reason for reallocation of use rights. Thus, specialization in production can be tied to the possession of use rights to the extent that we interpret specialization as reflecting a subdivision of use rights over assets.[13]

This implies that the extent of experimentation depends on how well-specified and easily monitored use rights are, since the more well specified they are, the less able are those who use assets to experiment and the more constrained will their experimentation and discovery be.[14] Discretion may thus enable individuals to learn a broader set of skills and to conduct experiments which may result in innovations. In this sense, there is a direct link between property rights and possibilities of discovery.[15]

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[13] So that each individual holds rights over a more narrow set of assets or holds a more narrow set of rights over the same assets.

[14] If, for example, the manner in which a computer operator runs a program is pre-specified in a contract and easily monitored, his learning by doing may be limited to improving the speed with which he activates the keyboard. If he has greater discretion in deciding how to operate the program, he might have a greater opportunity for learning by experimenting.

[15] This is a possible economic interpretation of the much hyped talk about "empowerment" in the workplace.

Coordination and Property Rights

So far we have told a story inspired by both Smith and Hayek in which the discretionary behavior of agents result in productivity gains. However, discretionary behavior may not always result in such gains. First, if the discretionary behavior takes place inside a firm, shirking or other ways of appropriating a greater part of the value from the use of an asset are possible instances of discretionary behavior.[16] Thus, there is a trade-off here between local innovativeness and the possibility of morally hazardous behavior (Jensen and Meckling 1992; Nicolai Foss 2001). To some extent, these problems may be mitigated by giving agents a share of output (e.g., Minkler 1993). Second, discretionary behavior may cause problems when various kinds of interdependencies are present (Rosenberg 1976; Sahal 1981; Langlois 1992; Milgrom and Roberts 1992; Nicolai Foss 2000a).[17] For example, in production systems that are characterized by strong interdependencies between tasks, discretionary behavior may result in bottlenecks or in uneven development of components.

From a property rights perspective, such seemingly technological problems may be ascribed to imperfectly specified rights over assets. If rights had been perfectly specified, which they would have been had knowledge been perfect (Barzel 1994), the coordination problems caused by bottlenecks, etc. would have been eliminated. Essentially, these technological problems are externalities. Ongoing changes of the division of labor, as entrepreneurs experiment with dividing production tasks, introduce more complexity as more interdependencies are introduced, which in turn introduce more uncertainty. Thus, it may be difficult for the entrepreneur to specify all valued dimensions of assets *prior to* specialization, since many of the valued dimensions of assets only become apparent from *experimenting* with the uses of assets and discovering the best uses of those assets.[18] Given the great deal of interdependence that may exist in a complex production system which may span several stages of production and involve myriads of inputs and numerous tasks, the best time and place to use an asset depend on the specification of the uses of all other assets that are needed in production (Hayek 1941).

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[16] In Leijonhufvud's (1986) story, the interdependencies that characterize the division of labour also introduce the possibility of hold-up (Klein, Crawford, and Alchian 1978; Williamson 1985, 1996). We neglect this possibility here.

[17] The concept of "complementarities" in the modern economics of organization (idem.; Hart 1995) covers much of what we mean by interdependencies. (Complementarities/interdependencies were also much emphasized in Austrian capital theory, e.g., Lachmann 1956). However, in contrast to the modern economics of organization, we emphasize coordination rather than hold-up problems and the like.

[18] Even if important dimensions can in fact be specified, it may be difficult to allocate these rights in ways that ensure the best use of assets. This may, for example, be the case with the time and place dimension of assets where non-optimal allocations result in excess stocks of intermediate products or in idle assets.

This creates costs of specialization due to unsolved coordination problems, that is, problems of making agents' plans mesh (Hayek 1937, 1941; Lachmann 1956; Malmgren 1961; Richardson 1975). In firms, such coordination problems emerge as, for example, problems of bottlenecks. These are problems where complexity and interdependent activities make it difficult to specify how best to sequence various activities, or where the introduction of more specialized tools and equipment creates capacity utilization problems due to technical indivisibilities, or where innovations in individual activities result in an uneven development of tools, equipment and components. Basically these problems arise when those who deliver parts or carry out activities are not aware of the need for mutual adjustment, or do not have the incentive to make their activities mesh with those of others.

Solving problems that arise from technological interdependencies is an important souse of innovative improvements (Rosenberg 1976; Sahal 1981). However, such innovations do not emerge because of increased specialization, but because of learning in coordination. The question then arises: What governance structure best provides for experimentation and accumulation of experience in coordination? We shall follow basic Coasian arguments (Coase 1937, 1991), and stress that one of the reasons why managed coordination through the use of the authority relation may be advantageous relative to price coordination is because the former reduces costs of learning about the coordination of technologically interdependent tasks.

Experimenting and Learning: Firms as Low Cost Experimenters

It is in the handling of the coordination problems associated with interdependencies between tasks that we may find a rationale for the firm. Specifically, firms can be viewed as solutions to problems of coordination in situations where use rights over assets cannot be perfectly specified and allocated in manners which ensures the functionality of complex technologies. Such situations may occur because agents have only limited computational capacity (Williamson 1985, 1996), making it to difficult for them to specify use rights in ways that solve problems of interdependencies. Or they may occur because agents face uncertainty in the sense that they lack the ability to imagine "... the alternatives between which decisions are made" (Littlechild 1986: 29). This kind of uncertainty (which characterizes the radical subjectivist model) has typically been attributed to the possibility of inventions that change the set of alternatives between which economic agent can choose and thus also the structure of (shadow) prices. However, such uncertainty is also associated with much experimental activity. In the context of "running a business" (Coase 1991), a large part of experimental activity lies in the many trials and errors involved with setting up and maintaining a smoothly running production system, consisting of many interdependent specialized tasks and assets. Of course, such experimentation is only needed if there is uncertainty with respect to the best way of operating technically interdependent production systems. Because of such technological uncertainty, firms may start different kinds of experiments and follow different paths of learning.

The firm provides a low cost way of discovering solutions to coordination problems related to bottlenecks and uneven development of components. For managed direction of resources to be efficient, it is required that entrepreneurs are at least as qualified in discovering the relevant prices (that is, finding the highest valued uses of assets) as independent contractors would be.[19] Otherwise, costs of transacting may be saved at the expense of efficiency in the use of resources. If entrepreneurs are better able to determine the valuable uses of resources compared to other agents, entrepreneurs have a ownership advantage over resources. Such an advantage explains the single person firm, but not necessarily why entrepreneurs hire employees who are prepared to take orders within certain limits in order to take advantage of this knowledge. Entrepreneurs could as well rent the labor time of an agent in return for the exercise of a certain well specified task.

However, in actuality, entrepreneurs stand a good chance of acquiring superior knowledge about the best uses of the assets that make up a complex technology (Demsetz 1991; Casson 1994). From the innovation literature, it is apparent that the solution to problems of bottlenecks and uneven development in components are based on learning by doing in production and development (Rosenberg 1976; Sahal 1981). The argument here is that this experience from learning by doing is probably more easily accumulated within the boundaries of firms. One of the reasons why one might expect this learning to be less costly within the boundaries of firms may be that entrepreneurs who hold residual rights over assets -- including rights to re-define and reallocate specific rights -- are able to conduct experiments. They can do this without continuously having to re-negotiate contracts (which will have more or less unforeseen outcomes because of the uncertain nature of the experimental process). This saves all sorts of (transaction) costs related to time, bargaining and contract drafting (Foss and Foss 2000a).[20]

Entrepreneurs are then able to create "controlled" experiments in which they only change some aspects of the tasks in order to trace the effects of some specific re-arrangements of rights. Setting up a controlled experiment may be more difficult across the boundaries of firms, particularly when interdependencies exists between firms and if it is difficult to specify all the tasks which must and must not be changed. Coordinating interdependent tasks within the boundaries of a firm may provide entrepreneurs with a more complete picture of the nature of interdependencies. Such information is not only important in relation to

[19] Coase (1937) mentions "... increasing opportunity costs due to the failure of entrepreneurs to make the best use of the factor of production" (p.23) as one of the factors which set a limit to the efficient size of a firm. He also assumes that "… the costs of losses through mistakes will increase with an increase in the spatial distribution of the transactions organized, in the dissimilarity of the transactions, and in the probability of changes in the relevant prices. As more transactions are organized by an entrepreneur, it would appear that the transactions would tend to be either different in kind or in different places" (p.25). Managers, in other words, have limited capacity to "discover the relevant prices" and this increases the occurrence of mistakes as more and more dissimilar transactions are organized in a firm.

[20] In this connection wage contracts may be an efficient way of sharing risks from experimenting.

eliminating bottlenecks, but also in relation to avoiding problems of uneven development of components by setting up interface standards and other more permanent solutions. It may also be important in connection with establishing organizational structure inside a firm, since this structure at least partly reflects the nature and sequence of productive tasks.[21]

Specialization and the Boundaries of Firms

So far, the argument has been that relative to markets, firms may economize on the transaction costs of learning the best way of coordinating technological interdependent systems. Now, once a firm has discovered how to coordinate some specialized tasks, there would be little advantage from managed direction relative to market transacting, and coordination by order contracts may substitute for coordination by management.[22] The task will be spun-off. However, such specialization between firms gives way to economic gains from further specialization in tasks, and this *in turn* creates new uncertainty and new opportunities for reducing coordination costs by means of experimental activity. In other words, there will be an *ongoing process* of specialization in tasks, learning in coordination and specialization between firms and new ways of coordination will continuously be imagined by entrepreneurs, much like the process of cumulative causation envisaged by Allyn Young (1928). Thus, firms contain many mechanisms that endogenously produce change, such as the (related) mechanisms of ongoing learning, experimenting, and changes in the division of labor, and these have profound consequences for the process aspects of economic organization.

Conclusion

In this paper, we have brought market process ideas to bear on the theory of the firm. In particular, we have argued that it is possible to arrive at an experimental view of the firm from broadly Austrian principles. Thus, the experimental view of the firm developed here stresses the role of the firm as a repository for a broad range of experiments, mostly with production technology. It is a view that stresses the role of discovery and learning. However, experimental activities are in general costly, and are particularly to be so when experimentation with strongly interdependent technologies is involved. The costs of coordinating such technologies may be reduced by bringing them in-house. This explains the existence of the firm from an experimental point of view.

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[21] Thus, although we have stressed experimentation in connection with complex production systems that may span several stages of production, our view is not inconsistent with the contemporary emphasis on more or less autonomous teams that experiment with local, well-defined products and activities (Cowen and Parker1997; Miles at al. 1997). Even in firms that are based on project teams, there are multiple complementarities between activities and therefore often a need for hierarchical direction (Foss 2000a&b).

[22] Managed direction could still be advantageous in cases where adaptation of interdependent production systems to unforseen contingences were called for.

The story we have tried to tell in this paper is broadly consistent with much of the modern economics of organization. Thus, we have borrowed ideas from the property rights literature (e.g., Barzel 1997), and have applied these ideas to settings involving complementarities between assets and activities (Milgrom and Roberts 1992; Hart 1995). Like Coase (1937) and Williamson (1985, 1996) we have stressed the superior flexibility conferred by incomplete contracts in the context of an authority relation. However, we have invested these ideas with distinctively market process interpretations, first, by stressing the experimental nature of economic activity, second, by arguing that a primary task of the entrepreneur/manager is to conduct controlled experiments with interdependent production technologies, and, third, by assuming that the goal of these experiments is to achieve internal plan consistency (i.e., make the production process run smoothly). Clearly, all of this can be taken further; our main aim has been to provide building blocks and suggest that a distinct view of economic organization is possible, based on market process fundamentals.

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