

The Entrepreneurial Organization of Heterogeneous Capital

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Abstract: Transaction cost, property rights, and resource-based approaches to the firm assume that assets, both tangible and intangible, are heterogeneous. Arranging these assets to minimize contractual hazards, to provide efficient investment incentives, or to exploit competitive advantage is conceived as the prime task of economic organization. None of these approaches, however, is based on a systematic theory of capital heterogeneity. In this paper we outline the approach to capital developed by the Austrian school of economics and show how Austrian capital theory provides a natural bridge between theory of entrepreneurship and the theory of the firm. We refine Austrian capital theory by defining capital heterogeneity in terms of subjectively perceived attributes, the functions, characteristics, and uses of capital assets. Such attributes are not given, but have to be created or discovered by means of entrepreneurial action. Conceiving entrepreneurship as the organization of heterogeneous capital provides new insights into the emergence, boundaries, and internal organization of the firm, and suggests testable implications about how entrepreneurship is manifested.

1. Introduction

The theory of entrepreneurship comes in many guises. Management scholars and economists have made the entrepreneur an innovator, a leader, a creator, a discoverer, an equilibrator, and more. In only a few of these theories, however, is entrepreneurship explicitly linked to asset ownership (examples include Knight, 1921; Mises, 1949; Casson, 1982; Foss, 1993; Langlois and Cosgel, 1993; and Foss and Klein, 2005). Ownership theories of entrepreneurship start with the proposition that entrepreneurial judgment is costly to trade, an idea originally suggested by Knight (1921). When judgment is complementary to other assets, it makes sense for entrepreneurs to own these complementary assets. The entrepreneur's role, then, is to arrange or organize the capital goods he owns. Entrepreneurial judgment is ultimately judgment about the control of resources.

In a world of identical capital goods, entrepreneurial judgment plays a relatively minor role. Unfortunately, mainstream neoclassical economics, upon which most economic theories of entrepreneurship are based, lacks a systematic theory of capital heterogeneity. Strongly influenced by Knight's (1936) concept of capital as a permanent, homogeneous fund of value, rather than a discrete stock of heterogeneous capital goods, neoclassical economists have devoted little attention to capital theory. For this reason, ownership theories of entrepreneurship, as well as contemporary theories of firm boundaries, ownership, and strategy, are not generally founded on a systematic theory of capital or asset attributes. This paper outlines the capital theory associated with the Austrian school of economics and derives implications for entrepreneurship and economic organization.

The Austrian school of economics (Menger, 1871; Böhm-Bawerk, 1889; Mises, 1949; Lachmann, 1956; Rothbard, 1962; Hayek, 1948, 1968; Kirzner, 1973) is well known in management studies for its contributions to the theory of entrepreneurship and the complementary "market process" account of economic activity (Jacobson 1992; Hill and Deeds, 1996; Chiles and Choi, 2000; Langlois, 2001; Chiles, 2003; Roberts and Eisenhardt, 2003). Other characteristically Austrian ideas such as the time structure of capital and the "malinvestment" theory of the

business-cycle theory have received much less attention. To several Austrians, the theory of entrepreneurship was closely related to the theory of capital. As Lachmann (1956: 13, 16) argued: “We are living in a world of unexpected change; hence capital combinations . . . will be ever changing, will be dissolved and reformed. In this activity, we find the real function of the entrepreneur.” It is this “real function” that we elaborate in the following.

Management scholars will hardly be startled by the claim that entrepreneurs organize heterogeneous capital goods. The management literature abounds with notions of heterogeneous “resources,” “competencies,” “capabilities,” “assets,” and the like. Linking such work to entrepreneurship would seem to be a rather natural undertaking (see, e.g., Alvarez and Busenitz, 2001). However, modern theories of economic organization are not built on a unified theory of capital heterogeneity; instead, they simply invoke *ad hoc* specificities when necessary. The Austrian school offers a systematic, comprehensive theory of capital, and Austrian notions of capital heterogeneity can inform, synthesize, and improve the treatment of specificities in the theory of the firm. Adopting the Austrian view of capital also reveals new sources of transaction costs that influence economic organization.

The paper proceeds as follows. We begin, building on Foss and Klein (2005), by linking the theory of entrepreneurship and the theory of the firm. The link involves first, defining entrepreneurship as the exercise of judgment over resource uses under uncertainty, and second, viewing the theory of economic organization as a subset of the theory of asset ownership (“*Entrepreneurship, Judgment, and Asset Ownership*”). We then discuss “assets” in the specific context of capital theory, showing that the assumption of heterogeneous capital is necessary to the theory of the firm (“*Capital Theory and the Theory of the Firm*”). We next summarize the Austrian theory of capital, elaborating and expanding on those parts of the theory most relevant for economic organization (“*An Austrian Approach to Capital Heterogeneity*”). The final section weaves these elements together to provide new insights into key questions of the emergence, boundaries, and internal organization of the firm (“*Organizing Heterogeneous Capital*”). We conclude with some suggestions for testable implications that may be drawn from our theory.

2. Entrepreneurship, Judgment, and Asset Ownership

Entrepreneurs are the founders and developers of business firms. Indeed, the establishment of a new business venture is the quintessential manifestation of entrepreneurship. Yet, as Foss and Klein (2005) point out, the theory of entrepreneurship and the theory of the firm developed largely in isolation. The economic theory of the firm emerged and took shape as the entrepreneur was being banished from microeconomic analysis, first in the 1930s when the firm was subsumed into neoclassical price theory (O'Brien, 1984) and again in the 1980s as the theory of the firm was restated using game theory and information economics. Modern contributions to the theory of the firm (Williamson, 1975, 1985, 1996; Milgrom and Roberts, 1992; Hart, 1995) mention entrepreneurship only in passing, if at all.

Foss and Klein (2005) show how the theory of entrepreneurship and the theory of the firm can be linked using the concept of entrepreneurship as *judgment*.¹ This view traces its origins to the first systematic treatment of entrepreneurship in economics, Richard Cantillon's *Essai sur la nature de commerce en général* (1755). It conceives entrepreneurship as judgmental decision-making under conditions of uncertainty. Judgment refers primarily to business decision-making when the range of possible future outcomes, let alone the likelihood of individual outcomes, is generally unknown (what Knight terms uncertainty, rather than mere probabilistic risk). More generally, judgment is required "when no obviously correct model or decision rule is available or when relevant data is unreliable or incomplete" (Casson, 1993).

As such, judgment is distinct from boldness, daring, or imagination (Begley and Boyd, 1987; Chandler and Jansen, 1992; Aldrich and Wiedenmayer, 1993; Hood and Young, 1993; Lumpkin and Dess, 1996), innovation (Schumpeter, 1911), alertness (Kirzner, 1973), leadership (Witt, 1998a, 1998b), and other concepts of entrepreneurship that appear in the economics and management literatures. Judgment must be exercised in mundane circumstances, as Knight (1921) emphasized, for ongoing operations as well as new ventures. Alertness is the ability to react to

¹ For related treatments along the same lines, see Casson (1982) and Langlois and Cosgel (1993).

existing opportunities while judgment refers to the creation of *new* opportunities.² Those who specialize in judgmental decision-making may be dynamic, charismatic leaders, but they need not possess these traits. In short, decision making under uncertainty is entrepreneurial, whether it involves imagination, creativity, leadership, and related factors or not.

Knight (1921) introduces judgment to link profit and the firm to uncertainty. Judgment primarily refers to the process of businessmen forming estimates of future events in situations in which the relevant probability distributions are themselves unknown. Entrepreneurship represents judgment that cannot be assessed in terms of its marginal product and which cannot, accordingly, be paid a wage (Knight 1921: 311). In other words, there is no market for the judgment that entrepreneurs rely on, and therefore exercising judgment requires the person with judgment to start a firm. Of course, judgmental decision makers can hire consultants, forecasters, technical experts, and so on. However, as we explain below, in doing so they are exercising their own entrepreneurial judgment. Judgment thus implies asset ownership, for judgmental decision-making is ultimately decision-making *about the employment of resources*. An entrepreneur without capital goods is, in Knight's sense, no entrepreneur.³

The notion of entrepreneurship as judgment implies an obvious link with the theory of the firm, particularly those theories (transaction cost economics and the property-rights approach) that put asset ownership at the forefront of firm organization (Williamson, 1996; Hart, 1995) (cf. also Langlois and Cosgel, 1993). The firm is defined as the entrepreneur plus the alienable assets he owns and therefore ultimately controls. The theory of the firm then becomes a theory of how the entrepreneur arranges his heterogeneous capital assets—what combinations of assets will he seek to acquire, what (proximate) decisions will he delegate to subordinates, how will he provide incentives and use monitoring to see that his assets are used consistently with his judgments, and

² In Kirzner's treatment, entrepreneurship is characterized as "a *responding* agency. I view the entrepreneur not as a source of innovative ideas *ex nihilo*, but as being *alert* to the opportunities that exist *already* and are waiting to be noticed" (Kirzner, 1973, p. 74).

³ This contrasts with Schumpeter's and Kirzner's conceptions of entrepreneurship, in which entrepreneurship can be exercised without the possession of any capital goods. On this contrast see Foss and Klein, 2005.

so on. Given this emphasis on entrepreneurship, one might expect the modern theory of the firm to be based on a coherent, systematic theory of capital. This is not the case, however.

3. Capital Theory and the Theory of the Firm

Shmoo Capital and Its Implications

Modern (neoclassical) economics focuses on a highly stylized model of the production process. The firm is a production function, a “black box” that transforms inputs (land, labor, capital) into output (consumer goods). As is widely recognized in modern treatments of the firm, this model omits the critical organizational details of production, rarely looking inside the black box to see how hierarchies are structured, how incentives are provided, how teams are organized, and the like. An equally serious omission, perhaps, is that production is treated as a one-stage process, in which factors are instantly converted into final goods, rather than a complex, multi-stage process unfolding through time and employing rounds of intermediate goods. “Capital” is treated as a homogeneous factor of production, the “K” that appears in the production function along with “L” for labor. Following Solow (1957) models of economic growth typically model capital as what Paul Samuelson called “shmoo”—an infinitely elastic, fully moldable factor that can be substituted costlessly from one production process to another.

In a world of shmoo capital economic organization is relatively unimportant. All capital assets possess the same attributes, and thus the costs of inspecting, measuring, and monitoring the attributes of productive assets is trivial. Exchange markets for capital assets would be virtually devoid of transaction costs. A few basic contractual problems — in particular, principal-agent conflicts over the supply of labor services — may remain, though workers would all use identical capital assets, and this would greatly contribute to reducing the costs of measuring their productivity.

While transaction costs would not disappear entirely in such a world, asset ownership would be relatively unimportant. The possibility of specifying all possible uses of an asset significantly reduces the costs of writing complete, contingent contracts between resource owners and entre-

preneurs governing the uses of the relevant assets.⁴ Contracts would largely substitute for ownership, leaving the boundary of the firm indeterminate (Hart, 1995).

Capital in Modern Theories of the Firm

By contrast, all modern theories of the firm assume (often implicitly) that capital assets possess varying attributes, so that all assets are not equally valuable in all uses. Here we review how capital heterogeneity leads to non-trivial contracting problems, the solutions to which may require the creation of a firm.

Asset specificity approaches. In transaction cost economics (TCE) (Williamson, 1975, 1985, 1996) and the “new” property-rights approach (Grossman and Hart, 1986; Hart and Moore, 1990), some assets are conceived as specific to particular users. If complete, contingent contracts specifying the most valuable uses of such assets in all possible states of the world cannot be written, then owners of productive assets face certain risks. Primarily, if circumstances change unexpectedly, the original governing agreement may no longer be effective. The need to adapt to unforeseen contingencies constitutes an important cost of contracting. Failure to adapt imposes what Williamson (1991) calls “maladaptation costs,” the best known of which is the “holdup” problem associated with relationship-specific investments.

It is obvious that maladaptation costs largely disappear if all assets are equally valuable in all uses. Potential holdup would still be a concern for owners of relationship-specific human capital and raw materials, but disagreements over the efficient use of capital goods would become irrelevant.⁵ The scope of entrepreneurial activity would also be severely reduced, since entrepreneurs would have no need to arrange particular combinations of capital assets.

⁴ Contracts might still be incomplete because contracting parties have different, subjective expectations about the likelihood of various contingencies affecting the value of the (homogeneous) capital asset. Agents may also differ in their ability to learn about possible uses of the capital good. In other words, Knightian uncertainty plus bounded rationality could drive contractual incompleteness even in a world without capital heterogeneity. However, the neo-classical world of shmo capital is characterized by parametric uncertainty, common priors, and hyperrationality.

⁵ Resources that are *initially* homogenous could become heterogeneous over time, through learning by doing or co-specialization of human and physical capital. Here we refer to conditions of permanent homogeneity.

Resource- and knowledge-based approaches. Resource-based (Wernerfelt, 1984; Barney, 1991; Lippman and Rumelt, 2003) and knowledge-based (Penrose, 1959; Grant, 1996) approaches also emphasize capital heterogeneity, but their focus is not generally economic organization, but rather competitive advantage.⁶ The emphasis in these approaches is not economic organization, however, but competitive advantage. The latter is seen as emerging from bundles of resources (including knowledge). Different resource bundles are associated with different efficiencies, translating into a theory of competitive advantage. Resource- and knowledge-based scholars often emphasize that heterogeneous assets do not give rise independently to competitive advantages. Rather, it is the interactions among these resources, their relations of specificity and co-specialization, that generate such advantages (e.g., Dierickx and Cool, 1989; Barney, 1991; Black and Boal, 1994). However, this notion is not developed from any comprehensive perspective on asset specificity and co-specialization (or complementarity) (as in Teece 1982).

“Old” property rights theory. A sophisticated approach to capital heterogeneity can be drawn from the property-rights approach associated with economists such as Coase (1960), Alchian (1965), Demsetz (1964, 1967), and, particularly, Barzel (1997). These writers focus not on individual assets per se, but on bundles of asset attributes to which property rights may be held (Foss and Foss 2001).

While it is common to view capital heterogeneity in terms of physical heterogeneity—beer barrels and blast furnaces are different because of their physical differences—the old property-rights approach emphasizes that capital goods are heterogeneous because they have different levels and kinds of valued attributes (in the terminology of Barzel, 1997).⁷ Attributes are characteristics, functions, or possible uses of assets, as perceived by an entrepreneur. For example, a copying machine has multiple attributes because it can be used at different times, by different

⁶ Penrose’s approach, unlike modern resource- and knowledge-based approaches, did emphasize one important element of economic organization, namely the rate of growth of the firm.

⁷ Foss and Foss (2005) link the property rights approach to the resource-based view, demonstrating how the more “micro” approach of the property rights approach provides additional insights into resource value. See also Kim and Mahoney (2002, 2005) for similar arguments.

people, and for different types of copying work; that it can be purchased in different colors and sizes; and so on.⁸ Property rights to the machine itself can be partitioned, in the sense that rights to its attributes can be defined and traded, depending on transaction costs (Foss and Foss, 2001).

Clearly, virtually all assets have multiple attributes. Assets are heterogeneous to the extent that they have different, and different levels of, valued attributes. Attributes may also vary over time, even for a particular asset. In a world of “true” uncertainty, entrepreneurs are unlikely to know all relevant attributes of all assets when production decisions are made. Nor can the future attributes of an asset, as it is used in production, be forecast with certainty. Future attributes must be *discovered*, over time, as assets are used in production. Or, to formulate the problem slightly differently, future attributes are *created* as entrepreneurs envision new ways of using assets to produce goods and services.⁹

Summing up. While capital heterogeneity thus plays an important role in transaction cost, resource-based, and property-rights approaches to the firm, none of these approaches rests on a unified, systematic theory of capital. Instead, each invokes the needed specificities in an *ad hoc* fashion to rationalize particular trading problems—for transaction cost economics, asset specificity; for capabilities theories, tacit knowledge; and so on. Some writers (Winter, 1988; Demsetz, 1991; Langlois and Foss, 1999) argue that the economics of organization has shown a tendency (albeit an imperfect one) to respect an implicit dichotomy between production and exchange. Thus, as Langlois and Foss (1999) argue, there is an implicit agreement that the production function approach with its attendant assumptions (e.g., blueprint knowledge) tells us what we need to know about production, so theories of the firm can focus on transacting and how transactional hazards can be mitigated by organization. Production issues, including capital theory, never

⁸ Clearly, this notion of subjectively perceived attributes of capital assets is related to Penrose’s (1959) point that the physically capital assets may yield different services, depending on, for example, the nature of the administrative framework in which they are embedded.

⁹ In this paper we do not distinguish between “discovery” and “creation” as alternative conceptions of the entrepreneurial act, though we recognize the general importance of the distinction (Alvarez and Barney, 2005).

really take center stage. This is problematic if production itself reveals *new* problems of transacting that may influence economic organization.

4. The Attributes Approach to Capital Heterogeneity

An alternative tradition in economics, the Austrian school, does have a systematic, comprehensive theory of capital, though it has not generally been applied to the business firm.¹⁰ Instead, most of the substantial literature on Austrian capital theory focuses on the economy's overall capital structure and how money and credit markets affect the allocation of resources across different stages of the production process.¹¹

Austrian Capital Theory

The concept of heterogeneous capital has a long and distinguished place in Austrian economics.¹² Early Austrian writers argued that capital has a time dimension as well as a value dimension. Carl Menger (1871), the founder of the Austrian school, characterized goods in terms of “orders”: Goods of lowest order are those consumed directly. Tools and machines used to produce those consumption goods are of a higher order, and the capital goods used to produce the tools and machines are of an even higher order. Building on his theory that the value of all goods is determined by their ability to satisfy consumer wants (i.e., their marginal utility), Menger showed that the value of the higher-order goods is given or “imputed” by the value of the lower-order goods they produce. Moreover, because certain capital goods are themselves produced by other, higher-order capital goods, it follows that capital goods are not identical, at least by the time they are employed in the production process. The claim is not that there is no substitution among capital goods, but that the degree of substitution is limited; as Lachmann (1956) put it,

¹⁰ Of the several dozen papers on Austrian economics and the theory of the firm (including, for instance, the papers collected in Foss and Klein, 2002), only a few are based on Austrian capital theory. (See Yu, 1999; Chiles, Meyer, and Hench, 2004; Lewin, 2005; and various papers by the present authors.)

¹¹ Hayek's 1974 Nobel Prize in economics was awarded for his technical work on the business cycle and not, as is commonly believed, for his later work on knowledge and “spontaneous order.” For a modern restatement of Austrian business cycle theory, see Garrison (2000).

¹² For overviews see Strigl (1934), Kirzner (1966), and Lewin (1999).

capital goods are characterized by “multiple specificity.” Some substitution is possible, but only at a cost.¹³

Kirzner (1966) added an important refinement to the Austrian theory of capital by emphasizing the role of the entrepreneur (the theme that dominates Kirzner’s later, better known, work). Earlier Austrian writers, particularly Böhm-Bawerk, tried to characterize the economy’s capital structure in terms of its physical attributes. Böhm-Bawerk attempted to describe the temporal “length” of the structure of production by a single number, the “average period of production.” Kirzner’s approach avoids these difficulties by defining capital assets in terms of subjective, individual *production plans*, plans that are formulated and continually revised by profit-seeking entrepreneurs. Capital goods should thus be characterized, not by their physical properties, but by their place in the structure of production *as conceived by entrepreneurs*. The actual place of any capital good in the time sequence of production is given by the market for capital goods, in which entrepreneurs bid for factors of production in anticipation of future consumer demands. This subjectivist, entrepreneurial approach to capital assets is particularly congenial to theories of the firm that focus on entrepreneurship and the ownership of assets.¹⁴

Understanding Capital Heterogeneity

The Austrian approach to capital generated considerable controversy, both within the school itself and between the Austrians and rival schools of economic thought. Given the attention de-

¹³ Hayek’s *Prices and Production* (1931) emphasized the relationship between the value of capital goods and their place in the temporal sequence of production. Because production takes time, factors of production must be committed in the present for making final goods that will have value only in the future after they are sold. However, capital is heterogeneous. As capital goods are used in production, they are transformed from general-purpose materials and components to intermediate products specific to particular final goods. Consequently, these assets cannot be easily redeployed to alternative uses if demands for final goods change. The central macroeconomic problem in a modern capital-using economy is thus one of *intertemporal coordination*: how can the allocation of resources between capital and consumer goods be aligned with consumers’ preferences between present and future consumption? In *The Pure Theory of Capital* (1941) Hayek describes how the economy’s structure of production depends on the characteristics of capital goods—durability, complementarity, substitutability, specificity, and so on.

¹⁴ Penrose (1959) also emphasizes the subjectivity of the firm’s perceived opportunity set (Kor and Mahoney, 2000). In her approach, entrepreneurs must learn how best to deploy their productive resources; because learning is idiosyncratic, firms with similar stocks of physical resources may differ in their strategic opportunities. Our emphasis on subjectively perceived attributes of capital assets may be seen as an example of a Penrosian perceived opportunity set. Kirzner’s concept of entrepreneurial “alertness,” by contrast, is not a learned skill, but a talent or ability that is not subject to further explanation.

voted to the problem of measuring a heterogeneous capital stock, it is surprising that relatively little analytical effort has been devoted to the concept of heterogeneity itself. The notion of heterogeneous capital is crucial not just for Austrian capital theory, but for (Austrian) economics in general. For example, the Austrian position in the socialist calculation debate of the 1930s (Mises, 1920; Hayek, 1935) is based on an entrepreneurial concept of the market process, one in which the entrepreneur's primary function is to choose among the various combinations of factors suitable for producing particular goods (and to decide whether these goods should be produced at all), based on current prices for the factors and expected future prices of the final goods. If capital is shmoos with one price, then entrepreneurship is reduced to choosing between shmoos-intensive and labor-intensive production methods (or among types of labor), a problem a central planner could potentially solve. The failure of socialism, in Mises's (1920) formulation, follows precisely from the complexity of the economy's capital structure, and the subsequent need for entrepreneurial judgment. As Lachmann (1956: 16) points out, real-world entrepreneurship consists primarily of choosing among combinations of capital assets:

[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.

Kirzner's argument that capital goods are heterogeneous not because of their objective characteristics, but because they play particular roles within the entrepreneur's overall production plan, further developed the link between entrepreneurship and capital heterogeneity.

In our interpretation, as discussed above, capital goods are distinguished by their *attributes*, in the terminology of Barzel (1997) (Foss and Foss, 2001). As Alchian and Demsetz (1972: 793) note, "[e]fficient production with heterogeneous resources is a result not of having *better* resources but in *knowing more accurately* the relative productive performances of those resources." *Contra* the production function view in basic neoclassical economics, such knowledge is not *given*, but has to be created or discovered. Even in the literature on opportunity creation and exploitation, in which entrepreneurial objectives are seen as emerging endogenously from

project champions' creative imaginations, entrepreneurial means (resources) are typically taken as given (see, for example, Sarasvathy, 2001).

Heterogeneous Assets, Property Rights, and Ownership

Focusing on attributes not only helps conceptualize heterogeneous capital, but also illuminates the vast literature on property rights and ownership. Barzel (1997) stresses that property rights are held over attributes; in his work, property rights to *known* attributes of assets are the relevant units of analysis. In contrast, he dismisses the notion of asset ownership as essentially legal and extra-economic. Similarly, Demsetz argues that the notion of “full private ownership” over assets is “vague,” and “must always remain so,” because “there is an infinity of potential rights of actions that can be owned.... It is impossible to describe the complete set of rights that are potentially ownable” (Demsetz, 1988:19).

However, as we noted above, most assets have unspecified, unknown future attributes, and an important function of entrepreneurship is to create or discover these attributes. Contrary to Demsetz, it is exactly this feature that creates a distinct role for asset ownership, the acquisition of legal title to a bundle of existing and future attributes. Specifically, ownership is a low-cost means of allocating the rights to attributes of assets that are created or discovered by the entrepreneur-owner. For instance, those who create or discover new knowledge have an incentive to use it directly because it is costly to transfer knowledge to others. In a well-functioning legal system, ownership of an asset normally implies that the courts will not interfere when an entrepreneur-owner captures the value of newly created or discovered attributes of an asset he owns. Consequently, the entrepreneur-owner can usually avoid costly negotiation with those who are affected by his creation or discovery. Moreover, asset ownership itself provides a powerful incentive to create or discover new attributes, as ownership conveys the legally recognized (and at least partly enforced) right to the income of an asset, including the right to income from new attributes.

Heterogeneous Capital and Experimental Entrepreneurship

The Austrian idea of heterogeneous capital is thus a natural complement to the theory of entrepreneurship.¹⁵ Entrepreneurs who seek to create or discover new attributes of capital assets will want ownership titles to the relevant assets, both for speculative reasons and for reasons of economizing on transaction costs. These arguments provide room for entrepreneurship that goes beyond deploying a superior combination of capital assets with “given” attributes, acquiring the relevant assets, and deploying these to producing for a market: Entrepreneurship may also be a matter of *experimenting* with capital assets in an attempt to discover new valued attributes.

Such experimental activity may take place in the context of trying out new combinations through the acquisition of or merger with another firms, or in the form of trying out new combinations of assets already under the control of the entrepreneur. The entrepreneur’s success in experimenting with assets in this manner depends not only on his ability to anticipate future prices and market conditions, but also on internal and external transaction costs, the entrepreneur’s control over the relevant assets, how much of the expected return from experimental activity he can hope to appropriate, and so on. Moreover, these latter factors are key determinants of economic organization in modern theories of the firm, which suggests that there may be fruitful complementarities between the theory of economic organization and Austrian theories of capital heterogeneity and entrepreneurship.

5. Organizing Heterogeneous Capital

Here we show how Austrian notions of capital heterogeneity give additional insights into the theory of the firm. The key questions are why firms emerge and what explains their boundaries (scope) and internal organization. In the following, we relate these issues to our emphasis on entrepreneurship as judgment about organizing and using heterogeneous capital assets.

¹⁵ We note in passing that the understanding of management may also be furthered by beginning from heterogeneous capital assets and the need for coordination they imply. From a resource-based view, Mahoney (1995) argues that an important function of management is the coordination of such assets.

The Emergence of the Firm

Coase (1937) explained the firm as a means for economizing on transaction costs, a theme elaborated by Williamson (1975, 1985, 1996). Alchian and Demsetz (1972) viewed the firm as an (albeit imperfect) solution to the free-rider problem in team production. Resource-based theories emphasize the need to generate and internalize tacit knowledge. It is not obvious where the entrepreneur fits into these approaches, however. Our framework suggests a slightly different approach.

Incomplete markets for judgment. Agents may realize rents from their human capital through three means: (1) selling labor services on market conditions, (2) entering into employment contracts, or (3) starting a firm. As Barzel (1987) argues, moral hazard implies that options (1) and (2) are often inefficient means of realizing rents. In other words, entrepreneurs know themselves to be good risks but are unable to communicate this to the market. For this reason, firms may emerge because the person whose services are the most difficult to measure (and therefore are most susceptible to moral hazard and adverse selection) becomes an entrepreneur, employing and supervising other agents, and committing capital of his own to the venture, thus contributing a bond.

However, there are other reasons why the market may not be able to evaluate entrepreneurial services. For example, Kirzner (1979: 181) argues that “entrepreneurship reveals to the market what the market did not realize was available, or indeed, needed at all.” Casson (1982: 14) takes a more Schumpeterian position, arguing that “[t]he entrepreneur believes he is right, while everyone else is wrong. Thus the essence of entrepreneurship is being different—being different because one has a different perception of the situation” (see also Casson, 1997). In this situation, non-contractibility arises because “[t]he decisive factors . . . are so largely on the inside of the person making the decision that the ‘instances’ are not amenable to objective description and external control” (Knight, 1921: 251). Hence moral hazard is not the only important factor underlying non-contractibility. An agent may be unable to communicate his “vision” of a commercial experiment—a specific way of combining heterogeneous capital assets to serve future consumer wants—in such a way that other agents can assess its economic implications. In such a case, he cannot be an employee, but will in-

stead start his own firm. The existence of the firm can thus be explained by a specific category of transaction costs, namely, those that close the market for entrepreneurial judgment.

Note that in a world of uncertainty and change, these factors explain not only the emergence of new firms, but also the ongoing operations of existing firms. The entrepreneurial process of combining and recombining heterogeneous resources plays out continually, through time, as new attributes are created or discovered (and as consumer preferences and technological capabilities change). In our framework, the entrepreneurial act is not restricted to new venture formation; entrepreneurial judgment is necessarily exercised on an ongoing basis. Our approach is thus inconsistent with what we perceive as an undue emphasis on new venture creation in the applied entrepreneurship literature.

Finally, there is an important sense in which judgment can never be fully delegated. Resource owners, by possessing residual rights of control, are the decision makers of last resort, no matter how many day-to-day decision rights they delegate to hired managers. Jensen (1989) famously distinguished “active” from “passive” investors. Active investors are those “who hold large equity or debt positions, sit on boards of directors, monitor and sometimes dismiss management, are involved with the long-term strategic direction of the companies they invest in, and sometimes manage the companies themselves.” While not denying the importance of this distinction, we argue that residual control rights make all resource owners “active,” in the sense that they *must* exercise judgment over the use of their resources. In our approach, investors choose how “Jensen-active” they wish to be, which makes them “active” by definition.¹⁶

¹⁶ Compare Rothbard (1962: 538): “Hired managers may successfully direct production or choose production processes. But the ultimate responsibility and control of production rests inevitably with the owner, with the businessman whose property the product is until it is sold. It is the owners who make the decision concerning how much capital to invest and in what particular processes. And particularly, it is the owners who must choose the managers. The ultimate decisions concerning the use of their property and the choice of the men to manage it must therefore be made by the owners and by no one else.”

Kirzner (1973: 68) makes a similar point about alertness: it can never be fully delegated. “It is true that ‘alertness’ . . . may be hired; but one who hires an employee alert to possibilities of discovering knowledge has himself displayed alertness of a still higher order. . . . The *entrepreneurial* decision to hire is thus the *ultimate* hiring decision, responsible in the last resort for all factors that are directly or indirectly hired for his project.” Kirzner goes on to quote Knight (1921: 291): “What we call ‘control’ consists mainly of selecting some one else to do the ‘controlling.’”

Firms as controlled experiments. The idea of incomplete markets for judgment helps us understand the one-person firm. However, similar ideas may also be useful for understanding the multi-person firm. For instance, as discussed above, when capital is homogenous it is easy to conceive, coordinate, and implement plans for producing, marketing and selling goods and services. The decision problem is one of choosing the intensities with which shmoo is applied to various activities. In the real world of heterogeneous capital assets, by contrast, production plans are much more difficult to conceive, coordinate, and implement. It is not necessarily obvious to which activities capital goods are most profitably applied and account has to be taken of complex relations between capital goods.

Given that the optimal relationships among assets are generally unknown *ex ante*, and often so complex that resort to analytical methods is not possible (Galloway, 1996), some experimentation is necessary. First, one must isolate the system boundaries, that is, where the relevant relationships among assets are most likely to be. Second, the experimental process must be like a controlled experiment (or a sequence of such experiments) to isolate the system from outside disturbances. Third, there must be some sort of guidance for the experiment. This may take many forms, ranging from centrally provided instructions to negotiated agreements to shared understandings of where to begin experimenting, how to avoid overlapping experiments, how to revise the experiment in light of past results, and so on. The central problem is how this experimental process is best organized. Does the need for experimentation help explain the existence of the firm, or can such experimentation be organized efficiently through markets?

In a world of complete knowledge and zero transaction costs, all rights to all uses of all assets could be specified in contracts. By contrast, in a world of heterogeneous assets with attributes that are costly to measure and partly unforeseen, complete contracts cannot be drafted. The resulting set of incomplete contracts may constitute a firm, a process of coordination managed by the entrepreneur's central direction. If relationship-specific assets are involved, the holdup problem described above becomes a serious concern.

Thus, asset specificity may itself be an outcome of an experimental process. To be sure, Williamson (e.g., 1985, 1996) clearly allows for intertemporal considerations relating to what he calls the “fundamental transformation” (i.e., the transformation of large numbers to small numbers situation, and therefore the emergence of asset specificity). However, he doesn’t describe this process in much detail. In the present approach, as experimental activity provides information about how to organize the system, assets will be increasingly specific in time and location. Temporal and site specificity will tend to increase as assets become more efficiently coordinated. This provides one rationale for organizing the experiments inside firms. Firms may also be justified by problems associated with the dispersion of knowledge across agents. Production systems may exhibit multiple equilibria, and it may not be obvious how to coordinate on a particular equilibrium or even which equilibria are preferred.

In principle, an experimenting team could hire an outside consultant who guides the experimental activity, giving advice on the sequence of actions and asset uses, initiating the experiments, drawing the appropriate conclusions from each experiment, determining how these conclusions should influence further experimentation, and so on. However, such an arrangement is likely to run into serious bargaining costs. Under market contracting any team member can veto the advice provided by the consultant, and submitting to authority may be the least costly way to organize the experimental activity. “Authority” here means that the entrepreneur has the right to redefine and reallocate decision rights among team members and to sanction team members who do not use their decision rights efficiently. By possessing these rights, entrepreneur-managers can conduct experiments without continuously having to renegotiate contracts, saving bargaining and drafting costs. Such an arrangement then provides a setting for carrying out “controlled” experiments in which the entrepreneur-manager changes only some aspects of the relevant tasks to trace the effects of specific rearrangements of rights. Establishing these property rights is tantamount to forming a firm.

The Boundaries of the Firm

In the approach developed in this paper, the theory of firm boundaries is closely related to the theory of entrepreneurship. Mergers, acquisitions, divestitures, and other reorganizations can generate efficiencies by replacing poorly performing managers, creating operating synergies, or establishing internal capital markets. Like other business practices that do not conform to textbook models of competition, mergers, acquisitions, and financial restructurings have long been viewed with suspicion by some commentators and regulatory authorities. However, the academic literature clearly suggests that corporate restructurings do, on average, increase shareholder value (Jarrell, Brickley, and Netter, 1988; Andrade, Mitchell, and Stafford, 2001). Given such benefits, why are many mergers later “reversed” in a divestiture, spin-off, or carve-out? Klein and Klein (2001) distinguish between two basic views. The first, which may be termed *empire building*, holds that entrenched managers make acquisitions primarily to increase their own power, prestige or control, producing negligible efficiency gains, and that acquisitions by manager-controlled firms are likely to be divested ex post. Most important, because the acquiring firm’s motives are suspect, such acquisitions are ex ante inefficient; neutral observers can predict, based on pre-merger characteristics, that these mergers are unlikely to be viable over time. (Moreover, by permitting these acquisitions, capital-market participants are also guilty of systematic error.)

A second view, which Klein and Klein (2001) term *entrepreneurial market process*, acknowledges that unprofitable acquisitions may be “mistakes” ex post, but argues that poor long-term performance does not indicate ex ante inefficiency. In the market-process perspective, a divestiture of previously acquired assets may mean simply that profit-seeking entrepreneurs have updated their forecasts of future conditions or otherwise learned from experience. They are adjusting structure of heterogeneous capital assets specific to their firms. As Mises (1949: 252) puts it, “the outcome of action is always uncertain. Action is always speculation.” Consequently, “the real entrepreneur is a speculator, a man eager to utilize his opinion about the future structure of the market for business operations promising profits. This specific anticipative understanding

of the conditions of the uncertain future defies any rules and systematization” (p. 585, emphasis added).

Klein and Klein (2001) discuss empirical evidence that the long-term success or failure of corporate acquisitions cannot, in general, be predicted by measures of manager control or principal-agent problems. However, significantly higher rates of divestiture tend to follow mergers that occur in a cluster of mergers in the same industry. As argued by Mitchell and Mulherin (1996), Andrade, Mitchell, and Stafford (2001), and Andrade and Stafford (2004), mergers frequently occur in industry clusters, suggesting that mergers are driven in part by industry-specific factors, such as regulatory shocks. When an industry is regulated, deregulated, or re-regulated, economic calculation becomes more difficult, and entrepreneurial activity is hampered. It should not be surprising that poor long-term performance is more likely under those conditions.

This notion of entrepreneurial decision-making under uncertainty squares with recent theories of acquisitions as a form of experimentation (Mosakowski, 1997; Boot, Milbourn, and Thakor, 1999; Matsusaka, 2001). In these models, profit-seeking entrepreneurs can learn their own capabilities only by trying various combinations of activities, which could include diversifying into new industries. Firms may thus make diversifying acquisitions even if they know these acquisitions are likely to be reversed in a divestiture. This process generates information that is useful for revising entrepreneurial plans, and thus an acquisition strategy may be successful even if individual acquisitions are not.¹⁷ In these cases, the long-term viability of an acquisition may be systematically related to publicly observable, pre-merger characteristics associated with experimentation, but not characteristics associated with managerial discretion.

¹⁷ The real options literature also argues that merger strategies can benefit potential acquirers even when acquisitions themselves are unsuccessful (Smith and Triantis, 1994; Smit, 2001). Because specific terms and final prices are determined only following due-diligence investigation and negotiation, acquisitions constitute relatively flexible forms of investment. We do not disagree, but here we are talking about the value not of particular acquisition attempts, but of the acquisition profile over time. Regardless of the option value of a particular merger announcement, the information gathered from transactions that are completed, but later reversed, may be valuable to the acquirer.

Internal Organization

As Foss and Klein (2005) point out, most existing approaches to entrepreneurship, even if linked to the existence of firms, say little about the key questions of internal organization: How should decision rights be assigned? How should employees be motivated and evaluated? How should firms be divided into divisions and departments? The notion of judgment-based entrepreneurship offers insight into these questions as well.

Productive and destructive entrepreneurship. Consider first the way firm structure affects the exercise of entrepreneurial judgment—or a proxy version of such judgment—within the organization. In much of the entrepreneurship literature, there is a general, though usually implicit claim that all entrepreneurial activity is socially beneficial (Mises, 1949; Kirzner, 1973). However, as Baumol (1990) and Holcombe (2002) point out, entrepreneurship may be socially harmful if it takes the form of rent-seeking, attempts to influence governments (or management) to redistribute income in a way that consumes resources and brings about a social loss. It is therefore necessary to introduce a distinction between productive and destructive entrepreneurship.

When agents expend effort creating or discovering new attributes and taking control over these in such a way that joint surplus (net social benefit) is reduced, we shall speak of “destructive entrepreneurship.” Thus, discovering new forms of moral hazard (Holmström, 1982), creating hold-ups (Williamson, 1996), and inventing new ways of engaging in rent-seeking activities (Baumol, 1990; Holcombe, 2002) are examples of destructive entrepreneurship. “Productive entrepreneurship” refers to the creation or discovery of new attributes leading to an increase in joint surplus. For example, a franchisee may discover new local tastes that in turn may form the basis for new products for the entire chain; an employee may figure out better uses of production assets and communicate this to the TQM team of which he is a member; a CEO may formulate a new business concept; etc. In the following we use this distinction to sketch an entrepreneurial approach to internal organization. Note that we here use the term “entrepreneurship” more broadly than before, referring not only to decisions made by resource owners (entrepreneurship

in the strict sense), but also to decisions made by employees, acting as proxy decision-makers for the resource owners.

Fundamental tradeoffs in internal organization. The first such problem concerns the control of destructive entrepreneurial activities. For example, firms may delimit employees' use of telephone and internet services by closely specifying their use rights over the relevant assets, instructing them to act in a proper manner towards customers and to exercise care when operating the firm's equipment, and the like. However, firms are unlikely to succeed entirely in their attempt to curb such activities. Monitoring employees may be costly; moreover, employees may creatively circumvent constraints, for example by inventing ways to hide their behavior. Although firms may know that such destructive entrepreneurship takes place, they may prefer not to try to constrain it further. This is because the various constraints that firms impose on employees (or, more generally, that contracting partners impose on each other) to curb destructive entrepreneurship may have the unwanted side effect that productive entrepreneurship is stifled (see Kirzner, 1985).

More generally, imposing (too many) constraints on employees may reduce their propensity to create or discover new attributes of productive assets. At any rate, many firms increasingly appear to operate on the presumption that beneficial effects may be produced by reducing constraints on employees in various dimensions. For example, firms such as 3M allocate time to research employees that they are basically free to use however they wish in the hope that this will produce serendipitous discoveries. Many consulting firms do something similar. More generally, industrial firms have long known that employees with many decision rights—researchers, for example—must be monitored and constrained in different, and typically much looser, ways than those employees charged only with routine tasks. More broadly, the increasing emphasis on “empowerment” during recent decades reflects a realization that employees derive a benefit from controlling aspects of their job situation. Moreover, the total quality movement emphasizes that delegating various rights to employees motivates them to find new ways to increase the mean

and reduce the variance of quality (Jensen and Wruck, 1994). To the extent that such activities increase joint surplus, they represent productive entrepreneurship.

Stimulating the productive creation and discovery of new attributes by relaxing constraints on employees results in principal-agent relationships that are less completely specified. This is not simply a matter of delegation, or collocating decision rights and specific knowledge (Jensen and Meckling, 1992), but also giving agents opportunities to exercise their own, often far-reaching, judgments. However, as we have seen, this also permits potentially destructive entrepreneurship. Managing the tradeoff between productive and destructive entrepreneurship thus becomes a critical management task.

Choosing efficient tradeoffs. In this context, asset ownership is important because it gives entrepreneurs the right to define contractual constraints, that is, to choose their own preferred tradeoffs. Briefly stated, ownership allows the employer-entrepreneur's preferred degree of contractual incompleteness—and therefore a certain combination of productive and destructive entrepreneurship—to be implemented at low cost. This function of ownership is particularly important in a dynamic market process, the kind stressed by Knight (in the later chapters of Knight, 1921) and the Austrians (Hayek, 1948; Kirzner, 1973; Littlechild, 1986). In such a context, an ongoing process of judgmental decision making requires contractual constraints to address the changing tradeoffs between productive and destructive entrepreneurship inside the firm. The power conferred by ownership allows the employer-entrepreneur to do this at low cost.¹⁸

6. Concluding Discussion

This paper emphasizes the importance of capital heterogeneity for theories of entrepreneurship and the firm. If capital were homogeneous, the entrepreneurial act would be trivial. Many, if not most, of the interesting problems of economic organization would disappear. This implies that the theory of capital should be an integral part of theories of entrepreneurship and economic

¹⁸ For a fuller analysis of this point see Foss and Foss (2002).

organization. It also suggests extending the Austrian emphasis on entrepreneurship in markets to entrepreneurship in firms.¹⁹

However, the concept of capital heterogeneity does more than simply establish the necessary conditions for entrepreneurship and the typical problems of economic organization. Taking fuller account of heterogeneous capital, as developed by the Austrian school, reveals exchange problems (i.e., transaction costs) that are relevant to economic organization but neglected in mainstream theories of the firm.²⁰ In a setting with heterogeneous capital and uncertainty, the process of entrepreneurial experimentation has distinct implications for economic organization. As we have argued, the process of experimenting with heterogeneous capital may be best organized within a firm, helping to explain why firms emerge. Similarly, experiments with heterogeneous capital assets may underlie much of the observed dynamics of the boundaries of firms. Thus, it is not *a priori* known whether capital assets controlled by potential takeover target will be a good fit with the firm's assets; this has to be tried out in an experimental fashion. Finally, we have argued that internal organization is also illuminated by a focus on judgment, heterogeneous capital, and experimentation.

To be sure, our analysis so far is preliminary and incomplete. We have concentrated on exploring the links between Austrian economics and modern approaches to economic organiza-

¹⁹ The alert reader will notice that while we enthusiastically endorse Kirzner's contributions to the Austrian theory of capital, our own conception of entrepreneurship differs substantially from his. Kirzner, a leading member of the modern Austrian school, received his Ph.D. under Mises at New York University and has described his work as the working out of various parts of Mises's system. However, we see Mises in the Cantillon-Knight tradition of viewing entrepreneurship as judgment over the deployment of resources, not alertness per se. Kirzner (1973: 39-40) agrees that in a world of uncertainty, resource owners exercise entrepreneurial judgment in allocating their resources to particular uses. But he goes on (1973: 40-43) to introduce the analytical device of "pure entrepreneurship," the act of discovery or alertness to profit opportunities by those with no resources under their control, and claims that this function, rather than uncertainty-bearing, is the "driving force" behind the market economy. We do not find the concept of pure entrepreneurship or the "alertness" metaphor useful to understanding the nature of the market system. For more on this see Klein (1999: 24-25).

²⁰ In contrast, our emphasis on understanding economic organization in a dynamic context has obvious parallels to Langlois's (1992) notion of "dynamic transaction costs."

tion.²¹ Because we offer here an exploratory, suggestive treatment, we have not described specific causal mechanisms and have not put any explicit, testable propositions on the table.

However, our approach is potentially rich in explanatory power. For example, because entrepreneurial judgment requires resource ownership, the theory of employment—the contractual relations between the entrepreneurs and those they hire to help them execute their plans—is ultimately a theory of *delegation*. Judgment, as the ultimate decision-making factor of production (in Grossman and Hart’s terminology, the residual rights of control) cannot be delegated, by definition. But many other proximate decision rights can, and frequently are, delegated to employees. Operationalizing this insight, and deriving testable implications from it, can be done by identifying the circumstances under which particular decision rights (what we may call *derived judgment*) can be delegated to particular individuals. These circumstances can be described by characteristics of the business environment (technology, markets, regulation), employees’ human capital (what Schultz [1975] calls “the ability to deal with disequilibria”), and aspects of firm strategy. Consider the following applications.

Decentralization. One approach to delegation is to build on the literature on optimal decentralization, such as Jensen and Meckling’s (1992) important (and, in our judgment, underappreciated) application of Hayek’s and Polanyi’s theory of knowledge to internal organization. Jensen and Meckling identify some benefits and costs of decentralizing decision rights to lower levels of an organization. The primary benefit is more effective use of specific (local, tacit) knowledge, while costs include potential agency problems and less effective use of central information. Decentralization, in Jensen and Meckling’s terminology, achieves the co-location of knowledge and decision rights. Employees who are not owners, however, exercise only derived judgment, no matter how many decision rights they hold. Optimal decentralization can thus be interpreted in terms of the tradeoff between knowledge and judgment. Assigning decision rights to employees co-locates specific knowledge and derived judgment, while judgment itself remains

²¹ See Shook, Priem, and McGee (2003) for ideas on empirical research on the behavioral aspects of entrepreneurial judgment.

in the hands of owners. The decision to decentralize therefore depends not only on the importance of specific knowledge, but on the “wedge” between ultimate and derived judgment. Where environmental uncertainty is high, this wedge may be sufficiently large that decentralization reduces firm value, even controlling for the importance of specific knowledge.

Occupational choice. Another application relates to the literature on occupational choice. Many studies of entrepreneurship treat entrepreneurship as an *occupation* (i.e., self-employment), rather than a *function*, as we treat it here. (See, for example, Hamilton, 1990.) What is the correlation between self-employment and judgment? Self-employed individuals who finance their ventures with debt or personal savings are surely acting as Knightian entrepreneurs. If a new venture is financed with equity, then in our framework it is the financier—the venture capitalist or angel investor, for example—who is bearing the relevant uncertainty and therefore performing the entrepreneurial function, not the firm founder (except to the extent that the founder’s compensation is a function of the outcome of the venture). We are unaware of existing empirical work relating self-employment to the entrepreneurial function, though such work should be important in understanding the role of self-employment in generating economic growth.

Contract design. Moreover, our approach to the entrepreneurial function has implications for contract design. If we think of judgment as filling in the gaps of incomplete contracts, then the more complete the contract, the fewer circumstances in which “ultimate judgment” must be exercised, and hence the more decision rights that can be delegated. This implies an inverse relationship between contractual completeness and monitoring costs. While several TCE papers examine the determinants of completeness (Crocker and Masten, 1991; Crocker and Reynolds, 1993; Saussier, 2000), they generally focus on asset specificity, not monitoring costs, as the independent variable.

Organizational learning. Our approach also has implications for organizational learning. If entrepreneurship, and hence economic organization, is the act of arranging heterogeneous capital resources, then it is important to understand how individuals and teams learn to do this successfully. Mayer and Argyres (2004) show that contracting parties do not necessarily anticipate con-

tractual hazards, and design arrangements to mitigate them, as TCE predicts; rather, contracting parties must often experience maladaptation to adjust to it. It is thus important to understand not only efficient contracting, but the process of learning to contract efficiently. In our framework, contracting—an exchange of legal rights and responsibilities governing the exchange of property titles—is part of the process of entrepreneurial experimentation. Just as asset attributes must be created or discovered over time, the efficient contractual arrangements governing asset uses must be created or discovered over time, through experimentation. Conceiving the problem this way calls for a theory of learning to organize heterogeneous capital.

More generally, we hope the analysis here inspires researchers to investigate the Austrian approach to capital and to explore its applications not only to the theory of entrepreneurship, but also to other aspects of economic organization and management. Management scholars are beginning to recognize the value of Austrian economics beyond generalities about the “market process” or “alertness.” (Lachmann’s capital theory, for example, features prominently in Lewin and Phelan, 2002; Chiles and Zarankin, 2005; Lewin, 2005; and Chiles, Bluedorn, and Gupta, 2006.) We hope that researchers seeking to incorporate the concept of entrepreneurship into organization, strategy, and the theory of the firm will consider the Austrian notion of capital heterogeneity as a possible link between entrepreneurship and economic organization.

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