

The Sensory Order and Organizational Learning

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Version 2.0
July 2008

Prepared for inclusion in *Advances in Austrian Economics* Special Issue on Hayek's *The Sensory Order*, edited by Bill Butos. The author thanks the editor and an anonymous referee for very helpful suggestions.

“Many of the individual and unique features of a particular corporation which make for its success are of the same character as the similar features of an individual person; they exist largely as an intangible tradition of an approach to problems, based on a tradition which is handed on but ever changing, and which, though it may secure superiority for long periods, may be challenged at any time by a new and even more effective corporate personality” Hayek (1967 [1959], p. 288).

Over the last decade or so, scholarly examination of Hayek’s work has increasingly focused on the role played by *The Sensory Order* (1952) in his overall theoretical framework. One key strand of this work is that Hayek’s vision of the operation of the mind was that it was a spontaneous order, specifically that it could be understood as a rule-structured, ends-independent, complex, emergent order that arose from the more simple biological connections of the human brain. Because Hayek’s first work on the mind was a student paper in the early 1920s, only to be revisited in the late 1940s in the writing of *The Sensory Order*, some have argued that his vision of the mind as spontaneous order was perhaps in some ways always present as a guiding idea for his work in economics and then his later development of spontaneous order theory more specifically.

There is another way to see the place of *The Sensory Order* in Hayek’s work. Rather than mind being central, the concept of spontaneous order was always there, but frequently unarticulated until his work in the 1950s. Instead, Hayek proceeded by discovering in various applications analogous forms of argument and examples of spontaneous order, all of which interested him even if he could not precisely identify what they all had in common. In fact, in an essay of his in which he describes his own approach to his work, he says of people like himself: “many of their particular ideas in

different fields may spring from some more general conception of which they are themselves not aware, but which, like the similarity of their approach to the separate issues, they may much later discover with much surprise” (Hayek 1978 [1975], p. 54). It would not be surprising to find in Hayek a number of parallel or analogous approaches to objects of inquiry, especially before he could develop a common framework for understanding them.¹

Because Hayek’s theory of mind is essentially a theory of learning, it can be analogized and applied across a wide range of phenomena. As the head quote of this paper indicates, Hayek glimpsed some ways in which the firm could be understood as a process of learning. In such a firm, ways of doing things and structures would come to take the form of a knowledge-containing tradition of approaches to problems that could define the firm much as similar processes define individual people. Written in the late 1950s, this notion of the firm as an organization that learns through repeated practices and processes was ahead of its time. A great deal of work on the theory of the firm in the 50 years since, and especially in the last few decades, has focused on the way in which firms learn and embed routines into their organizational operations. With the even faster pace of economic change that characterizes our own time, the ability to learn and adjust quickly to new circumstances, or to apply existing structures and processes to new areas, has become a defining feature of successful firms.

In this paper, I want to explore more deeply the ways in which Hayek’s theory of mind and its corresponding theory of learning might relate to more recent work on organizational learning and the theory of the firm. The latter literature is far too vast for me to give it the treatment it deserves, but I will try to draw from some canonical sources,

as well as recent extensions of those ideas, that give an accurate flavor of the work in question. My goal is mostly to be suggestive. Organizational theorists have not, to my knowledge, taken a serious look at Hayek's argument in *The Sensory Order*, despite the fact that they are aware of Hayek's more narrow economic contributions. My hope is that pointing out some of the relevant parallels will inspire them to do so. A more conscious application of Hayek's work on mind and learning might provide a stronger foundation for many of the observations in the organizational learning literature as well as opening up new lines of inquiry.

The paper opens with a discussion of Hayek's vision of mind and its implicit learning theory. That is followed by an excursion into the recent literature on organizational learning, which leads to several sections exploring the analogy between minds and firms. The final substantive section takes a brief look at the effects of the institutional environment on the ability of organizations to learn.

The Implicit Learning Theory of *The Sensory Order*

Detailed summaries of the core ideas of Hayek's theory of mind as presented in *The Sensory Order* can be found in a number of places, including contributions to this volume.² For my purposes here, I will provide a very brief summary of the general approach of the book and then focus on the aspects of Hayek's theory that are relevant to the question of how individuals, and by analogy organizations, learn.

Hayek's self-imposed task is to explain how the mind creates a sensory order, i.e. our subjective experience of the world, that is different from what we know comprises the physical order of the world based on our understanding of science. The world is

made up of a jumble of atoms, molecules, waves, and particles, yet our mind somehow presents those to us as a largely orderly and organized set of perceptions. Hayek argues that the mind is primarily a process of classification, where incoming sensory data get sorted based on the organism's history. The mind "pre-classifies" incoming stimuli based on a built-up set of neural connections that are the result of both our biological inheritance and our unique individual interactions with the external world. These connections reflect classifications and associated behavior that have "worked" in forwarding the individual's ability to navigate the external world. In addition, this classification is contextual and multiple. How the mind classifies any particular input will depend on the other inputs that arrive with it, implying that there is no simple one-to-one relationship between any given stimulus and the sensory order the mind constructs. Rather, the sensory order is the emergent outcome of the particular pattern of stimuli being classified by a specific set of neural connections that, while having much in common with that of other individuals, is nonetheless unique to the individual in question.

As a way of understanding this process, Hayek uses the metaphors of "map" and "model." These two concepts are particularly important for understanding the theory of learning that is implied by Hayek's theory of mind. The "map" refers to the established neural connections that the mind has created over the course of the individual's lifetime. That is, it is the entire "network of connections" among the various external stimuli the organism is processing and the "structure of external events which it can be said to reproduce" (Hayek 1952, p. 109). The map is the set of neural and physical phenomena in the brain that are the product of the learned associations that the individual's mind has

built up over time. Important for our purposes is Hayek's insistence that this is a "very imperfect map, but also a map which is subject to continuous although very gradual change" (110). The map then is a sort of storehouse of historically-constructed relationships that is the result of the interplay between the physical structure of the brain and the particular stimuli that comprise the individual's life experience. The map is a reflection of the individual's long-term learning about the nature of the external world.

The model draws from the map to represent the "particular environment in which the organism finds itself at the moment and which will enable it to take account of that environment in all of its movements" (Hayek 1952, pp. 114-15). The map reflects the individual's past learning, while the model is the application of that past learning to the present situation. Like any model, it is a less-than-complete representation of the current environment, but it attempts to capture, in a skeletal form, the basic outline of the situation so that it can guide behavior appropriately. The model can only be constructed from the elements of the map, hence our understanding of our current situation at any point in time is necessarily constrained by the physiology of the brain and our past experiences as an individual. Unlike the semi-permanent neural connections of the map, the model is far more dynamic as it will change as the environment changes and the organism draws upon other aspects of the map. It is a snapshot of the current neural "roads" that are being "travelled" as opposed to a depiction of the whole network of routes available. One might analogize it further to the difference between a chart depicting the patterns of traffic flow on a major city's streets over the course of some long period of time and a graphic depiction of the actual flow of traffic through the mapped streets at the current moment, or a radio or GPS traffic report.³

This analogy points out another important difference between the map and model. As we have noted, the map is a product of the organism's historical learning and experience. The model, however, is what guides the individual's behavior in the moment. It is "forward looking." Of course, the ability of the model to help the actor "look forward" is dependent on its relationship with the map, which reflects what the actor has learned in the past. However, the map itself provides no direct guidance for action. Knowing the history of the traffic flow cannot by itself provide sufficient guidance if you wish to navigate the streets right now precisely because it is the product of experience only. The model of the current flow is what you need in order to navigate successfully, and you need a depiction of the specific areas in which you plan to travel. Of course the model of the current flow can only draw from the same set of streets that comprise the historical map, but it is also true that the information from the model feeds back to the map. In the case of our traffic analogy, the current state of traffic flow will be added to the data of the historical map and perhaps, if enough change accumulates over time, change the frequencies of that long-run map in significant ways.

The model is best understood as a set of expectations about the future that guide the organism's immediate behavior. It is "predictive" in an "if-then" sense, as all models aspire to be. Hayek (1952, p. 121) explains this point in further depth:

The representation of the existing situation in fact cannot be separated from, and has no significance apart from, the representation of the consequences to which it is likely to lead. Even on a pre-conscious level the organism must live as much in a world of expectation as in a world of "fact," and most responses to a given stimulus are probably determined only via fairly complex processes of "trying

out” on the model the effects to be expected from alternative courses of action.

The reaction to a stimulus thus frequently implies an anticipation of the consequences to be expected from it.

The process by which the organism “tries out” various possibilities on the model often happens, of course, at the pre-conscious level. But even on the conscious level, humans might choose to imagine alternative courses of action based upon their current understanding of the world. Such imaginings are also about the consequences to be expected from the various alternatives. In either the pre-conscious or conscious case, the results of the actions taken comprise a new set of stimuli to be classified by the mind.

What we are describing here is the organism’s learning process. As evolutionary psychologists have argued, the human brain as a physical organ already has some degree of “preset” neural connections. Some portion of the Hayekian “map” is therefore part of our biological heritage. However, the rest of it is the product of the learning that is the product of the individual’s interaction with the external world. As the model is validated or invalidated by successful or unsuccessful navigation of that external world, the results are part of the historical experience that is reflected in the map. Hayek notes that the map is “semi-permanent,” meaning that those neural connections can change as the individual learns and grows. If Hayek’s views are correct, and modern neuroscience more or less suggests he was on the right track (e.g. Edelman 1987; Fuster 1999), then human learning “redraws our maps” and thereby affects the model through which we act in the world. Hayek’s work here refers to the sort of experiential learning involved with success and failure of action in the world.⁴ This also ties nicely with evolutionary

approaches to the mind, which argue that our “mental systems” were forged in the long evolutionary process that produced homo sapiens.

We can also tie Hayek’s cognitive theory and its associated theory of learning to a very general understanding of what we mean by a “personality.” If the sensory order is largely a set of rules by which the brain in the form of the mind mediates between external stimuli as inputs and human behavior as outputs, it seems fair to say that humans are essentially “rule-following animals.” This is true even if, as with the mind, we cannot articulate all of the rules that we follow.⁵ Who we are, and what our personality is, is in some sense nothing more than the collection of rules by which we classify the world and act within it. This does not imply a kind of crude biological reductionism, as we can learn and we can, at least to on the margins, change some of those rules, both intentionally and through experience. It is, however, a recognition that humans are rule-followers and that often those rules are ones we are not aware of as they operate on us. Self-reflection and self-criticism are thus the essence of our humanness as we try to understand and change the rules we do not like, to the extent we can. This differentiates us from other species for whom learning can take place, but only through experience, rather than by self-reflection as well. The set of often tacit mental rules that comprise our identity are what Hayek refers to in the head quote as the “intangible tradition of an approach to problems” that characterize both individuals and corporations.

The firm as a collection of routines reflecting organizational learning

As noted in the introduction, over the last few decades economists have developed a variety of new ways of looking at the firm. For much of the 20th century, the

firm was conceptualized as a production function that translated inputs into outputs subject to constrained maximization of profits. This way of thinking treated the inner workings of the firm as a “black box” and took little notice of how that view of the firm did not correspond with the real world competitive environment in which firms actually operated. The “firm-as-production-function” approach certainly allowed for mathematical tractability, particularly in the context of the ongoing growth of general equilibrium theory. However, the static environment necessary for the mathematics created enormous challenges for applying the theory to a world of disequilibrium, uncertainty, and changing knowledge, and, by implication, how firms and other organizations might learn.

Moving away from the black box view required that firms be understood as social institutions that solve specific kinds of organizational problems. For early contributions, such as Coase (1937), this meant that the institution of the firm could be seen as a lower-cost option for coordination than using the market. Bringing the direction of resources under the conscious control of the firm and its managers could reduce the information/transactions costs of using those resources to satisfy human wants. Coase’s work, along with renewed interest in Schumpeter’s (1961) work on the entrepreneur, prompted a re-examination of the inner workings of the firm. Work in this direction really begins with the contributions of Penrose (1959) and Richardson (1972). Penrose argued that the firm was best understood as a “bundle of resources,” and she used this perspective to look at how firms changed and grew over time, with a particular emphasis on the inner organizational processes that forwarded such growth. As Mathews (2006, p. 74) points out, Penrose’s approach enabled her to distinguish between the

“entrepreneurial” role in gathering the distinct resources needed to pursue the firm’s objectives and the “managerial” role in ensuring the most efficient use of those resources possible in service of those objectives. The so-called “resource-based view” (RBV) of the firm has emerged from this work.

The current RBV literature tends to focus on the ways in which a firm’s distinct resources provide it with rents because those resources are specific to the firm in ways that prevent them from having the equivalent value to other producers. The goal for management is to amass a set of resources that fit together in ways that are highly effective in producing the desired output, but whose value is tied up with that particular firm’s production process in ways that make their opportunity cost significantly lower than the value of their marginal product to that firm. Firms acquire long-run competitive advantages this way when opportunities for imitation by competitors have ceased, i.e., when the market reaches equilibrium. As Foss and Ishikawa (2007, p. 750) describe it, the RBV is “a competitive equilibrium model with factor market imperfections.” Implicit in the RBV approach is that actors have full relevant information about consumer demands and the value of their own resources. The challenge they face is the maximization under constraints problem that is at the core of modern microeconomics.

However, despite the insights that the RBV approach generates, its equilibrium orientation limits some of the questions it can ask about how organizations learn in the face of novelty, which is a key element of real world, as opposed to “perfect,” competition. Infusing the RBV approach with some disequilibrium foundations from the Austrian tradition can help to overcome these limits and enable us to explore issues of learning more richly. Of particular importance to doing so is the Austrian theory of

capital, particularly in the hands of Lachmann (1978), building off of earlier work by Hayek (1941). Lachmann saw the firm as a set of complementary capital goods, where capital is understood as anything that contributes to human plans. In the Austrian view, capital goods are heterogeneous or have “multiple specificity.” Capital goods and human capital are neither specific to only one plan, nor so general as to serve equally well in all plans. This fits nicely with the RBV emphasis on the uniqueness of resources. However, the key difference is that the Austrians bring in the entrepreneur as the organizer of those capital combinations and see his task as attempting to peer through the fog of uncertainty that surrounds the production process (Kirzner 1973). Rather than assembling capital good of known value to make an output of known value, the entrepreneur is the one responsible for deciding *which* capital goods will be combined in complementary ways to produce *which* output.⁶

Entrepreneurs operate in an environment full of errors waiting to be corrected and opportunities for profit waiting to be exploited. They bring together the physical and human resources that they believe will “fit together” in a coherent plan that will produce the desired output. From this perspective, the firm exists as a way of “pulling together” a variety of entrepreneurial discoveries by all the parties to the contracts that define it (Sautet 2000, p. 76). It is the entrepreneur who imagines how a group of resources might, when combined, bring into existence a set of capabilities not currently in place, and how such capabilities might enable the firm to exploit a market profit opportunity hitherto unexploited. Sautet (2000, p. 75) argues that the firm as a set of entrepreneurially-envisioned contracts comes into existence in part:

to secure the capabilities of the inputs that will come into existence when they are used in common. The only way the entrepreneur-promoter can exploit his/her discovered opportunity is by the implementation of a firm.

Setting the RBV approach in a disequilibrium context allows us to see that the value of a firm's resources can never be known with certainty and that it is the task of the entrepreneur to imagine ways of using undervalued resources to exploit noticed profit opportunities in the market.

The focus on entrepreneurship moves the firm beyond just being a set of resources, but that is not quite far enough. In the eyes of more recent work in strategic management, the firm can be seen as a set of *resources* in the way Penrose describes: a group of *activities* that the firm engages in, and a collection of *routines* that link the resources to the activities (Mathews 2006, p. 75). The concept of "routines" comes from the work of Nelson and Winter (1982), who explicitly tie the idea to disequilibrium approaches such as Schumpeter's (1961). Routines are the various rules, procedures, behavioral patterns and the like that define how a firm operates. As the name suggests, they grow from repetition, and can become increasingly effective as the firm evolves. Effective routines allow the firm to engage in increasingly complex tasks by, essentially, increasing their capabilities. Rather than just seeing the firm's resources as a static collection of things, the emphasis on routines provides a "dynamic capabilities" perspective on the firm's behavior (Teece, Pisano, and Shuen 1997). The firm is not just a collection of resources, but an institution that can learn to improve its own operation so as to enhance the productivity of those resources.

In this alternative to the production function view, firms are seen as institutions that are created to solve knowledge problems and are engaged in an ongoing process of learning. They face an uncertain future where they must entrepreneurially anticipate what their customers want (their “activities”), imagine the physical and human capital necessary to meet those wants (their “resources”), and then develop linkages between their resources and activities through the evolution of routines. Those routines become the crystalization of the firm’s learning processes. The knowledge they both represent and create can be the learning of knowledge that is “out there” but unknown to the firm, or it can be genuinely creative and innovative discovery. Routines are knowledge formed into rules, procedures, and practices that have passed the market test.

The Analogies of Minds and Firms

Minds and Firms as Learning Processes

As is probably clear from the preceding section, there are a number of fruitful analogies between Hayek’s theory of mind in *The Sensory Order* and the understanding of organizations and how they learn that is associated with the RBV view of the firm. Before exploring those analogies, it is worth pointing out some important differences between the two cases. The most important of those differences is the fairly obvious point that the learning that takes place in firms is all ultimately processed through the minds of human actors. Certainly the change that comes from the top down in the form of new organizational forms or changes of mission must be the conscious product of entrepreneurs and managers. A good deal of learning comes “from below” as well, in the form of discoveries made by employees (what is often termed “intrapreneurship”).

Though such discoveries are themselves often serendipitous, the choice to repeat them and the choices by others to imitate them such that they become part of the firm's routines are the production of intentional human action. The final routines that emerge will likely be things that match no one person's intentions exactly, but are nonetheless a product of various human actions (if not human designs).

The rules that comprise the mind are, by contrast, not always consciously chosen by the actor. As we saw in the discussion of *The Sensory Order*, some number of the rules that guide our behavior are the "hard-wired" products of evolution, while others come into being through our interaction with the world through learning processes that occur "automatically." Neither of these is under the direct conscious control of the actor associated with the brain in question. Again, this is not to say that we can do nothing to change how we understand and act in the world. To the contrary – as we saw earlier, we do have the ability to change the rules by which we understand the world. However, that ability is limited, and certainly more limited than the analogous ability to change the way in which firms operate.

As Hayek has emphasized in other contexts, the very nature of spontaneous orders is such that their complexity prevents anyone from having a complete understanding of the details by which they operate. We are limited to offering "explanations of the principles" (Hayek 1967 [1955]) by which spontaneous orders operate. The entire reason that certain institutions have the characteristics of spontaneous orders is that they could not achieve their degree of complexity without making use of such processes. The most obvious example of this point is the evolution by natural selection. Rather than seeing the complexity of the products of nature as evidence for some sort of "design," an

understanding of spontaneous order and evolutionary theories more generally points to the fact that higher degrees of complexity require processes that can sort and filter quickly and effectively, and can thereby process more knowledge through shorthand than any supposed designer could.

Firms, by contrast, allow for more forms of conscious human intervention into their design and operation. In Hayek's earliest work on the differences between spontaneous and constructed orders, the firm was one of his first examples of the latter, perhaps unsurprisingly given Coase's dichotomization of the "firm" and the "market." However, as our discussion of recent work in the theory of the firm illustrated, firms are now thought to have more elements of complexity and spontaneous order in them than the earlier dichotomies of Coase and Hayek would suggest. They are better understood as a hybrid perhaps best described as being the product of conscious human design at the higher level of organization and mission, but more like a spontaneous order in the interstices of the detailed production processes that comprise it. For many of the same reasons that Hayek argued that spontaneous ordering processes are necessary for societies of a particular degree of complexity (or for a complex natural phenomenon such as the human mind), so would we expect that firms of a certain size would have to take advantage of local knowledge, rule-following, and individual initiative, rather than centrally directing every aspect of the firm's actions. Very large firms, such as Wal-Mart, do precisely this by creating a very powerful corporate culture that inculcates its values into every employee, which in turn allows senior management to trust that such employees can and will exercise individual initiative in ways that forward the firm's goals, both day-to-day and during times of crisis.⁷

When such hybrid firms learn through their spontaneously ordered elements, the results of that learning can be consciously applied to the way they are structured and organized in a way that is much more difficult when we speak of individuals. The argument in this paper's head quote that a firm's "corporate personality" is always subject to challenge and capable of being increasingly "effective" should be read in this light. The analogies we draw between minds and firms are powerful, but like all analogies they do have their limits. In the next two sections, I explore two of those analogies in some detail.

Rules and Routines

The most obvious of the analogies between minds and firms and their learning processes is the parallel between the rules by which the sensory order operates and the routines that guide the operation of the firm. A firm's routines link its resources and activities, i.e., they provide the rules by which its inputs/resources are converted into output-producing activities. To understand why some firms were more successful than others it is necessary to move beyond just examining their objective resources (including human capital) and the activities they decided to engage in. Attention began to be paid to the less visible ways in which those were connected through "approaches to problems," as Hayek put it, that effectively translated the resources into successful activities. The opening of the "black box" of the firm brought the role of routines into greater focus as an explanation of how firms do what they do.

The analogies between routines and the rules of classification by which brains and minds operate should be fairly clear. Mental rules link the sensory stimuli that come into

the brain to the actions that the organism takes based on them. How the mind classifies those stimuli determines how the organism acts upon the external world. Like firms, people have “activities” or goals that they wish to achieve, whether conscious or automatic (e.g., breathing or other non-conscious activity), and they have “resources” that go into the process of achieving those goals in the form of their perceptions of the world around them. The mind’s rules of classification are, in essence, routines that guide the organism’s behavior by turning stimuli into action on the external world. The classification process is a matter of “faced with this set of sensory inputs, what is the best model of the current world and what does that imply about how to react, given the goal at hand?” Of course the process is not intentional in the sense that question suggests, but that does capture the mental classification process with some accuracy.

Firms process inputs to outputs in similar fashion. The particular constellation of inputs the firm has at any one point and the specific goal it has in mind will trigger a particular routine for turning those inputs into outputs. Such routines can also be understood as classification processes, as they are learned responses to how particular combinations of inputs, including human labor, should best be turned into effective (i.e., profitable) outputs. How a specific input will get used will depend on the context it appears in: what are the other inputs with it and what is the output the firm wishes to produce? Thus, just as with the sensory order there is no one-to-one correspondence between a stimulus and a response because the appropriate response depends upon the context in which the stimulus arrives, within the firm there is not necessarily a one-to-one relationship between any specific input and any specific output.

Although the opening quote from Hayek points out the tacit nature of both the rules that guide individuals and the routines that guide firms, neither is exempt from the gaze of critical assessment.⁸ Individuals frequently strive to improve themselves through introspective processes that attempt to figure out (sometimes with the help of a professional) why they have developed the rules that they have and how they might change them. Firms can and do engage in a similar process. One can think of business process documentation as a way of trying to articulate a piece of a firm's operation and subject it to organizational introspection to see if it can be done better. Sometimes improvements in routines happen serendipitously as noted above, but they can also be the result of management creating an environment in which routines are subject to collective examination with the goal of improving them. What a firm cannot do is to throw everything out the window and start completely from scratch. It must always start from a set of practices that are parts of the "intangible tradition" that Hayek noted. Organizational routines, like mental rules, are not beyond the reach of intentional human action.

Maps and Models; Balance Sheets and Budgets

Another way to think about the parallels between firms and the mind is to analogize the map and model to the balance sheet and budget/business plan respectively. As we saw earlier, the map, for Hayek, represents the semi-permanent neural connections that the brain builds up through experience. The map is, to a significant degree, a product of the individual's history, in combination, of course, with the physical structure of the brain and its evolved capacities. Although it is "semi"-permanent, it does change as the

individual's experiences accumulate in ways that provide evidence that the established ways of doing things are no longer successful.

The firm's balance sheet functions in a similar way. It would not be accurate to describe a balance sheet as "semi-permanent;" however, the balance sheet is a periodic snapshot of the deployment of resources within the firm. In that sense, it is not something the firm totals up minute-to-minute, but rather it is a tool to be looked at over somewhat longer runs of time to examine the firm's effectiveness and potential. The value of the firm's current assets, liabilities, and net worth represent both the inherited situation at the start of the period under examination as well as the results of the actions taken during that period. A year-end balance sheet will reflect both the value of what the firm started with and the value it added or subtracted over the year. Like the sensory order's map, it represents the "built-up" set of relationships among the firm's assets and liabilities. Hayek (1952, p. 115) describes the map as representing "the kind of world in which the organism has existed in the past...it provides by itself no information about the particular environment in which the organism is placed at the moment." As firms attempt to evaluate their profitability using the balance sheet, they are describing the world in which the firm has existed in the past. By itself, it tells us nothing about how to move forward, although, like the map does for the model, it serves as the backdrop for constructing the more forward-looking budgets and business plans.

The budget for the next period, and the business plan that accompanies it, is the analogy of the model in Hayek's theory of cognition. More so than the balance sheet, the budget and business plan are constructed to be forward looking, reflecting the firm's expectations of how the next period will unfold. Much as the model represents those

parts of the map that are “in play” in the current environment, so does the budget/business plan represent the uses to which the items in the balance sheet will be put in the relevant period and the environment in which it will unfold. Like the individual, the firm does live in world of expectations, where its behavior is guided by budgets and plans that reflect historical learning that has been translated into a set of implicit predictions about how inputs will be transformed into outputs. What Hayek (1952, p. 121) says about the use of the model in the mind has clear parallels to the way in which firms behave: “most responses to a given stimulus are probably determined only via fairly complex processes of ‘trying out’ on the model the effects to be expected from alternative courses of action.” The mind, as Hayek also notes, performs these processes “pre-consciously,” but within the firm they are the ongoing conscious decisions of managers and employees. Managers and entrepreneurs now frequently speak of “budgeting models” and will often create a variety of models to “try out” before deciding how to proceed.

For example, if the price of an input changes (a new stimulus), the firm’s managers are likely to be guided in determining what, if any, action to take by assessing the effects of that price change on the current budget and business plan. They are likely to do this by exploring possible substitutions for the more costly input and seeing whether the substitutions will work in complementary ways with the other inputs. In other words, the firm will “try out on the model the effects to be expected from alternative courses of action.” The results of this process of “trying out” will inform the firm’s final decision. Hayek (1952, p. 121) says of the mind, “The reaction to a stimulus thus frequently

implies an anticipation of the consequences to be expected from it.” This seems to be how firms react to new “stimuli” as well.

Even the map and the model do not get us all the way to the most basic level of the sensory order, which is the physical process of exciting neurons. The map and model remain metaphors for the underlying physical processes. Can we find an analogy to the excitement of neural connections in the operation of the firm? Perhaps the closest we can get is a sort of tracking of the firm’s cashflow on a daily basis. Where are the funds coming in and where are they going out? Which products are customers buying and which inputs need to be replenished by the firm? What prices are being paid for all of these? The cashflow is the most immediate indicator of which places within the firm’s budget and business plan are being activated at any given moment, or over the very short run of a day, for example. To a large degree, what “trying things out” via the model leads the firm to do is to adjust its own spending or to perhaps alter the prices and quantities of its outputs, both of which change the cashflow, just as the action an organism takes requires that certain neural connections be activated.

Finally, the map and model relationship can also be seen by the ways in which the actions that emerge from trying things out through the model eventually feed back to the map. Like the semi-permanence of the map, the snapshot reflected in the balance sheet is open to change as the firm acts through time. As cashflows change and actions guided by the budget and business plan are taken, the value of the assets and liabilities captured by the balance sheet change as well. Although within the firm the snapshot might only be taken quarterly or semi-annually or annually, the movement captured by that still photograph is ongoing. The moments at which they are taken represent the firm’s past at

those moments, where that past is informed by the outcomes of the choices firms make on an ongoing basis. At the moments reflected in the balance sheet, the firm uses that past to inform its future, just as in the dialectical relationship between the map and model. At the highest level, this is how the firm learns. It watches the success of its expectations as embedded in a model, which it turn informs the value of its capital, which in further turn informs the next round of action.

If we bring our earlier discussion of routines to bear on these issues, we get a more complete picture of how Hayek's cognitive theory might serve as a template for organizational learning. The dialectic learning process that is represented in the relationship between the balance sheet (map) and the budget (model) is what informs the development of the routines (rules) that guide moment to moment behavior in the firm (individual). Good organizational routines are both the cause and effect of successful behavior by the firm. Patterns and rules that connect resources and activities well, i.e., staying within budget and carrying out the current business plan, will generate positive results on the balance sheet and thus be imitated and replicated. If the current budget/plan is not successful, and is so reflected in the balance sheet, then existing routines will need to be critically assessed (as may, perhaps over a longer run, the firm's resources and activities). Humans who continue to find their attempts to navigate the world to be unsuccessful will eventually have to realize that the rules that guide their behavior are in error. Firms have the same relationship to their routines, assuming that the institutional environment is one in which the incentive structure rewards such learning.

Environmental effects on organizational learning

All of these considerations about organizational learning need to be placed in one other explanatory context. For firms, the competitiveness of their economic environment will be a key factor in how quickly and effectively they learn, where “effectively” refers to doing a better job at linking their resources and activities. If we assume that the firm’s general goal is to profit by providing the goods and services consumers want at a price they will pay, learning how to do that, and do it well, will be more likely when the firm faces significant competition. The idea that firms will perform better under competition than monopoly is hardly new in economics. However, linking that claim to a view of firms as organizational learners in a Hayekian manner provides some additional insights.

For learning to be quick and effective, the learner must receive quick and effective feedback from the external environment *and must also bear fully the costs and benefits that the feedback provides*. In Hayek’s cognitive theory, it is assumed that when the individual (or any organism) acts successfully in the world that the very same individual receives the benefits of that success (or at least a substantial portion of them). Hayek’s argument also assumes that when action is unsuccessful that the actor bears the costs of that failure. Without that assumption, there is no way to link the accuracy of the expectations implicit in the model with longer-term changes in the map, which in turn help to assure the future accuracy of the model. When we prevent individuals from garnering the benefits of successful action of any sort, or when we cushion them from bearing the losses of unsuccessful ones, we break these connections and prevent them from developing rules that provide accurate guidance for navigating the external world.⁹ These same features can be seen in the behavior of firms.

Firms that operate in highly competitive environments are more likely to develop effective routines and respond well to the unexpected. In such environments, economic survival is tightly linked to finding effective routines that bridge resources and activities. Firms whose routines cannot do so, or cannot do so well, will quickly be replaced by firms whose routines can. Success in a highly competitive market is highly suggestive of a high degree of organizational learning generated by the constant contact with an external world in which the success of the firm's actions is judged frequently and powerfully. Learning requires that both individuals and firms have the incentive to learn and improve and feedback processes that provide them with the knowledge necessary to know *what* to do in order to learn and improve.

Firms that have monopoly protections and other organizations, such as government agencies, that do not operate in competitive environments will learn much more slowly, if at all. Moreover, operating in different environments with different sets of incentives and different forms of feedback can alter the very structure of such organizations. For example, a firm that now benefits from some sort of monopoly protection will likely add to its activities various attempts to lobby to keep or expand that protection. In turn, this will likely mean acquiring new resources that are more specific to securing political rents. With these new resources and activities, and operating at least part of the time in an environment that rewards them, the firm is likely to develop new routines and shift others, all in the direction of political rents rather than meeting the wants of customers. This diversion of resources is well-noted in the rent seeking literature, but it would be a useful project to try to understand it in terms of organizational learning. The same can be said of government agencies themselves, which operate in a

world of votes, budgets, and power where the feedback of that environment encourages learned routines that link resources and activities that are not concerned with genuinely meeting the needs of the citizenry.

A comparison of the performance of Wal-Mart and other private sector retailers with that of the Federal Emergency Management Agency (FEMA) during Hurricane Katrina illustrates some of these issues.¹⁰ Wal-Mart and others were able to get resources into New Orleans and the rest of the damaged areas along the Gulf Coast days, if not weeks, before FEMA. Given the competitive environment in which Wal-Mart operates, it has well-honed routines for managing its supply chain and getting supplies to stores, during both crises and normal competitive times. Faced with the somewhat novel circumstances of Katrina, it was fairly easy for Wal-Mart to apply those routines to a slightly different situation and to get the job done well. FEMA, by contrast, operates in a totally different environment that both undermined its ability to learn in general, thanks to a high degree of political uncertainty, and diverted any learning that did take place to satisfying the goals associated with bureaucracy. When the drastic and severe conditions of Katrina were upon them, they were unable to respond effectively without the sorts of routines for moving resources that the private sector firms had developed. The emphasis on environment for the effectiveness of organizational learning should create skepticism that “better leadership” is the automatic solution for poorly performing organizations. Better leadership is of little help where the incentives and knowledge needed for learning in ways that get the job done are absent.

Suggestions for Further Research and Conclusion

If the Hayekian-cognitive perspective on organizational learning that I have sketched above is worth pursuing, the next task will be to apply it empirically. Perhaps the most obvious research agenda would be to explore in detail how firms react to change and what sorts of organizational structures and cultures seem to enable better adaptation. Such studies could focus on how new routines are formed and/or how old routines get adapted to new circumstances, with particular attention paid to the speed at which such learning takes place. Examining how firms react in crisis situations can also reveal important elements of the effectiveness of its organizational learning, as the prior discussion of Wal-Mart's performance during Hurricane Katrina suggests. Detailed analyses of these sorts of episodes could benefit from the Hayekian perspective presented herein. A third set of internal-to-the firm questions would revolve around the relationship between organizational learning and organizational structure. Do "flatter" organizations develop "better" rules and routines? Do organizations that give more scope for individual initiative learn better? If so, what features of such organizations make such initiative possible? We know that for humans, exploration and risk are central to learning. Does the same hold for organizations?

Another set of research questions would be comparative across types of organizations. This essay touched on some of the reasons that private firms might learn more effectively than public agencies, but there is much more to be explored there. In addition, the question of where non-profits and organizations such as universities fit into a Hayekian view of organizational learning is pregnant with possibilities.¹¹

A final set of research questions would be ones involved with larger political economy issues. In particular, it would be valuable to understand how various institutional arrangements affect the incentives facing organizations and thereby divert or distort the sort of learning that takes place. The brief discussion of rent-seeking earlier provides a hint at where such analyses might go: do highly politicized markets lead firms to develop routines that are geared more toward *politically* effective activities and uses of their resources, which mostly benefit the firm itself, rather than the *economically* effective ones that would benefit consumers as a whole as well. A similar analysis might be made of the effects of environmental concerns, both legislative and cultural. How do the powerful cultural forces that reward “green” firms affect the ways in which firms learn and the kinds of routines they develop? One might think of this as an organization theory analogue of child development theory in psychology: under what conditions to firms and children both learn and thrive?

Although all of these questions are at a high level of generality, I believe they point toward an agenda for understanding organizations that makes use of Hayek’s cognitive theory. That this would be a next step in Hayekian research should not be surprising as the long-standing emphasis in Hayekian political economy on the way in which competition and markets generate both the incentives and knowledge necessary for the effective allocation of resources in society as a whole can be understood as a generalization of Hayek’s own cognitive theory. When Hayek (1978 [1968]) referred to competition as a “discovery procedure” and argued that freedom is justified not by our rationality but by our ignorance, he was seeing the market, or the “catallaxy,” as an example of human learning. Much of his work in the 1930s and 40s, from the core

argument of “Economics and Knowledge” (1937) that markets are a learning process, to his work on the possibility of socialist calculation (1940) that emphasized the ways in which markets generated knowledge that planners could not access, was the beginning of a vision that connected individual human learning and cognition to the ways in which social processes, such as the market, were also epistemic ecosystems. Included in all of these ideas is the importance of tradition and tacit knowledge as the sedimentary results of those learning processes.

Hayekians have had much to say about the cognitive processes within the individual and the way in which social systems involve learning. They have had less to say about those organizations that sit “between” the individual and large-scale social processes, such as the firm or the family. Hayekian approaches to the theory of the firm have become more numerous in recent years, but few have approached that topic from the perspective associated with Hayek’s cognitive theory and *The Sensory Order* in particular. The Hayek quote that opens this paper provides some sense that Hayek glimpsed some of these connections, and I hope that I have outlined some of the ways in which such an investigation might proceed. It is not new to view firms as organizations that learn, nor is it new to explore the social-scientific implications of Hayek’s cognitive theory. By bringing them together, however, something new and valuable might well emerge.

Notes

¹ For example, Horwitz (2008) offers an analogy between Hayek's theory of capital and the theory of mind in *The Sensory Order*.

² Interested readers might consult McQuade and Butos (2005), Steele (2002), Horwitz (2000), and Butos and Koppl (1993).

³ I thank Roger Koppl for discussion of this analogy.

⁴ Whether Hayek's views extend in the same way to formal education is an interesting question to pursue. Garnett (2007) explores the idea of "Hayekian pedagogy," but is more interested in the role that spontaneous order and decentralized knowledge play as opposed to Hayek's cognitive theory.

⁵ Here is where Hayek's cognitive theory matches so well with his broader social theory. Much of his work from *The Constitution of Liberty* forward focused on the way in which humans are rule-following animals in the social order, even though many of the social rules we follow are ones we cannot articulate. The idea that rules lead to an order more complex than we can understand applies both to our own minds and to the social world. The relationship between these two orders is explored in Horwitz (2000).

⁶ See also Lewin (1999).

⁷ See the discussion of Wal-Mart's behavior during Hurricane Katrina in Horwitz (2009).

⁸ As Hayek has said elsewhere, it is not that we cannot criticize inherited rules and traditions, but that we cannot criticize all of them at once.

⁹ This argument also is suggestive of a way to think about child development from the perspective of Hayekian cognitive theory. The tricky part is finding the right line between ensuring that children feel the consequences of their own mistakes but not so severely as

to harm them or discourage them from rational risk taking. For Hayek, the connection between freedom and learning was a life-long theme, most clearly articulated in *The Constitution of Liberty* (1960).

¹⁰ See Horwitz (2009) for an elaboration.

¹¹ I thank the referee for raising the question of how non-profits fit the theory.

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