

Experience and Repetition as Antecedents of Organizational Routines and Capabilities: A Critique of Behaviorist and Empiricist Approaches

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ABSTRACT

We discuss the behaviorist and empiricist foundations of the organizational routines and capabilities literature, specifically the extant emphasis placed on experience, repetition and observation as the key inputs and mechanisms of behavior, learning and change in organizations. Based on this discussion we highlight several concerns associated with specifying experience and repetition as antecedents of routines and capabilities, namely, (1) the problem of origins and causation, (2) the problem of extremes, (3) the problem of intentionality, (4) the problem of *new* knowledge, and (5) the problem of the environment. We highlight the “poverty of stimulus” argument and more generally discuss how internalist or rationalist, choice-based approach might provide a more fruitful (though preliminary) foundation for extant research on organizational routines and capabilities.

KEY WORDS: organizational routines and capabilities, repetition and experience, empiricism and rationalism

INTRODUCTION

Many have argued that routines are “*the* central unit of [organizational] analysis” (Becker 2004a: 643; Nelson and Winter 1982). The routines construct has also become the explicit foundation for capabilities-based work in strategic management, and definitions of organizational capabilities are frequently anchored on routines. For example, Zollo and Winter define organizational capability as a “learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating *routines* in pursuit of improved effectiveness” (2002: 340, *emph. added*; cf. Eisenhardt & Martin, 2000: 1107). Generally, routines are argued to be the most fundamental unit and building block of organizational capabilities (cf. Winter, 2003).

However, despite several decades of work on organizational routines, fundamental questions persist, suggesting an opportunity to carefully revisit the underlying analytics and epistemological foundations of the routines literature. While others have focused on definitional issues and associated ambiguities and research opportunities related to routines (e.g., Becker, 2004, 2005; Foss, 2003; Felin & Foss, 2005), the purpose of this paper is to address and explicate the behaviorist and empiricist foundations of the organizational routines and capabilities literature.

Specifically, we focus directly on the underlying antecedents and mechanisms of organizational routines and capabilities, namely, experience and repetition. We revisit foundational literature in psychology and epistemology and highlight how repetition and experience can only provide a partial, and thus incomplete, understanding of organizational behavior. The purpose of this paper, then, is both critical and developmental. We first discuss five problems associated with specifying repetition and experience as the key antecedent and mechanism of organizational routines and capabilities, namely (1) the problem of origins and causation (2) the problem of new knowledge, (3) the problem of extremes, (4) the problem of intentionality, and (5) the problem of the environment. We argue that the traditional input (experience)–output (behavior or capability) relationship in extant research on routines and capabilities is underdetermined, and the associated theoretical mechanisms (such as repetition) need to be revised. Second, in response to the above problems, we theoretically highlight how the “poverty of stimulus”

argument from rationalist epistemology (Chomsky, 1986; Popper, 1972) might theoretically provide a fruitful way to understand and overcome the problems associated with the behaviorist and empiricist foundations of the routines and capabilities literatures.

BEHAVIORIST FOUNDATIONS AND ORGANIZATIONAL ROUTINES

Historical Origins and Review

Much of the literature on organizational routines and capabilities is founded on a behaviorist and empiricist epistemology, or theory of knowledge.¹ The behaviorist tradition, building on a longer tradition of empiricism (Chomsky, 1959; Popper, 1972), suggests that behavior and capability is determined by external stimuli perceived by the senses, thus placing heavy emphasis on perception, observation, experience and the environment as key independent variables: what individuals and organizations believe and know is a function of their past, heterogeneous experiences, repeated exposures, sense perceptions and observable environmental contingencies. The argument in this tradition—also foundational to March and Simon’s (1958) classic work—is that experience and environmental stimuli are critical in determining the beliefs and expectations that drive individuals and organizations behavior.² Theoretically there is a strong link between psychological behaviorism (as pioneered by the likes of Thorndike, Watson, and Skinner) and subsequent models of organizations (specifically see e.g., March and Simon, 1958: 9-10; 139-142). As a brief example, Simon and March note that “activity (individual or organization) can usually be traced back to an environmental stimulus of some sort, e.g., a customer order or a fire gong” (1958: 139; Skinner, 1989). The influence of behaviorist theory is also evident in Cyert and March’s classic *A Behavioral Theory of the Firm*, which, among other things, discusses the role of simple rules and standard operating procedures—clear forerunners of organizational routines—and

¹ By epistemology we simply mean “theory of knowledge.” Thus, our emphasis is on how individuals and organizations develop “justified beliefs” or expectations about what actions to take in a given environment. Behaviorist and empiricist traditions, both in psychology and organizational research, focus heavily on the external and observable factors that drive action and behavior. Furthermore, as we will highlight, the approach is heavily empiricist given its strong emphasis on such *explanans* as experience, observation, and so forth (for a primer on empiricist versus rationalist epistemology, see Markie, 2008).

² March and Simon (1958: 9-10) explicitly build on such behaviorist psychologists as Thorndike (1898) and Tolman (1935) and thus root their work in an empiricist tradition and epistemology with an emphasis on repetition, experience and environmental stimuli (cf. Chomsky, 1959, 2003).

focuses on environmental stimuli and experience as key antecedents (1963: 114-127).³ It is argued that, for the most part, “the firm learns from its experience” and environment (Cyert and March 1963: 118; see also Greve 2003).

Central currents and assumptions of the behaviorist tradition also carry into Nelson and Winter’s (1982: 14) classic work and their conception of organizational routines. For example, Winter’s early definition of a routine—a “pattern of behavior that is followed repeatedly, but is subject to change if conditions change” (1964: 263)—arguably reflects the behaviorist emphasis on repetition, as well as the environment’s role in determining learning, change and behavior. While scholars have since offered numerous definitions of routines (cf. Becker, 2004, 2005), most definitions of routines indeed have behaviorist assumptions strongly built into them, specifically given the emphasis on the role of repetition, experience and the environment. Thus, Cohen et al, for example, define a routine as an “...executable capability for *repeated* performance in some context that has been *learned* by an organization in response to selective [environmental] pressures” (1996: 683; *emph. added*). Routines, then, “reflect *experiential wisdom* in that they are the outcome of *trial and error learning* and the selection and retention of past behaviors” (Gavetti and Levinthal, 2000: 113, *emph. added*). More generally, “amongst the dimensions [of routines] identified in the literature, the frequency of repetition seems to be a particularly important one” (Becker, 2004: 650). Overall, repetition and experience, by definition, go hand in hand and provide the overall foundation for both organizational routines and capabilities and thus strongly link routines-based work to an empiricist epistemology (cf. Chomsky, 2003).⁴

The literature on organizational capabilities is also behaviorist in its antecedents given the experiential focus. For example, Zollo and Winter (2002) give primacy to the role of “accumulated experience” as the origin of organizational capabilities. Gavetti and Levinthal (2000) focus on

³ For a discussion of different conceptions of rules, habits and routines in organizations (Veblen versus Simon versus Nelson/Winter), see Lazaric, 2000.

⁴ McGilvray notes that central to empiricism “is the idea that similarity [experience and repetition] plays the central role in learning, productivity, and use. Every empiricist version of a generalized learning procedure relies on similarity at some point” (Chomsky, 2003: 38). A similar point is made by Popper about association and related forms of experiential and observational learning (1972: 3-7).

“experiential wisdom,” Eisenhardt and Martin (2000) emphasize various “simple experiential routines,” Levinthal and March (1993, also see Lounamaa and March 1986) focus on “experiential learning,” Levitt and March (1988) focus on routines as the “experiential lessons of history,” and, finally, Nonaka (1994) focuses on “hands-on experience” and “shared experience” (see also Reagans et al., 2005). There is also a very closely related literature both in economics and organization theory on experience curves, which has often been tied to organizational learning and performance outcomes (Spence, 1981; Yelle, 1979).⁵

Experience and Repetition as Inputs and Mechanisms

The behaviorist and empiricist approach, whether in psychology or the organizational routines and capabilities literatures, can be summarized as a simple input-output model (see Figure 1).

Insert Figure 1 about here

In short, behaviorist approaches postulate a strong, deterministic relationship between various inputs and associated outputs. Various “external” factors (whether stimulus, experience, environment, exposure, situation) essentially determine not only outcomes but also the internal make-up of the organism in question. As noted by Popper (1972: 60-64), behaviorist and empiricist theories effectively represent a “bucket theory” of the mind that presumes an empty bucket, a *tabula rasa*, that then is filled with experiential, observational and sensory inputs. Building on this behaviorist tradition, organizational scholars have also argued that the decision-rules, routines, behaviors, capabilities, etc of the organization are a function of the history of environmental inputs, and thus the initial state of the organizations essentially is a “blank slate” (cf. Popper, 1972; Pinker, 2002). Importantly, behaviorist and empiricist

⁵ Note that work on learning curves theoretically originates from early psychological experiments in animal behavior (e.g., rats and pigeons), which essentially suggest that with conditioning, stimulus and reinforcement, and repetition over time (i.e., experience) output increases, “learning” cited as the reason (Thorndike, 1898; Tolman and Brunswick, 1935; Schwartz, 1978). While there certainly are variations in how experience is defined and various associated contingencies and extensions in the behavioral learning literature (e.g., Holyoak’s research on learning by analogy (e.g., Holyoak and Thagard, 1995); see Zollo and Reuer, 2004 or Gavetti et al., 2005 for recent applications to organization theory), essentially the underlying model has remained the same (see Schwartz, 1978 for an excellent review of behavioral learning theory), that is, external stimulus and accumulated and repeated experience determines behavior, learning, and outcomes.

theories assume that the relationship between input and output is *commensurate* as the organism's behavior and capabilities are the result of the number of times an activity is pursued, done, or "experienced" via the environment, assumptions that are also strongly reflected in how routines and capabilities are also measured in the organizational literature (e.g., Haleblian and Finkelstein, 1991). More generally, the empiricist tradition focuses on history, environment and "accumulating bits of sensory information" (Schwartz, 1979: 16-17), and is often empirically operationalized in the form of counts (of experiences, observation or events) as the key parts of the explanans. Not surprisingly, in the context of organization studies, this tradition is a close ally of evolutionary modes of explanation (Simon, 1969; Nelson and Winter, 1982).

The emphasis in behaviorist approaches on various external and environmental factors is clear (Figure 1). For example, Skinner notes: "A scientific analysis of behavior dispossesses autonomous man and turns the control he has been said to exert over to the *environment*...He is henceforth to be controlled by the world around him, and in large part by other men ... *environmental contingencies* now take over functions once attributed to autonomous man." (1971: 196, emphasis added). This same emphasis is also evident in the organizational literature. Haleblian and Finkelstein aptly summarize this environmental focus as follows: "Behavioral learning theory predicts an individual's behavioral outcomes by analyzing environmental influences. According to the theory, there are both present and past environmental influences on behavior" (1999: 31).

Overall, what is rather striking about the routines and capabilities-based literature is that it utilizes the *exact same* inputs, mechanisms and theoretical arguments as the psychological literature that it builds on. For example, Schwartz's (1979) book on psychological learning illustrates that the same exact input-output relationships and theoretical mechanisms are featured both in behaviorist psychology and much of the organizational literature on routines (see Figure 1). And importantly, both literatures also make the same underlying assumptions as to the initial state (in this case of the organization) and the critical role placed on experiential and *external* sources for behavior, learning and change.

However, understanding the link between behaviorist approaches in psychology and those in organization theory and strategy is important, as arguments in the former have been significantly challenged (see, e.g., Chomsky, 1957; Fodor, 1991; Popper, 1972) and there are promising alternative ways to think about beliefs, learning and capabilities in organizations as well. In short, as we will highlight, the behaviorist and empiricist emphasis on experience and repetition has rather persuasively been refuted in the very disciplines from which the concepts (and more general epistemology) originate.

PROBLEMS WITH BEHAVIORIST FOUNDATIONS

A fundamental, underlying question, which essentially provides the impetus for our central thesis for challenging experience, observation and repetition as the causal antecedent of behavior and learning, is, *What are the origins of heterogeneous experience or the repetition of an activity?* Implicit in much of our subsequent discussion is that this question has not and cannot be adequately answered with the present behaviorist and empiricist foundations.

We argue that experience and repetition is only an epiphenomenon of more ultimate theoretical causes of organizational behavior. Put differently, we conclude that citing experience and repetition as causes of expectations and behavior only restates rather than resolves the theoretical problem of understanding and explaining organizational behavior. Or, put yet another way, experiences proximally co-vary with capability outcomes, but cannot logically be ascribed as the causal antecedents. By an epiphenomenon we refer to the question of whether the theoretical explanation given provides causal finality, or whether the explanation induces immediate questions about the nested, actual antecedents (cf. Boudon, 1998: 172-173). We argue that experience remains quite proximate to outcomes as the immediate question becomes the underlying *origins* of heterogeneous experiences, and the reasons for its repetition. We will next identify and more systematically explicate the key theoretical problems associated with specifying experience and repetition as the antecedents of organizational routines and capabilities (our discussion is essentially summarized in Figures 1 and 2).

Insert Figure 2 about here

The Problem of Origins and Causation

The general question of where different types of experiences originate from in the first place and to what we impute heterogeneous experience (and its repetition) remains unanswered in extant theories of routines and capabilities. Behaviorist learning theories impute causality to various experience and external factors (Schwartz, 1979), but how one (an individual or organization) sets out to have a “better” or “quality” (heterogeneous) experience(s) remains unanswered. We can of course look to the theoretical mechanisms highlighted in Figure 1, that is, the need to experience, do, repeat, and accumulate experiences, but what does that mean where perhaps there is no past? This point is particularly poignant as there is a general emphasis on the past as the source for organizational learning (specifically see Levitt and March, 1988) in theories of learning, but it inherently leads to an infinite regress that deserves to be more carefully unpacked. In other words, the perpetual look to the past immediately begs further questions of the initial conditions of experience accumulation *especially* since behaviorist theory gives subsequent emphasis on the localness and path dependence of continued organizational operations (Cyert and March, 1963). Thus, where does the first experience (which would seem quite critical given subsequent path dependence) come from? Or put differently, how does an organization begin to “accumulate” experiences in the first place? How are the better *and* the right experiences accumulated? Where does a routine come from?

More importantly, if experience and repetition is the origin of learning, then logically the experiences themselves, and input and environmental stimuli more generally, should in essence carry the contents of experience or “lessons learned” within them (cf. Most et al., 2005).⁶ There is indeed frequent mentions of the notion of “lessons learned” from past experience and repetition in work on organizational

⁶ An interesting parallel discussion has very recently been raised in psychology, where the misuses of and problems with the term ‘experience’ have been highlighted (McKnight and Sechrest, 2003).

learning and capabilities (e.g., Argote and Epple, 1990; Levitt and March, 1988: 336; Zollo and Winter, 2002: 348). In theoretically and empirically emphasizing the number or types of experiences (e.g., failures; Haunschild and Sullivan, 2002) that an organization has had, there is, in effect, an implicit theoretical assumption that the lessons learned are contained in the experiences (or environmental stimuli) themselves. This seems quite tenuous. From a methodological and experimental perspective, the initial conditions and characteristics, choices, nature and abilities of the individual or organization itself should be studied rather than the experiences themselves, which may be epiphenomena. While we realize that experiences (and their repetition) are used as empirical proxies, these empirical proxies are not tightly coupled with final theoretical and causal factors. Thus a theory-data disconnect is created, with the theory being driven by the data, that is, theory being developed based on what is empirically observed *post hoc* in the environment (e.g., “counts” of experiences). It is not clear what in the experiences themselves, especially their number or repetition, has meaningful content. Indeed, this theory-data disconnect provides one rationale for the many mixed findings in experiential models of learning (cf. Hayward, 2002; Zollo and Singh, 2004).

There is also a serious problem of survivor bias and endogeneity in specifying the experiences themselves as the cause or origin of learning and behavior. That is, organizations which began particular activities early on and continue to repeat and accumulate the right activities inherently took initial, important steps which have nothing to do with *number* of experiences, but rather underlying factors which allowed them to have the experience in the first place. Again, this is particularly important in light of path-dependence. To put this in the context of the mechanisms highlighted in Figure 1, it is not the amount of doing or repetition that is the key causal factor, but rather the ability to do and repeat in the first place (which a blank slate conception does not allow). The distinction is quite fine, though it has wide theoretical ramifications for the very notion of learning. Specifically, in analyzing behavior, learning scholars may simply see a *trailing* track record of success (again, as proxied by experience and history), where the organizations that were not able to experience some activity, or those that simply pursued the wrong activities, fall out of the equation. However, imputing the experience or activity itself

and its repetition leads theories to be mis-specified (Rock, 1957). To best crystallize this point, think, for example, of the practical or managerial implications of the literature on experience curves. The practical advice for a young organization would be to have “lots of good experiences.” But, what those activities are, and how and why organizations are able to pursue these experiences in the first place should become a more important causal factor than the experiences themselves.

The Problem of Extremes

Another problem in experience or repetition-based models of organizational routines and capabilities is that they do not readily account for extremes. In part, the problem of extremes can be attributed to underlying statistical and empirical matters recently noted by McKelvey and Andriani (2005) (e.g., the Gaussian denial of extremes and unstable means), though there are important *theoretical* considerations as well, which we explicate in relation to experiential models of organizational learning and capabilities.

Specifically, given the commensurate input-output relationship of experiential and behaviorist models (Figure 1), there are numerous anomalies related to the problem of extremes which cannot be accounted for, though they should theoretically fall within explanatory bounds. To take one glaring example from the literature, how do experiential models account for organizational “diseconomies” (Zenger, 1994), that is, the oft-noted discrepancy between the radically skewed innovation outcomes in small and young versus large and old organizations (the former being much more productive and innovative in relation to their size)? That is, experience and repetition-based learning models would of course predict the primacy of older, larger (thus *more experienced*) organizations, given that the theoretical mechanisms (e.g., repetition, accumulation, cf. Figure 1) have “operated” both longer and more frequently thus leading to increased organizational capability (cf. Felin & Zenger, 2009). By way of attempting to solve this problem, the organizational capabilities literature of course does point to issues of “too much” experience and associated redundancy, learning myopia or rigidity (e.g., Leonard-Barton, 1992; Levinthal and March, 1993), however, beyond simply citing curvilinear experiential effects (cf. Halebian and Finkelstein, 1999; Hayward, 2002) or offering somewhat ad-hoc language to solve the

problem, theoretical models should be able to better account for and explain the extremes, that is, answer the question: why do *less-experienced* companies disproportionately outperform more-experienced companies (cf. Zenger, 1994)? Overall, explaining extremes is a critical issue for strategic management given the field's raison d'être of explaining competitive advantage, as much of what is exciting about organizational analysis happens at these extremes, presently outside the scope of experiential and behaviorist models of organizations.

To more carefully delve into the underlying experiential learning theory (again, recognizing that organizational theoretical models focus on the same inputs and mechanisms as behaviorist learning theories, Schwartz, 1979), how would we account for differential outcomes in individuals within the same setting (given the same experience, stimulus, and instruction)? The behaviorist psychologist and social learning theorist Lev Vygotsky (whose work is built upon in several knowledge-based papers, e.g., Spender, 1996; Brown and Duguid, 2001) indeed briefly recognized the problem of extremes in a short chapter titled, "The Problem of Giftedness" (1926). Vygotsky rightly argues and admits that theories should be able to account for the full range of data, and both at the high end (e.g., gifted individuals) and the low end (e.g., learning-challenged individuals) there is a vast discrepancy and theoretical vacuum in experiential and behaviorist models as to the underlying sources and antecedents of capability (also see Estes, 1970). In fact, the discrepancy of the theory at both ends of the data is such that it questions whether models anchored on experience are appropriately specified even for the "average" individual or organization. Similarly, the problems in capabilities-based work associated with averages and extremes also loom large. Why, despite similar environments, do we nonetheless observe differential overall outcomes? That is, why do individuals and organizations in the same environments have different "experiences?" Why are younger companies proportionally more innovative? How do some have "better" experiences?

The Problem of Intentionality

A closely related problem is the issue of intentionality in routines and capabilities-based work. Experientially based models argue that what happens in organizations simply reflects input-output

relationships (stimulus-response), leaving little room for discretion. This of course remains quite implicit, but nonetheless important to highlight. Environmental feedback and various stimuli determine behavior, which is a strong legacy from behaviorist psychology and empiricist epistemology. However, organizational analysis should not only be interested in describing the determinacy of outcomes (experiential and behaviorist models have a certain built-in inevitability, cf. Langlois & Csontos, 1993; De Rond & Thietart, 2007), but should also be interested in *the intentional* (also see Hodgson, 2002). That is, strategy's reason for being is not just explaining random heterogeneity or the inevitable (cf. Alchian, 1950), but more importantly, also the intentional and choice-related actions of individuals and organizations (cf. Felin & Foss, 2006).

The notion of intentionality suggests that we take seriously the matter of “free will” and choice (cf. Chisholm, 1967; Lucas, 1970), and other closely related notions such as volition (Zhu, 2004) and, consciousness (Nagel, 1974). While intention and free will perhaps are hard-to-define concepts, nonetheless they deserve careful consideration in any social science. It may indeed be that “proving” free will or intention is problematic as an artifact of the fact that scientifically (from an empiricist perspective) proving anything in experiential models is specifically defined as pointing to the *external, observable* causes of behavior (Fodor, 1991; Popper, 1972). However, though this admittedly is simplistic, to refute behaviorist theories which only allow external and observable causes I can simply raise my right hand, or not, while typing this sentence, with no apparent external, observable cause. In fact, the very act of writing this article is a manifestation of intention and creativity (we hope) — as for example none of the sentences constructed in this paper have appeared elsewhere and also have not been externally “put in,” but rather are genuinely a new and novel creation (Chomsky, 2003). The behaviorist approach indeed argues that to explain *any* behavior, we need to simply look for external stimuli (see Schwartz, 1979: 6), though it seems that the simple illustration above refutes the point. Underlying internal factors provide better and more final theoretical grounds than the more proximate external or experiential factors.⁷ While

⁷ Note that matters related to the notion of intentionality have recently been discussed in conjunction with organization learning and capabilities in an effort to correct some of the problems inherent in experiential and

a form of intentionality does emerge via second-order functions into the routines and capabilities-based literatures, nonetheless their operation is also tied to stimuli (related to lower-order routines not functioning or environmental queues) while we think that more active conceptualizations are also warranted, as our “internalist” discussion will later illustrate.

The Problem of Creativity and New Knowledge Creation

Central to work in organizational routines and capabilities is understanding the emergence of new alternatives. That is, where does new knowledge and creativity come from, what are its underlying sources and antecedents? As we have outlined, experiential and behaviorist models focus on various external factors as antecedents to organizational learning, though this leaves the central question of new knowledge and creativity unanswered (Figure 2). The input-output relationship is commensurate (compare Figures 1 and 2). Put differently, experiential and behaviorist models logically must presuppose that all knowledge is externally determined and thus, in effect, that all knowledge already exists (nothing emerging internally), and there is no wiggle-room for an individual or organizational contribution (beyond past, accumulated external and experiential inputs). However, we clearly observe creativity and new knowledge above and beyond, or even *sans*, apparent external inputs. In short, the experiential input-output relationship in organization theory is underdetermined.

Various theoretical mechanisms, as we have discussed (Figure 1), have of course been highlighted as a potential source of new knowledge and innovation, such as recombination (Fleming and Sorensen, 2004) or repeated interaction (Ethiraj et al., 2005) or socialization (Nonaka, 1994), but these mechanisms do not resolve the problem of the sources of newness as they fundamentally depend on piecing together, for example via association (see Popper, 1972: 3-7), existing, *external* knowledge elements (or cite “emergence”) (cf. Felin & Zenger, 2009). That is, important, unanswered, theoretical questions remain, including - how specifically do new knowledge elements arise and more specifically,

behaviorist models. For example, Gavetti and Levinthal (2000) discuss the role of not only “looking backward” (i.e. experience and the past) in organizational learning, but they also address the role of “looking forward,” which certainly suggests a measure of intentionality. Others have discussed and focused on such related matters as “deliberate learning,” (Zollo and Winter, 2002) or “mindfulness” (Fiol and O’Connor, 2003).

from where? How and why are certain "recombinations" made – simply through iterations of random trial and error or some sort of intelligence? Where did the previously pieced together knowledge arise from in the first place? Which external knowledge elements are combined, why, and by whom? The intervening theoretical mechanisms cited seem to serve at best as temporary conceptual placeholders requiring further theory development.

A quite helpful way to recast the problem of new knowledge and creativity in experiential and behaviorist models of behavior is through very closely related arguments in artificial intelligence. Specifically, much of the intuition in organization and management theory indeed relies on concepts which are central to artificial intelligence as well, namely: input-output relations, programs and routines, trial and error learning, hill-climbing, and if-then statements (Simon and Newell, 1958; Minsky, 1961; Russell and Norvig, 1994; also see Cyert and March, 1963; Gavetti and Levinthal, 2000; Levinthal 1997).⁸ Simon explicitly makes some links between behaviorist theories and artificial intelligence in his book *Sciences of the Artificial* (1969). In short, behaviorist theories and associated arguments in artificial intelligence in essence argue that individuals and organizations can be cast as experience (input-output) machines or automata or "information processing systems" (March and Simon, 1958: 9; Minsky 1961). In conjunction with this Simon suggests the following behaviorist conceptualization of individuals: "A man, viewed as a behaving system, is quite simple. The apparent complexity of his behavior over time is largely a reflection of the complexity of the environment in which he finds himself" (1969: 65). The equivalent relationship between machines/computers and individuals and organizations has indeed been useful in helping us understand correlations between environmental stimuli (e.g., actions of peers and imitation) and knowledge outcomes, but these models all inherently remain closed and un-open to *original* contributions on the part of the organism itself (outside of the history of external inputs), and thus do not account for new knowledge (only its replication or recombination) and creativity, which is

⁸ March's (1991) notion of exploration and exploitation in organizational learning directly builds on intuitions from machine learning. Simon and Newell (1958; see Cyert and March, 1963 for similar theoretical intuition, though implicit, in notions such as programs) explicitly focus on Charles Babbage as the "patron saint" of management science and also point out the closely related experiential and behavioral assumptions which they argue are central to the field (also see Simon, 1969).

readily observed. If behavior and learning depend on mechanisms such as imitation or recombination, where does the new originate from?

The problem of creativity and new knowledge as it relates to computers and machines has long been recognized, and also has implications for understanding human creativity. Specifically, despite optimistic projections on the possibilities of creativity and learning on the part of computers (see e.g., Simon and Newell, 1958: 7; also see Minsky, 1961; Russell and Norvig, 1994 for a more general discussion), computers and artificial agents can only produce what they are programmed to do, originating no new knowledge and showing no creativity (e.g., Block, 1981; Bringsjord, 1992). In general, mechanistic and computational approaches to the mind and behavior have persuasively been refuted on grounds of their determinism, lack of intention and creativity (e.g., Dreyfus 1992; Lucas, 1961). Creativity and new knowledge are outside the realm of possibility for computers (and empiricist theories as well, given that the input-output relations that are similarly specified) as they are inherently dependent on what the programmers or designers of the machine "put in" in the first place.

Overall, we argue that neither the automaton or agent of artificial intelligence (Minsky, 1961), nor the maze-running rat of behaviorist psychology (Tolman and Brunswick, 1935), is the appropriate model for understanding organizational capabilities or learning given that the input-output relations simply cannot account for the new. The input-output under-determination was also recognized by Descartes (1637) who noted the creativity, appropriateness, and newness (all three being unattainable by machines) of even everyday activities such as children speaking, where unique and novel outputs are constantly being generated without external stimulus and experience. For example, we can answer any question in infinite varieties, or more generally speak without any external inducement, or even think an infinite variety of creative "un-thought" thoughts without any external inputs or stimuli (Block, 1981; Chomsky, 2003; Popper, 1967).

The Problem of the Environment

The final problem, the problem of the environment, is closely related to the above problems, and indirectly provides an apt summary of sort for the other four central problems associated with behavioral and empiricist models of organizational capabilities.

Nothing, of late, seems to be more real to strategy and organizational scholars than the notion of the environment. It molds (Simon, 1969) and determines much of organizational behavior and learning (Cyert and March, 1963). Behaviorist learning theory in fact suggests that "... if you want to know why someone did something, do not ask. Analyze the person's immediate environment until you find the reward" (Schwartz, 1979: 6). However, what the relevant environment is, how it is defined, where it originates from, and so forth generally only becomes clear in behaviorist models *after* the actions of the individual or organization are *observed* (see Popper, 1972). The *post hoc* hunt for experience and external stimuli, however, leads behaviorist theories to be mis-specified (showing potential correlations between experiences and behavior, though not causation) as logically what "stimulates" does not depend on the stimulus (e.g., its repetition or intensity; Yerkes and Dodson, 1908) but rather the underlying *a priori* characteristics, nature and choices of the organism itself (as we will discuss in the next section). In short, there is no environment as such (given the multitude of possible stimuli and inputs) without individuals and organizations and their respective intentions, nature, and characteristics; which begs the question of what the environment is in the first place and why it has received such primacy as the key antecedent to organizational capabilities?

The problem of the environment is also highlighted by Simon: "The world we live in today is much more a man-made, or artificial, world than it is a natural world. Almost every element in our environment shows evidence of man's artifice" (1969: 4-5). Unfortunately, behaviorist and empiricist models in organization theory have been closely linked to natural sciences with the emphasis placed on such things as incremental and experiential evolution, randomness, and environmental selection (e.g., Nelson and Winter, 1982; also see Holland, 1995), and thus the evidence of "man's artifice" essentially gets lost in ascribing causal roles to the artifice rather than man. The question that our arguments then

begs for is whether the borrowing of these environmental models — inputs, mechanisms, assumptions and all — serves strategic management and organization theory well, given the clearly intentional efforts of individuals to create organizations, artifacts, and products. Recently, in quite related fashion, the physicist George Ellis points out that physics, natural science, or evolutionary models, simply cannot explain man-made artifacts: “Our environment is dominated by objects that embody the outcomes of intentional design (buildings, books, computers, teaspoons). Today’s physics has nothing to say about the intentionality that has resulted in the existence of such objects, even though this intentionality is clearly causally effective” (Ellis, 2005: 743). We argue that questions of capabilities, behavior and learning are also best kept separate from approaches that heavily emphasize the strongly causal role of external stimuli and the environment, particularly when it comes to understanding matters of new knowledge creation, creativity, and innovation.

THE POVERTY OF STIMULUS ARGUMENT:

AN INTERNALIST AND RATIONALIST APPROACH

In this section we provide some preliminary outlines toward an internal or rationalist approach to understanding behavior; we also make important links to the economics and strategic management literature.⁹ Our sketch here is of necessity brief, though given the criticism that we have levied toward the behaviorist and empiricist foundations of the routines and capabilities-based work, it is important for us to also offer some constructive directions and at least the beginnings of an alternative approach. Specifically, we advance an internal or rationalist approach to knowledge by giving specific emphasis to the “poverty of stimulus” argument, and we also begin to partially reconcile internal and external epistemologies of learning and capability by focusing on the triggering role of the experiential environment. Our efforts here most certainly do not amount to a full theory, but rather, we introduce the notion of “poverty of stimulus” and a focus on the “internal” in the same spirit as Simon introduces bounded rationality (see

⁹ For a historical perspective on internal and rationalist epistemology, see Chomsky (2003).

Augier, 2001: 272), namely, not as a theory but as theoretical and methodological tools in hopes of (re)-directing attention to underdeveloped research considerations.

Internal Factors and Human Nature

We begin with the assertion that to understand behavior we must focus on internal factors related to the organism itself that is under study, rather than external factors surrounding the organism in question (whether individual or organization). To recap and contrast, behaviorist and empiricist models presume that the emphasis should primarily be on various external factors, the history of external inputs and the environment (Figure 1), while we argue that what in the first place gets “put in” (and is created) is more a function of the organism than the environment or stimulus (and its repetition) (Figure 2). Behaviorist and empiricist approaches, then, essentially engage in an “epistemology without a knowing subject” (Popper, 1972: 102), without consideration of the potential contribution of the nature of the organism itself to behavior.

To more concretely illustrate what we mean by an internal focus, consider a hypothetical, ever-present “pet bee” that a child might carry around (Chomsky, 2002). Both organisms, the child and the bee, would be exposed to the same exact environment and stimuli; nonetheless quite different outcomes would be readily evident (cf. Brewer, 1974). The child would not develop the navigational ability of the bee and the bee would not develop language capabilities, despite uniform environmental stimuli. In short, to understand behavior and what is learned, there is also a need to understand the contribution and nature of the organism itself (internal rather than external factors) (see Figure 2). In fact, no amount of external reinforcement, experience, stimulus repetition, or doing (see theoretical mechanisms in Figure 1), is likely to help a bee to learn how to talk, and vice versa, the navigational abilities of the child are unlikely to match the bee. While it may appear as if the external stimuli cause the respective capability, the environment in behaviorist and experiential models is determined *post hoc* (i.e. *after* behavior is observed - the environmental stimuli are sought after, cf. Schwartz, 1978; cf. Fodor, 1991), thus not controlling for underlying capabilities and mental activities which may already pre-exist and be latent. One confound is that we only find bees in what appear to be rich environments with stimuli commensurate to outputs

(Chomsky, 2002). That is, it misleadingly looks like, for example, that the experiences or interaction of the bees somehow causes the navigational capability (cf. Figure 1). And similarly, it may mistakenly look like the experiences of the firm result in capability, but disentangling external and internal effects becomes confounded and problematic.¹⁰

The Poverty of Stimulus

A central notion from an internal or rationalist perspective is the "poverty of stimulus" argument (Figure 2). While experiential approaches focus on the causal role of environmental stimuli in learning, the poverty of stimulus highlights creative and new output *despite* impoverished inputs (cf. Chomsky, 2003; Cudworth, 1996). Or put differently, experiences may trigger but not meaningfully cause outcomes (see Felin & Zenger, 2009). The poverty of stimulus argument, then, allows us to answer the question: How specifically do we account not only for the acquisition of a particular piece of knowledge, but also for the quite apparent competence and even creativity given impoverished environmental inputs, or even *without* any environmental stimuli? While we certainly can look to the environment for observable causes of beliefs, learning or behavior, however, the *post hoc* search for rich stimuli mis-specifies and biases theories. What gets "put in" then depends more on the organism and its characteristics and choices (see Figure 2), rather than the attributes of the environment or stimulus.

The notion of poverty of stimulus has been introduced in the context of language acquisition (e.g., Chomsky, 1986; see Laurence and Margolis, 2001 for an overview), though earlier antecedents can readily be found in Greek philosophy (e.g., Plato's *Meno*). Furthermore, the poverty of stimulus

¹⁰ The causal chicken-egg-like problem and inherent confound of determining whether external factors such as environment, stimulus, and experience or internal factors such as *a priori* knowledge and characteristics of the organism determine learning and knowledge have persuasively been studied by psychologists studying infants. In direct contrast to behaviorist, experiential, and external learning models of influential theorists like Bandura, Ryle, and Thorndike, Spelke et al. (1992, cf. Gopnik, 1993) find strong support for knowledge *without* (and prior to) doing, repetition, imitation, and interaction. In juxtaposing external versus internal models of cognition and learning the authors conclude that "cognition develops from its own foundations, rather than from a foundation of perception and action" lending support for an internal, *a priori* approach or a "core knowledge thesis" (Spelke et al., 1992: 605, 628). In short, what is observed, perceived, and "put in" and so forth depends more on internal rather than external factors (compare Figure 1 and Figure 2).

argument is an underlying assumption in all of internal or rationalist epistemology. In short, from the context of language acquisition, the poverty of stimulus is perhaps best summarized as follows:

One can describe the child's acquisition of knowledge of language as a kind of theory construction. Presented with highly *restricted data*, he constructs a theory of language of which this data is a sample (and, in fact, a highly degenerate sample, in the sense that much of it must be excluded as irrelevant and incorrect - thus the child learns rules of grammar that identify much of what he has heard as ill-formed, inaccurate, and inappropriate). The child's ultimate knowledge of language obviously extends far *beyond the data* presented to him. In other words, the theory he has in some way developed has a predictive scope of which the data on which it is based constitute a *negligible part*. The normal use of language characteristically involves new sentences, sentences that bear *no point-by-point resemblance or analogy* to those in the child's *experience* (Chomsky, 1975: 179, italics added).¹¹

The explanatory burden in explaining both learning and behavior falls from external inputs to the organism itself, in that there are latent and internal capabilities, which deserve to be explicated and understood given remarkable and creative output despite impoverished inputs (Figure 2). The context here of course is linguistics and psychology, though the intuition is also central for understanding organizations, particularly since, as we have discussed, behaviorist theories (and assumptions) have been directly imported from psychology into organizational analysis. Given the poverty of stimulus argument, the key differentiating factor in explaining learning or behavior becomes not the stimuli nor experiences *per se*, but rather the respective individual-level characteristics and processes related to the nature of the organism that is being studied. In short, the poverty of stimulus argument suggests that the external environment does not in any meaningful way contain the "lessons learned" within it, but rather, what is learned and "put in" *is a function of the organism itself* (Figure 2). That said, the stimulus of course may provide an important triggering role in eventual competence (see Felin & Zenger, 2009). But, the nature, characteristics and choices of the organism itself become a more final causal explanation of heterogeneous experiences, with the experiences themselves only being epiphenomena of these *a priori* factors. In other words, for all learning there must logically be an *a priori* ability to "handle" the

¹¹ While it may appear that reference to linguistics is detached from our present discussion, linguistics however has been a central context for behaviorist scholars to study learning (e.g., Vygotsky, Skinner), and developments in this field also have implications for organization theory, which, as we have discussed, heavily builds on behaviorist learning theory.

experience and furthermore the ability to discern and recognize stimuli, which has less to do with the characteristics of the stimulus itself and more to do with the underlying characteristics and choices of the organism.

From Behavior to Human Nature to Situationally Rational Action and Choice

As the reader might note, the emphasis we place on human nature seemingly moves us from one form of determinism (behaviorist approaches and their environmental determinism) to another form of determinism (the role of nature in determining behavior). We might have unwittingly have replaced one deterministic and physical theory with another form. However, the rationalist approach that we build on is an intriguing epistemology in that it not only insists that human nature be appropriately accounted for, but also then allows for choice, intention and creativity to play a central role in determining behavior and outcomes (Chomsky, 2003). Popper (1972) also succinctly makes this point in his classic “clouds and clocks” essay, significantly sub-titled “An Approach to the Problem of Rationality and the Freedom of Man.”¹² In this essay Popper argues that “what [social science] wants to understand [is] how such non-physical things as *purposes, deliberations, plans, decisions, theories, intentions, and values*, can play a part in bringing about physical changes in the physical world.” (1972: 229; emphasis in original; cf. Ellis, 2005). In other words, there is “Spielraum,” an extended possibility space, that should be accounted for in the decision-making and choices and behavior of individuals and organizations.

Versions of heterodox economics have of course dealt with the issue of free will and choice (e.g., Shackle, 1972), for example via discussions of bounded rationality and “situationism” (Latsis, 1972, 1982; Langlois & Csontos, 1993; Simon, 1955). However, the extant focus on bounded rationality in the routines-based literature places far too much emphasis on the boundedness rather than rationality of action (Bianchi, 1990; Grandori, 2005). The rationalist approach that we are arguing for specifically is interested in the “intervening” mechanisms that might play a role in the situationally rational decisions that individuals and organizations make. As illustrated in Figure 2, there are a host of central, intervening

¹² Thanks to an anonymous reviewer for directing us to Popper’s thought.

variables and mechanisms that behaviorist approaches dismiss implicitly or logically cannot address given the commensurate input-output relationship (cf. Figure 1).

Our focus on the “situationally rational agent” then not only seeks to unpack the nature of the organism itself but also, in the case of human beings, the subjective plans, purposes and hypotheses that agents bring to situations. As noted by Popper (1972: 247), human beings, unlike animals or physical objects, have the capacity for purposeful deliberation which itself is causal and generative in nature.¹³ In other words, rather than strongly anchor on external factors as sources of behavior (Figure 1), the internalist and rationalist approach focuses on the anticipations, calculations, preferences, interests and even creative conjectures of actors. Popper articulates this poignantly by pointing out that “observations are secondary to hypotheses” (1972: 346); by comparison, a behaviorist approach gives causal precedence to observations as central inputs in explaining outcomes (Figure 1). In other words, rather than emphasize the senses and experiences as causal in behavior and learning, the hypotheses and theories of the human agents involved play a central role in not only determining what is experienced and repeated, but also what is learned and acted upon (cf. Felin & Zenger, 2009). As encapsulated in philosopher Ned Block’s so-called productivity argument: “people are capable of thinking vast numbers of thoughts that they have not thought before--and indeed that no one may have ever thought before” (1995: 3). In other words, thoughts and deliberations are not epiphenomenal to observations and experiences (as highlighted in Figure 1), but rather, the other way around (as highlighted in Figure 2).

Our focus on situational rationality and choice is in line with some extant models in economics. In other words, while evolutionary approaches to economics have distinguished themselves by focusing on adaption and learning, extant models in economics also are adaptive, accounting for the situational rationality of agents. As Casson (1996: 1163) notes:

Learning does not appear explicitly in the rational action approach because it is built in from the outset. Because of learning the rational actor continuously adapts his behavior to

¹³ This view is embedded within Popper’s evolutionary epistemology and his notion that all organisms engage in a “conjectural” process of trial and error, but that what makes Einstein differ from an amoeba (1972: 247) lies in the amoeba being unable to adopt a “consciously critical attitudes to his own ideas,” that is, at best it manifests a low degree of plastic control.

changes in the environment. In the absence of information costs, his adaptation is instantaneous and complete, which is clearly unrealistic, but when positive information costs prevail this is no longer true: adaptation becomes an incremental and time-consuming process.

More broadly, Jensen and Meckling (1994) argue that the view of man in the “rational action” or situational analysis approach is that of a “resourceful, evaluative, maximizing” man (i.e., the REMM model)—a view that they argue is entirely consistent with differences in observed behavior and with learning: “Human beings are not only capable of learning about new opportunities, they also engage in resourceful, creative activities that expand their opportunities in various ways” (1994: 5).¹⁴

Future Directions

Our call for rationalist foundations for the organizational routines and capabilities literature suggests several opportunities for future research. First, the intervening drivers and mechanisms (between the inputs and outputs), as pointed out in Figure 2, provide a fruitful area for future investigation. Rather than search for external factors (such as experience) as antecedents of capability, we suggest that the underlying characteristics of the organization itself provide an opportunity for future work. Thus, for example, the underlying “microfoundations” of organization suggest an opportunity to study the individuals that compose the organization, their underlying characteristics, abilities, choices and so forth (see Felin & Foss, 2005). Furthermore, the organization itself, as an actor, might be studied to understand its underlying nature, such as the identity-related choices of organizations (King et al., 2009). Second, there is an opportunity to understand how choice sets emerge for organizations, specifically how the set of “possible” actions is conceptualized by individuals within organizations. The rationalist approach specifically presumes that the hypotheses and theories of agents drive observations and experience rather than the other way around (Chomsky, 2003; Popper, 1972). As powerfully noted by Charles Peirce: “Man’s mind has a natural adaptation to imagining correct theories of some kinds...If

¹⁴ It is true that while “economists generally profess fidelity to REMM, their loyalty is neither universal nor constant” (Jensen and Meckling, 1994: 10n). For example, economists may routinely invoke the assumption that individuals are pure maximizers of monetary wealth. However, this is fundamentally an operationalization issue, and the rational action model is not committed to this assumption (Popper, 1967; Buchanan, 1962; Jensen & Meckling, 1992).

man had not the gift of mind adapted to his requirements, he could not have acquired any knowledge” (1957: 71). Thus there is an opportunity to understand how the imagination and theorizing of possibilities occurs within organizational settings and how it impacts organizational behavior and performance. Third and finally, our goal has not been to necessarily completely dismiss the role of experience, repetition and the environment in understanding organizational behavior, and thus there is an opportunity to more carefully explicate how experience and the environment “triggers” the emergence of routines or capabilities, as suggested by the “poverty of stimulus” argument. Naturally there are important links between the external (Figure 1) and internal factors (Figure 2) that affect organizational behavior and performance. We hope that this paper leads to additional work along these promising dimensions.

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FIGURE 1
 A Simplified, Input-Output Model of Organizational Routines and Capabilities

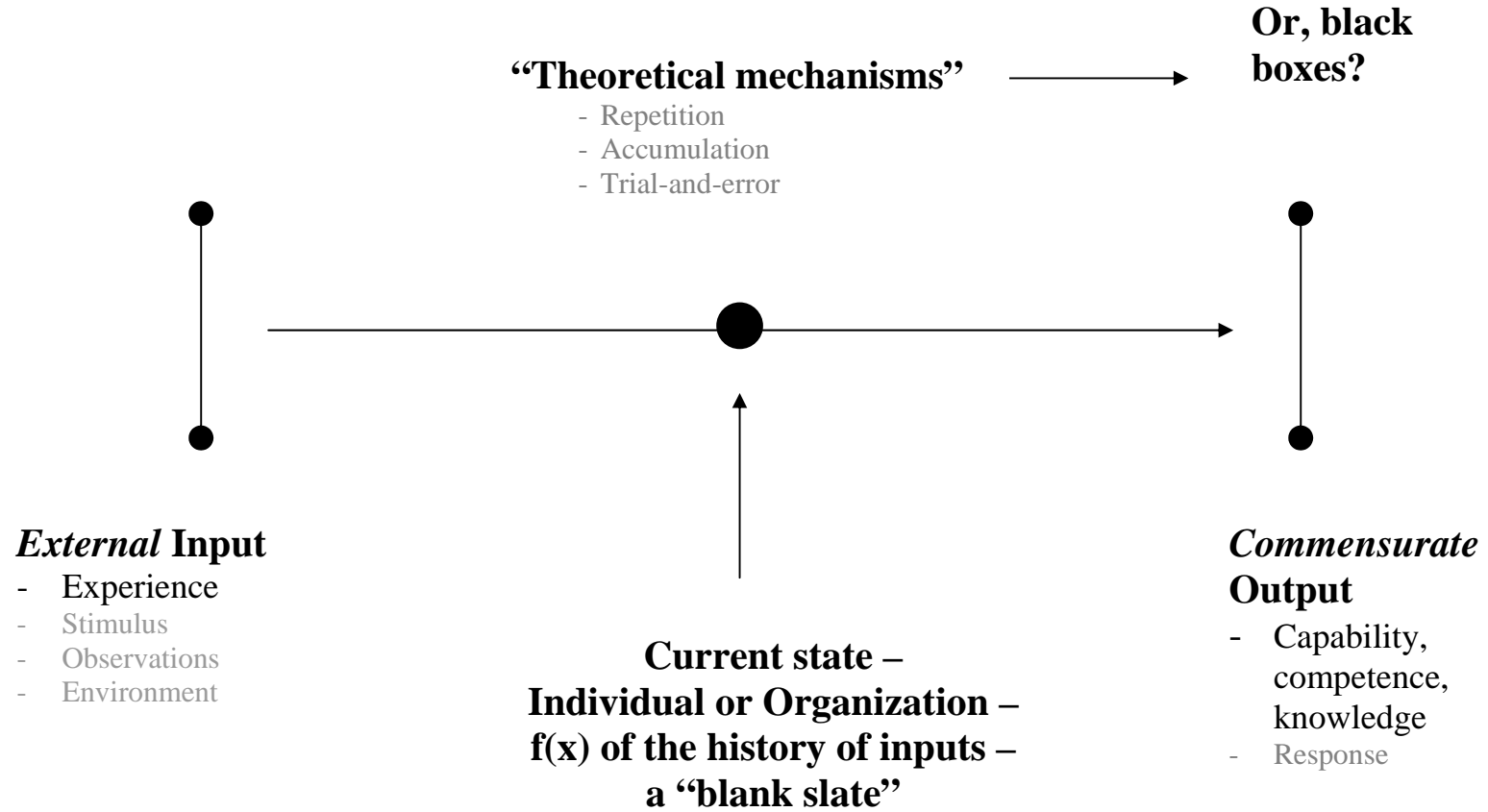
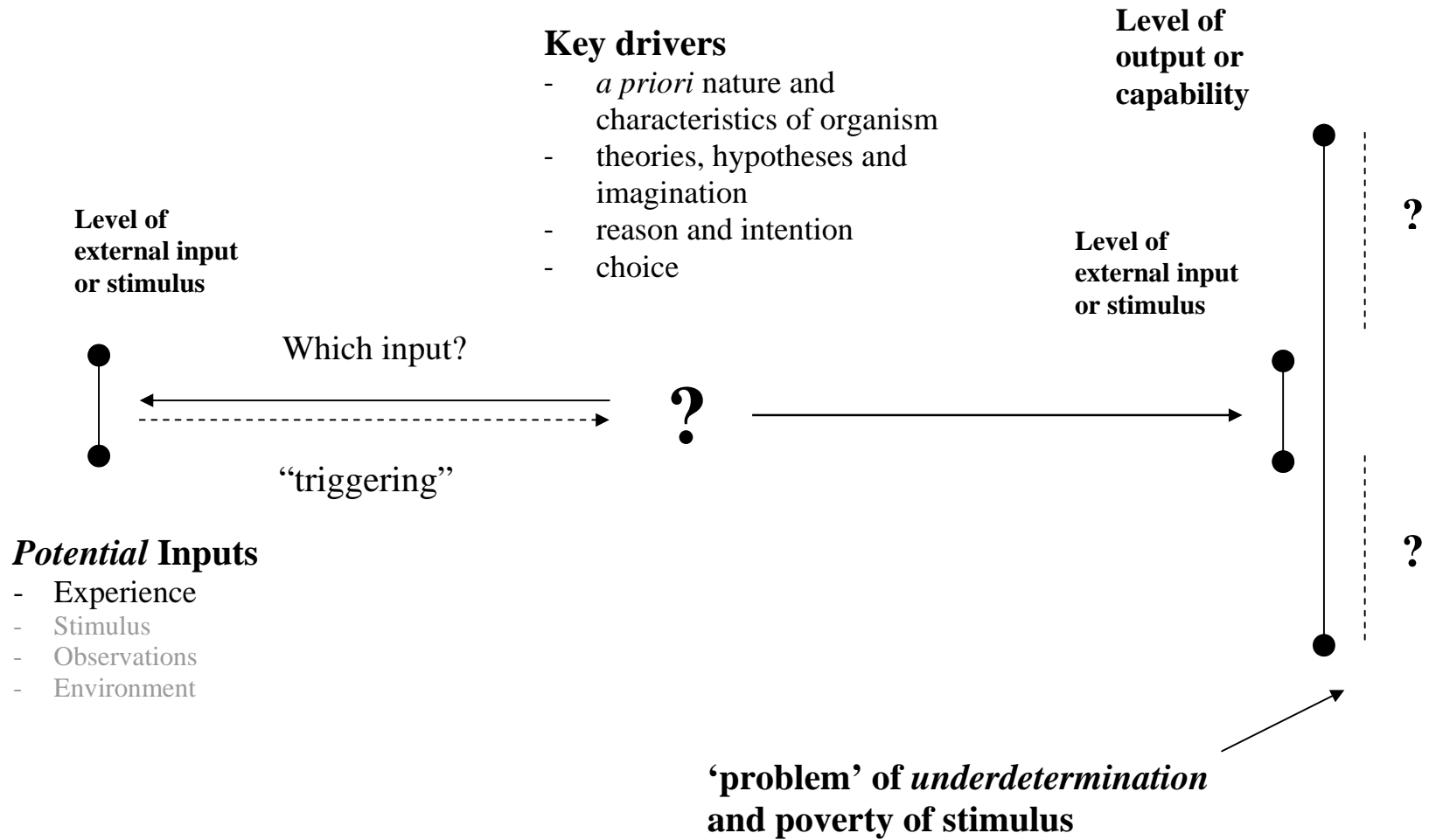


FIGURE 2
The Poverty of Stimulus and Capability Input-Output Relationship



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