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Distinguishing Four Kinds of Beliefs

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ABSTRACT

This paper distinguishes among four kinds of beliefs: *conviction, confidence, perception, conception.* *Conviction* concerns self-ability:"I can build these stairs." *Confidence* also concerns the self—ut focuses on the assertion of will in the face of weakness of will. *Perception* is about the environment such as weather prediction. *Conception* is also about the environment—but usually couched with context. While convictions are noncognitive and nonevidential beliefs, the other beliefs are either cognitive, evidential, or both. This paper uses the terms "cognition" and "evidentiality" as axes to distinguish the four beliefs. While "cognitive beliefs" are about one's environment, "noncognitive beliefs" are about one's self. While the *cognitive/noncognitive divide* is unconventional, it generates a payoff in light of the evidentiality axis. While "evidential beliefs" are correctable via Bayes's rule, "nonevidential beliefs" are not. However, when the nonevidential belief is about the environment, the evidence can at least make the belief more (or less) warranted— where "warrantability" is a weaker criterion than "correctability." And when the nonevidential belief is about the self, i.e., a conviction, the evidence cannot even make the belief more (or less) warranted. The evidence itself develops when one tries to test a conviction. This paper highlights that convictions are the basis of tenacity—crucial for entrepreneurship and economic growth. This paper further demonstrates how three major theories of action—standard rationality, normative theory, and procedural rationality—fail to distinguish the four kinds of beliefs. They, hence, commit, although in different ways, a set of confusions called here the "Bayesian fallacy."

Key words: *Cognitive Dissonance; Internal Motivations (convictions); Normative Theory (embodied cognition); Other Beliefs (confidence, perception, conception); Procedural Rationality Theory (pragmatism); Self-Perception Theory; Standard Rationality Theory*

Introduction

James Heckman has stumbled onto a puzzle. While the expected return on investment in education has risen in the US in the last few decades, people have reduced their investment (Heckman 2007; in Heckman & Krueger 2003; Heckman & Rubinstein 2001). He has proposed that investment in education, "cognitive skills," is not only a function of expected returns, but also a function of "non-cognitive" skills. Noncognitive skills consist of perseverance, tenacity, morale, or internal motivations. Internal motivations must have declined at a steeper rate than the rise of expected returns, which can be regarded as the external motivations or stimuli. He has advocated a policy to stave off the further decline of morale, given that such noncognitive skills are nurtured mostly in the first seven years of life.

The term "noncognitive" is too general. This paper employs "convictions" to denote internal motivations, which amount to self-belief in relation to *the capability to produce*: "I can paint" or "I can finish this project." This paper distinguishes convictions from three other beliefs: "confidence," "perception," and "conception." Confidence is also a self-belief—but it is about *the assertion of rights* vis-à-vis the rights of others and, in case of temptations, future self: "I will not overeat." Perception is a belief about the environment—when the object is *purely empirical*: "the storm will incur about $2 billion in damages." Conception is also an environment-related belief—but it entails *framing, meaning, or context*, which is non-empirical: "the remedy saves 50% of the patients" as opposed to "the remedy kills 50% of the patients" (Tversky & Kahneman 1981; Khalil 2003a).

It is imperative to distinguish among the four kinds of beliefs. It would shed light on the interconnection between internal and external motivations. Further, agents may not be able to

use empirical data to update, via Bayes's rule, internal motivations (convictions)—and hence such inability should not be misconstrued as evidence of irrationality. To distinguish among the four kinds of beliefs, this paper advances a "two-axis information" hypothesis. Along the two axes, e.g., convictions are noncorrectable and nonwarrantable, while conceptions are noncorrectable but warrantable. Both are noncorrectable in the sense that they cannot be judged, via Bayes'srule, as true or false *because both involve meaning (context)*, which is non-empirical. When one asserts "I can paint" or when one conjures the help of God to finish a project, one is setting up an aspiration that acts as a context and hence non-empirical. On the other hand, warrantability is a weaker criterion of empirical corroboration than correctability. Convictions are nonwarrantable *because they involve development of potentiality or capability*—while the same cannot be said about conceptions. As one pursues a goal, the supposed evidence, self-ability, develops—and hence one cannot use self-ability as evidence. In this light, we can define the "Bayesian fallacy":

> **The Bayesian Fallacy:** A view commits the Bayesian fallacy when it treats convictions, which cannot be the subject of Bayes's rule, as no different from other beliefs which are, although in different ways, the subject of Bayes's rule.

This paper actually argues that the Bayesian fallacy comes in two degrees. But, first, this paper explicates, in Section 1, the proposed two-axis information hypothesis. Section 2 stresses the importance of convictions. Sections 3-5 advance the core thesis: convictions are nonBayesian beliefs because, following the two-axis information hypothesis, they involve *meaning* as well as *development*. The rest of the paper sketches three major approaches that commit, at different

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degrees, the Bayesian fallacy: i) standard rationality theory; ii) normative theory, which is dominant in traditional sociology and can be traced to the "embodied cognition" approach of Friedrich Hayek and others (e.g., Varela *et al.* 1991; Lakoff & Johnson 1999; Damasio 2003a, b; 2005; Mareschal *et al.* 2007).; and iii) procedural rationality, which can be traced to Herbert Simon's theory and to American pragmatism, especially John Dewey's later work with Arthur Bentley.

1. The Two-Axis Information Hypothesis

The usage of the term "noncognitive" by Heckman to denote perseverance, morale, or, in short, internal motivations is non-indicative of what is supposes to signify. To start with, what is "cognition"? The term is derived from Latin, *cognoscere*, "to know." The literature on knowledge, knowledge development, cognitive psychology, and neurological substrate of knowledge acquisition is enormous (Still & Costall 1991). This is not the place to survey the literature.[1] It is sufficient to state that the term "noncognitive" in this literature usually denotes the emotions, given that the term "cognitive" is used to denote reasoning (Greene 2005). This paper distances itself from the emotion/reasoning juxtaposition and, hence, does not use the terms "noncognitive" and "cognitive" insofar as they advance such juxtaposition. The juxtaposition can be ultimately traced to the Cartesian dichotomy of emotions and rational thinking.

Even if the term "noncognitive" is used to denote the emotions, the emotions are too broad to denote one particular emotion, viz., morale or internal motivation. To denote morale, this paper employs instead the more precise term "conviction." As defined here, the belief called "conviction" concerns one's ability with respect to *goal commitment* such as running in a race,

start an enterprise, manage a business, or persevere a storm.

Nonetheless, this paper continues to use the broad, non-descriptive term "noncognitive." The term is used in a debate on moral philosophy which can be traced to G.E. Moore's "naturalistic fallacy" and, earlier, to David Hume's law. While complicated and with long and varied literature, Hume's law stipulates that moral believes (noncognitive) cannot be drawn from propositions about the environment (cognitive) (Garner & Rosen 1967, ch. 13). Likewise, this paper restricts, although without necessarily subscribing to Hume's law, the employment of the term "noncognitive" to beliefs about the *self*, while restricts the term "cognitive" to beliefs about the *environment*. As such, cognitive beliefs make sense of the world, which consists of whatever is external to one's skin, human capital (skills), or physical capital (tools of production). So, the environment includes the selves that constitute one's society, other societies, other species, and physical resources and terrains. For instance, a belief about whether one can pass an exam would be noncognitive and, in this case, a conviction—while a belief about the future movement of interest rates or the change of fashions would be cognitive.

This proposed definition of "cognitive beliefs" is narrower than the standard usage of the term in cognitive psychology (Garnham 1994, p. 167; Lycan 1999; Reber 2003). Anyhow, the term "cognitive" is used in the literature in diverse and confusing senses. It generally, though, used to denote the faculty of knowing or mental processes undertaken to solve a problem, i.e., decide on the proper response to a stimulus. This process, though, involves two different moments. First, there is the problem of knowing the environment. Second, there is the problem of deciding on the best response. A belief about the environment usually does not—or should not if one to avoid the self-serving bias—depend on how one thinks about one's self, and in this

sense it is called "cognitive." Cognitive beliefs are images that make sense of how the world works. Defined as such, such images may not be undertaken in order to decide on the proper response to a stimulus. Even when such images serve as inputs for such a response, they *should not* be tainted by one's beliefs about the self. In contrast, a decision on how to respond is different. Although the decision greatly depends on cognitive beliefs, it must depend also on beliefs concerning the self, i.e., what is defined here as noncognitive.

However, this paper employs the term "noncognitive" as an umbrella, i.e., in a somewhat non-descriptive sense. The term here includes beliefs about the self other than convictions, i.e., self-beliefs other that involving *goal commitment*. The term may include self-beliefs that concern honesty or integrity, which is rather about *obligatory commitment*. Obligatory commitments, as opposed to goal commitments, are rules or self-commands aimed to restrain the self from weakness of will such as the temptation to cheat, take a bribe, free-ride, and so on (Khalil 1999). Such obligatory commitments, to delineate them from convictions, are called, for the lack of a better word, "confidence." Confidence expresses one's belief in one's will in withstanding temptations, i.e., the accidental encounters with stimulus that might make him respond in ways that deviate from an optimal (rational) plan of action (Khalil 2008).

But what is the criterion that delineates convictions from confidence—when both are noncognitive, self-beliefs? There is another axis, viz., the type of information, orthogonal to the self/environment divide. Convictions are based on a type called "*context* information." Context affords *meaning* or level of expectation or desire which is non-empirical or nonevidential. So, convictions cannot be subjected to Bayesian updating even at the theoretical level. In contrast, confidence is based on "*content* information"—i.e., information derived from evidence. Thus,

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confidence can be subjected to Bayesian updating—at least at the theoretical level once we give

room to "wishful thinking," "over-confidence bias," or "self-serving bias" (Rosenhan & Messick

1966; Babcock & Loewenstein 1997) and to representativeness heuristic (Grether 1980; 1992).

So, confidence is a "Bayesian belief" because, to borrow the term from Marshall Swain (1972, p.

297), it is an "evidential belief." In contrast, conviction is a "nonBayesian belief" because it is a

"nonevidential belief."

       As Table 1 makes clear however, not all nonevidential beliefs are nonBayesian beliefs.

Type of Information		*Domain* of Information	
		Noncognitive (Self)	**Cognitive (Environment)**
	Evidential (Content)	*Confidence* (Bayesian Belief: Correctable)	*Perception* (Bayesian Belief: Correctable)
	Nonevidential (Context)	*Conviction* (nonBayesian Belief: Noncorrectable and Nonwarrantable)	*Conception* (quasi-Bayesian Belief: Noncorrectable—but Warrantable)

Table 1: Four Kinds of Beliefs

If nonevidential belief is cognitive, i.e., conception it is quasi-Bayesian. This is the case because,

given the "two-axis information" hypothesis, we can characterize beliefs along two orthogonal

axes: the evidential/nonevidential divide and the cognitive/noncognitive divide. The

evidential/nonevidential divide is about the *type* of information, while the cognitive/noncognitive

divide is about the *domain* of information. Consequently, we have four kinds of beliefs:

confidence, conviction, perception, and conception. Confidence is about the self with respect to

content information. Conviction is also about the self, but with regard to context information.

On the other hand, perception is about the environment with regard to content information.

Conception is also about the environment, but with regard to context information.[2]

As argued below, confidence and perception are "Bayesian beliefs" because they are correctable, i.e., can be subjected to truth/false modifications via Bayes's rule. Mike Oaksford and Nick Chater (2007; 2008) surveyed the literature in experimental psychology and showed how robust Bayesian updating in this regard. However, there are other kinds of beliefs, convictions and conceptions, which are noncorrectable because context is nonevidential information. So, such beliefs cannot be corrected as true/false via Bayes's rule. Nonetheless, in the case of conception, the context can be made more (or less) warranted in light of evidence via Bayes's rule and, hence, called "quasi-Bayesian belief." In the case of conviction, the context cannot be warranted because the object, self-ability, evolves with action and, hence, called "*non*Bayesian belief."

One payoff of the two-axis information hypothesis concerns Hume's law and self-perception theory. Concerning Hume's law, according to the noncognitivist view of ethics, moral statements are about the ethical constitution of the self and, hence, by definition cannot be the object of factual evidence as the case with cognitive beliefs (Garner & Rosen 1967, pp. 219-220). Critics of this noncognitivist view (Glassen 1959; 1963) argue that there is no need for the cognitive/noncognitive divide because all moral beliefs about the self are ultimately factual propositions. If the proposed two-axis information hypothesis is granted, the critics of the noncognitivist view of ethics would be correct with regard to confidence, but would be incorrect with regard to convictions. That is, while confidence and conviction are noncongnitivist, it does not entail anything about the other axis, evidentiality or scientific corroboration.

The proposed hypothesis has a similar payoff with regard to Daryl Bern's (1972) self-

perception theory and its critics, viz., the cognitive dissonance approach. Bern postulates, with some evidence, that people update their perception of themselves by observing their own behavior—using the same Bayesian method when they update their perceptions of the behavior of others. Some psychologists have challenged self-perception theory on the ground that agents experience cognitive dissonance (Festinger 1957; Aronson 1969; Harmon-Jones & Mills 1999): If people are simply detached observers of themselves—as they are of the environment—they would not resort to self-rationalization to cover up the gap that arises between actual action taken and the prescribed action that they should have taken.

Such a criticism invokes the issue of positive versus prescriptive theory. The fact that agents self-rationalize does not deny the possibility that they can, at least theoretically, avoid self-rationalization. That is, they can via Bayes's rule update their perceptions of themselves. On the other hand, in light of the discussion below of convictions, there is no undisputable ground upon which the agent can update his or her self-assessment. So, the Bayesian fallacy proposed here goes beyond cognitive dissonance—if cognitive dissonance is limited to cases about beliefs concerning confidence or self-integrity. If granted, this paper implies that Bern's theory is limited to Bayesian and maybe quasi-Bayesian beliefs.

2. Why Convictions?

Psychologists have focused on desire, morale, and aspirations, all related to convictions. Economists have, at least until recently, ignored morale—which is strange given the role of morale in explaining creativity, productivity, division of labor, entrepreneurship, development of capability and economic growth (Khalil 1997a; 2007b). In particular, morale is important to the

functioning of organizations and, hence, has ramification for the theory of the firm (Nooteboom 2000; Weick 1995; Smircich 1983; Choo 1998). It has ramification for economic development (Sen 1999). Further, convictions are the basis of aspiration and ambition, to which Adam Smith (1976, pp. 50-62) paid a great attention. He argued that ambition is at the origin of competition for status in society, which he uses to explain classes, political authority and the origin of the state (Khalil 2005a; 2006).

In the past decade, more economists started to pay attention to convictions or, more broadly, to noncognitive beliefs, to solve puzzles such as the one discovered by Heckman. For instance, Goldsmith *et al.* (1997) call morale "psychological capital." Samuel Bowles *et al.* (2001a, b) highlight how differences in earnings can be traced to differences in internal motivation, morale, or what they call "incentive-enhancing preferences." A number of economists started to note that external motivations (incentives or what psychologists call stimulus) may crowd out internal motivations (Bénabou & Tirole 2002; 2003; Frey 1997a,b; Fehr & Gächter 2000a,b; Ostrom in Gintis *et al.* 2005). The crowding out has been long noted in psychology, starting with the work of M.R. Lepper and D. Greene (1978).

But before delving into the intricate connection between external and internal motivations, this paper shows the failure of standard theory of rationality in isolating and defining convictions, i.e., the beliefs that originate internal motivations. It also examines why alternative approaches, dominant in sociology and psychology, do not fair better in capturing convictions as different from other beliefs. One alternative approach—associated with the later work of Herbert Simon—is based on the view of rationality as *procedural*, which views action as the outcome of heuristics. The other alternative approach—associated with the work of Friedrich Hayek and

dominant in sociology—is based on the view of rationality as *ecological*, which views action as the outcome of algorithms.

Simon (1976; 1977) advanced the notion of procedural rationality in order to distinguish his view of rationality from how mainstream, neoclassical economics has incorporated the concept of *bounded rationality*. The concept of bounded rationality was ironically proposed by the early Simon (1957). The notion of procedural rationality is at the core of modularity approach generally (Callebaut & Rasskin-Gutman 2005), evolutionary psychology (Cosmides & Tooby 1994), and the fast-and-frugal *heuristics approach* (Gigerenzer 2005; 2006; Goldstein *et al.* 2001; Rieskamp *et al.* 2006). Simon's procedural rationality has also gained adherents among non-mainstream economics (Rizzello 1999; Egidi & Rizzello 2003). Simon argued that agents do not make decisions by examining opportunities while taking constraints (which included mental ones) as given. Rather, agents act according to how they acted in the past, i.e., act according to routines or procedures. To wit, Simon's idea of procedures and routines is in line with a particular tradition in institutional economics, called here "pragmatic institutionalism." Pragmatic institutionalism includes the work of Thorstein Veblen, Richard Nelson, Sidney Winter, Bart Nooteboom, and Douglass North. This paper shows that procedural rationality and pragmatic institutionalism are simply based on classical pragmatism epitomized in the work of Dewey and Bentley (1949).

Hayek (1967; 1978), and more clearly Vernon Smith (2003), attacked the neoclassical notion of rationality from a perspective that differs from Simon's. Hayek and Smith were apprehensive about a "constructionist" notion of rationality—a notion that lends hand to setting up a social planner in place of the market. They argued that agents would be involved in self-deceit if they think that anyone can understand all the options in a system as complex as the market—not to

mention trying to submit such a system to a comprehensive plan. For them, agents make decisions according to rules or algorithms that they hardly understand, but they work because of their effectiveness. Smith calls this view of rule-based action as based on "ecological rationality," which greatly resembles the newly emerging research program called "agent-based" modeling (Terano *et al.* 2003; Epstein & Axtell 1996). For Hayek, as well as for proponents of agent-based modeling, action is governed by routines or algorithms. These algorithms are not the outcome of rational deliberation. According to Hayek's notion of rationality, called more appropriately "normative," rules are the product of evolutionary selection operating at the group level (Khalil 1996). So, the normative rules at the level of the agent are the same as the ecological rationality typifying agent-based modeling. These normative rules are similar to the embodied cognition agenda (Varela *et al.* 1991; Lakoff & Johnson 1999)—where rules are seen as part of the body given, at first approximation, prior to experience.

There are deep differences among the standard rationality view, Hayek's normative approach, and Simon's procedural rationality theory. Nonetheless, the three traditions suffer, although in different degrees, from the Bayesian fallacy, i.e., the failure to distinguish convictions from other beliefs.

3. Why are Convictions Nonevidential?

3.1 The Issue of Meaning (Context): Some Philosophy of Science

The question of meaning has been the focus point of many philosophers of social science who argued, such as Peter Winch (1958), that only human action has meaning that can be understood by fellow beings. Thus, the social sciences differ from biological sciences where the behavior of

nonhuman animals does not supposedly involve meaning to be understood by conspecifics. Such a thesis is outdated and need not be discussed here (Khalil 1997b). Anyhow, the thesis of this paper is that convictions involve meaning. The thesis is not that *only* human beings can express meaning.

The question of meaning is central for the philosophy of science. The question is about the relation between categories of the mind, such as beliefs, and empirical data. Can these categories or beliefs, at least theoretically, amount to a mirror of nature, i.e., be mind-independent? For standard rationality theory, as shown below, they more-or-less can be mind-independent. But for the normative and the procedural rationality theories, they can never be mind-independent. Philosophers of science, likewise, are split along the same fissure. Richard Bernstein (1983) classifies them as "objectivists" (corresponding to standard rationality) and "relativists" (corresponding to normative and procedural rationality theories). Peter Lipton (2005) uses, respectively, the terms "realism" and "projectivism." Lipton identifies a third broad grouping under the name "instrumentalism," which we ignore here. Briefly, the instrumentalists, such as Bas van Fraassen (1980, ch. 2) and, in economics, Milton Friedman (1953), dismiss the question because they ultimately regard scientific enterprise as engineering. Scientists, for them, are not interested in theories that reflect nature, but rather interested in models that allow us to predict. So, categories are judge not according to its accuracy or mind-independent—but according to their predictive power.

For realists, such as Karl Popper (1968), the world is full of unobservables, which can become knowable. As Swain states succinctly, the pillar of realism, or more narrowly "empiricism," is the assertion that our knowledge about the world is, or should be, fully based on

evidence:

> One of the pillars of empiricism is the thesis that the primary source of our knowledge about the world is experience. More precisely, to say that we have knowledge of the world means, in part that our beliefs about the world are justified by some true body of evidence that we have gained through experience (Swain 1972, p. 291).

That is, for realists, or theories or, in our case, beliefs are evidential, even when they use unobservable entities such as quarks. In many instances, the beliefs turn out to be inaccurate or even wrong. But, with the hard work of trial and error, which can stretch over decades, scientific theories and beliefs can get better at being mind-independent, i.e., at providing beliefs that can be falsified by the data and hence withstand the rigorous tests of truth.

In contrast, for projectivists—starting from Immanuel Kant (1993) to Thomas Kuhn (1970)—theories, categories, or beliefs can never be mind-independent. The appropriation of the empirical data always involves a perspective, a viewpoint, or the much-used word "paradigm." Perspective, by definition, cannot be mind-independent.

Note, the proposition of the projectivists, viz., that perspective is not mind-independent, should not be confused with the fact that properties such as color, texture, or taste, are always subjective. Such properties obviously require an organism with consciousness to experience them. Realists recognize such subjective properties. John Locke (1975) called them "secondary properties." He distinguished them from "primary properties" such as mass or direction of motion, which supposedly do not require subjectivity or consciousness. It is beyond the scope of this essay to discuss the primary/secondary distinction. In any case, primary and secondary

properties are about *content* information. After all, color or texture, although subjective, is indicative of a property that can be as mind-independent as mass or motion. While a red object might impress one as "red," such redness must stem from a characteristic in the object that makes it look only "red"—rather than "green," "blue," and so on.

Put differently, the issue of perspective raised by the projectivists is not about consciousness, subjectivity, and how organisms experience the world differently according to their particular senses. It is rather about the special type of information at hand. Namely, perspective— what is called here meaning or *context* information—cannot be reduced to content information. If so, context that underpin some beliefs, whether cognitive (environment-related) or noncognitive (self-related), cannot be fully corrected via Bayes's rule.

3.2 Nonevidential Beliefs

The projectivist notion has received a boost with the now-classic Asian disease experiment of Amos Tversky and Daniel Kahneman (1981). In the experiment, two groups of people, selected randomly, behaved differently when offered the same choices except for one difference with respect to the meaning or context of the choices, or what they called "framing." When participants are offered choices of "saving lives," i.e., choices put in positive language, the choices invoke a "gain frame" and prompt most participants to behave in a risk-aversion manner. When participants are offered the same choices but framed or contextualized as "avoiding death," i.e., choices put in negative language, the choices invoke a "loss frame" and prompt mot participants to behave in a risk-loving manner. These results, part of "prospect theory," show discontinuity in the utility function, where one part is concave while the other is convex.

The switch of frames is a robust phenomenon across different treatments (LeBoeuf &

Shafir 2003). In particular, when participants were told about the choice made by the other group,

they did not feel a need to "correct" their perspective. Even when given a chance to think and write

the reason behind their choices, each group chose according to its perspective prompted by the

context or frame. And such framing effect persisted across age groups and professional

backgrounds. The experiment clearly shows that, after all, a glass half-full differs from a glass half-

empty. And such framing language cannot be mind-independent. Such a finding confirms the role

a priori concepts, which Kant's theory stresses. The perspective or conception can never be traced

back to evidence and, hence, is a nonevidential belief.

While conception is a nonevidential belief, it must involve content information. For

instance, there has to be persons saved/killed in the Asian experiment. There has to be water mass

in the cup. To state that a belief is nonevidential, i.e., involves conception, is only about the issue

of how the content information (number of people alive/dead or the mass of water) is interpreted or

made sense of. And such meaning is suggested only by presenting a background or context that

suggests to the participants on what is the foreground.

The issue of foreground/background is the hallmark of gestalt psychology—as clearly

popularized in Rubin Vase and Necker Cube (Gregory 2005). The Rubin Vase, e.g., demonstrates

nonevidential beliefs that are cognitive (i.e., about the environment) and, hence, would be

conceptions. The Rubin Vase shows how empirical evidence viz., the black/white pixels, cannot

ultimately adjudicate between two beliefs: is the picture a drinking goblet or is it two profiles of

human heads? Such a disagreement can never be *corrected* via Bayes's rule because it is about

context that specifies what the foreground as opposed to the background is. Such a context is rather

a command or a choice made by the mind—and no amount of content information (data) can make one belief more truthful than the alternative belief.

This does not entail that more data—e.g., adding eyes, nostrils, and ears to appropriate space of Rubin Vase—does not matter at all in weighing the judgment whether the picture is more about two profiles than about a goblet. Likewise, if one adds ornamented flowers to alternative space of Rubin Vase, the belief that the picture is a goblet becomes more warranted than the alternative belief. In either case, the extra data, content information, or learning is not making one context or meaning more true/false than an alternative. To start with, context information is a mind-dependent category that helps one arrange content information. The set of data only makes one meaning more, following Dewey and Bentley (1949), *warrantable* than the alternative meaning. A belief is warrantable than an alternative if it affords greater simplicity than the alternative, i.e., affords greater union of both the concept and the available data. While such union is mind-dependent insofar as it is infused with the concept (context), it is also mind-independent insofar as it depends on content information that exists *independently* of the mind.

Given these two features of conceptions—viz.,, as mind-dependent and mind-independent—conceptions are "quasi-Bayesian belief." On one hand, conceptions are not "Bayesian belief," as in the case of confidence and perceptions, because the beliefs concern context information that is still nonevidential. On the other hand, conceptions are not "nonBayesian," as in the case of convictions, because the beliefs concern content information, such as eyes and ears in Rubin Vase, which exists independently of the belief.

How does context operate with relation to beliefs about ability, i.e., convictions? When one receives a salary increase of 4%, it might lead to a disappointment if one had expected a 10%

increase. This disappointment is probably behind the much studied phenomenon "loss aversion" or the "endowment effect": When one has an endowment, one expects of himself to spend effort to protect it, while one cannot spend such effort if he does not possess the item (Khalil 2007c). The potential of such disappointment is probably behind the internal motivation to cultivate goals in light of one's expectation. The disappointment of earning 4%, less than one expects, is ultimately about self-assessment. One's reference group does not originate the disappointment. It can only make the disappointment sharper in the case when the members of the group receive 10% salary increase.

However, the 4% salary increase would lead to a great elation if one expected 0% increase. And such elation does not vanish even when one's family members receive 10%, because the agent would not use, or not supposed to use, any acquaintance as one's reference group. The agent uses, or supposed to use, only a proper reference group, i.e., a group that validates self-belief in one's ability (Falk & Knell 2004). Aside from the issue of the "Joneses," one's salary increase may seem a loss or a gain depending on the context or self-expectation. And such context depends on one's choice of how to interpret the salary increase. Such a choice is a command or a context and, hence, cannot be corrected via Bayes's rule.

3.3 Evidential Beliefs

Are there beliefs that are context-free, i.e., evidential beliefs? To assert, and here is the crux of the matter, that context is nonevidential does not entail the total rejection, at first approximation, the arguments of realists. Put differently, to assert that context is nonevidential does not mean that all beliefs must be nonevidential—as the projectivists tend in general to postulate.

There are beliefs about the self that are correctable by content information and, hence, they are evidential beliefs such as "it is better for me to abstain from sweets" and "given my short life, it is better for me to indulge in overeating." Agents rely *fully* on content information to update such beliefs in the sense of coming up with beliefs that are closer to the truth. For instance, if one finds out that sweets are not as harmful, one would adjust his confidence. If one finds out that one will live longer, one would abstain from myopic pleasures that would harm the future self. In these cases of confidence, the agent is formulating what is the best (optimum) plan in light of content information. Given there is no context involved, confidence is evidential.

Context is also not involved in perceptions, where the agent is formulating beliefs solely on content information, such as "the Earth is flat," "it will rain tomorrow," "the storm damaged 200 homes," and "the others are not trustworthy and will cheat me in the next round." The belief concerning trustworthiness usually, at first look, impresses researchers as involving context (Khalil 2003c). The belief about the trustworthiness of others is based on assessment of their intentions, which generally appears to researchers as non-empirical, and hence about context, because intention is reflexive, i.e., invites the problem of self-fulfilling prophecy. It is true that the sub-game perfect Nash equilibrium is reflexive or involves backward induction where intention creates its own reality: One withholds cooperation given that others will not cooperate, which makes others not cooperate. But the issue of backward induction or reflexivity is separate from the belief that others will not cooperate. The reflexivity issue and the belief about the intention of others in a game theoretic setting are often confused (Dupuy 2004). Once the two issues are separated, the belief is nothing other than the respect of property of others or fairness, which is a fully empirical. The agent can find out whether others are trustworthy. Such a task, even though it can be self-serving

and the product of self-rationalization, is still content information that can be correctable, i.e., a

perception represented by true/false statements updated via Bayes's rule.[3]

So, perceptions, similar to confidence, are correctable and, hence, are Bayesian beliefs. In

fact, behavioral decision psychologists and behavioral economists have shown that agents are

ready to correct mistakes about their beliefs in light of new information or the realization that they

have made a mistake, as in the cases of preference reversal (Grether & Plott 1979) and the Wason

selection task (Wason & Shapiro 1971). Also, agents who use heuristics tend to commit errors,

widely known as the representativeness heuristic, the gambler's fallacy, availability heuristic, and

subadditivity (Baron 2000, ch. 6). These errors are the outcome of the fact that agents use

heuristics or rules-of-thumb. Heuristics work efficiently in most cases—and the errors arise in the

few cases when the agents should not have applied the heuristics. They pay the acceptable price of

committing errors (not different from optical illusion) as long as that the total expected benefit of

the heuristics is higher than the cost of the errors. With more careful reflection and thinking, agents

tend to agree and correct their mistakes—which is not the case with the framing (context) effect in

the Asian disease.

4. Why are Convictions Noncognitive?

4.1 The Issue of Development of Capability

The issue of meaning only sets evidential beliefs, i.e., confidence and perceptions, apart from

nonevidential beliefs, i.e., convictions and conceptions. The issue of meaning (context) is

insufficient to set convictions apart from conceptions. The pertinent issue that separates

convictions from conceptions is the domain of information. Conceptions are about the

environment, and called here cognitive, such as interpreting Rubin Vase or the Asian disease remedy. Convictions, on the other hand, are about the self, and called here noncognitive, such as whether one has the ability to receive a 10% salary increase.

So far, though, the cognitive/noncognitive divide is mere re-labeling. Why is the domain of information germane? It is germane in light of a simple observation: Convictions involve an object, viz., self-ability, which evolves as a result of the belief, while conceptions involve another object, viz., the environment, which does *not* evolve as a result of the belief.

4.2 Cognitive Beliefs

Agents express perceptions such as "the Earth is flat," "the son pulled the trigger that killed his father," and "this set of lines will never meet." These agents cannot evolve or change as a result of such perceptual beliefs. This is obviously the case because the Earth will not change its shape and lines will not change their direction as a result of the organism's perception. Organisms are usually ready to correct their perceptions in light of learning more about the environment they are trying to comprehend.

But with regard to cognitive beliefs, viz., conceptions, it is not as obvious that the object of belief does not evolve as a result of the belief. For instance, in the case of Rubin Vase, the object changes depending on the conceptual belief. After all, one would see a goblet (context information) if one commands one's attention to focus on the center space as the foreground. Otherwise, one would see two profiles. Likewise, one would see a half-full glass if one focuses on the bottom half as the foreground. Otherwise, one would see a half-empty glass.

Upon reflection, though, the object (content information) of the conception, as expressed in

the pixels of the picture or water mass in the glass, does not change as a result of the change of conception (context information). That is, if one sees a half-full glass or, as a result of gestalt switch, sees a half-empty glass, does not cause the amount of molecules in the glass to change. As defined above, while conceptions are mind-dependent insofar as they are infused with concepts (context), the water mass are mind-independent. This complication prompts one to call conceptions "quasi-Bayesian beliefs" in order to distinguish them from Bayesian beliefs such as "the Earth is flat." That is, conceptions are "quasi-Bayesian" in the sense that they are infused with context information, which is absent in the case of Bayesian beliefs.

On the other hand, the context that infuses conceptions can still be warranted in light of content information—unlike nonBayesian beliefs called here "convictions." Although conceptions depend on context information that is nonevidential, conceptions depend on content information that is solid, i.e., mind-independent. This explains why conceptions, although nonevidential, are warrantable, but still noncorrectable, via Bayes's rule: The content information is allowed to be used via Bayes's rule to support one interpretation or meaning of the data to be more warranted, but not more true/false, than an alternative. No matter what frame (context) one adopts, the frame underpinning conceptions, at best, rearranges the data to highlight what is important and what is less important. And as more data is introduced, one interpretation can become more warrantable than an alternative. This is possible only because the content information is mind-independent.

4.3 Noncognitive Beliefs

There is the set of beliefs, i.e., "convictions," where the content information cannot be mind-

independent—unlike the mind-independent data in conceptions. Such beliefs, besides being

nonevidential, they are noncognitive, i.e., they concern the self. The context in the case of

convictions, unlike the case of conceptions, cannot even be warrantable via Bayes's rule: The

content information cannot be used via Bayes's rule to support one conviction or another. The

mere testing of one's conviction entails the development or evolution of the content information.

In convictions, content information is not merely re-arranged by the context as the case with the

Rubin Vase. Rather, in convictions, the content information itself evolves in light of the context.

The context which defines the aspiration level entails action that makes ability, the basis of the

aspiration to start with, to develop.

While both involve context, convictions by definition entail internal motivation while

conceptions do not. Kahneman (in Kahneman &Tversky 2000, Introduction) notes the difference

when he contrasts the framing effect with the endowment effect. But Kahneman does not

explain it. Namely, the framing effect in the Asian disease (i.e., conception) is free from

motivation, while loss aversion that is behind the endowment effect (i.e., conviction) involves

motivation. One can be dogmatic about an interpretation of events according to a conception. In

fact, the dogmatic belief might urge one to make certain choices. But one can equally be

dogmatic about an alternative interpretation and purse a different course of action. So, particular

conception cannot explain persistence or perseverance, because an alternative conception can

deliver the same result. In contrast, if one gives up a conviction, such as "I cannot be a

successful carpenter," there is no alternative conviction that can deliver same perseverance,

tenacity, or internal motivation.

The reason why conviction entails internal motivation is that when the context information

is about the self, the meaning affords an evaluative dimension of what one could become. As such, one cannot first verify the belief of what one is capable of becoming, and then acts. The very step to verify involves action. Let us say that one aspires to be a successful carpenter. In order one to have a belief that he can become such a carpenter, it seems that one, first, needs information to substantiate, via Bayes rule, such a belief. To have such information, though, one must perform and cut some wood. The mere act of cutting the wood, though, involves the evolution of ability, which changes the evidence that one is supposed to use. That is, there is no evidence that exists independently of the conviction (Khalil, 1997a; 2007b).

The issue is not that one is ignorant of one's type and, hence, needs some kind of self-signaling to affirm one's belief as argued by Bénabou and Tirole (2002; 2003). Rather, the issue is that self-ability is created as the person acts—there is no mind-independent type that the person can discover (Khalil 2005b).

In this light, one can make sense of what Peter Carruthers (2006; 2007) calls "act-first," as opposed to "thought-first," behavior. For Carruthers, theorists have modeled action as the product of beliefs, as if beliefs are first thought out on the basis of Bayesian updating. However, he argues, much of our behavior is the outcome of "act-first"—where the action is not justified by thought out beliefs.

5. First- and Second-Degree Bayesian Fallacy

So, convictions are characterized by two axes or dimensions: context (meaning) and development. As a result, we can identify two degrees of Bayesian Fallacy:

First-Degree Bayesian Fallacy: A view commits the first-degree Bayesian

fallacy when it treats convictions (nonBayesian belief) as no different from

confidence or perceptions (Bayesian beliefs).

Here, the theorist would be committing the Bayesian fallacy along two dimensions. First, the

theorist would be reducing context to content information—which should not be the case given that

context information is nonevidential. Second, the theorist would be ignoring the issue of

development as if all beliefs are warrantable—as if the object of the belief does not develop as a

result of the belief.

In contrast, we can have the Bayesian fallacy only along one dimension:

Second-Degree Bayesian Fallacy: A view commits the second-degree

Bayesian fallacy when it treats convictions (nonBayesian belief) as no

different from conceptions (quasi-Bayesian belief).

Here, the theorist would be ignoring the issue of development—as if convictions are warrantable as

conceptions. But there are beliefs, as just stated, that cannot be warrantable because the object of

the belief evolves in light of the belief.[4]

Note, the two degrees of the Bayesian fallacy do not encompass another confusion, namely,

the solipsism or the rhetorical approach of Friedrich Nietzsche (1989; see Breazeale 1979). In the

two degrees of fallacy, the conflation runs by treating issues concerning convictions as a matter of

empirical corroboration. In both degrees of fallacy, hence, there is a commitment to a modernist

project (McCloskey 1994; 1998). In contrast, Nietzsche is not at all committed to the "truth

business" of the modernist agenda. He rather runs the conflation in the opposite direction. Namely,

he would dissolve Bayesian and quasi-Bayesian beliefs as instances of convictions. Put simply,

Nietzsche treats all statements about the environment as no different than statements about self-

ability. Given the space constraint, this paper discusses only with modernist theories.

This paper identifies three major modernist theories. All three commit, although in different degrees, the Bayesian fallacy. Figure 0 provides a thumbnail guide of the three theories
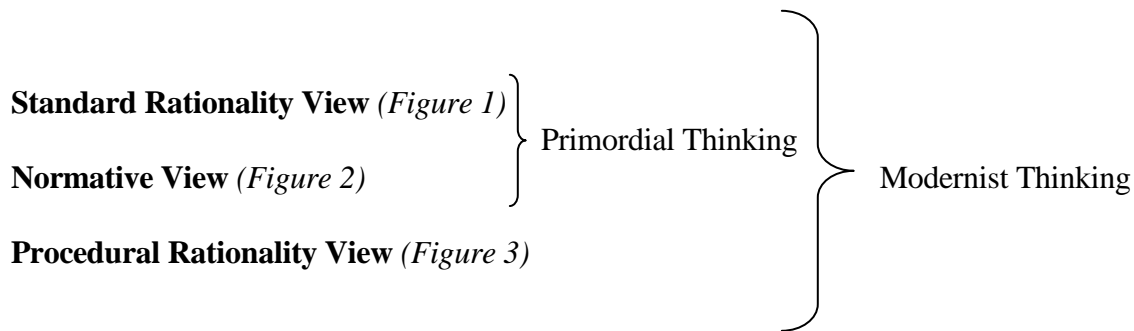
Standard Rationality View *(Figure 1)*

Normative View *(Figure 2)* ⎬ Primordial Thinking

Procedural Rationality View *(Figure 3)*

Modernist Thinking

Figure 0: Theories of Beliefs

which are examined in the following three sections. The rational choice theory of beliefs is dominant in economics and behaviorism in psychology. It generally treats convictions as no different from confidence or perceptions, i.e., commit the first-degree Bayesian fallacy. The normative theory of beliefs that typifies embodied cognitions (Hayek's approach) is dominant in sociology and anthropology. Finally, the procedural theory that typifies classical pragmatism (Simon's approach) is juxtaposed to the standard and normative approaches. The last two approaches treat, in different ways, convictions as conceptions. Thus, they commit the second-degree Bayesian fallacy.

6. Standard Rationality View: Belief-as-Choice

According to the standard rational approach, as Figure 1 shows, agents choose an action
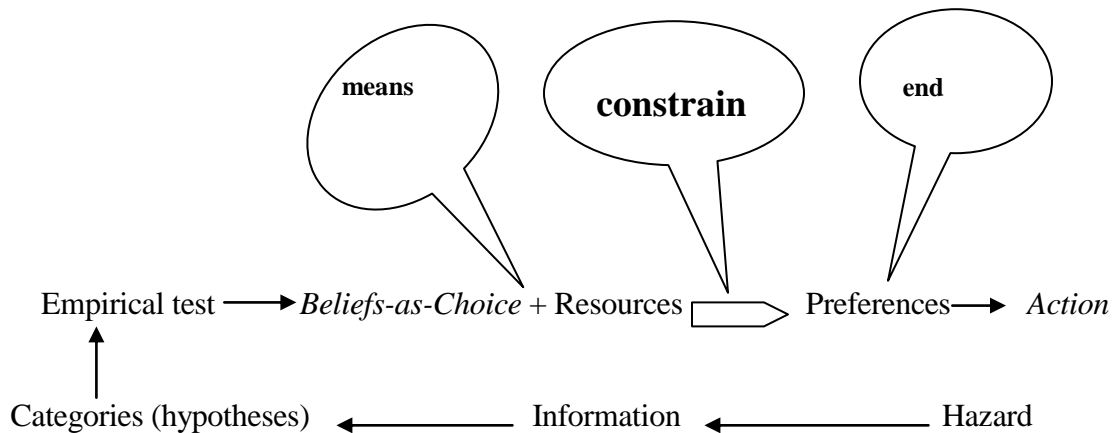
Figure 1: Standard Rationality View of Belief

as the result of means (the budget function) that constrain the ends (the preference set). Action is a choice in the sense that the agent can substitute among preferences in light of incentives. The incentives include beliefs about the environment, viz., expectations of relative abundance of means or resources. So, to account for an action or a response, one only has to consider the beliefs about the incentives, which are rationally formed via Bayesian updating. So, such beliefs are Bayesian. Dewey and Bentley (1949) call this view "interactional" because the source of response is supposedly the stimuli or the incentives that the external environment imposes on the agent.

For the standard rationality (interactional) view, the set of means does not only include the usual resources (capital, labor, and land), but also includes beliefs. So, beliefs are supposedly of one kind: All beliefs have to be justified by available empirical evidence. These beliefs include conceptions about regularities of nature (including one's society) as well as convictions about self-ability.

Such a view of beliefs makes no distinction between evidential beliefs (confidence and perception) and nonevidential beliefs (conception and conviction). It also does not make a

distinction between cognitive beliefs (perception and conception) and noncognitive beliefs

(confidence and conviction). In short, while confidence, perception, and conception are sensitive,

in different degrees, to empirical evidence, they do not undergo development because the object of

these beliefs, the environment, is given. This is not the case with regard to convictions. The

objects of convictions develop with action. The standard rationality approach, hence, commits the

first-degree Bayesian fallacy.

The lumping of convictions with other beliefs is illustrated in Figure 1. The direction of

causality between beliefs and empirical evidence makes no distinction of whether the belief is

Bayesian, quasi-Bayesian or nonBayesian. Beliefs are seen as the result of a confirmation method:

categories and hypotheses are the products of empirical evidence. Beliefs are justifiable insofar as

the limited, but available, empirical evidence supports them. The evidence afforded by the

information can change as a result of a hazardous event, i.e., an exogenous shock that changes the

content of information or the cost of collecting information. So, as shown in Figure 1, it is hazard

that sets the whole mechanism into motion. When hazard strikes, the relative costs of information

changes, which means we have a new optimum level of information. The new optimum level

induces the rise of new categories that give, in turn, rise to new beliefs. Consequently, action-as-

choice changes.

The interactional model of action-as-choice faces a problem. Namely, the action might be

indeterminate. The same agent may take two different actions, even when there is no change in the

data in terms of preferences and constraints. The reason, as already discussed, is framing: Action

depends on changes in the context, which should be irrelevant since context cannot be part of the

data. One should not decide whether to drink from a glass if he sees it as half-full or half-empty.

Note, some changes of data is not about context—such as whether one would want to buy a home next to funeral parlor or eat steak after a visit to the slaughterhouse. Such encounters invoke certain emotions that are based on content data. However, context does not involve content data. It is about the manner in which the *same* information is presented; it is about the framing of data in a language of loss or gain (Tversky & Kahneman, 1981). So, action is indeterminate given that context can change without any change in the data.

The fact that some beliefs—and hence actions—can change without any change in the empirical data undermines the basic assumption of rational choice. It also undermines the basic assumption of empiricist methodology, viz., the assumption that the mind is ultimately a blank slate (*tableau rasa)*. After all, some facts do not speak for themselves. The agent may have to organize some facts according to beliefs or categories that cannot be empirically based.[5] So, the empirical evidence is not, at least in some cases, so innocent: It is constructed (individually or socially) by the context or perspective that the agent brings with him or herself.

Consequently, there are two options. One can follow David Hume and become skeptical of beliefs themselves, and argue that they are merely figments of the mind. Or one can conclude that empirical evidence, after all, is not the prime mover. The latter option is the basis of the normative view discussed next.

7. Normative View: Belief-as-Norm

The normative view defines basically the approaches of classical sociology and anthropology. It also typifies schools in psychology that stress the importance of personality traits or childhood history in determining current behavior. These approaches minimize the influence of incentives or

stimuli. The normative view is orthogonal to the debate between reductionism and holism, i.e.,

whether the traits/predispositions of agents are socially, as opposed to biologically, determined.[6]

Dewey and Bentley (1949) call this view "self-actional" to signify that the view regards the primary

source of behavior is internal disposition as opposed to the external environment, incentives, or
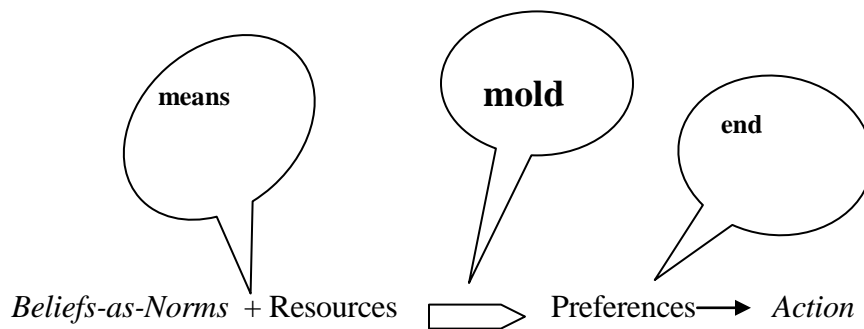
stimuli.

Figure 2: Normative View of Belief

Figure 2 captures the core of the normative (self-actional) view. Here the set of means

molds, rather than constrains, preferences after its own image. The molding is carried out by

beliefs-as-norms ranging from biological needs, psychological imperatives, social roles, and

cultural customs. So, the end result, action, is not primarily formed by environmental incentives.

The action of the agent—whether seen as a person or a social group—is rather rigid vis-à-vis the

environment.

The normative (self-actional) view basically does not try to explain the origin of beliefs.

People behave in certain ways because of their cultural norms, mentality, or childhood inhibitions.

The normative view may allow for hazard to influence the formulation of beliefs. In any case, once

formed, beliefs-as-norms generally mold the information of the environment after their own image.

Logical reasoning may act to make the beliefs internally consistent. But the beliefs are ultimately

prior to empirical data. That is, beliefs are not, at first approximation, formed by empirical data—contrary to the standard rationality view.

There has been great attention, with the recent revival of post-modernist thinking, on the importance of language as the entry point of theorizing. That is, language supposedly encourages certain beliefs that explain behavior. In particular, according to Ludwig Wittgenstein and other postmodernist thinkers, terms and phrases that a culture employs have, firstly, little meaning without context, and thus cannot refer to person-independent reality (Winch 1958). Secondly, words and phrases make sense in relation to other words as formulated in sentences. Sentences thus make sense of a world that comes unlabeled by structuring the environment of everyday experience after their own meaning. If this is the case, the information that agents see are already entailed by their particular linguistic heritage. So, agents examine their environment with a norm, or what John Searle (1999; 2001) calls "background," which is woven into a "socially constructed" reality.

Thorstein Veblen, or at least his legacy, also advanced a normative view, where norms were regarded as socially constructed (Khalil, 1995b). The normative view, though, need not be based on the view that norms are socially constructed. Some thinkers, such as Hayek (1952; 1967; 1978), advance a normative view that is based on asocial, reductionist grounds. Hayek argues that the mind is ordered around categories or units of "knowledge." Such categories are profoundly subjective (Boettke *et al.* 2004). The "subjectivity" notion entails that the categories precede experience and, hence, the categories frame what one conceives (Scazzieri 2003). This view of knowledge is reminiscent of the embodied cognition view of George Lakoff and Mark Johnson (1999), and Francisco Varela (Varela *et al.* 1991) view: The categories of knowledge arise largely

prior to experience. The categories are seen, at first approximation, as the determinants of experience. Such a proposition has not gone unchallenged. For instance, Andy Clark (1997) appreciates the idea that our categories are not mirror reflections of objective reality, but he nonetheless argues that they cannot be seen as constructs that precede experience. Similar to Clark, Edward Feser (2003) argues that Hayek considered the things in-themselves to be beyond knowledge as discovered by experience. Hayek's view, according to Feser, is based on the assumption that experience is shaped by *a priori* categories.

Hayek's idea of norms as preceding experience resembles the approach of Antonio Damasio (2003a; 2003b) and a host of others (cf. Elster 1998; Green 2005). For Damasio, most of human behavior, norms, and moral values are determined by the emotions—whereas reasoning is only recognized as secondary. He even argues that reasoning is a social construction or a "justification" of moral intuitions which are given prior to interaction with the environment (Damasio 2005, p. 53). Such a view affirms the Cartesian dichotomy between the emotions (intuitions) and reasoning—but unlike Descartes, Damasio emphasizes the emotions or hidden processes as more perennial than rational thinking in explaining behavior. For Damasio, the emotions are the states of the organism that shapes the organism's specific wants. Therefore, choice is seen as expressive of some innate or indoctrinated norms.

The normative (self-actional) view of action-as-norm faces two problems. The first problem, shared also by the procedural rationality view, it basically cannot answer the question concerning the origin of beliefs. And when "society" or "culture" is invoked as the source of beliefs, it only postpones the questions: Why would a society or a culture choose one norm over another? The normative view cannot provide reasons grounded on the set of means, such as

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geography or technology, because it would mean that beliefs are optimum outcomes. The normative view must ultimately rely on hazard or accident.

In this regard, the normative view resembles a core assumption of neo-Darwinism. For neo-Darwinism, the genotype also arises from hazard or accident. For neo-Darwinism, the behavior of the agent—whether conceived as organism or social group (Sober & Wilson, 1999)—is more-or-less determined by the genotype, irrespective of the environment. But there is one difference. For neo-Darwinism, natural selection makes sure that the best genotype is allowed to procreate at a rate greater than other genotypes. Over many generations, the behavior of the organism is said to be optimum—in the same sense as if the behavior is the outcome of rational optimization.

The normative view does not recognize that there are many kinds of beliefs. One type, Bayesian beliefs, can be grounded on empirical data and learning—as in the case of finding out about the weather tomorrow or who won the football match ten years ago. Such beliefs arise from optimization in light of information or constraints such as geography and technology. So, we do not need to appeal to hazard and accident to explain the origin of at least Bayesian beliefs.

Concerning the second problem, even when beliefs originate from non-empirical categories, the normative view fails to disentangle convictions from conceptions. This is discussed next since the procedural rationality view also fails to disentangle convictions from conceptions. That is, both views commit the second-degree Bayesian fallacy.

8. Procedural Rationality View: Belief-as-Routine

While the standard (interactional) view traces the categories to empirical evidence, it cannot

ultimately explain why same evidence can give rise to different beliefs. On the other hand, while the normative (self-actional) view traces empirical evidence to categories, it cannot explain Bayesian beliefs where empirical data is primary.

As Peter Godfrey-Smith (1996) amply shows, Dewey proposed an alternate account to supersede the shortcoming of the standard rationality and normative views. Dewey's account anticipates Simon's notion of decision making as about procedures. Simon's procedural view is the basis of pragmatic institutional economics as evident in the works of Richard Nelson, Douglass North, and, earlier, Thorstein Veblen (Khalil 2007a). For them, institutions are not chosen; they rather proceed as routines. As such, routines are not questioned or revised unless a hazard occurs.

Dewey developed the procedural view, which he called the "transactional view," with Bentley (Dewey & Bentley 1949). They chose the term "transaction" specifically to argue against the dichotomy between fact and category. Such a dichotomy is behind the assumption that either fact precedes category (the standard rationality view) or the assumption that category precedes fact (the normative view). Dewey and Bentley stressed that fact and category are involved in a union or a transaction. Dewey and Bentley were not the first to articulate the philosophical approach that expresses the unity of categories and empirical facts. A host of new philosophers of science, of whom Kuhn (1970) is the most well-known, stressed this transactional union of categories, which he called "matrix" or "paradigm," and empirical evidence. And before Kuhn and pragmatism, there is a long philosophical tradition that extends to Søren Kierkegaard and runs through the phenomenology of Edmund Husserl and the existentialism of Martin Heidegger. In this paper, we will restrict ours attention to the procedural rationality (transactional) view as advanced by Dewey and Bentley.

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The transactional view regards categories and empirical evidence as facets of the same complex reality. Contrary to the standard rationality view, reality does not consist of empirical evidence, while categories are mere mirror image made up in the mind. Contrary to the normative view, reality does not consist of categories, while empirical data is a figment or a shadow of the categories. Rather, reality is the union (transaction) between categories and empirical evidence. The reality of a "tree" is the product of empirical evidence and how we classify a number of objects. There is no "tree" out there. There are only particular individual examples of particular orders of plants.

As Figure 3 shows, adopted from Frank Ryan's (2002) reconstruction of Dewey/Bentley's theory,

Categories (hypotheses and ends)

"Hazard"   (intellect)

Beliefs as routine ⟶ Problematic situation   Experiment ⟶ Beliefs as explicit
(Action-as-routine)   (warranted assertions)

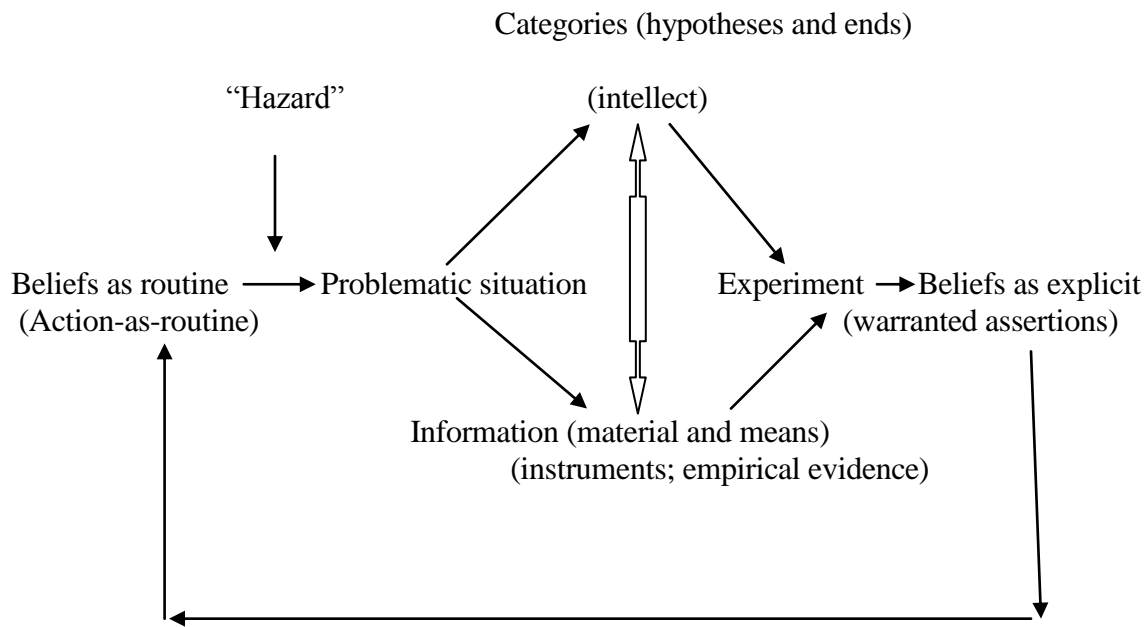Information (material and means)
(instruments; empirical evidence)

Figure 3: Procedural View of Belief

the transactional view postulates that the entry point should *neither* be a mind or intellect *nor* empirical facts—as if the two are separate. Rather, there is no entry point. The belief that appears

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as a routine appears as part of a circle that involves the union intellect and empirical data.

Aside from their differences, the standard rationality (interactional) view and the normative (self-actional) view share the same Cartesian entry point that posits the subject (mind or intellect) as separate from the objects (sensations or empirical data) (Khalil 2004). It is true that in everyday experiences, the mind reflects on sensations as if the two are distinguishable. For Dewey and Bentley, while the subject and object are distinguishable, they cannot be separated in a radical way. Following Charles Peirce's critique of the Cartesian dualism, Dewey and Bentley regard reflection or thinking as the aberration; it is the result of a shock that inflicts an unreflected routine or belief. For Peirce, Dewey and Bentley, the first approximation of organisms should not be thinking. This is contrary to the first approximation of the Cartesian view: it posits thinking as the foundation of action. For them, the first approximation of organisms is action-as-routine, where the action is informed by more-or-less stable beliefs. That is, organisms are not born to think and make conceptions of the environment, but rather to act and make a living. In *Logic*, Dewey (1938, ch. 6) argues that agents have implicit beliefs consisting of "primary experience" or "havings." The "havings" are not the result of cognitive reflection, but rather the result of successful problem solving activity of a living, breathing organism.

So, beliefs involve the union (i.e., transaction) of subject and object in the form of the union between, respectively, categories and sense data. To clarify, the term "categories" for the transactional view is not exclusively about conceptions of the world, but also about beliefs about the self. Likewise, the term "empirical evidence" is not simply about information concerning how the environment works, but also about available resources that define the ability of the self.

The proposed symbiosis of categories concerning *knowing* and sense data concerning he

known is the bedrock of the transactional view. To posit *knowing* as prior to the *known*, as

supposed by the normative view, or *vice versa,* as supposed by the standard rationality view,

amounts to a primordial framework that invites the problem of the external environment, viz., how

do we know what we know about the environment. To avoid the problem of the external world,

which has occupied Western philosophy at least starting with Descartes' work, Dewey and Bentley

rejected the separation of the mental from sensations, the categories from information, or, what they

called, respectively, the knowing from the known.[7]

But how do beliefs change? This question is pertinent given that Dewey and Bentley, as

well as advocates of Simon's procedural rationality, refuse to start the analysis with the intellect,

knowing, awareness, or consciousness. For them, awareness or consciousness arises as a product

rather than a starting point. As a product, awareness emerges when a routine process is confronted

with a crisis or, what Dewey calls, a "problematic situation." For Bentley (1941), the organism

involves the body and whatever it uses to survive, such as the grass that supports it. While the body

is delimited by the skin, the organism should not be delimited by the boundary of its body, i.e., the

skin, fur, and whiskers. The organism need not be aware of the grass upon which its body stands as

much as it need not be aware of its forelegs or its hair. Forelegs and hair are tools that are part of

the production process as much as the grass. The organism becomes aware of its tools only when

something goes wrong that disrupts the routine, i.e., when a problematic situation arises.

With the advent of a problematic situation, the implicit belief taken as a routine becomes

explicit, the subject of reflection and scrutiny. In a problematic situation, the transactional union of

knowing and the known breaks up into intellect, on one facet, and empirical evidence, on the other.

 The agent seeks new categories to solve the problematic situations or make sense of the new data.

If the newly proposed category or belief (called "hypothesis," if carried out systematically by a scientist) stands the experimental test repeatedly, it becomes warranted. As such, and over time, the warranted belief becomes an implicit belief that informs action-as-routine (see Figure 3). The agent would not reflect on the new routine unless another crisis disturbs the settled, implicit belief.[8]

For the procedural rationality view, hazard disturbs the unreflected routine—irrespective of whether the routine concerns conceptions about patterns in the environment or concerns technological action that entails convictions about self-ability. The procedural rationality approach expressly conflates cognitive routines, based on conceptions, and technological routines, based on convictions (Khalil 2007a). Both routines supposedly proceed in the same manner and are re-assessed only when hazard strikes. The re-assessment takes the form of an alternative hypothesis which, if it survives empirical testing, becomes the new routine. This means that action to produce, which involves beliefs about self-ability, and action to inquire about the environment, which involve beliefs about the environment, are subjected to some quasi-Bayesian updating. It is quasi-Bayesian because, for the procedural rationality view, categories are not mirrors of empirical data to start with. So, they cannot be right or wrong. They can be only warranted or nonwarranted. The procedural rationality view, similar to the normative view, recognizes that the categories are nonevidential. Therefore, when hazard strikes, which calls for new categories, the new ones, if proved to be suitable, would become more warranted, but not more true, than the older ones.

While conceptions about the environment can be more warranted than other conceptions, this cannot be the case with convictions. The environment does not develop as a result of holding one conception rather than another. If one views a medical remedy in the loss frame, as opposed to the gain frame, it would not change the effectiveness of the remedy.

However, as stated earlier, ability does develop as a result of one's conviction. If one upholds a belief that one can paint and act on it when young, while shelving the belief that one can sing, the person would evolve as a painter. Such evolution is an irrevocable development arising from action (Khalil 2007b). Such development makes it impossible to test whether the other conviction about singing is more warranted than the conviction about painting. The "evidence," i.e., ability, has developed in an irrevocable manner. While mechanical systems, such as the motion of a billiard ball, can be reversed, biological ability moves in a direction that cannot be retraced.[9] If one starts singing at a later stage, the outcome cannot be used as evidence. The person at a later stage is not the same, younger person that started painting. Once one "tests" ability, the ability itself develops along a process that cannot be revoked. The young person cannot be retrieved anew to test the belief that was not attempted. The ability has developed in an irrevocable way that sets up a new person on the stage.

This highlights the problem that faces the procedural rationality account, similar to the one that faces the normative view. Namely, both fail to distinguish between conceptions and convictions—even if both are non-empirically based beliefs. For instance, some non-empirically based beliefs are flimsy. The belief that the figure in Rubin Vase is a goblet, as opposed to two profiles, is shallow in the sense that the agent can easily switch away to another belief. Definitely, if more details are added to the Rubin Vase, such as ornaments on the goblet, agents would tend to see the figure as a goblet. But insofar as the Rubin Vase remains free of details, the belief that it is a goblet is never stable. This is not the case with beliefs concerning one's assessment of self-ability. Beliefs abouself-ability are usually deep—i.e., they are not shallow. Even after many failures and obstacles, agents usually persevere. In some cases, failures may simply make the agent

more determined to succeed.

With respect to empirical verification, the beliefs about self-ability (convictions) and beliefs about figures in the environment (conceptions) are similar, namely, both are noncorrectable despite of further examination of empirical data. Nonetheless, they cannot be of the same kind, given that one belief is shallow while the other is deep. So, the treatment of all non-empirically based beliefs as equivalent, subject to warrantability, amounts to committing the second-degree Bayesian fallacy.

9. Conclusion

Not all beliefs are born equal. The proposed four-way distinction among beliefs would, foremost, help us avoid the Bayesian fallacy. One would commit the Bayesian fallacy when one treat beliefs as if they are all equally updatable via Bayes's rule. The four-way distinction allows us to identify one kind of beliefs, "convictions," which proves to be of particular importance. Convictions are about *internal* motivations, which differ from *external* motivations or what economists call "incentives" and psychologists call "stimuli."

Convictions are beliefs about one's ability to produce: "I can be a successful hairdresser"; "I can climb this mountain." Convictions are at the origin of perseverance, tenacity, or morale. A conviction concerns an object, namely, ability, that cannot be defined precisely even in a world of perfect information. Ability is a potentiality in the sense that it undergoes development and evolution as a result of action. This is not the case with the other three kinds of beliefs.

The other three kinds of beliefs—involved differently in formulating external motivations— are called "confidence," "perception," and "conception." Confidence is also about the self—but the belief concerns the will with regard to withstanding temptations: "I will resist cheating on the

exam." Perception is about the environment—when the belief is fully based on empirical

evidence: "the interest rate rose last year." Conception is also about the environment—but the

belief involves framing, context, or meaning: "the interest rate rose unexpectedly last year."

Convictions can neither be corrected nor made warranted via Bayes's rule. First,

convictions are noncorrectable because the object, self-ability, involves context which has no

empirical basis. One chooses the context to make sense of one's ability. The context is at the

origin of self-expectation, aspiration, or desire. Second, convictions are nonwarrantable because

the object, self-ability, evolves when one acts to test it. Convictions are of some importance

because they are at the core of entrepreneurship, innovation, and creativity. They are imperative

for understanding the vitality of organizations and economic development.

To understand how convictions (internal motivations) are related to the other three beliefs

(external motivations), we need to explicate how humans process information. This paper

proposes a "two-axis information" hypothesis: *type of information* versus *domain of information*.

Concerning the type, is the information about empirical content, such as rise of interest rate, or is

it about the context, such as how to interpret such rise? The content information forms *evidential*

beliefs, while context information occasions *nonevidential* beliefs. It is possible to use Bayes's

rule to correct evidential beliefs, but one cannot use information to correct nonevidential beliefs.

Concerning the domain, is the information about the self or is it about the environment? The

self-related information gives rise to *noncognitive* belief, while the environment-related

information occasions *cognitive* belief. These two axes can sort out the four kinds of beliefs:

1. *Confidence:* noncognitive-and-evidential belief

2. *Conviction:* noncognitive-and-nonevidential belief

3. *Perception:* cognitive-and-evidential belief

4. *Conception:* cognitive-and-nonevidential belief

If evidential, the beliefs (confidence and perception) can be subjected to Bayesian modification and, hence called "Bayesian belief." However, if nonevidential, the beliefs (conviction and conception) cannot, although with one *qualification*, be subjected to Bayesian modification. If the belief is about the environment (conception), the information can make the belief more (or less) warranted and, hence called "quasi-Bayesian belief." If the belief is about the self (conviction), the information cannot even make the belief more (or less) warranted and, hence, called "nonBayesian belief."

The paper calls the modeling of conviction (nonBayesian belief) à la confidence or à la perception (Bayesian belief) a "first-degree Bayesian fallacy." It is first-degree because it amounts to treating conviction not differently from a scientific proposition about mind-independent reality. In contrast, the paper calls the modeling of conviction à la conception (quasi-Bayesian belief) a "second-degree Bayesian fallacy." It is second-degree because it at least acknowledges that the belief involves context and, hence, cannot be corrected as true or false. But still it is a fallacy because it treats the object of conviction as, similar to conceptions, independent of the belief.

The paper sketches three major views of beliefs/actions in the social sciences: standard rationality theory, normative theory dominant in sociology, and Herbert Simon's procedural rationality theory. While standard rationality theory commits the first-degree Bayesian fallacy, normative theory and procedural rationality theory commit the second-degree Bayesian fallacy.

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Endnotes

[1]. It is sufficient to make four clarifications, though, on how the term "cognition" is used here. First, the term does not mean consciousness or the product of thought, while "noncognitive" is the subtle and subconscious processes behind the product of thoughts. The product/process dichotomy is not assumed here. Cognitive knowledge need not be conscious. It also need not be the outcome of thinking or deliberation. It can be both non- conscious and instantaneous (Boulding 1956; Polanyi 1958; 1966). Second, the term does not denote mental processes such as thinking, while "noncognitive" denotes biologically based neural processes such as breathing, body temperature, sensation of pain, and so on. The mind/body dichotomy is also not assumed here. Cognitive knowledge can be simple or can become sophisticated, i.e., developed into elaborate categories and systems of thoughts about the world. Third, the term is not identical to the same term coined by William James (1998), where he distinguished it from "affective" and "conative." No distinction is drawn here between rational calculation and the emotions. Fourth, the term does not denoted justifiable beliefs based on prudent deliberation, while the term "noncognitive" denotes unruly imaginations and the inspirational injection of the whimsical spirit. The inspiration/justification dichotomy is thus not assumed here either.

[2] The proposed two-axis information hypothesis should also guide us on how to make sense of the multivariate deviations from the predictions of standard rationality theory (Khalil 2007c). These deviations range from hyperbolic discounting, certainty principle (Allais paradox), preference reversals, rules of thumb (heuristics), representativeness heuristics, endowment effect, loss aversion, and the framing effect (Baron 2000; Camerer *et al.*, 2004).

[3] If we regard the work ethic to be based on a belief about self-ability, the work ethic must be considered to be a conviction. If so, Harvey Leibenstein's (1987) theory about the work ethic is definitely misconceived. Leibenstein explains the work ethic as the outcome of sub-game perfect Nash equilibrium concerning whether one should trust his colleagues in team work. As such, Leibenstein conceives the work ethic as the outcome of a perception—i.e., not different from trustworthiness. Agents may adopt cooperative or non-cooperative beliefs, depending on their assessment of the trustworthiness of their partners. In some games, agents may trust their partners and cooperate. In other games, though, the same agents can become, for no apparent reason, distrustful of their partners. It is true that the held belief is always verified simply because of the mechanism of self-fulfilling prophecy (Dupuy 2004). Nonetheless, the trustworthiness belief remains empirically-based and, hence, best considered to be a perception. In this light, how should we regard expectations about the financial markets, real estate, and so on. John Maynard Keynes (1937) considered such expectations to be greatly the product of reflexivity, i.e., one should be optimistic if others are or, otherwise, pessimistic. It seems that at least Keynesian expectations are also the subject of self-fulfilling prophecy. Nonetheless, Keynesian expectation belief remains empirically-based and, hence, best considered to be a perception. If so, Keynesian expectations are not radically different from rational expectation theory (Khalil 2007c).

[4] My earlier attempt to explain entrepreneurship (Khalil 2003b) suffers from the second-degree Bayesian fallacy. In this attempt, I tried to explain entrepreneurship and other convictions (which

are about self-ability) in terms of conceptions.

[5] Charles Peirce puts this point sharply:

> Suppose a being from some remote part of the universe, where the conditions of existence are inconceivably different from ours, to be presented with a United States Census Report—which is for us a mine of valuable inductions. …. He begins, perhaps, by comparing the ratio of indebtedness to deaths by consumption in counties whose names begin with different letters of the alphabet. It is safe to say that he would find the ratio everywhere the same, and thus his inquiry would lead to nothing… The stranger to this planet might go on for some time asking inductive questions that the Census would faithfully answer without learning anything except that certain conditions were independent of others. … Nature is a far vaster and less clearly arranged repertoire of facts than a census report; and if men had not come to it with special aptitudes for guessing right, it may well be doubted whether in the ten or twenty thousand years that they may have existed their greatest mind would have attained the amount of knowledge which is actually possessed by the lowest idiot (Peirce 1931-1958, vol. 2, pp. 474-476; see also Peirce 1877; Buchler 1980).

[6] The reductionism/holism debate in evolutionary biology concerns the proper unit of selection. In the social sciences, it translates to whether organizations, such as states and firms, are better understood in terms of the strategies and actions of persons (Hodgson 2004). Such a debate

should not shed light on the explication of types of beliefs. Reductionists, as shown below with respect to Hayek, can uphold the normative view as much as holists.

[7] As Dewey (1977) argued in his famous 1905 essay, a thing does not stand in-itself. A person only exist in relation to something else. As he sums it up, "What *is* is what it is experienced *as*." What is experienced is the transaction of the categories (knowing) with the sensations (known). So, "reality" is nothing other than the product of the transaction. Here, Dewey is arguing for ontological pluralism—there is no one "thing," but rather a range of potential things as determined by the context of use. There is no entity that can be defined in isolation, apart from its field of transactions that include the knower. However, such a postulate should not be confused with the relativist or postmodernist position. For postmodernism, put simply, while things exist somewhere independent of us, they are impenetrable because we are locked away from them as a result of our senses, categories, and language (Bernstein 1983). Dewey denies, to start with, that things exist independent of the categories.

[8] In this manner, Dewey resolves to his satisfaction the problem of the external environment. For Dewey, transaction amounts to the working of nature in the organism and the working of the organism in nature. That is, the organism is an extension of the laws of nature and physical nature is part of the organization of the organism. Dewey, therefore, avoids the primordial conviction work that opposes the organism (categories) and physical nature (sensations): Categories and sensations are coexisting parts of transaction or union of the organism and nature. The categories do not precede sensations, contrary to the self-actional view. And sensations do

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not precede categories, contrary to the interactional view.

[9] Nicholas Georgescu-Roegen (1971, pp. 196-200) makes useful trichotomy among "reversible" motion, "irreversible" motion, and "irrevocable" motion. The motion of the billiard ball or the pendulum is reversible. The expansion of the universe or the motion of planets in the solar system is irreversible. While the motion cannot be reversed, it can in principle be reversed. On the other hand, for Georgescu-Roegen, influenced by Alfred Whitehead's process philosophy, organismic development or evolution of species is irrevocable because it cannot be retraced even in principle.