

# Behavior and Cognition of Economic Actors in Evolutionary Economics

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**Abstract** An evolutionary perspective on the nature of economic activity requires a theory of human behavior and cognition that highlights human creativity and innovativeness, while at the same time recognizing that in many arenas of economic life change is slow and more routine aspects of behavior obtain. It is proposed that Herbert Simon's conception of human behavior as largely "bounded rational" is capable of suiting both aspects. However, to be able to encompass the enormous advances humans have achieved over the years in their ability to meet a variety of wants, a theory of behavior and cognition suitable for evolutionary economics needs to recognize the evolving cultural context of economic behavior and cognition.

## 1 Introduction

While we Schumpeterians may differ in some of the details of our theoretical orientation, we all share a view of what is going on in the economy, and the context in which economic actors are operating, that is very different than that laid out in today's standard economics texts which have been so much influenced by neoclassical theory. Those texts picture action going on in an economy that is in equilibrium, or at least is operating in a way that is stable and familiar to the participants, with the actors knowing the best course of action for them to take, and taking it. Economic actors are not seen as, in many situations, venturing out on new paths because they think that, if their venture is successful, they will be handsomely rewarded, or just because they like trying new things, or because they are forced to do so because what they had been doing no longer is viable. Yet a Schumpeterian or evolutionary (I often will use the terms interchangeably) perspective would highlight the importance of these latter contexts, and we Schumpeterians need a theory of economic behavior and cognition that deals with them.

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An earlier version of this essay was presented at the 2014 meeting in Jena of the International Schumpeter Society.

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## 2 Framing the Question

What kind of a theory about the behavior and cognition of economic actors is needed if one sees what is going on in the economy through Schumpeterian or evolutionary glasses?

Any theory of economic behavior faces the problem that it must deal with a range of different kinds of economic actors, doing a variety of different things. It must deal with the behavior of households making consumption decisions, and business firms deciding what and how much to produce. In some cases economic analysis addresses the behaviors of school systems and individual teachers, and in others hospitals and doctors. If the analysis is concerned with public sector activity it must deal with government agencies, and perhaps with how regulations are set, and maybe voting behavior. As I highlighted above, Schumpeterian economics needs to encompass what goes on in the processes involved in invention and innovation, and perhaps deal with scientific research.

This need to deal with enormous variety is there whether the general theoretical perspective is neoclassical or Schumpeterian. But if it is the latter the theory also must recognize different kinds of contexts. Some of these may be relatively tranquil and familiar to the actors. But, of particular importance to Schumpeterians, others involve actors attempting something they have not done before, and often dealing with contexts with which they have little or no experience.

In the light of this diversity, one can ask whether any single theory can cover the full range of things. Neoclassical theory attempts to do so, by admitting a variety of different specifications of what is in the actor's utility function, and in the kinds of actions that are specified as in the choice set, but then assuming that actors maximize, whatever that context. Much of the criticism of neoclassical theory involves consideration of cases where this kind of a behavioral theory seems impossible to square with actual observed behavior. The rise over the last decades of "behavioral economics" largely reflects increased recognition of these kinds of cases.<sup>1</sup>

The lessons here are highly relevant in thinking about what kind of a broad theory of behavior and cognition would fit a Schumpeterian-evolutionary perspective. My position is that it is futile to try to build a tightly structured unified general theory of economic behavior that would cover all cases. Indeed I will argue that recognition of a variety of different modes of behavior is an important part of the understanding we want of what is going on and why. However, I also think it useful to have a broad umbrella theory that covers and, in a sense, explains this diversity.

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<sup>1</sup>For a fine broad review of behavioral economics see Diamond and Vartianen (2007).

### 3 What Can We Draw from Psychology?

To some extent the agenda I am identifying overlaps some of the themes being developed by behavioral economics. And there certainly are some important insights and premises highlighted by behavioral economics that ought to be encompassed by a theory of behavior and cognition that suits how Schumpeterian and evolutionary economists see economic activity.

One is the proposition that the way an actor sees, frames, a decision problem very much affects what that actor chooses to do, and that what might be regarded as the same real problem can get framed very differently depending on how it is presented or comes to attention, or the past experience of the actor involved. A second is that it is a mistake to presume that economic actors always behave consistently; indeed the evidence is clear that actors have trouble reasoning coherently about choice problems where basic background facts are uncertain, and in particular tend to be inconsistent both in thought and in action in dealing with the probabilities involved in the problem. A third general proposition, that has been particularly highlighted recently by Daniel Kahneman (2011), is that much of human action taking actually is guided by very little explicit thinking, and that conscious deliberation about what to do is the exception not the rule. This proposition has been standard for a long time in various sub-fields of psychology, and I propose it is particularly important to take aboard in a theory of behavior and cognition that fits with evolutionary economics.

But while there is overlap of interest, the orientation of behavioral economics is not to the central issues of human behavior and cognition relevant to Schumpeterian economics. The agenda for Schumpeterian and evolutionary economics is motivated by the belief that neither the innovation going on in modern economies nor the associated shifting and previously inexperienced ground for much of decision making more broadly are treated adequately by neoclassical rational behavior theory. Our objective is to develop a theory of cognition and behavior that can illuminate what goes on in these kinds of contexts as well as more tranquil ones. The agenda of behavioral economics is motivated by the argument that observation and experiment have revealed many contexts in which what individuals do and don't do is clearly inconsistent with the canons of neoclassical rational decision theory, but the contexts studied are not in general ones that particularly interest Schumpeterian economists.

Behavioral economists seem divided on whether they see the long run goal of the discipline as finding the areas of behavior where rational behavior theory falls down worst, and providing a better theory for those areas, or whether they see the objective as the achievement of a new general theory of behavior of economic actors to replace neoclassical theory. Particularly the behavioral economists in the latter camp believe that the theory of behavior in economics ideally ought to be based on the understandings in psychology. A problem with this perspective is that modern psychology is a fragmented field, which includes a number of quite different broad perspectives on human behavior, and within each empirical research

is largely oriented to particular phenomena and questions that are germane in particular contexts but not others.

Of the various branches of psychology, for our interests here cognitive science is the most important, and important lessons can be drawn from the fact that it itself is a divided field.<sup>2</sup>

At its inception the presently broad field of cognitive science was strongly oriented by the basic conception of artificial intelligence: the proposition that the workings of the digital computer could provide a plausible model for the workings of the human mind. The focus was on aspects of human behavior that seemed to involve sophisticated thinking about what to do, including drawing on relevant information taken into and stored in the mind relevant to a mental characterization or model of what to do, and “computational” processes assumed to be analogous to the computation that computers did. The particular cases studied by proponents of this view of human intelligence tended to be relatively complex explicitly posed analytic problems, like playing a game of chess or proving a mathematical theorem.

Relatively early in the game, a point of view began to be articulated that much of human problem solving and thinking was not like that at all, but rather involved the recognition of patterns, and tended to proceed through parallel processing of different pieces of information taken into the brain through the senses, and fitted together so as to make sense of some event or phenomena, with logical thinking playing at most a minor role. Recognizing particular faces is one prominent example. Language learning, both oral and written, a more complex one. While there clearly was dispute regarding the nature of human intelligence between those that stressed logical information processing and those that stressed pattern recognition, it was clear to many within the developing cognitive science community that many human tasks required and involved elements of both.

As cognitive science developed as a field, a number of participants called attention to the fact that much of human action seemed simply to be more or less automatic responses to particular circumstances which, to be effective, may have required some prior trial and error learning, and memory of what happened, but once learned its activation did not seem to require either subtle recognition of complex patterns or much logical processing. I note that this kind of action taking, and the nature of the learning associated with its development, was a central subject of research in psychology prior to emergence of cognitive science. And, as noted, this aspect of human behavior has been highlighted more recently by Kahneman.

More generally, as research and reflection by cognitive scientists has progressed over the years, there has been growing recognition within the discipline that humans come to the actions they take through a variety of different cognitive processes. Merlin Donald (1991) has used the term “the hybrid mind” to highlight this diversity.

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<sup>2</sup>For a compact review of the field and how it connects to economic analysis see Nelson and Nelson (2002). For a more recent and extensive review written for psychologists see Glenberg et al. (2013).

## 4 Economic Behavior as Mostly “Boundedly Rational”

I propose that, rather than a comprehensive theory that purports to be relevant to all cases if tailored appropriately, the kind of theoretical perspective on the cognition and behavior of economic actors that may be achievable and useful involves a typology of different modes of cognition and action generation that tend to be invoked by different contexts, and a way of assessing at least some aspects of the outcomes that are likely to be generated. But at the same time, I believe it is useful to have a broad umbrella perspective that helps one understand the variety. In my view, the proposition developed by Herbert Simon<sup>3</sup> and his colleagues then at Carnegie Institute of Technology that much of human and organizational behavior can be understood as “boundedly rational” can provide that general point of view.<sup>4</sup>

The perspective on economic behavior as mostly “boundedly rational” has the particular attractiveness for economists of being consonant with the traditional economic theory of behavior, going back to the days of Adam Smith, that sees economic actors doing what they do with purposes in mind and in many contexts at least a rough understanding of the consequences of following various courses of action. I believe that, treated with care, and recognizing human fallibility, this broad theoretical perspective has shown considerable explanatory and predictive power. The problem with the full blown rational behavior theory of neoclassical economics is that it does not recognize these caveats.

On the other hand, recognition that rationality is bounded highlights that there are limits to the power of the human mind and the knowledge actors can master and work with, and that the contexts for human action generally are too complicated or subtle for actors to understand and take into account adequately the wide range of factors bearing on what they should be doing. The formulation is quite open to significant differences across contexts in the strength of human understanding. And empirical studies guided by this broad framework have recognized a variety of particular modes of decision making and action taking in different contexts, and among different kinds of actors.

However, I would propose that, to address phenomena of particular interest to Schumpeterian economists, and to get clearly into view that bounded rationality is a concept that encompasses a variety of different kinds of behavior, several distinctions and factors need to be highlighted more than they have been in the literature to date.

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<sup>3</sup>Perhaps the best general reference is Simon (1957).

<sup>4</sup>Giovanni Dosi has urged me to state clearly that the conception of bounded rationality I am endorsing here must not be interpreted as implying that there is something that could be interpreted as fully rational behavior that bounded rationality is not quite up to achieving. Under the perspective I develop here truly fully rational behavior is simply impossible, often even to define, much less achieve, except under tightly defined and controlled contexts that are quite unlike the contexts actually faced by economic actors.

First, it is important to distinguish between choice contexts which the economic actor considers familiar and responds to more or less automatically by taking actions that have sufficed before in this kind of context, and contexts that induce the actor to engage in serious contemplation of alternatives. And where action taking is preceded by conscious deliberation, it is important to distinguish between contexts where the actors attention is focused on courses of action the actor has followed before perhaps in another context or has other reason to believe are well within it's range of competence, and those that involve trying to do something new. Schumpeterian and evolutionary economists of course have a special interest in the latter—that is what innovation is all about—but innovation only can be understood in juxtaposition to more routine behavior, and more generally action taking that involves doing the familiar.

Second, particularly for the kinds of phenomena which particularly interest Schumpeterian economists, it is important to recognize that actors differ in the capabilities that they bring to various choice contexts. They differ in their knowledge and experience, and in the skills they possess. For these reasons they may differ significantly in what they do in contexts that, to an outside observer, may look basically the same. And some will do better than others will.

Again, I note that this aspect of behavior—differences in capabilities—has received little attention from psychologists, or from behavioral economists. Yet differences in capabilities obviously are of central interest to Schumpeterian and evolutionary economists.

A third important limitation of most of the writings on economic behavior that, in my view, needs to be remedied is failure to relate the perceptions of individual actors about the contexts they face, the courses of action that they understand are available, and their judgments about which of these actions are appropriate and likely to be effective, to the beliefs and understandings and know-how of the broader community of which the actor is a part. This can and has been raised as a criticism of modern psychology in general. And it is hardly recognized in behavioral economics.

In basically ignoring the social and cultural context within which individual and organizational actors operate, contemporary mainline economic analysis in effect blinds itself to important influences on the phenomena in which it is most interested.<sup>5</sup> The purchases of consumption goods and services by households clearly is strongly influenced by consumption patterns and notions about appropriate life style held by the social community of which the household is a member. The practices of individual businesses, and the broad strategies they have adopted to guide their decision making, obviously are influenced by the perceptions and norms shared by the management community and what is taught by its gurus.<sup>6</sup>

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<sup>5</sup>The argument that a theory of economic behavior and cognition needs to recognize the cultural basis of human action and thought of course was a central premise of the American Institutional Economists who were an important part of the academic economic community from the beginnings of the twentieth century until after World War II. For a survey of their perspective, see Mazzoleni and Nelson (2013).

<sup>6</sup>For a very interesting discussion see J. C. Spender's *Industry Recipes* (1989).

I want to argue that it is especially important that Schumpeterian economists recognize clearly the social and cultural context of action taking. We are centrally interested in how modern capitalist economies have become so productive, and the sources and mechanisms of future progress. When one observes powerful and complex methods being used by individuals and organizations to achieve their ends, it is almost a sure thing that the heart of the knowledge base of what they are doing is shared by their professional peers, and is acquired by individuals only as they are part of this broader community.

And, where one sees action being very effective, almost always that common knowledge that enables it has been achieved through a lengthy cultural learning process. Thus characterization of the actions taken today needs to be understood as a frame in an evolutionary moving picture.

I note that these observations would not have surprised Thorstein Veblen who, over a century ago (Veblen 1898) asked “Why is Economics Not an Evolutionary Science?”. The school of institutional economics, that largely grew up inspired by Veblen’s views, in its early days was very much oriented to the continuing processes of evolutionary change going on in modern economies, and highlighted the cultural and sociological context of this evolution. Unfortunately this intertwining of evolutionary and institutional analysis has not carried over to the “new” institutional economics. But there is some reason to be hopeful.<sup>7</sup>

To return to the general theme, under the perspective on economic behavior and cognition I am proposing, economic actors are assumed to be boundedly rational. When in contexts that call for them to do something, they proceed with some notions about the outcomes they would like to see happen, a perception of at least some actions they might take that seem plausible, and some thoughts on which of these might be most appropriate. But the contexts they face differ widely, and they go about generating the actions they actually take in different ways in different kinds of contexts.

In some contexts, actors are likely to respond to the requirement to do something by following patterns of behavior that they have successfully used before. In others, for some reason this is impossible, or the context is different from what the actor has faced before, or while the context may be familiar there are strong incentives to scan and reflect on the options before acting. Simon himself made this distinction in a number of his analyses, and I note that this also is a distinction made by Kahneman.<sup>8</sup> Sidney Winter has reminded me that John Dewey (1992) presented a similar view of behavior, with perhaps more emphasis on the role played by emotion and anxiety in some contexts. More generally, not surprisingly the point

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<sup>7</sup>For a history of what happened see the introduction by Hodgson and Stoelhorst (2014), to the special issue of the *Journal of Institutional Economics* concerned with the future of institutional and evolutionary economics.

<sup>8</sup>These two different modes of action taking were built into most of the models developed in Nelson and Winter (1982).

of view on how to understand economic behavior that I am espousing here is similar in many respects to arguments Winter has made (Winter 2013, 2014).

I note that Kahneman puts less weight than I do here on the argument that routine or habitual behavior is often an effective way of acting. Also, he seems to presume to a greater extent than I do that active deliberation is likely to come up with an effective course of action. My argument is that, where one does see effective problem solving, the reason almost always is that deliberation can draw on a strong fund of knowledge that has been accumulated culturally generally over a long period of time.<sup>9</sup>

## 5 Routines

Under most circumstances the range of actions that need to be taken often over a short period of time by an individual person, household, firm, research laboratory, economic actor more generally, is far too great for that actor to be able to think carefully before taking action, except in a minority of cases. And where the environment for action has been relatively tranquil actors generally have had time to learn what works and what doesn't. Most of the actions one observes in such contexts should be understood as actors following routines that have in the past yielded satisfactory outcomes, and are triggered relatively automatically by circumstances under which action along these lines seems appropriate.

I suggest that individual or household shopping for the kinds of items bought relatively regularly largely involves following routines. In my recent paper with Davide Consoli (Nelson and Consoli 2010) we propose that much of household behavior can be understood in terms of the routines they use. And of course a quite extensive empirical and theoretical literature exists arguing that firm behavior largely involves the following of established routines.<sup>10</sup> In our earlier work Sidney Winter and I used the term "routine" to characterize these aspects of firm behavior. Here I am using it to denote the relatively automatic behavior patterns of any economic actor.

The fact that little conscious thought is involved in the invoking and execution of a routine does not imply that routines are crude ways of doing things. The routines a store has for reordering stock and for setting prices may be quite elaborate, even though once in place they are carried out routinely. The operation of highly sophisticated technologies largely involves the use of routines. Many of the routines used by economic actors are very powerful and highly effective in meeting their objectives.

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<sup>9</sup>There is good reason to believe that Dewey would agree with me on this.

<sup>10</sup>For a fine review of the literature on organizational routines, see Becker (2004).



Also, routines need not be ridged. Indeed viable routines generally have a reasonable amount of flexibility built into them to enable them to adjust to the kind of variable circumstances that are to be expected in the broad context where they are operative. Household shopping routines need to be sensitive to what is and is not available at the store, and to some degree to prices. Firm pricing routines need to take costs into account. But my argument is that in established shopping routines these adjustments generally are made relatively routinely. There may be some conscious consideration of alternatives, but so long as the context remains in the normal range, wide search and intensive deliberation is highly unlikely. Similarly, the pricing routines of firms almost always are sensitive to costs, with much of that sensitivity, if not necessarily all, built into a formula used relatively routinely.

Elsewhere (Nelson 2013) I have used the term “adaptively responsive” to denote the sensitivity of routines to broadly experienced and thus anticipated variation in the details of the context that invokes their use. My proposal is that most routines that are used for a significant time are adaptively responsive.

Economists of a neoclassical persuasion would be inclined to argue that routines persistently employed by an economic actor must be, in some sense, optimal. If one’s view of human behavior is that it is “boundedly rational”, then in general one would deny that choice sets are objectively defined, and if this is so it is not clear what optimal means. Relatively effective given the actors goals, and adaptively responsive to not surprising changes in the details of the context do not imply optimality. However, that an actor continues to use a particular routine indicates that the results are “satisfactory” in the sense that doing things in a significantly different way is not being actively considered.<sup>11</sup> On the other hand, of course, some of the actions that are carried out routinely by some actors are clearly clumsy, and likely even counterproductive given the objectives they aim to reach. An important challenge for evolutionary economics is to illuminate the conditions under which routines are effective, and those where they often are not.

From one point of view, to explain or predict what an economic actor does in a domain of activity marked by the use of routines it is sufficient to identify and analyze the routines that are in use. And this is exactly what is done in studies like those reported in the classic book by Cyert and March (1963), *A Behavioral Theory of the Firm*.

But for the theory of behavior to have any depth, it is important to understand why the routines in use are what they are. I have argued that the neoclassical mode of answering that question—to propose that they are optimal—is not convincing if one holds to a theory of bounded rationality, and wants an explanation, not simply a purported characterization, of observed behavior. Under evolutionary theory such an explanation needs to be posed in terms of learning and selection processes. More on this shortly.

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<sup>11</sup>This is Herbert Simon’s concept of “satisficing”.

## 6 Deliberating, Problem Solving, Choosing

The proposition that much of the economic behavior one observes at any time should be understood as economic actors following routines is not meant to play down the role of deliberation, problem solving, and often creativity in the generation of economic activity. These more active cognitive processes are brought into play when economic actors face contexts with which they are not familiar, or where no established routine seems suitable, or more generally where the actor for whatever reason wants to do something new. And of course in many cases they are involved in the genesis of prevailing routines in the first place.

This perspective is, of course, very Schumpeterian. Chapter 1 of his *Theory of Economic Development* (Schumpeter 1934) is all about routine activity in an economic steady state. In the actual economic world as we know it no context is as constant as the context for economic action Schumpeter depicts in Chap. 1, or is laid out in general equilibrium theory. However, my argument is that at any time a good portion of economic activity does proceed in contexts that are regular enough so that behavior that follows an established routine can suffice to meet the actor's objectives, at least if the routine used has a certain amount of built in flexibility.

In Chap. 2 Schumpeter describes a very different kind of economic behavior: innovation. Innovation is creative by desire or necessity, uncertain as to success, often failing, sometimes winning big. But involving thinking and problem solving in an essential way.

In recent years cognitive scientists have significantly improved our understanding of how the cognitive capabilities and practices of human beings differ from those of other higher animals; the most interesting comparisons have been with other primates.<sup>12</sup> There would appear to be two basic capabilities that humans have that other primates do not. One is built in biologically. The other, while based on this, is essentially cultural.

Other animals share with humans the ability to solve problems by doing different things until they find something that works, and then carrying over what has been learned to subsequent experiences with situations like that. But humans have the ability, that even other primates have to a far lesser degree, to in effect reflect on a context or a way of doing something (perhaps something they have observed others doing) even when that context is not present or that action not being actually implemented, in effect anticipating future situations and actions.<sup>13</sup> Thus the kind of deliberation we are considering here would seem to be a capability that is largely unique to humans.

And humans are unique in having the capacity for cumulative collective learning. While the cutting edge of progress generally has been discovery or trying out of a new method by an individual, major advance over time has depended on the

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<sup>12</sup>Donald (1991) provides a splendid discussion of these and related matters.

<sup>13</sup>There is some evidence that certain other animals have this capability, but to a very limited degree.

spread across the community of what has been learned, and the further building on that by others.<sup>14</sup> The development of shared language has been essential for this to happen to any major extent. There is no question that the ability of humans to reflect and gather and process relevant knowledge prior to action is an important capability in its own right. However, I would argue that, in the absence of strong cultural know-how that has been developed over time through collective learning on which that capability can draw, what human reflection can achieve on its own is modest.

In my view Schumpeter draws too sharp a line between innovating, and the imitative responses by followers to the innovations of others. The latter also requires ability to conceptualize a way of doing something that is new for the particular actor, and often involves considerable uncertainty.

However, what is a new situation or new activity for a particular actor will tend to be conceived very differently if that actor knows about and can draw on the experience of other actors, than if the actor is all alone, as it were. Much of what actors do that is new to them is invoked by their knowledge of the experience of others. The abandonment by an actor of an old routine and the adoption of a new one may be induced simply by knowledge that others are doing something different and doing well, as contrasted with any compelling evidence that the old routine is not yielding satisfactory results. While direct imitation often is not easy, and the efforts of one economic actor to do what another is doing may achieve something somewhat or widely different, at any time a shared body of know-how provides the basis for the range of activities used in a field, and is the reason why one generally observes a certain amount of similarity in what the various actors are doing.

## 7 Innovation and the Advance of Know-How

While I believe the lines are blurred not sharp, the term “innovation” as contrasted with “imitation” connotes an endeavor by an actor to do something new not only to that actor, but to the community of actors doing roughly similar things. Empirical research shows clearly that innovators, like imitators, almost always draw heavily on know-how, and more general knowledge, possessed by their peer community. And a large share of innovation is based on and aims to improve artifacts and processes that are in use, often use by the innovator. But innovators are reaching beyond what has been done before. And if they are successful, what they have achieved sooner or later becomes part of the knowledge base shared by that community. That is, know-how in an area of economic activity advances over time through an evolutionary process driven largely by the innovation going on.

The principal difference between the orientation of evolutionary and Schumpeterian economists, and that of today’s more orthodox orientation to the

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<sup>14</sup>Other species have the capability of spreading the effective behaviors learned by one individuals to others in the community, but not of building further and cumulatively from that.

study of economics, is our focus on innovation. Our argument is that what makes economic activity today so effective in meeting a wide variety of human wants is that the means we have available to achieve our ends have become so powerful as the result of cumulative innovation. It is not because economic decision makers are so effective. Human economic decision making remains, as it always has been, often mechanical, sometimes creative, but in these cases often mistake ridden.

While there has been considerable research over the years by scholars of management on what makes firms successful, there is little evidence that firm managers today are more effective than firm managers were a half century or a century ago. The failure rates of new firms, and of new ventures by established firms, remains high. Business management remains an art, in which luck is an important factor determining success.

The situation is similar regarding household purchases and other decisions regarding how they spend their money. It is not for naught that we have in place a number of regulatory agencies justified explicitly by the proposition that households often have limited understanding of what they are buying. Wesley Clair Mitchell's "The Backward Art of Spending Money", published in 1912, rings as true today as it was then.

Or consider highly trained engineers working in a field of advanced technology trying to design an artifact that will have important capabilities that presently available artifacts do not. Their design efforts may be highly sophisticated, guided by strong scientific knowledge. However, like firm managers and household shoppers, their rationality is bounded in the sense that, if they try to do something significantly different from prevailing practice, they are highly likely to make at least some mistakes. To achieve the capabilities they are aiming for will then require that they or someone else somehow finds a way that works, to a considerable extent through trial and error problem solving.

However, boundedly rational human actors, can achieve remarkably good outcomes, if the know-how they have to work with, the means they know how to use, are good enough.

For these reasons, where one observes effective human action going on the principal reason is not so much that someone or some organization earlier had effectively thought through the background problem and surmised, or calculated, a good way of doing things in that context, but rather that there has been a lot of collective learning going on generally over a considerable period of time that, cumulatively, has led to the development of ways of doing things that work reasonably, or even extraordinarily, well. Thus a key part of the theory of behavior and cognition that we need is a theory of how collective learning occurs.

Efforts at innovation clearly are the key driving force. However, a key premise of evolutionary economics, amply supported by empirical evidence, is that the efforts of economic actors to venture beyond established practice almost always are associated with uncertain outcomes. While in areas where knowledge is reasonably strong, innovative efforts are far from blind, nonetheless all areas of innovative activity are marked by failures as well as successes, and even the most knowledgeable experts sometimes turn out to be wrong. A fundamental consequence is that,

while economic progress certainly depends on the creative efforts of individual inventors and innovators, it depends at least as much on the existence of a number potential innovators holding somewhat different perceptions of the most promising routes to advance, with competition in ex-post practice being a large part of the selection process determining the winners. And continuing progress depends on the essence of what has been achieved in one round of innovative effort becoming part of the collective knowledge base for the next round.

As I suggested earlier, the emphasis I am putting here on the need to recognize that the knowledge and orientation of individual economic actors regarding appropriate and effective ways of doing things, including their efforts at innovation, as largely determined by the culture they share with their peers is very much in the spirit of the old American institutional economics tradition, as is a focus on the mechanisms involved in economic progress. This overlap of perspectives and interests calls for reaching out to the institutional economics tradition that is reemerging.<sup>15</sup>

## **8 The Need for a More Eclectic and Flexible Conception of “Rational” Behavior**

Earlier I noted that, since the times of Adam Smith, economists observing the behavior of economic actors in the contexts in which they had a central interest have assessed these behaviors as largely reasonably rational, given the actors’ apparent objectives, and the range of options they faced. This point of view, and the kinds of behavior and contexts on which economists have focused, has given economic theorizing about behavior a very different orientation than that taken by psychologists, who mostly have focused on contexts and on kinds and aspects of behavior outside of the range where economic analysis has been concentrated.

I also have stressed that, even within the relatively constrained range that economists are interested in, there is great variety of both contexts and behaviors. For economists of a Schumpeterian and evolutionary orientation, there is special interest in behaviors associated with efforts to do something new, and contexts that economic actors have not experienced before. But as I will argue shortly, it is important not only to have a perspective on behavior and cognition that treats innovation and its consequences adequately, but does so with a broader framework that also treats behavior in more stable contexts. Within that framework there needs to be room for both creativity and habit, for both insightful understanding of the situation, and biased or simply ignorant views of what is going on.

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<sup>15</sup>See Mazzoleni and Nelson (2013), for a discussion of that tradition of economic research. The December 2014 special issue of the *Journal of Institutional Economics* reviews the state of both evolutionary and institutional economics and considers their connections. See in particular the opening essay by Hodgson and Stoelhorst.

I believe that the kind of perspective on economic behavior and cognition that I have sketched here, based on the presumption that economic behavior is “boundedly rational”, but emphasizing the bounded as well as the rational, and being careful to recognize important differences associated with different kinds of contexts and conditions, has the promise of doing this. It provides a much better and richer characterization of economic behavior that is for the most part purposeful and functional than the theory of full blown optimization that neoclassical theory is stuck with. It is applicable across a much wider spectrum of conditions, and it avoids some of the obvious problems. And for those that care about such matters, it provides an explanation for much of economic behavior that one actually can believe.

As Schumpeterian economists long have understood, neoclassical theory cannot deal with efforts at innovation, as we know about these empirically. A theory of innovative behavior certainly should recognize that inventors and innovators are pursuing goals, and that their efforts generally reflect their best understanding of how to achieve their goals. However, the full blown rationality assumption of neoclassical theory does not at all help the analyst to understand why different inventors generally try different kinds of solutions to the challenges they face, and that a large share of these efforts fail. A theory that inventive efforts are “boundedly” rational is quite consistent with these facts and, further, leads the analyst of innovation in a particular arena of economic activity to consider the weaknesses as well as the strengths of the current knowledge base.

Some advocates of neoclassical economics will admit the difficulties that theoretical structure has in dealing with innovation, but argue that for analysis of many other economic phenomena neoclassical economics does just fine. In particular, it provides a way of analyzing how markets work, and the determinants of prices, and of how prices influence supply and demand, that fits many of the important facts. I propose that our response should be that a theory that the behavior of economic actors is boundedly rational can generate all of the understandings of neoclassical market theory that are worth preserving, and does so with a view of how individual economic actors think and behave that is much more consistent with what is known about that. The key, I propose, is the argument that in the relevant contexts boundedly rational behavior generally is “adaptively responsive” to changes in conditions.

Earlier I argued that, in contexts that were repetitive and broadly similar from case to case, much of observed behavior involved the following of routines. I also proposed that routines that had been honed by considerable experience tended to have flexibility built into them so that what was done could be adaptive to not unexpected differences in the contexts they face. There is no case to be made that these adaptive responses are optimal. But my argument here is that they are highly likely to be in the right direction.

I would make a similar argument regarding behavior in contexts that are sufficiently different from the norm to trigger conscious thinking about what to do. Again, no case to be made that the actions taken would be optimal. However, a

good case can be made that they would be adaptively responsive to the particular features of the context that induced reflection on alternatives in the first place.

This is specially likely to be so if the alternatives being considered are reasonably well established ways of doing things. But the evidence suggests that, despite the uncertainties and variation in viewpoints involved, the kinds of innovations that an economy gets also is adaptively responsive to changes in the context. What is tried and what succeeds are strongly sensitive to the kinds of returns that might be expected from a successful innovation.

In a recent article (Nelson 2013) I have argued that a theory that the behavior of economic actors is adaptively responsive in the above sense is sufficient to generate virtually all of the empirically relevant “theorems” about how markets works that one finds in neoclassical textbooks, for example responses of demand and supply to changing prices.<sup>16</sup> (Of course the theorem to the effect that market solutions are “optimal” has no counterpart in evolutionary theory). And it does so with assumptions that much better fit the facts that we know about individual and organizational behavior.

## 9 The Range of Topics Schumpeterian: Evolutionary Economic Theory Must Cover

I conclude by proposing that, if a Schumpeterian and evolutionary perspective on what is going on in a modern capitalist economy is to take hold broadly in academic economics, it is not sufficient that it provide an illuminating analysis of innovation as the driver of economic change and the nature of competition and of creative destruction that goes on in arenas of economic activity where innovation is prominent. It must provide a general way of understanding economic behavior and activity, and how this is shaped by and shapes the way that markets work, that covers contexts and questions where innovation is not the central force at work, as well as those where innovation is the heart of what is going on.

Schumpeter’s great work focused on the former of these arenas. He never developed a general “price theory” of the sort that Marshall did. And a large share of the questions asked by economists are of the sort that price theory, and the tools that Marshall developed, addresses. I believe that Schumpeter’s position, at least in his *Theory of Economic Development*, was that economists could work with two sets of theories: Schumpeter’s regarding innovation and innovation driven economic change, and the developing neoclassical price theory for the topics and questions it seemed to fit. I believe many present day Schumpeterians take a similar position.

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<sup>16</sup>Formal proofs of important aspects of this argument can be found in Chap. 7, “Firm and Industry Response to Changed Market Conditions” in Nelson and Winter (1982).

But with the wisdom of hindsight, one can see that it is very difficult for a Schumpeterian theory of innovation and a neoclassical price theory to co-exist broadly in the economics discipline. The central reason, I believe, is that to hold a Schumpeterian theory of dynamics and a neoclassical theory when change is not disruptive is schizophrenic.<sup>17</sup> Particularly as neoclassical theory tightened up and its theory of behavior increasingly stressed full rationality, the awkwardness of holding both theories became more and more evident. Economists are not about ready to give up the tools of price theory. And the development of a neoclassical theory of economic growth provided main line economists with a way of understanding economic behavior and activity under relatively tranquil conditions, and how technological change driven economic growth occurred, that were intellectually compatible.

Neo Schumpeterians and evolutionary economists are rightly pleased with the major advances in understanding of innovation and its sources and effects that have been won over the last 30 years by research guided by our perspective. But we have been frustrated by how little of that literature has been picked up by our main stream colleagues, even when they are writing about technological advance.

The argument I am making is that, if we are to have a chance of becoming a significant influence within academic economics, we Schumpeterians must articulate a theory that addresses both economic questions associated with innovation and innovation driven change, and economic questions of the sort that price theory deals with, with a consistency of viewpoint between the two. I propose that the kind of perspective on the behavior and cognition of economic actors that I have sketched above can enable us to do this.

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<sup>17</sup>For a more elaborate discussion see Nelson (2012).



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