

Ambiguity of Rationality

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The Economics of the Good, the Bad, and the Ugly: Secrets, Desires, and Second-Mover Advantages. Manfred J. Holler. London: Routledge, 2019, 268 pages, £115 hardcover.

Economics books have a beginning, a middle, and an end. Not this one. Most monographs in economics pitch an argument proceeding as follows. First the thesis is outlined. Then the supporting material is presented. Finally, a thread knits this material together in support of the original thesis. Manfred Holler dispenses with this structure for a reason. He wanders through ideas in economics, philosophy, history, and art interspersed with discussion of game theory in the context of a movie, flagging up issues in rational choice theory in a truly interdisciplinary manner.

Occasionally Holler goes off seemingly on a tangent talking about secrets, science policy, and Schumpeterian ideas on innovation. They all hang together, but each of these discussions can be read separately. The book need not be read from the beginning to the end in that order. It can be picked up in the middle and still found to be interesting. When the book is read in its entirety in whatever order, a coherent picture begins to emerge from this unorthodox structure. This way of organising stories and arguments, each of which can be approached separately and many of which make the reader sit up and take note, is a strength of the book.

It is a book about rational choice, simultaneously one of the most precise branches of neoclassical economics and one that often contributes to lack of clarity in the evaluation of economic policy or the analysis of behavior. A culprit is the

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conflation in the literature of the positive and the normative: what is rational in the positive sense is a description of choice based on a whole range of assumptions about an abstraction from reality. The behavior that is described as rational choice is a description. No normative conclusion about what rational choice ought to be can be drawn from a description alone. The word rational as described in economics need not be rational in the normative sense that the word is used in everyday conversation. There is also lack of clarity about the informational basis of choice, a fact that is brought out in the formulation of games discussed in the book under review.

In reviewing the book, we need not begin at the beginning for reasons given above, but we have to start somewhere. Let us consider the title, *The Economics of the Good, the Bad, and the Ugly: Secrets, Desires, and Second-Mover Advantages*. The first half of the title is a take on a once popular, perhaps it is still popular, immensely enjoyable sub-genre, Spaghetti Western, of Western movies. These films were produced and directed in Europe, mostly by Italians, but set in a bleak American landscape characteristic of the genre of Western film.

The Movie

The film has been released under different titles in different languages in different countries reflecting the dictates of marketing or, perhaps, suggesting different interpretations. *The Good, The Bad, and The Ugly* is the title of the English language version in DVD which informs the discussion in Holler's book. The film version issued in DVD is directed by Sergio Leone, filmed in southern Europe, but set in the American Southwest during the Civil War. There are three main characters, Blondie, Angel Eyes, and Tuco. They are played, respectively, by Clint Eastwood, Lee Van Cleef, and Eli Wallach. In the version watched by Holler, these characters are also identified as Good, Bad, and Ugly, but these adjectives are contestable in the context of the film. On the evidence of behavior which unfolds, none of the three can be described as a good man. Unlike many of the forgettable Westerns, this film does not have a hero. The protagonists are thoroughly amoral, but they remain human. Each person is prepared to kill the other two in pursuit of buried treasure. Greed might be a motive, but the last scene makes clear that it is not the only motive. Perhaps there could be revenge or even an element of recreational violence. Yet these men, defined by their ruthlessness and violence, also display humanity. They can be moved by the killing fields of war. Blondie shows kindness to a dying soldier by offering him water. If Blondie displays a slight flicker of humanity seeing a dying soldier, he also utters his credo later in the movie in a different context at the cemetery (quoted by Holler, p. 58): "You see in this world there's two kinds of people my friend: those with loaded guns and those who dig. You dig." He is no better than Tuco or Angel Eyes.

The Story in the Movie

The story can be told from different angles. It is set in the middle of a war in the background of an unforgiving desert, placing a sharp focus on the carnage of war. The dialogue mirrors the senseless cruelty of the battlefield. It was first released in Europe in the late 1960s in the time of anti-war protests in the United States. There are complex messages. The violence is often comical, gratuitous, and mindless, as might be expected in a Western.

The simplest way of looking at the story is to focus on an outward motive of the three protagonists. They come to know of a large trove of treasures, \$200,000 in stolen gold coins, buried in a grave at a cemetery by someone who went by the name of Carson, a participant in the war. It appears at first sight that our protagonists are motivated by greed. Holler tries to make sense of their action in terms of game theory. For that he needs to understand the expected payoff to each actor of his choice of action. This is Holler's reaction to watching the film (p. 3): "As a spectator, I was pushed into a choice situation that does not allow me to form helpful expectations and to suggest rational actions."

What a player desires can change with time. As the film characters set off on their journey in search of the treasure, there is constant quarrel. It may be a kind of male camaraderie characteristic of Westerns, as hesitatingly hinted by Holler (p. 230). In any event, we cannot rule out a change over time in their attitude to sharing. The goal can change over time, as new information comes to light. Holler gives examples of changing goals from the economics of research and development in Section 3.4, entitled *Public Pioneers and the Entrepreneurial State*. A computer algorithm developed for one purpose finds unanticipated commercial applications. The focus of research now changes, and it is motivated by a different goal.

Tuco is a bandit on the run who has got wind of the buried treasure. He has an idea of the general area, the name of the cemetery, but not the grave. Angel Eyes, a mercenary killer, independently comes to know about the existence of the gold and mistakenly believes that Tuco might be Carson. He seeks out Tuco and tortures him to find out all that Tuco knows, even as the latter turns out not to be Carson. In a truly Western fashion, Tuco not only survives extreme torture but also remains ambulant and still capable of unleashing violence at the drop of a hat. Tuco and Blondie had met Carson when he was on his deathbed. Only Blondie was with Carson immediately before the latter's death. Tuco knows that, and suspects Blondie knows the exact location of the buried treasure. Tuco almost kills Blondie, leaving him for dead, trying to extract this information. Later when they meet up again, Tuco is kinder to Blondie. Perhaps he has read a book on cooperative game theory. Perhaps he has got to like Blondie and may even contemplate sharing the loot. Carson may have whispered something. We do not know. We know that, from now on, they may quarrel, but Tuco does not attempt to inflict

much harm. They manage to force each other, in sequence, to trek through a bleak, inhospitable desert where not a blade of grass can grow. Somewhere along the line, Tuco and Blondie exchange secrets at Tuco's suggestion. Tuco discloses that Carson had told him that the treasure was buried in a grave at Sad Hill Cemetery. In return, Blondie tells him that the treasure is to be found in Arch Stanton's grave. They continue on their journey. Our characters can survive extremes of physical deprivation. When Angel Eyes catches up with the other two, he is also kinder to Blondie than he had earlier been to Tuco. Resorting to rational choice theory cannot specify any particular course of action without knowledge of how Blondie might react to kindness and whether he would die under vigorous interrogation, taking with him to the grave the information about the location of the treasure. Holler can only speculate about strategies for extracting information.

The book has a long discussion on secrets, their extraction and use in formulating strategy (Chapter 4). Holler suggests that there is a hierarchy of secrets. When Tuco and Blondie purportedly exchanged their secrets, Tuco mentioned Sad Hill Cemetery. Blondie told him the name of a grave, Arch Stanton, afterwards. Blondie could test if Tuco had indeed told the truth by checking if Arch Stanton's grave was there on arrival at the cemetery. The treasure was buried at a grave marked Unknown, next to one marked Arch Stanton. Holler wonders if there was a second mover advantage to Blondie because Tuco divulged information first. He develops (pp. 131–132) the idea of hierarchy of secrets by way of an example of the Zimmermann telegram which was used by the British in efforts to persuade the United States to join the first world war. This discussion leads Holler to an interesting dilemma in the use of extracted information in game theory.

When a game is not instantaneous and lasts longer, any use of extracted information for gain might disclose the process of extraction. Holler gives examples. He discusses the dilemma faced by the British in the second world war when the codebreakers at Bletchley Park penetrated German naval communications. Citing a military historian (Keegan, 1990, pp. 288–289), Holler points out that the Germans also faced the same dilemma:

According to Keegan (1990:288), “for long and significant periods of the war the German-B-Dienst could read the Royal Navy's codes, sometimes when the reverse was not the case.” Moreover, like the British, like [Alan] Turing's team, the Germans faced the problem that they “were obliged to forego the use of such valuable information out of prudent concern to protect the secret of their cipher-reading success [sic]” Keegan (1990:289) points out. There are serious restrictions to the use of secrets when secrets should be treated as secrets — after secrecy is gone. (p. 149)

We shall come to a further discussion of the chapter on secrets later. Let us turn to other unknowns in games, for example, the motivation of players. The literature in game theory assumes that motivation is common knowledge. When it comes to money, greed is assumed to be the driver of desire. The dialogue in this film appears at first to suggest as much when we listen to the three characters as they

set off on the road to the cemetery. We become less sure about motive only at the very end of the story.

After a difficult journey through inhospitable but amazing landscape, they end up at the cemetery. Tuco rushes to Stanton's grave first and starts digging. Then the others arrive at the grave. Tuco and Angel Eyes discover that there are only some bones from a skeleton. Blondie picks up a stone and appears to scribble something, claiming to have disclosed the location of the treasure, and puts it down. All three of them gather around the stone, each standing at one of the three points of an equilateral triangle, outwardly exuding confidence at being the top dog in full command of that ubiquitous symbol of manhood in such films, the pistol. Then the camera focuses on their anxious faces. In this truel, each protagonist appears ready to fell the other two, but Tuco's gun has no bullets. Blondie had taken the bullets out earlier when Tuco was not looking. Suspense builds up as the music soars. Who is going to be the first to shoot? Would the second mover have an advantage? The sub-title of Holler's book focuses on second-mover advantage, whether there is any, but the film's story is a backdrop to a deeper question about the rationality of individual and strategic choice. There are lots of uncertainties. To play a game to maximize his own advantage, each player must translate uncertainties into risk by assigning probabilities to the choice that others may make. How do they arrive at the probabilities and how much faith do they have in their own calculations? Beliefs play a critical role. How do they come about? Holler examines the words and actions of the protagonists to engage the reader to the idea of ambiguity of choice.

Desires, Beliefs, Evidence, and Action

Chapter 2 is entitled *On Desires* and Chapter 4, the longest of the five chapters, is called *Secrets*. Together they explore how secrets might be revealed to enrich evidence, and how evidence, beliefs, and action relate to desire in game theory. Even when rational choice theory suggests action, the best it can do is to recommend moves consistent with beliefs and desires without examining how beliefs are formed, and why desires are what they are. Let us return to the truel by the stone. Suppose that Angel Eyes wishes to get hold of the entire treasure for himself, and he believes that Blondie has indeed written down on the stone the location of the treasure. Suppose also that he manages to shoot and kill both Blondie and Tuco before either could respond. Then he goes on to read the inscription on the stone. His actions would expose his belief that Blondie has indeed correctly identified the location of the treasure. It will also reveal his objective: to get hold of all the gold coins for himself. If the writing on the stone takes him to the grave, he would be able to claim all the gold coins for himself. His action would be consistent with his belief about what Blondie has disclosed on the stone. His desire would be fulfilled. On the evidence presented in the movie, there is no compelling reason to

hold the belief that Blondie has revealed the location of the grave on the stone. If the stone contains no relevant information, Angel Eyes would have killed the only person who knows where the treasure is hidden. His action in killing the other two protagonists would again be consistent with his belief, but his action would not lead to the achievement of his desire.

In what sense is it rational for action to be consistent with desires and beliefs if our understanding of the way that desires and beliefs are formed is lacking? Economists far too often conflate desire with greed. Do each of the three protagonists desire to keep the entire treasure for himself? In the film, Angel Eyes gets killed before we could be certain of the outcome he desired. Blondie could kill unarmed Tuco. He does not. We do not know what either of them desires. Until the penultimate scene, we are led to believe that all the characters are solely motivated by greed in their search for the grave. That is shown to be false for Blondie when, at the end of the film, we see him going away with only half of the treasure. What desire was fulfilled by leaving Tuco in sight of half the loot but leaving him standing precariously on a rickety plank over a hole with a noose hanging around his neck? Could it be revenge or recreational cruelty? What about beliefs? Are beliefs, for example about the futility of trying to extract information from Blondie through torture, based on evidence? When direct evidence is lacking about whether Blondie has disclosed on the stone the location of the treasure, how are the beliefs of Tuco and Angel Eyes concerning the content of the inscription on the stone formed?¹ We cannot evaluate the rationality of action, in the sense that the word is used in everyday language, without examining the underlying beliefs and desires.

Consider the following example. Suppose I desire to live until the age of 99 and then die painlessly in a single instant. I believe that my desire will be realized if I eat an apple a day while contorting my body in some yoga position. I act according to that belief. My action is commensurate with my desire and belief. It is also rational if we define rational action as action consistent with beliefs and desires. To explore the idea of rationality, going beyond that tautology, we need to ask more questions. Why do I believe that the above combination of apple and yoga would lead to my desire being fulfilled? Are beliefs based on evidence? What is

¹ Russell (1963, p. 19) maintains that beliefs are weakly, if at all, related to facts. They may sometimes be influenced by desire. Ayer argues that “the grounds which are thought to justify belief are in general not so strong as those which are required to authorize a claim to knowledge” (1976, p. 55). Scientists sometimes get around this problem in choosing potentially fruitful directions of investigation by substituting judgement for belief. A judgement is an informal and thus a non-transparent way of processing information. Therefore, scientists do accept that all avenues that are chosen may not lead to the desired end, for example, finding a cure for a disease. The difficulty for rational choice in the social sciences remains more problematic because the choice is supposed to be the optimal choice, subject to external constraints that restrict the set of choices available for achieving desire. Hence this distinction between belief and judgement does not resolve the problem of choice in rational choice theory in the social sciences.

the information that is required to arrive at action which best achieves desires?² These issues are highlighted by Holler (p. 59):

Why does Blondie initiate the truel, instead of simply shooting down Angel Eyes after he put the gun back into his holster? Why should Tuco and Angel Eyes believe that Blondie writes on the rock the name of the grave which contains the \$200,000 treasure?

Holler does not provide an answer, let alone a clinching answer, to his questions. No one can. He explores the idea of rationality from different angles telling stories from many disciplines. He does so not by setting out a task for solving a problem, but by drawing our attention to the problematic nature of the concepts of beliefs, desires, and information. We are invited to reflect. These concepts and their relation to the idea of rational action are central to economics. The idea of rationality cannot be adequately explored without recourse to disciplines outside the bubble of economics (Simon, 1986). Holler develops this view illustrating his arguments with literature ranging far and wide, from psychology to art.

Rational Choice

To study the problematic idea of choice, it may be helpful to start with an abstract model of the perfectly competitive market, one of the building blocks of neo-classical economics. In this perfectly competitive market, where all producers are profit maximizers and no single producer is large enough to influence the price, consumers make purchases (make choices) which are limited by their budget, and dictated by their objective of maximising desire. The production technology does not confer any advantage to larger producers in transforming inputs into outputs. Consumers are assumed to prefer more to less and hence they choose a combination of quantities of available goods until their budget is exhausted. The consumer takes no consideration of anyone but herself in setting her objective of fulfilling desire. The desire for a bundle of things is a reflection of satisfaction that this bundle provides.³ Satisfaction is also controversially called utility in neo-classical economics which derives from utilitarian philosophy.⁴ Suppose the decision maker has a clear view of what she desires and is motivated in making the choice solely by a solipsistic

² Elster (1985, p. 11) talks about the "ambiguity of rational behavior" in a discussion of strategic rationality, something that concerns game theorists like Holler. If the outcome of choice depends on the choice made by others, then the individual choice is a strategic choice. It is in this context that Holler analyses whether there is any second-mover advantage.

³ I say "reflection" and not "measure" to avoid assigning a cardinal value to satisfaction. Neo-classical economics aims to derive a theory of relative prices between things without resort to a cardinal concept of satisfaction or utility.

⁴ The words utility and satisfaction are not as precise as the mathematical rendering of utility maximisation subject to constraint might imply. There is an excellent discussion in Little (1950/1973, p. 22).

focus on reaching the highest level of utility. She believes that her choices would bring about a successful conclusion of that optimisation exercise, where goods are purchased in combination of quantities such that utility is maximized subject to the budget, putting restriction on bundles that are affordable.⁵ Armed with a few more technical assumptions, this exercise can be translated into a mathematical form of maximisation subject to constraint. These assumptions ensure that the optimisation exercise has an interesting solution. For example, we can compare at the margin how much one is prepared to give up of one thing for another. This pairwise comparison between goods or utilities at the margin provides a mathematical theory of relative prices in a perfectly competitive market. The idea of rational choice in this model is a description of choice and utility resulting from exercises of that choice. One of the essential features of that description is that choice is based on pairwise comparison over all possibilities. Rational choice is defined as pairwise choice that is consistent. If I choose an apple over a pear once, I am assumed to choose an apple over a pear whenever that binary choice is presented to me. In making that decision between an apple and a pear, I take no account of what else might be available. That is a description. No normative value can be attached to a description, but this caveat is far too often forgotten by economists in prescribing policy or analysing behavior.

Description of choice can at best tell us what people have chosen, but without clarifying the motivation for that choice. This difficulty crops up in Amartya Sen's analysis of a rational fool (Sen, 1977). If I choose a small apple over a bigger apple when there is a child in the background who wishes to claim the big apple, that does not mean that I would make the same choice if the child was not there. The reason for choice is not clear if the only information is the observed choice. Confusion results when this caveat is ignored in prescribing policy. Price theory loses its claim to precision when the confusion results in the conflation of what people have chosen with what people might have preferred (Sen, 1973). For example, I may choose an apple over a pear to eat, but I like the taste of a pear over an apple. I choose an apple because I wish to live until my 99th birthday, not a day more or a day less, and I believe that my choice of an apple would fulfil my desire. An observation of what I choose is not sufficient to know why I make that choice. The informational basis of choice poses challenging problems in the application of rational choice economics to the funding of academic research (Chakravarty, 2016), design of political institutions (Chakravarty, 2018), or the amelioration of unemployment (Chakravarty and MacKay, 1999). Holler's book plays with the idea of information with a focus on game theory. Hence the phrase second-mover advantage in the subtitle. In a wider context, Holler refers to secrets and desires, words which also appear in the subtitle. The novelty lies in the stories that he

⁵ A maximization exercise, choosing a combination of things from a choice set, subject to a constraint that limits the quantities that can be chosen is called an optimization exercise within that constraint.

weaves to illustrate his argument about the difficulty in fitting problems of choice into the straightjacket of what social scientists call rational choice.

The idea of rational choice has contributed as much to precision in discourses on economics as it has contributed to lack of clarity in economic discourse. We can define rational choice however we please, but we cannot then attribute a normative property to that definition. In general use, the word rational has a normative connotation. This difficulty is especially manifest in the ordering of policy alternatives in utilitarian economics. Frank Hahn, one of the foremost proponents of the application of the ideas of rational choice in articulating with mathematical rigour assumptions needed to rank policy alternatives draws attention to an inherent imprecision in rational choice theory in economics:

Suppose I chose to work eight hours a day for five days a week at the current wage and at the current prices of goods. Suppose next that I wake up one morning and find that the government has passed a law forcing me to work at my existing job at the existing wage for five days a week. Prices are still the same. All that has happened is that I am now by law obliged to do what I had freely chosen to do before. Nonetheless, I claim that it is reasonable for me to feel a great deal worse off than I did before the law was passed. (1984, p. 188)

Rational choice theory requires pairwise comparison to be consistent. Insofar as that description does not clarify the background in which the choice is being made, it is an imprecise description of the choice that is faced. I freely chose to work “eight hours a day for ... current prices of goods.” Yet I would balk at working as above if I am “by law obliged to do what I had freely chosen to do before.” There appears to be a contradiction, but only if the policy background under which the choice is made is ignored. What is called policy dependent choice is not catered to in rational choice economics. I am not rational by the definition of rational choice, but my distaste for being told what to do is not necessarily irrational in the everyday use of the word rational. Rational choice as described in rational choice theory might not always be the observed choice.

Once it is admitted that observed choice might be dependent on the policy background under which the choice is made, the theory of prices underpinning neo-classical microeconomics becomes shaky. That is why the building block of Keynesian macroeconomics does not start with that microeconomics, notwithstanding ill-conceived attempts in the last quarter of the twentieth century to search for a micro foundation of macroeconomics (Chakravarty and MacKay, 1999).⁶

⁶ See Skott (2010) for an analysis of critiques of the developments in macroeconomics during this period, especially since the 1970s. He cites Willem Buiter amongst others to describe the teaching of macroeconomics since the 1970s “at UK and US universities as a ‘costly waste of time.’” Skott’s paper follows a discussion of a question put by the British monarch at the London School of Economics: Why did none of the great intellects in the economics profession present at the function foresee the financial crunch?

Holler on Choice

Game theory is the peg on which the stories in the book hang, and there are more stories than there are in the film. There are detours into social choice, psychology, history, art, cinema and even tidbits on George Orwell. The writing demonstrates scholarship which cannot be compartmentalized into any single discipline. Holler expands on the argument that choice is policy dependent in a new direction by citing artist Nicola Atkinson–Griffiths. Atkinson–Griffiths maintains that how we interpret what is before us depends on the environment. Holler quotes her words approvingly:

My work questions people's perception of their environment. I produce framework of ideas which enable the public to contemplate other views of the world.
(p. 160)

Let me take this discussion further by taking up a point made by Joan Robinson (1962/1974), an early critic of rational choice theory. She maintains that choice is not perceived by individuals in the way that is described in rational choice theory:

... the consumer is "a man," a Robinson Crusoe, an individual with his tight, impermeable, insulated equipment of desires and tastes. When we admit the influence of society, of the Joneses, of advertisement, upon the individual's preferences, the problem of framing the experiment becomes teasing indeed. (p. 51)

The description of rational choice misses the point that, in making a choice, the individual first has to clarify in his mind whether he is making that choice as someone living in his own solipsistic bubble or he is making that choice as a member of a community. Consider Ng (1989):

Suppose that a chemical has been invented which if released into the air will clean up the atmosphere and make us healthy, able to enjoy life better and not get any older. But it will also make us all sterile (but sexually still active, if not more so) and die painlessly after one hundred years. Suppose also that everyone regards the better health, etc as more than compensating for the inability to have any more children. So all existing persons will be better off and no new person will be born. (p. 237)

Should we choose to release the gas? If we define rational choice as the phrase is understood in neo-classical economic theory, a minimum requirement for individual choice is that it should be consistent with beliefs and desires. The desires are formulated in a solipsistic bubble of one's own by every individual. From that perspective, the rational choice for all individuals in society would be to favour releasing the gas. There is something problematic in the description of choice in neo-classical economics if that theory is to provide policy prescriptions. Confronted with the Ng problem, it might be inappropriate to view society as an entity comprising individuals living in solipsistic bubbles. What one desires living within the bubble may not be the same as that which one might desire as part of

humankind. A choice which would entail the annihilation of humankind might not seem acceptable even if that choice in isolation might be tempting. The choice set, whether to release the gas or not, appears different to an individual depending on how he perceives the background, the context, in which the choice is to be made. The choice set remains ambiguous if the context is missing.⁷

Holler draws attention to another ambiguity in the rational choice literature when confronting the idea of non-isolation. Game theory addresses the question of individual choice when the outcome of that choice depends on the choice made by at least one other person. Suppose that I have a choice set where the outcome of my choice depends on choices made by others. To make any sense of my choice problem, I must make an ad hoc assumption about how others would choose if they exchanged places with me and faced the choice that I face. This is the assumption of a shared idea of rationality, as described in rational choice economics, which permeates game theory. Yet this assumption is wholly arbitrary, and contradictory evidence can be found in experiments in psychology (Frank, Gilovich, and Regan, 1993).

Frank et. al. conducted an experiment of repeated prisoners' dilemma for student participants at Cornell University. The number of repeats was declared at the outset. The co-operative strategy would be more lucrative to both players if they could trust each other and refused to fall for the lure of what is called the dominant strategy. The dominant strategy is so called because it would be chosen by both players if they had the same idea of rationality in choice as taught in neo-classical microeconomics, and they made the assumption of common knowledge which is a standard assumption in rational choice economics. All players are assumed to share the same idea of rational choice. The authors report that mostly only those that had studied a microeconomics module taught by a strong proponent of rational choice theory and did well (i.e., they imbibed what was taught) in that module chose not to cooperate. Most of the participants who had not studied microeconomics rejected the dominant strategy in favour of the cooperative strategy.

Second-Mover Advantage

Holler's book is published in a series entitled *The Graz Schumpeter Lectures*. It is natural that he should revisit Schumpeter. Holler takes up Schumpeter's idea of entrepreneurship and technological progress in Chapter 3. The title of the chapter, *Second-Mover Advantages*, is the vantage point of his analysis. He entertains and

⁷Elster (1985, p. 35) cites a range of philosophers who differ strongly on many issues but agree to the following proposition, which gets us around the conundrum posed by the discovery of Ng's gas: "...the central concern in politics should be the transformation of preferences rather than their aggregation. On this view the core of the political process is the public and rational discussion about the common good, not the isolated act of voting according to private preferences."

informs us about the development of light beer, video recording equipment and much else. In explaining the Schumpeterian idea of creative destruction, he gives examples from developments in green technology.

Holler takes us through the literature in industrial economics to examine what drives entrepreneurs and how they approach their task. They are not always motivated by money, as also noted in an earlier discussion (p. 35) of Frey (1997). Holler (p. 123) returns to this idea again in Chapter 5 in a discussion of a book by the physicist Richard Feynman (1985). Feynman highlights the role of curiosity about the unknown being a motivation in the advancement of knowledge. This exploration of the motivation of scientists and entrepreneurs draws attention to a limitation of rational choice theory in “ranking sets in order to be able to specify their impact on decisions” (p. 35). Government plays a role in technological progress at early stages, and private firms are often second or subsequent movers in this game. Basic research is done by scientists working in a non-commercial environment. When they conduct that work, it is not known if the knowledge gained will directly transfer into product development. It can be years if not decades before any commercial considerations can justify the work.⁸

In approaching Schumpeter’s views on technical progress, Holler discusses at length examples given by Mazzucato (2014) that government took the lead in major technological developments in the United States, but not on the basis of cost–benefit analyses to identify winners and losers. There are too many uncertainties for such an analysis to be meaningful. Instead, government-funded research at universities and government agencies is often dictated by scientific curiosity. DARPA (Defense Advanced Research Projects Agency) was an important source of funds in the United States for fundamental research in the 1960s. Early work on personal computers was done at DARPA before Apple and IBM entered that market. They had second-mover advantage. Holler quotes Mazzucato to conclude that argument:

From the development of aviation, nuclear energy, computers, the internet, the biotechnology revolution, nanotechnology and even now in green technology, it is, and has been, the state not the private sector that kick-started and developed the engine of growth, because of its willingness to take the risk in areas where the private sector has been too risk-averse. (2014, p. 13)

If it is simply a matter of risk, as Mazzucato suggests, then government involvement as described by Mazzucato might not have been needed. Schumpeter talked about spreading risk to reduce the adverse consequence to private investors in case of failure. There are ways of doing that through the financial system. Holler finds that it is not a question of risk alone why the private sector leans on government to take the initiative of developing new technology. Holler suggests the

⁸ For a more detailed argument, see Chakravarty (2016).

need to make a distinction between risk and uncertainty in discussing Schumpeterian ideas of technological progress. There was a lively debate in the 1930s about information which in principle can be known, but is not known, and information which is unknowable. The former can be quantified as risk, and the latter as uncertainty (Krugman, 2016). He finds that the first movers in technological development often have very different ways of looking at the problem of choice of topics for research than second movers or subsequent entries.⁹

Concluding Comments

This is a thoroughly enjoyable book which could be read simply for pleasure or for seeking insight into the economics of strategic choice. It is not a monograph advancing a thesis in the way that academic books are often structured. It is an invitation to enjoy the stories that are told, and to reflect on ideas that come to mind. That is a novelty. The thread that came to mind as I read the book was to make me reflect on the idea of rational choice. But the stories can also be read for their sheer enjoyment. Holler, the story teller, challenges the reader to engage with novel approaches to the philosophical underpinning of concepts which are the mainstay of the social sciences, but especially of economics.

To make analysis tractable, it is often necessary to set aside the problematic nature of concepts — desires, beliefs, evidence and the processing of evidence, to name a few — to formulate policy and make predictions in the social sciences. But the problems remain. They need to be revisited from time to time because they are not just abstract exercises. Consider the financial crunch in 2008. Belief about the probabilities of default of financial products were formed by models validated with vast amounts of data. This belief turned out to be faulty due to, *inter alia*, an assumption of ergodicity in the estimation of parameters. The future is not an image of the past. The models also failed because society was viewed simply as an aggregation of individuals not connected to each other. For example, the default probability of mortgages was estimated without consideration of Keynesian insights about the potential failure of aggregate demand. Vast amounts of data were used in the estimation of parameters, but relevant data were missing. Evidence and data were not fully comingled. Some economists like Mervyn King, the former Governor of the Bank of England, now argue that a blurring of the distinction between risk and uncertainty contributed to the credit crunch of 2008, as explained by Krugman (2016). Failing to engage with the assumptions underlying models of the behavior of decision makers in the economy, what

⁹ Even when competitors have knowledge about the outcome for all the players of entering an activity — for example, developing a new product — they may assign different probabilities to these outcomes for competitors other than themselves (Broome, 1989). I have not seen an application of this idea of different probabilities being attached by different players to the outcome of prospects for other players in any game theoretic models in industrial economics.

passed for financial economics was often simply hubris. Lessons from this crisis are important for an understanding of Schumpeter's idea of devising methods for spreading risk.

The British Queen during a ceremonial visit to the London School of Economics in 2008 asked a simple question to an audience comprised of economists at the highest ladder of their profession: Why did no one foresee the credit crunch? A conference of the great and the good was organized under the auspices of the British Academy to write a letter in reply dated 27 July 2009 (Besley and Hennessy, 2009):

When Your Majesty visited the London School of Economics last November, you rightly asked: why had nobody noticed that the credit crunch was on the way? The British Academy convened a forum on 17 June 2009 to debate your question, with contributions from a range of experts from business, the City, its regulators, academia, and government. This letter summarises the views of the participants and the factors that they cited in our discussion, and we hope that it offers an answer to your question.... One of our major banks, now mainly in public ownership, reputedly had 4000 risk managers. But the difficulty was seeing the risk to the system as a whole rather than to any specific financial instrument or loan.... There were many who warned of the dangers of this. But against those who warned, most were convinced that banks knew what they were doing. They believed that the financial wizards had found new and clever ways of managing risks. Indeed, some claimed to have so dispersed them through an array of novel financial instruments that they had virtually removed them. It is difficult to recall a greater example of wishful thinking combined with hubris.... So in summary, Your Majesty, the failure to foresee the timing, extent and severity of the crisis and to head it off, while it had many causes, was principally a failure of the collective imagination of many bright people, both in this country and internationally, to understand the risks to the system as a whole.

Amongst those that had not fallen for the charm of the wizards were Sheila Dow at Stirling University and Geoffrey Hodgson at Staffordshire University. They consulted colleagues at universities in the United Kingdom and Australia and also talked to people outside academia to draft a further letter addressed to the Queen. The letter was dated 10 August 2009, and it was signed by ten economists (Dow et. al., 2010).¹⁰ In their letter, they highlight the deficiency in the training of economists.

We agree with many of the points made by Professors Besley and Hennessy, principally those summarized in the next paragraph, but we regard their overall analysis as inadequate because it fails to acknowledge any deficiency in the training or culture of economists themselves.... [The letter from Besley and Hennessy] does

¹⁰Following is the full list of signatories. Sheila Dow (Stirling), Peter Earl (Queensland), John Foster (Queensland), Geoffrey Harcourt (Cambridge), Geoffrey Hodgson (Hertfordshire), J. Stanley Metcalf (Manchester), Paul Ormerod (Academy of Social Sciences), Bridget Rosewell (Greater London Authority), Malcolm Sawyer (Leeds), and Andrew Tylecote (Sheffield).

not consider the typical omission of psychology, philosophy or economic history from the current education of economists in prestigious institutions. It mentions neither the highly questionable belief in universal “rationality” nor the “efficient market hypothesis”—both widely promoted by mainstream economists.... What has been scarce is a professional wisdom informed by a rich knowledge of psychology, institutional structures and historical precedents. (Dow et al., 2010, pp. 334–335)

It is important occasionally to think about assumptions underlying economic theory, and to re-visit ideas in other related disciplines if failures of the collective imagination are not to become the hallmark of the mainstream of the economics profession. Manfred Holler’s book makes us reflect on the assumption of rationality, and it does so by taking a tour through history, psychology, art, and philosophy. It is a welcome contribution to the economics literature.

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