

On the recent philosophy of decision theory

Ivan Moscati*

Published in [*Journal of Economic Methodology*, 28, 2021: 98–106](#)

Accepted version: November 2020

Abstract

In the philosophy of economics, the last fifteen years have witnessed an intense discussion about the epistemological status of economic models of decision making and their theoretical components, such as the concept of preference. In this article I offer a selective review of this discussion and indicate the directions in which I believe it should evolve.

Keywords: Preference; Choice; Mentalism; Behaviorism; Heuristics; Naturalism; Scientific realism and antirealism.

JEL Classification: B40; D80; D90.

* Department of Economics, University of Insubria, Varese, Italy, and Centre for Philosophy of Natural and Social Science, LSE; contact: ivan.moscati@uninsubria.it.

1. Introduction

The last fifteen years have witnessed an intense debate in the philosophy of the economic theory of decision making.

From a broad perspective, the debate can be seen as the methodological offshoot of enduring theoretical tensions between traditional decision theory and the behavioral approach to decision analysis. In a nutshell, these tensions originate from a disagreement between mainstream decision theorists and behavioral economists about the costs and benefits of including in economic models a detailed theory of the psychological determinants of decisions: while behavioral economists emphasize the benefits of this move, mainstream decision theorists call attention to its costs and resist to it.

From a narrow perspective, the debate was sparked by two publications. The first was 'The case for mindless economics', a paper that mainstream Princeton economists Faruk Gul and Wolfgang Pesendorfer circulated in 2005 and published in 2008 (Gul and Pesendorfer 2008). The second was *Nudge* (2008), a book coauthored by the behavioral economist and 2017 recipient of the Nobel Prize in economics Richard Thaler and legal scholar Cass Sunstein.

Roughly speaking, the discussion triggered by Gul and Pesendorfer's paper has concerned the 'positive' or 'descriptive' dimension of decision analysis and has focused on the epistemological status of decision models and their theoretical components, such as the concept of preference, while the discussion prompted by Thaler and Sunstein's book has centered around the 'prescriptive' or 'normative' dimension of decision theory and its policy applications.

In this essay, I focus on the discussion originated by Gul and Pesendorfer's paper. In sections 2–5 I offer a selective review of that discussion, with a focus on the debate about the status of the preference concept.¹ Based on this review, in sections 6–8 I indicate what I believe are the directions along which the discussion should continue and evolve.

¹ An incomplete list of contributions to the discussion originated by Gul and Pesendorfer's essay include: Spiegler (2008), Rubinstein & Salant (2008), Hausman (2008), Caplin (2008) and other papers included in the volume edited by Caplin & Schotter (2008), Harrison (2008), Craver & Alexandrova (2008), Berg & Gigerenzer (2010), Dekel & Lipman (2010), Vromen (2010), Hausman (2012), Moscati (2012, 2018), Harrison & Ross (2010), Ross (2011, 2014), Alexandrova & Haybron (2011), Guala (2012, 2019), Hands (2012, 2013a, 2013b), Lehtinen (2013), Pattanaik (2013), Fumagalli (2013), Grüne-Yanoff, Marchionni, & Moscati (2014a, 2014b), Manzini & Mariotti (2014), Gilboa et al. (2014, 2019), Cozic & Hill (2015), Hédoin (2016), Baccelli & Mongin (2016), Dietrich & List (2016), Clarke (2016, 2020), Okasha (2016), Heidl (2016), Bradley (2017), Engelen (2017), Angner (2018), Herfeld (2018), Nagatsu & Pöder (2019), Vredenburg (2020), Thoma (2020).

2. Gul and Pesendorfer's behaviorist account of decision theory

In opposition to various criticisms of economic decision theory voiced by behavioral economists, Gul and Pesendorfer (2008) advanced a behaviorist (i.e., anti-psychologistic) account of the economic modelling of individual decision-making.² They argued that economic models of decision making should ultimately aim at describing and predicting the choice behavior of individuals rather than studying the underlying psychological causes of this behavior. In particular, for Gul and Pesendorfer the notions of utility and preference should not be interpreted in a mentalist way, that is, as referring to some entity existing somewhere in the individual's mind, but as notions anchored to, and depending on, the notion of choice. Accordingly, for Gul and Pesendorfer 'the terms "utility maximization" and "choice" are synonymous' (p. 7), and an individual is said to prefer alternative x to alternative y 'if and only if, given the opportunity, the individual would choose x over y ' (p. 24).³

Gul and Pesendorfer's behaviorist appraisal of decision theory drew many criticisms. With respect to the concept of preference, critics basically contend that: (1) preferences are different from choices, not only from the viewpoint of commonsense, philosophy, and psychology but, most importantly, with respect to the role preferences play within economic decision models; (2) in models dealing with the decision making of single individuals, as opposed to models dealing with the decisions of organizations or non-human organisms, preferences are best understood in a mentalist way.

3. Preferences are not choices

Regarding contention (1), Dan Hausman (2008, 2012), Richard Bradley (2017), Francesco Guala (2019) and others argue that, in models dealing with decisions under uncertainty, preferences determine choices in conjunction with beliefs. Since various combinations of preference and belief may determine the

² Admittedly, the terminology used in decision theory is confusing because two almost identical words – *behavioral* and *behaviorist* – have almost opposite meanings. It might be therefore useful to reiterate that *behavioral* economists want to provide economics with more psychological underpinnings, while *behaviorist* economists want to free economic theory from psychological concepts.

³ As a number of commentators have noticed (e.g. Hausman 2008, Hands 2013a), although Gul and Pesendorfer cite neither Paul Samuelson nor Milton Friedman their account of decision theory owes much to the choice-based approach to consumer demand analysis originally proposed by Samuelson (1938) and later dubbed 'revealed preference theory', as well as to the as-if methodology to economic modelling advocated by Friedman (1953).

same choice, it is not possible to directly infer preferences from choices and, therefore, to identify preferences with choices.⁴

Ran Spiegler (2008), Andrew Caplin (2008), and others stress that many models of individual decision-making, including Gul and Pesendorfer's (2001) decision model of temptation, make assumptions about the decision maker's preferences between hypothetical or counterfactual states of affairs that the decision maker cannot actually choose. Also several results in the analysis of strategic decision-making, that is, game theory, are based on the preferences of each player between hypothetical states of affairs that she cannot choose because these states depend on the decisions of other players. Therefore, so the argument goes, the identification of preference with choice makes it difficult to account for some significant parts of decision and game theory.

Finally, John Beshears et al. (2008) and others have stressed that choices may be the combined outcome of preferences and decision-making errors due to inattention, limited personal experience, and possibly other factors. Ariel Rubinstein and Yuval Salant (2008), Nathan Berg and Gerd Gigerenzer (2010) and others have contended that choices may not derive from the maximization of preferences but result rather from the application of some heuristic on the part of the decision maker. In both cases, for these scholars inferring preferences from choice is misleading.

4. Mentalist accounts of preferences

Regarding contention (2), critics of Gul and Pesendorfer typically advocate a mentalist account of preferences. However, different critics have identified different mental correlates for the economic notion of preference.

Hausman (2012) argues that preferences in economics are 'total comparative evaluations', which are 'more cognitive, more like judgments, than [are] desires' (p. x). More precisely, for Hausman preferences are the output of a cognitively demanding process in which agents take into account not only their desires but also everything they regard as relevant to their choices, such as moral commitments, beliefs about the consequences of their actions, or the pursuit of consistent behavior.

Erik Angner (2018) and others, including myself (Moscati 2012), have criticized Hausman's cognitivist characterization of preferences. Among other things, as Angner (2018, p. 666) observes, actual economic practice reveals little evidence that economists treat preferences as exhaustive and cognitively demanding evaluations of the type suggested by Hausman. In their practice

⁴ In the philosophy of mind, the thesis according to which actions are determined by multiple and interconnected mental states is called the thesis about the holism of the mental realm, and is associated with the philosophy of Donald Davidson (1980).

economists seem to be closer to a Humean conception of preferences as primitive and cognitively unsophisticated desires.

Guala (2019) suggests that preferences should be seen as belief-dependent dispositions: saying that a decision maker A with certain beliefs prefers x to y means that A has a disposition to behave in a certain way B, e.g., to choose x over y, when a set of circumstances C occur. Knowing that the set of circumstances C triggers the decision maker A to choice behavior B is informative even if the causal mechanism connecting C to B remains unspecified. In effect, Guala stresses, the causal mechanism connecting C to B changes according to the nature of the decision maker. When the decision maker A is a multi-member organization such as a committee, or a non-human organism such as a jellyfish or a robot, the causal mechanism connecting C to B is not psychological and therefore the notion of preference/disposition cannot be interpreted in a mentalist way. In contrast, when the A is a human individual the causal mechanism connecting C to B 'is indeed mainly constituted by psychological mechanisms' (p. 398), and therefore a mentalist interpretation of the notion of preference/disposition is legitimate.

Franz Dietrich and Christian List (2016) defend a mentalist account of preferences and, more generally, of decision theory by adopting a doctrine in the philosophy of science called 'functionalism'. According to functionalism, we should 'accept that the entities, properties, and relations to which [our best scientific] theories are committed correspond to real entities, properties, and relations' (p. 264). With respect to decision theory, functionalism states that preferences, beliefs, and other entities posited by decision models really exist and have the desired properties just because our best decision theories are committed to them.

Although I welcome Dietrich and List's attempt to address the debate about the epistemological status of decision models from a broader philosophy-of-science perspective (see section 7), I find their appeal to functionalism problematic.⁵ On a general level, functionalism makes every decision-theoretic construct real by *fiat*. This move, however, voids the notion 'real' of any substantial, and thus interesting, content, and therefore ultimately begs the question about the status of preferences and other decision-theoretic constructs.

With specific regard to the notion of preferences, functionalism takes for granted that there is a unique best decision theory, and that this decision theory is committed to the notion of preference. However, what the best theory may be is not uncontested and not all candidates are so committed. It is correct that both mainstream decision theory and behavioral decision theory

⁵ Doubts about Dietrich and List's functionalism have been expressed also by Guala (2019), Thoma (2020), and Clarke (2020).

in the tradition of Daniel Kahneman and Amos Tversky (1979) are committed to some notion of preference.⁶ However, in the heuristic-based approach to decision theory, inaugurated by Herbert Simon (1955) and developed, among others, by Gigerenzer and his research associates (see e.g. Gigerenzer & Goldstein 1996, Brandstätter, Gigerenzer, & Hertwig 2006), preferences are absent and individual decision-making is modelled as the result of the application of simple rules on the part of the decision maker.

Although more popular in psychology, even in economics the heuristic-based approach to decision theory is a scientifically respectable line of research that cannot readily be dismissed as pseudoscience or a superseded theory (like phlogiston theory in chemistry). Therefore, adopting functionalism but acknowledging that there are at least two 'best' decision theories leaves it unclear what are the mental entities posited by decision analysis. According to the preference-based approach, preferences are real mental entities while heuristics are not. According to the heuristic-based approach, in the mind of decision makers only heuristics exist. The problem with functionalism, I believe, is that it does not help us figure out which alternative is more suitable.

5. Behaviorist rejoinders

Some contributors to the debate have defended a behaviorist account of decision models, typically in versions milder than Gul and Pesendorfer's.

As mentioned in Section 3, Spiegel (2008) argues against the identification of preference with choice. However Spiegel, Paola Manzini and Marco Mariotti (2014), and others stress the importance of accompanying new behavioral decision models formulated in the language of preferences, beliefs, and other putative mental concepts with a 'revealed preference exercise', that is, with an attempt to characterize the choice implications of the decision model. For Spiegel (2008, p. 99), the revealed preference exercise 'may serve as a safeguard against misleading interpretation of the model's assumptions, domain of applicability, and conclusions'.

Johanna Thoma (2020) accepts a minimal form of mentalism by conceding that decision theorists should define the choice options in a way that is consistent with the mental representation that decision makers have of these options. If this is granted, however, for Thoma the behaviorist identification of preference with choice is epistemically justified because it 'black-boxes the psychological processes that lead to choice', thereby allowing decision theory to avoid 'controversial substantive commitments about psychological processes we

⁶ For textbook overviews of mainstream decision theory and behavioral decision theory *à la* Kahneman and Tversky see, respectively Mas-Colell, Whinston, & Green (1995) and Dhami (2016).

know little about' (p. 3), and preserving 'a clearer disciplinary boundary to psychology and related disciplines' (p. 21).

I fully agree with Thoma's analysis of the benefits produced by black-boxing the psychological processes leading to choice. However, she does not discuss the costs associated with such black-boxing or, to put it differently, the benefits of opening the black-box. In a footnote, Thoma acknowledges that 'it might ... be desirable to open the black box in some cases, in particular when there are systematic violations of the theory', and that 'in fact, this is a core motivation behind behavioural economics' (p. 22, fn. 42). I agree, but this is just to take us back to square one of the discussion which, in my view, is ultimately about the costs and benefits of opening the black box.

A different defense of Gul and Pesendorfer's behaviorist account of decision theory is made by Don Ross (2011, 2014). The premise of Ross' defense is his thesis that economic science should be primarily concerned with aggregate market phenomena rather than individual decision-making: 'The fundamental ontology of economics is organized around markets rather than individuals' (Ross 2014, p. 28). In particular, for Ross the choices relevant to economics are the aggregate demand and supply choices of a population of economic agents, with respect to which the idiosyncrasies of individual choice behavior can be ignored (see also Herfeld 2018 for a similar view). According to Ross, when Gul and Pesendorfer refer to choice behavior they intend *aggregate* choice behavior, and therefore their choice-based account of economic theory suitably expresses the central role that the study of aggregate demand and supply has in economics.

Ross' characterization of economics as a discipline primarily concerned with macro-phenomena, and therefore fundamentally uninterested in the possible micro-foundation of such macro-phenomena, has a long and venerable tradition that might even be traced back, as almost everything else in economics, to Adam Smith. Although I find Ross' characterization inaccurate for a number of reasons, I will not here attempt systematic criticism but merely observe that it is not helpful for understanding the epistemological status of the variety of models of individual decision-making whose production, *pace* Ross, has kept busy a significant portion of economists over the last forty or so years.

Taking stock of the discussion so far, in the next three sections I indicate what I believe are the directions along which the debate about the epistemological status of decision models should continue and evolve.

6. Naturalism: OK; more naturalism: better

Almost all contributors to the discussion on the status of decision theory have adopted a broadly naturalistic attitude, in the sense that they appear to share

the conviction that philosophical accounts of decision theory should be consistent with scientific practice. Not only do I share this conviction, I think the naturalistic attitude should be implemented more thoroughly in two directions.

First, most philosophical discussions of decision theory continue to focus on traditional neoclassical theories of decision making, such as Expected Utility Theory (von Neumann and Morgenstern 1944/1953; Savage 1954), or basic versions of behavioral models, such as the initial version of Prospect Theory (Kahneman and Tversky 1979), tending to ignore the models of decision making that are most used, discussed, and experimentally tested by current decision theorists. Restricting attention to models of decision making under risk and uncertainty, we observe such models as Rank Dependent Utility theory, Cumulative Prospect Theory, Choquet Expected Utility theory, the Maximin Expected Utility model, or the Smooth Model (for a textbook presentation of these models, see Dhimi 2016). In my opinion, philosophers of economics should become more familiar with recent theories of decision making, and arguably take them as a novel subject of philosophical analysis.

Second, the heuristic-based approach to modelling individual decisions is a narrow but not negligible part of the scientific practice in decision theory, and I deem that contributors to the philosophical discussion on the status of decision models should pay more attention to it. Like Dietrich and List (2016), most philosophers of economics tend to identify decision theory with the approach based on utility or preference maximization, in either its neoclassical version or the behavioral version *à la* Kahneman and Tversky (see section 4 above). This identification, however, is an incomplete and therefore potentially misleading picture of the actual practices of decision theorists.

7. More philosophy of science

In an article on the state of the art of economic methodology at the turn of the century, Wade Hands (2001, pp. 53–54) welcomed the decline of what he labeled the ‘shelf of scientific philosophy’ approach to economic methodology. In this approach, economic methodologists took some doctrine from the general philosophy of science, such as Popper’s falsificationism or Lakatos’ methodology of scientific research programmes, and applied it to economics. This application typically had a ‘descriptive’ part, consisting in the attempt to reconstruct the scientific practices of some part of economics using the categories provided by the preferred epistemological doctrine, and a ‘normative’ part, in which the scientific practices of economists were judged right or wrong according to the preferred epistemological doctrine.

Over the last twenty years or so, the generalized adoption of a naturalistic attitude in the philosophy of economics has almost dispelled the ‘shelf of

scientific philosophy' approach to economic methodology. While I applaud the disappearance of the normative part of this approach, I worry that the fading of its descriptive part has some negative consequences, for it makes it more difficult to connect the issues discussed in the philosophy of economics to more general issues discussed in philosophy of science; a connection that, in turn, may reveal the former as but special cases of the latter.

Thus, I think, philosophers of economics have become very skilled in examining the various aspects and nuances of discipline-specific issues, such as the status of the concept of preference in the preference-based approach to the economic modeling of individual decision-making. This is good. However, in sharpening their eye for the detail, philosophers of economics (and I include myself in the group) have also somehow lost sight of the big picture, that is, our capacity to see that the specific methodological problems we examine are often a discipline-specific manifestation of more general epistemological problems that economics shares with other sciences. I am thinking, for instance, of problems related to the inference to the best explanation, the nature of scientific explanation, and the epistemic aims of science.

8. Back to realism and antirealism

In particular, the opposition between mentalist and behaviorist accounts of decision theory seems to me a discipline-specific manifestation of the time-honored clash in the philosophy of science between realist and antirealist accounts of scientific theories. Mentalism in decision theory has affinity with scientific realism while behaviorism seems a particular form of scientific antirealism. In particular, the discussion on the status of preferences in decision theory and their relationship with choices appears to be a disciplinary manifestation of the realism-antirealism debate about the status of unobservable terms in scientific theories and their relationships with the observable phenomena the theory attempts to explain, predict, or modify.

To be sure, scientific realism and antirealism are not simple and univocal epistemological positions but each consists of a cluster of related views about the status of theories, and each position has several variants. Variants of scientific realism include entity realism, structural realism, convergent realism, and semirealism, while empiricism, instrumentalism, operationalism, fictionalism, conventionalism, and constructivism are varieties of scientific antirealism.⁷

Stepping into the realism-antirealism debate is definitely to enter tricky and perhaps even muddy waters. Nonetheless, I am convinced that, at this stage

⁷ For recent reviews of the realism-antirealism debate, see Chakravartty (2017) and Rowbottom (2019).

of its history, that is, after twenty years or so of detailed but narrow methodological studies, philosophers of economics should once again attempt to navigate and chart those waters, and that this move could have significant payoffs in terms of future contributions to understanding how decision theory, and more generally economics, works.⁸

Acknowledgements

I thank Francesco Guala and Wade Hands for steady exchange of ideas on the topic of this essay. The usual disclaimer applies. I dedicate this work to the memory of Philippe Mongin, acute philosopher of decision theory and a research model for many of us.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

Ivan Moscati is Professor of economics at the University of Insubria, Varese, and Research associate of the Centre for Philosophy of Natural and Social Science at LSE. His research focuses on the history and methodology of choice and utility theory. He is the author of *Measuring Utility* (Oxford UP, 2018), and recent articles of his have been awarded best article awards of the History of Economics Society and the European Society for the History of Economic Thought.

ORCID

Ivan Moscati <https://orcid.org/0000-0002-8995-0015>

⁸ After completing the present paper, I made my own attempt to connect the philosophy of decision theory to the realism-antirealism debate in Moscati (2020).

References

- Alexandrova, A., & Haybron, D. M. (2011). High fidelity economics. In J. Davis & D.W. Hands (Eds.), *Elgar companion to recent economic methodology* (pp. 94–120). Edward Elgar.
- Angner, E. (2018). What are preferences? *Philosophy of Science*, 85, 660–681.
- Bacelli, J., & Mongin, P. (2016). Choice-based cardinal utility. *Journal of Economic Methodology*, 23, 268–288.
- Berg, N., & Gigerenzer, G. (2010). As-if behavioral economics: Neoclassical economics in disguise? *History of Economic Ideas*, 18, 133–165.
- Beshears, J., Choi, J.J., Laibson, D., & Madrian, B.C. (2008). How are preferences revealed? *Journal of Public Economics*, 92, 1787–1794.
- Bradley, R. (2017). *Decision theory with a human face*. Cambridge University Press.
- Brandstätter, E., Gigerenzer, G., & Hertwig, R. (2006). The priority heuristic: Making choices without trade-offs. *Psychological Review*, 113, 409–432.
- Caplin, A. (2008). Economic theory and psychological data: Bridging the divide. In Caplin & Schotter (2008, pp. 336–371).
- Caplin, A., & Schotter, A., Eds. (2008) *The foundations of positive and normative economics*. Oxford University Press.
- Chakravartty, A. 2017. Scientific realism. In E.N. Zalta (Ed.), *Stanford Encyclopedia of Philosophy* (Summer 2017), <https://plato.stanford.edu/archives/sum2017/entries/scientific-realism/>.
- Clarke, C. (2016). Preferences and positivist methodology in economics. *Philosophy of Science*, 83, 192–212.
- Clarke, C. (2020). Functionalism and the role of psychology in economics. *Journal of Economic Methodology*, 27, 292–310.
- Cozic, M., & Hill, B. (2015). Representation theorems and the semantics of decision-theoretic concepts. *Journal of Economic Methodology*, 22, 292–311.
- Craver, C., & Alexandrova, A. (2008). No revolution necessary: Neural mechanisms for economics. *Economics and Philosophy*, 24, 381–406.
- Davidson, D. (1980). *Essays on actions and events*. Oxford University Press.
- Dekel, E., & Lipman, B. (2010). How (not) to do decision theory. *Annual Review of Economics*, 2, 257–282.
- Dhami, S. (2016). *The foundations of behavioral economic analysis*. Oxford University Press.
- Dietrich, F., & List, C. (2016). Mentalism versus behaviourism in economics: A philosophy-of-science perspective. *Economics and Philosophy*, 32, 249–281.
- Engelen, B. (2017). A new definition of and role for preferences in positive economics. *Journal of Economic Methodology*, 24, 254–273.

- Friedman, M. (1953). The methodology of positive economics. In M. Friedman, *Essays in positive economics* (pp. 3–43). University of Chicago Press.
- Fumagalli, R. (2013). The futile search for true utility. *Economics and Philosophy*, 29, 325–347.
- Gigerenzer, G., & Goldstein, D.G. (1996). Reasoning the fast and frugal way: Models of bounded rationality. *Psychological Review*, 103, 650–669.
- Gilboa, I., Postlewaite, A., Samuelson, L., & Schmeidler, D. (2014). Economic models as analogies. *Economic Journal*, 124, F513-F533.
- Gilboa, I., Postlewaite, A., Samuelson, L., & Schmeidler, D. (2019). What are axiomatizations good for? *Theory and Decision*, 86, 339–359.
- Grüne-Yanoff, T., Marchionni, C., & Moscati, I., Eds. (2014a). *Methodological perspectives on recent theories of bounded rationality*. Special issue of the *Journal of Economic Methodology*, 21(4).
- Grüne-Yanoff, T., Marchionni, C., & Moscati, I. (2014b). Introduction: Methodologies of bounded rationality. *Journal of Economic Methodology*, 21, 325–342.
- Guala, F. (2012). Are preferences for real? In A. Lehtinen & P. Ylikoski (Eds.), *Economics for real* (pp. 137–155). Routledge.
- Guala, F. (2019). Preferences: Neither behavioural nor mental. *Economics and Philosophy*, 35, 383–401.
- Gul, F., & Pesendorfer, W. (2001). Temptation and self-control. *Econometrica*, 69, 1403–1435.
- Gul, F., & Pesendorfer, W. (2008). The case for mindless economics. In Caplin & Schotter (2008, pp. 3–39).
- Hands, D.W. (2001) Economic methodology is dead – long live economic methodology: Thirteen theses on the new economic methodology. *Journal of Economic Methodology*, 8, 49-63.
- Hands, D.W. (2012). Realism, commonsensibles, and economics. In A. Lehtinen & P. Ylikoski (Eds.), *Economics for real* (pp. 156–178). Routledge.
- Hands, D.W. (2013a). GP08 is the new F53. In M. Boumans & M. Klaes (Eds), *Mark Blaug: Rebel with many causes* (pp. 245–265). Edward Elgar.
- Hands, D.W. (2013b). Foundations of contemporary revealed preference theory. *Erkenntnis*, 78, 1081–1108.
- Harrison, G.W. (2008). Neuroeconomics: A critical reconsideration. *Economics and Philosophy*, 24, 303–344.
- Harrison, G.W., & Ross, D. (2010). The methodologies of neuroeconomics. *Journal of Economic Methodology*, 17, 185–196.
- Hausman, D.M. (2008). Mindless or mindful economics: A methodological evaluation. In Caplin & Schotter (2008, pp. 125–151).

- Hausman, D.M. (2012). *Preference, value, choice, and welfare*. Cambridge University Press.
- Hédoin, C. (2016). Sen's criticism of revealed preference theory and its 'Neo-Samuelsonian critique'. *Journal of Economic Methodology*, 23, 349–373.
- Heidl, S. (2016). *Philosophical problems of behavioural economics*. Routledge.
- Herfeld, C. (2018). Explaining patterns, not details: Reevaluating rational choice models in light of their explananda. *Journal of Economic Methodology*, 25, 179–209.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47, 263–292.
- Lehtinen, A. (2013). Preferences as total subjective comparative evaluations. *Journal of Economic Methodology*, 20, 206–210.
- Manzini, P., & Mariotti, M. (2014). Welfare economics and bounded rationality: The case for model-based approaches. *Journal of Economic Methodology*, 21, 343–360.
- Mas-Colell, A., Whinston, M.D., & Green, J.R. (1995). *Microeconomic theory*. Oxford University Press.
- Moscatti, I. (2012). Review of Hausman (2012). *Erasmus Journal for Philosophy and Economics*, 5 (2), 125–131.
- Moscatti, I. (2018). *Measuring utility: From the marginal revolution to behavioral economics*. Oxford University Press.
- Moscatti (2020). Process models are as-if models: An antirealist account of economic theories of decision-making. SSRN working paper <http://dx.doi.org/10.2139/ssrn.3724961>
- Nagatsu, M., & Pöder, K. (2019). What is the economic concept of choice? An experimental philosophy study. *Economics and Philosophy*, 35, 461–478.
- Okasha, S. (2016). On the interpretation of decision theory. *Economics and Philosophy*, 32, 409–433.
- Pattanaik, P.K. (2013) The concepts of choice and preference in economics. *Journal of Economic Methodology*, 20, 215–218.
- Ross, D. (2011). Estranged parents and a schizophrenic child: Choice in economics, psychology and neuroeconomics. *Journal of Economic Methodology*, 18, 217–231.
- Ross, D. (2014). *Philosophy of economics*. Palgrave.
- Rowbottom, D.P. (2019). Scientific realism: What it is, the contemporary debate, and new directions. *Synthese*, 196, 451–484.
- Rubinstein, A., & Salant, Y. (2008). Some thoughts on the principle of revealed preference. In Caplin & Schotter (2008, pp. 116–124).

- Samuelson, P.A. (1938). A note on the pure theory of consumer's behaviour. *Economica*, 5, 61–71, 353–354.
- Savage, L.J. (1954). *The foundations of statistics*. Wiley.
- Simon, H.A. (1955). A behavioral model of rational choice. *Quarterly Journal of Economics*, 69, 99–118.
- Spiegler, R. (2008). On two points of view regarding revealed preference and behavioral economics. In Caplin & Schotter (2008, pp. 95–115).
- Thaler, R.H., & Sunstein, C.R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.
- Thoma, J. (2020). In defence of revealed preference theory. *Economics and Philosophy*, <https://doi.org/10.1017/s0266267120000073>.
- Von Neumann, J., & Morgenstern, O. (1944/1953). *Theory of games and economic behavior*. Princeton University Press.
- Vredenburg, K. (2020). A unificationist defence of revealed preferences. *Economics and Philosophy*, 36, 149–169.
- Vromen J. (2010). On the surprising finding that expected utility is literally computed in the brain. *Journal of Economic Methodology*, 17, 17–36.