On the Individuation of Choice Options

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Abstract
Decision theorists have attempted to accommodate several violations of decision theory’s axiomatic requirements by modifying how agents’ choice options are individuated and formally represented. In recent years, prominent authors have worried that these modifications threaten to trivialize decision theory, make the theory unfalsifiable, impose over-demanding requirements on decision theorists, and hamper decision theory’s internal coherence. In this paper, I draw on leading descriptive and normative works in contemporary decision theory to address these prominent concerns. In doing so, I articulate and assess several different criteria for individuating and formally representing agents’ choice options.

Keywords
decision theory, rationality, axioms, preferences, consistency, choice options

1. Introduction

Standard decision theory (henceforth, DT) builds on specific axiomatic requirements on agents’ preferences, together with the representation theorems derivable from such requirements (e.g., Savage [1954] 1972; and von Neumann and Morgenstern 1944). Over the last few decades, several
violations of DT’s axiomatic requirements have been reported across choice contexts (e.g., Machina 2008; and Starmer 2000, for reviews). Decision theorists (henceforth, DTs) have attempted to accommodate various reported violations by modifying how agents’ choice options are individuated and formally represented (e.g., Broome 1991, chapter 5; also Bradley 2017; and Dietrich and List 2016b). In recent years, prominent authors have worried that these modifications threaten to trivialize DT (e.g., Hausman 2000; and Steele 2006), make DT unfalsifiable (e.g., Bhattacharyya, Pattanaik, and Xu 2011; and Hampton 1994), impose overdemanding requirements on DTs (e.g., Gilboa 2009; and Sen 1993), and hamper DT’s internal coherence (e.g., Alexander 2012; and Sugden 1991).¹

In this paper, I draw on leading descriptive and normative works in contemporary DT to address these prominent concerns. In doing so, I articulate and assess several different criteria for individuating and formally representing agents’ choice options. The contents are organized as follows. In section 2, I outline various reported violations of DT’s axiomatic requirements and explicate DTs’ attempts to accommodate such violations by modifying how agents’ choice options are individuated and formally represented (re-individuation strategy). In sections 3–6, I identify and address four major challenges put forward against such re-individuation strategy, namely: the trivialization challenge (e.g., Hausman 2000; and Steele 2006), the falsifiability challenge (e.g., Bhattacharyya, Pattanaik, and Xu 2011; and Hampton 1994), the challenge from overdemandingness (e.g., Gilboa 2009; and Sen 1993), and the

¹In the philosophical and scientific literatures, “accommodation” is commonly used to refer to the adjustment of theories’ assumptions and parameters so that these theories’ implications fit the available evidence (e.g., Lakatos 1970; and Worrall 2014). Several concerns have been voiced regarding accommodation (e.g., Maher 1993, 329, for the claim that “evidence for a [theory] typically confirms the [theory] more if the evidence was predicted than if it was accommodated”; Lange 2001, 577, for the claim that “accommodations are typically associated with hypotheses that do not have their predictive accuracy [confirmed] by their successes”). I do not aim here to address these concerns or assess the relative importance of accommodation and other goals (e.g., prediction) for DT analyses (e.g., Northcott 2019, for recent discussion). For my evaluation, it suffices to note that although some accommodations are plausibly regarded as questionable ad hoc attempts to immunize theories against contrary evidence, one can identify several cases of “scientifically acceptable” accommodations (e.g., Worrall 2014, on cases where the theories developed to accommodate specific findings make testable predictions that are corroborated by independent pieces of evidence; also sections 3-6 on some accommodations provided by DTs).
challenge from *theoretical incoherence* (e.g., Alexander 2012; and Sugden 1991). I shall argue for two claims of general interest to DTs and choice modelers across the decision sciences. First, the proffered challenges pose severe conceptual and practical difficulties to both descriptive and normative DT analyses. And second, these difficulties are not insurmountable, i.e. in spite of the proffered challenges, DTs can provide plausible and precise criteria for individuating and formally representing agents’ choice options. This result does not imply that there is one single version of DT that is generally immune to all the challenges put forward against the re-individuation strategy. Still, it indicates that specific applications of the re-individuation strategy can address the proffered challenges across several choice contexts. In this perspective, the four challenges I examine in this paper can be regarded as informative adequacy conditions on both proposed and forthcoming applications of the re-individuation strategy.

Before proceeding, three preliminary remarks are in order. First, I use the expression “standard DT” to indicate a set of works that build on the theories of von Neumann and Morgenstern (1944) and Savage ([1954] 1972). These theories make different assumptions concerning agents’ choice options and impose dissimilar axiomatic requirements on agents’ preferences between such options (section 2). Still, they can be plausibly regarded as special applications of a more general constrained maximization framework to the choice problems they target (e.g., Bradley 2017, chapter 10). My evaluation focuses prevalently on Savage’s theory since most discussions of the re-individuation strategy focus on Savage’s theory, but can be extended to von Neumann and Morgenstern’s theory (e.g., section 4; also see section 6 for some remarks on other versions of DT such as Jeffrey’s theory). Second, different applications of the re-individuation strategy may be regarded as plausible depending on whether such applications target the preferences that agents in fact have (descriptive DT analyses) or the preferences that agents can rationally have (normative DT analyses). I shall comment on the differences between descriptive and normative DT analyses in several cases where such differences bear on the merits of the re-individuation strategy (sections 3-6). And third, over the last few decades, DTs have made substantial progress in developing versions of DT for choice problems where one lacks precise probabilities (e.g., Bradley 2017, part IV; Joyce 1999; and Levi 1974) and well-defined utility functions (e.g., Gilboa 2009; Hare 2010; and Karni and Schmeidler 2016). However, comparatively less progress has been made in the assessment of criteria for individuating and formally representing agents’ choice options. My evaluation aims to fill this lacuna in the DT literature and thereby
contribute to the development of more adequate descriptive and normative DT analyses.²

2. Axioms’ Violations and the Re-Individuation Strategy

The representation theorems figuring in standard DT demonstrate that if an agent’s preferences satisfy specific axiomatic requirements, then this agent’s choices can be represented as if the agent maximizes expected utility (e.g., Fumagalli 2013; and Okasha 2016). In this context, the notion of utility does not refer to a psycho-physical magnitude independent of agents’ preferences that agents should maximize, but rather refers to a mathematical representation of agents’ preferences (e.g., Bradley 2017, chapter 1; and Fumagalli 2019). Distinct versions of DT impose different axiomatic requirements on agents’ preferences. Still, some axiomatic requirements figure in several versions of standard DT. For instance, von Neumann and Morgenstern (1944) demonstrate that if an agent’s preferences satisfy completeness, transitivity, continuity and independence, then there exists a utility function unique up to positive linear transformations such that for any two options, the one preferred is assigned higher expected utility. For his part, Savage ([1954] 1972) demonstrates that preference relations that satisfy completeness, transitivity, the sure-thing principle and further axiomatic requirements can be represented as if the agent maximizes expected utility relative to a unique subjective probability function.³

²My evaluation of the re-individuation strategy focuses on individual choices (as opposed to choices in situations of strategic interaction or aggregate choices) because DT focuses on individual choices. This evaluation could be extended to cover applications of the re-individuation strategy to game theory or social choice theory. I do not examine these applications in this paper because such applications raise various concerns (e.g., agents’ reputation, interpersonal comparisons of utility) beyond the scope of my evaluation.

³Completeness requires that, for any two options A and B in the choice set, the agent has definite preferences regarding such options. Transitivity requires that, for any options A, B and C in the choice set, if the agent prefers A to B and B to C, then the agent prefers A to C. Continuity requires that, if option A is preferred to option B but is not preferred to option C, then there exists a compound prospect over B and C that is indifferent to A. Independence requires that, for any two compound prospects (A, p; C, 1-p) and (B, p; C, 1-p), the common component of these prospects does not affect the agent’s preferences between such prospects. The sure-thing principle requires that, for any given event E, if the agent prefers option A to option B either knowing that E obtained or knowing that not-E obtained, then the agent prefers A to B (e.g., Savage [1954] 1972, 21-22).
Over the last few decades, several violations of DT’s axiomatic requirements have been reported. For instance, some studies have reported that real-world agents rarely have complete preferences over extended choice sets (e.g., Aumann 1962; and Gilboa 2009) and often exhibit intransitive preferences (e.g., Loomes and Sugden 1983; and Tversky 1969). Other studies have reported that real-world agents’ preferences frequently violate independence and the sure-thing principle (e.g., Allais 1953; and Tversky and Thaler 1990). In this context, various authors have built on the putative systematic character of the reported violations to question not just the descriptive validity, but also the normative validity of specific axiomatic requirements (e.g., Bales, Cohen, and Handfield 2014; and Levi 1986, on completeness; Anand 1993; and Sugden 1991, on transitivity; Hurley 1989, chapter 4; and Starmer 2005, on independence; Allais and Hagen 1979; and Gilboa, Postlewaite, and Schmeidler 2009, on the sure-thing principle).

DTs have developed three main lines of response to the reported violations of DT’s axiomatic requirements. The first response aims to show that the targeted axiomatic requirements are normatively defensible (e.g., Savage [1954] 1972; also Guala 2000; and Hands 2014, for recent discussions) and descriptively hold across a wide range of choice contexts (e.g., Plott 1996; and Smith 1991, on how the incidence of various axioms’ violations tends to diminish when agents are given time and incentives to learn during experiments). The second response aims to develop versions of DT that modify or even relinquish specific axiomatic requirements so as to increase the fit of DT’s axiomatic requirements with the available empirical findings (e.g., Machina 2008; and Starmer 2000, on so-called generalized expected utility theory; Buchak 2013; and Quiggin 1982, on different versions of rank-dependent utility theory). The third response aims to show that the reported violations of DT’s axiomatic requirements can be accommodated by modifying how agents’ choice options are individuated and formally represented (e.g.,

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4The extent to which one takes DT’s axiomatic requirements to fit agents’ preferences may partly depend on what conception of preferences one takes to be endorsed or presupposed by DTs. I am not concerned here with assessing the merits of different conceptions of preferences. The following remarks suffice for my evaluation. DTs commonly regard the preferences that figure in DT’s representation theorems as indexes of choices (e.g., Bradley 2017, chapter 2). However, standard DT is not committed to the further claim (often associated with revealed preference theory) that preferences in general are reducible to or identical with choices (e.g., Vredenburgh 2020). Indeed, different conceptions of preferences have been advocated in the DT literature (e.g., Dietrich and List 2016a; Guala 2019; and Hausman 2011), and most of these conceptions reject the purported equivalence between preferences and choices (e.g., Angner 2018; Hands 2013; and Hausman 2012).
Broome 1991, chapter 5; also Bradley 2017; and Dietrich and List 2016b). This *re-individuation strategy* attempts to accommodate the reported violations of DT’s axiomatic requirements by providing plausible and precise criteria for establishing what set of factors can be justifiably incorporated into the description of choice options.

Different applications of the re-individuation strategy have been proposed in the DT literature. By way of illustration, consider an agent who, faced with pairwise comparisons between food items $A$ (apple), $B$ (banana) and $C$ (cake), exhibits the intransitive preference pattern $A > B$, $B > C$ and $C > A$. One may attempt to accommodate this violation of transitivity by means of several applications of the re-individuation strategy. For instance, one application incorporates reference to *what options* are available to the agent into the description of each choice option. The idea is that, in many choice problems, an agent’s preferences for a given choice option do depend (descriptive DT analyses) or can rationally depend (normative DT analyses) on what other options are available to the agent in the pairwise comparisons she faces (e.g., Broome 1993; and Suzumura and Xu 2001, on cases where different properties of choice options become salient depending on what pairwise comparisons one faces). More formally, let us write $Ab$ to refer to $A$ when $B$ is the other option available, $Ba$ to refer to $B$ when $A$ is the other option available, and so on. The agent’s preference pattern can then be re-described as $Ab > Ba$, $Bc >Cb$ and $Ca > Ac$, which does not directly violate transitivity.5

Another application of the re-individuation strategy incorporates reference to *what payoff* the agent could get by choosing some other available option into the description of each choice option. The idea is that, in many choice problems, an agent’s preferences for a given choice option do depend (descriptive DT analyses) or can rationally depend (normative DT analyses)

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5One may object that the proffered re-description of choice options does not per se exclude that the agent’s preferences violate transitivity. The objection proceeds as follows. If preferences are complete, transitivity requires the agent to prefer either $Ab$ to $Ac$, or $Bc$ to $Ba$, or $Ca$ to $Cb$. Then “if [the agent] does not prefer $Bc$ to $Ba$, either she prefers $Ba$ to $Bc$ or she is indifferent between them. Consequently, since [the agent] prefers $Ab$ to $Ba$, she prefers $Ab$ to $Bc$. Similarly, if [the agent] does not prefer $Ca$ to $Cb$, she prefers $Bc$ to $Ca$. [And if the agent] does not prefer $Ab$ to $Ac$, she prefers $Ca$ to $Ab$. [Hence, the agent] prefers $Ab$ to $Bc$, $Bc$ to $Ca$, and $Ca$ to $Ab$ [which] is an intransitivity” (Broome 1993, 72). However, the agent cannot have a choice between $Ab$ and $Ac$ in the pairwise comparisons she faces. That is to say, incorporating reference to what options are available to the agent into the description of each choice option enables DTs to accommodate violations of transitivity that involve preferences for alternatives between which the agent can have a choice (e.g., Broome 1991, 74, on so-called practical preferences; also footnote 16 for discussion).
on what payoff the agent could get by choosing some other available option (e.g., Loomes and Sugden 1982, on regret theory, which incorporates reference to the regret agents feel when the payoff they get is lower than the payoff they could get by choosing some other available option; also Quiggin 1982, on rank-dependent utility theory, which incorporates reference to agents’ expectation to gain or to lose from the choice problems they face).6 Still another application of the re-individuation strategy incorporates reference to putative axiologically significant features of choice options into the description of each choice option. The idea is that, in many choice problems, an agent’s preferences for a given choice option do depend (descriptive DT analyses) or can rationally depend (normative DT analyses) on factors such as whether or not this option has been obtained as a result of lotteries (e.g., Machina 1989), whether or not such option has been produced by means of ethically questionable procedures (e.g., Gaertner and Xu 2004), and so on.7

DTs have attempted to accommodate several violations of DT’s axiomatic requirements by relying on these and other applications of the re-individuation strategy (sections 3-6). Still, the re-individuation strategy has been challenged on multiple grounds. In sections 3-6, I identify and address four major challenges put forward against such strategy, namely: the trivialization challenge (e.g., Hausman 2000; and Steele 2006), the falsifiability challenge (e.g., Bhattacharyya, Pattanaik, and Xu 2011; and Hampton 1994), the challenge from overdemandingness (e.g., Gilboa 2009; and Sen 1993), and the challenge from theoretical incoherence (e.g., Alexander 2012; and Sugden

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6Incorporating reference to additional factors into the description of choice options may lead to tensions with the assumptions made by specific versions of DT (e.g., Sugden 1991, on the tensions between attempts to incorporate reference to agents’ feelings of regret into the description of choice options and some of the assumptions made by Savage’s theory). I expand on the tensions internal to specific versions of DT in section 6.

7DTs have developed various frameworks to formally represent the sets of factors that respectively do and can rationally make a difference to agents’ preferences between choice options (e.g., Bernheim and Rangel 2009, 55, on the notion of ancillary conditions, which captures “feature[s] of the choice environment that may affect [agents’ preferences between choice options, but are] not taken as [normatively] relevant”; Salant and Rubinstein 2008, 1287, on the notion of choice frame, which “includes observable information that is irrelevant in the rational assessment of the alternatives, but nonetheless affects [preferences]”). My evaluation of the re-individuation strategy complements these frameworks with a substantive discussion of different criteria for demarcating what sets of factors respectively do and can rationally make a difference to agents’ preferences between choice options.
In doing so, I articulate and assess several different criteria for individuating and formally representing agents’ choice options.

3. Trivialization Challenge

The trivialization challenge holds that the re-individuation strategy may be used to accommodate some violations of DT’s axiomatic requirements, but threatens to “trivialise [decision] theory” (Steele 2006, 12). The idea is that unless DTs provide plausible and precise criteria for establishing what set of factors can be justifiably incorporated into the description of choice options, the re-individuation strategy could in principle be used to accommodate any violation of DT’s axiomatic requirements, thus “render[ing] all principles of rationality empty” (Hausman 2000, 110; also Pettit 1991, 164, for the claim that if the mere fact that some option figures in the context of distinct alternatives suffices to speak of different options, “nothing would then follow from one choice as to what a rational agent would pick in a second”).

The trivialization challenge correctly notes that “the re-individuation strategy, if used indiscriminately, would trivialize [DT]” in the sense just explicated (e.g., Stefánsson and Bradley 2015, 607). This, however, does not prevent DTs from providing plausible and precise criteria for establishing what set of factors can be justifiably incorporated into the description of choice options. In fact, DTs may provide various criteria which enable them to make sufficient distinctions between choice options to accommodate several violations of DT’s axiomatic requirements without trivializing DT. To illustrate this, let us consider descriptive DT analyses (see the end of this section for related remarks concerning normative DT analyses). The mere fact that some factor could conceivably make a difference to agents’ preferences between choice options by no means implies that observed violations of specific axioms can be accommodated by incorporating such factor into the description of choice options. For whether descriptive DT analyses can accommodate observed violations of specific axioms by incorporating additional factors into the description of choice options depends on whether these factors are shown to make a difference to agents’ preferences between choice options, i.e. whether DTs are able to identify patterns of counterfactual dependence between those factors and agents’ preferences. Still, DTs are frequently able to demarcate what set of factors can be justifiably incorporated into the description of choice options by pointing to cases where specific factors make a difference to agents’ preferences between choice options.

By way of illustration, consider again the pairwise comparisons of food items outlined in section 2. Suppose that the agent is unable to express definite preferences between specific food items. A wide variety of factors could
conceivably make a difference to the agent’s preferences between food items (e.g., the cost of each item, the spatial location of each item, the caloric content of each item, what gustatory experience the agent associates with eating each item, what childhood memories the agent recalls while eating each item, the square root of the number of protons in each item’s micro-physical structure). Of all these factors, only those factors that are shown to make a difference to the agent’s preferences between food items can be plausibly invoked to accommodate the hypothesized violation of completeness. For accommodating observed violations of DT’s axiomatic requirements by means of the re-individuation strategy requires DTs to show that the factors they invoke make a difference to the agent’s preferences. Still, DTs can point to various cases where the factors they invoke make a difference to agents’ preferences between food items (e.g., Rozin et al. 2011; and Rubinstein and Arad 2015, on cases where spatial location makes a difference to agents’ preferences between food items).8

A proponent of the trivialization challenge may grant that DTs can occasionally point to cases where specific factors make a difference to agents’ preferences between choice options. However, she may object that DTs lack non-arbitrary criteria for establishing what set of factors can be justifiably incorporated into the description of choice options. The objection goes as follows. Whether a given factor is justifiably incorporated into the description of choice options depends not just on whether this factor does (or can rationally) make a difference to agents’ preferences between choice options, but also on how much difference such factor does (or can rationally) make to agents’ preferences across the targeted choice contexts.

8Showing that a given factor makes a difference to agents’ preferences between choice options may enable DTs to accommodate various violations of DT’s axiomatic requirements by incorporating reference to such factor into the description of choice options. However, not all these accommodations are equally plausible. To see this, suppose DTs identified some patterns of counterfactual dependence between agents’ preferences for food items and these items’ relative distance from the nearest comet travelling outside the solar system. DTs might be able to accommodate some violations of DT’s axiomatic requirements by incorporating reference to this distance into the description of food items. Still, providing a plausible accommodation of observed violations of DT’s axiomatic requirements would require DTs to provide plausible reasons and/or evidence to think that food items’ relative distance from the nearest comet travelling outside the solar system makes a difference to agents’ preferences for food items across the targeted choice contexts. And it is hard to see what plausible reasons and/or evidence DTs may provide to think that food items’ relative distance from the nearest comet travelling outside the solar system makes a difference to agents’ preferences across the targeted choice contexts.
preferences and how robust such difference is across the targeted choice contexts. Regrettably, distinct DTs may endorse dissimilar views as to whether the difference that any given factor does (or can rationally) make is large and robust enough to justify incorporating this factor into the description of choice options (e.g., Thoma 2020b), and DTs lack non-arbitrary criteria for discriminating between such views. To illustrate this objection, consider the issue whether DTs can accommodate observed violations of completeness by incorporating differences in spatial location into the description of food items (e.g., think of food items’ different positions on a cafeteria’s shelves). As noted in the previous paragraph, DTs can point to various cases where spatial location makes a difference to agents’ preferences between food items (e.g., Rozin et al. 2011; and Rubinstein and Arad 2015). Yet, the objection goes, DTs lack non-arbitrary criteria for establishing whether the difference that spatial location does (or can rationally) make to agents’ preferences between food items is large and robust enough to justify incorporating differences in spatial location into the description of food items. Moreover, it remains unclear on what grounds DTs are to assess distinct criteria. Hence, it is dubious that DTs can accommodate observed violations of completeness by incorporating differences in spatial location into the description of food items.

This objection correctly notes that distinct criteria license incorporating dissimilar sets of factors into the description of choice options. Still, it seemingly overlooks that DTs can frequently point to plausible reasons and/or evidence to assess distinct criteria. By way of illustration, compare the following restrictive criterion, which requires DTs to incorporate into the description of choice options all the factors that do (or can rationally) make a difference to agents’ preferences between these options, and permissive criterion, which allows DTs to incorporate into the description of choice options any factor that does (or can rationally) make a difference to agents’ preferences between such options (e.g., Bradley 2017, chapter 1; and Joyce 1999, chapter 2). These two criteria license incorporating dissimilar sets of factors into the description of choice options. Yet, DTs can point to plausible reasons and/or evidence to assess such criteria. For instance, one may justifiably argue against the permissive criterion in cases where allowing DTs to incorporate into the description of choice options any factor that does (or can rationally) make a difference to agents’ preferences between these options threatens to make DT unfalsifiable (section 4). Conversely, one may justifiably argue against the restrictive criterion in cases where DTs lack sufficient epistemic and evidential access to agents’ choice problems to identify all the factors that do (or can rationally) make a difference to agents’ preferences between such options (section 5).
I shall expand in the following sections on the merits of these and other criteria for demarcating what set of factors can be justifiably incorporated into the description of choice options. For now, I note that it would be implausibly demanding to require DTs to provide general context-independent specifications of what set of factors can be justifiably incorporated into the description of choice options. For what set of factors can be justifiably incorporated into the description of choice options depends on a wide range of contextual elements, including DTs’ modeling purposes (e.g., descriptive vs. normative DT analyses), what kind of agents DTs target (e.g., real-world agents vs. ideal agents with unbounded cognitive and computational abilities), and what conception of preferences DTs endorse (e.g., behavioral vs. psychological conceptions of preferences). By way of illustration, what set of factors can be justifiably incorporated into the description of choice options may significantly depend on whether DTs aim to provide descriptive or normative DT analyses. To see this, consider the issue whether chances of outcomes are plausibly ascribed some intrinsic value or whether chances “have value only insofar as they are instrumental to the outcomes with which they are associated” (Stefánsson and Bradley 2015, 603). Descriptively, most authors agree that agents often ascribe some intrinsic value to chances of outcomes (e.g., Bradley 2017, chapter 14, on agents’ valuations of various lotteries). Normatively, distinct authors disagree as to whether agents can rationally ascribe intrinsic value to chances (e.g., Stefánsson and Bradley 2015, on agents’ valuations of risky activities such as mountain climbing). That is to say, DTs’ inclusion of some factors (rather than others) into the description of choice options is often contestable, but is not inherently arbitrary. For DTs can point to plausible reasons and/or evidence to demarcate what set of factors can be justifiably incorporated into the description of choice options without trivializing DT.

4. Falsifiability Challenge

The falsifiability challenge holds that the re-individuation strategy may be used to accommodate some violations of DT’s axiomatic requirements, but threatens to make DT unfalsifiable (e.g., Bhattacharyya, Pattanaik, and Xu 2011; and Hampton 1994). The idea is that since “some difference can always be found between two seemingly identical alternatives [DTs] can always individuate alternatives sufficiently finely to save [any particular axiom]” (Hampton 1994, 228). As Samuelson puts it, “if every time you find my axiom falsified, I tell you to go to a space of still higher dimensions, you can
legitimately regard my theories as irrefutable” (Samuelson 1952, 676-77; also Bhattacharyya, Pattanaik, and Xu 2011, 135).9

The falsifiability challenge correctly notes that allowing DTs to arbitrarily refine the proffered descriptions of choice options would significantly hamper the falsifiability of DT (e.g., Dietrich and List 2016b, 197; also Alexander 2012, 633, for the claim that if DTs are allowed to re-describe choice options as maximally specific possible worlds, then “there is almost always some minor difference [which] could support a [consistent] preference order”). This, however, by no means implies that DTs’ reliance on the re-individuation strategy makes DT unfalsifiable. For in primis, not all criteria for individuating choice options are equally plausible (e.g., the mere fact that agents’ preferences between choice options could conceivably depend on some factor falls short of indicating that agents’ preferences do or can rationally depend on such factor). And second, DTs can frequently point to plausible reasons and/or evidence to assess whether agents’ preferences between choice options do (or can rationally) depend on specific factors (e.g., section 3; also Dreier 1996, 260-61). To put it differently, DTs may accommodate several violations of DT’s axiomatic requirements by providing plausible and precise criteria for individuating choice options while retaining DT’s falsifiability.

A proponent of the falsifiability challenge may grant that DTs can accommodate some violations of DT’s axiomatic requirements by providing plausible and precise criteria for individuating choice options. Still, she may object that DTs’ reliance on the re-individuation strategy threatens to undermine their ability to test DT’s axiomatic requirements. The objection proceeds as follows. The implications of DT’s axiomatic requirements are conditional on the auxiliary assumption that the proffered descriptions of agents’ choice options incorporate all the factors that do (or can rationally) make a difference to agents’ preferences between such options (e.g., Sen 1993, 495). For this reason, the assumption that agents’ preferences satisfy specific axiomatic requirements cannot be tested in isolation, but can only

9Popper takes a theory to be falsifiable “if and only if it logically contradicts some (empirical) sentence that describes [events that it is] logically possible to observe” ([1989] 1994, 83), and argues that falsifiability is a necessary requirement for regarding theories as scientific (e.g., Popper 1962, 39, for the claim that “to be ranked as scientific, [theories] must be capable of conflicting with possible, or conceivable observations”). I am not concerned here with assessing whether falsifiability is a necessary requirement for regarding theories as scientific (e.g., Agassi 1991; and Hansson 2006, for critical discussions). For my evaluation, it suffices to note that both proponents and critics of DT alike regard falsifiability as a “key desideratum” of DT (e.g., Dietrich and List 2016b, 195, for the claim that “a key desideratum on any scientific theory is its falsifiability [and that] theories of individual choice should be no exception”).
be tested in conjunction with the auxiliary assumption that the proffered
descriptions of agents’ choice options incorporate all the factors that do (or
can rationally) make a difference to agents’ preferences between such
options (e.g., Bhattacharyya, Pattanaik, and Xu 2011, 142-43). Therefore, it
is “not possible to conclude” whether or not an agent’s preferences satisfy
DT’s axiomatic requirements “simply on the basis of our observations of the
agent’s choice behaviour [. . . ] without committing ourselves to a position
about whether or not the options, as we have specified them in our formal
model, capture” all the factors that do (or can rationally) make a difference
to the agent’s preferences (Bhattacharyya, Pattanaik, and Xu 2011, 143 and
145; also Sen 1993, 495-501). Moreover, if DTs are allowed to incorporate
additional factors into the description of choice options every time they
observe some violations of DT’s axiomatic requirements, then no empirical
findings can falsify the assumption that agents’ preferences satisfy specific
axiomatic requirements. For “an infinite number” of factors could conceiv-
ably make a difference to agents’ preferences, and so “no matter how care-
fully [DTs] may specify the options, there will still remain the possibility
that [their] specification of the options does not capture some [factors]”
(Bhattacharyya, Pattanaik, and Xu 2011, 146; also Sen 1993, 502-3).

This objection points to well-known falsifiability concerns regarding the-
tory testing in economics (e.g., Guala 2000; and Hausman 1992, chapter 12)
and other disciplines (e.g., Duhem [1906] 1954, chapter 6; and Quine 1953).
Moreover, it nicely elucidates the dependence of the implications of DT’s
axiomatic requirements on auxiliary assumptions concerning DTs’ specifica-
tions of agents’ choice options. However, it falls short of indicating that DTs’
reliance on the re-individuation strategy undermines their ability to test DT’s
axiomatic requirements. For DTs can frequently test the assumption that
agents’ preferences satisfy specific axiomatic requirements under progres-
sively more fine-grained specifications of agents’ choice options (e.g., Cubitt,
Starmer, and Sugden 2001; and Sugden 2005). And these tests may enable
DTs to significantly reduce the set of factors that can be plausibly invoked to
accommodate observed violations of DT’s axiomatic requirements (e.g.,
Fumagalli 2016, on studies showing that observed violations of specific axi-
omatic requirements persist even when DTs incorporate various additional
factors into the description of choice options; also footnote 8). In fact, DTs
can occasionally identify tightly controlled experimental settings where the
description of choice options can be plausibly taken to incorporate all the
factors that do (or can rationally) make a difference to agents’ preferences
between such options (e.g., Guala 2005). In these settings, empirical findings
contrary to the implications of DT’s axiomatic requirements can be plausibly
regarded as evidence against such axiomatic requirements. And both the proponents and the critics of DT frequently focus on such settings when testing specific axiomatic requirements (e.g., section 2 on the reported violations of various axiomatic requirements and on modified versions of DT developed in response to such violations).\textsuperscript{10}

More generally, the point remains that considerations regarding what set of factors do (or can rationally) make a difference to agents’ preferences may inform DTs’ evaluations of not only specific axiomatic requirements, but also different versions of DT. To illustrate this, let us examine how considerations regarding the difference that agents’ attitudes to chances do (or can rationally) make to their own preferences inform DTs’ evaluations of von Neumann and Morgenstern’s theory and Savage’s theory, respectively. Real-world agents often prefer lotteries with known chances of outcomes to ones with unknown chances (e.g., Ellsberg 1961; and Wakker 2010, chapter 11). This ambiguity aversion is typically taken to be inconsistent with von Neumann and Morgenstern’s theory because such theory takes the value of a lottery to equal a linear average of the utilities of its prizes (e.g., Bradley 2016). Faced with this contrast, some DTs hold that von Neumann and Morgenstern’s linearity assumption is correct and infer that ambiguity aversion is irrational (e.g., Machina and Siniscalchi 2014, for a review). Conversely, others hold that such linearity assumption is too stringent to count as a general requirement of rationality since it excludes commonly observed attitudes to risk that are not manifestly irrational and entails that even moderate risk aversion for small stakes is only consistent with implausibly extreme risk aversion for larger stakes (e.g., Stefánsson and Bradley 2015). On this basis, they infer that ambiguity aversion is rationally permissible and criticize von Neumann and Morgenstern’s theory for failing to accommodate ambiguity-averse preferences.

As to Savage’s theory, three main positions can be contrasted. Some DTs hold that ambiguity aversion is irrational and so does not refute Savage’s theory (e.g., Al-Najjar and Weinstein 2009; and Elga 2010). Others argue that ambiguity aversion is rational and violates Savage’s sure-thing principle

\textsuperscript{10}Showing that the proffered descriptions of choice options incorporate all the factors that do (or can rationally) make a difference to agents’ preferences between such options can be quite difficult for DTs (e.g., Northcott 2019, on some practical difficulties that hamper the set-up of controlled experiments in economics). Still, this difficulty does not prevent DTs from being able to identify some tightly controlled experimental settings where the description of choice options can be plausibly taken to incorporate all the factors that do (or can rationally) make a difference to agents’ preferences between such options (e.g., Guala 2005).
The challenge from overdemandingness targets the demands that the re-individuation strategy allegedly makes on DTs. This challenge is to be distinguished from the claim that axiomatic requirements themselves “place enormous cognitive demands on agents” (Hausman 2012, 17; also Gilboa 2009, chapter 12). I do not expand on this latter claim both because such claim does not directly bear on my evaluation of the re-individuation strategy and because discussion of such claim is already well-advanced in the specialized literature (e.g., Angner 2018; and Fumagalli 2020).

5. Challenge from Overdemandingness

The challenge from overdemandingness holds that the re-individuation strategy may be used to accommodate some violations of DT’s axiomatic requirements, but threatens to impose over-demanding requirements on DTs (e.g., Gilboa 2009; and Sen 1993). The challenge proceeds as follows. DTs may be able to accommodate some violations of DT’s axiomatic requirements by incorporating additional factors into the description of choice options. However, accommodating violations of DT’s axiomatic requirements frequently requires DTs to incorporate into the description of choice options all the factors that do (or can rationally) make a difference to agents’ preferences between choice options (e.g., Joyce 1999, chapter 2; also Joyce 2000, S8, on cases where the proponents of Savage’s theory have to individuate outcomes “so finely that everything the agent cares about is resolved by the state of the world once she chooses an action”). Unfortunately, DTs frequently lack sufficient epistemic and evidential access to agents’ choice problems to be able to identify all such factors (e.g., Hausman 2011, on limitations of DTs’ epistemic and evidential access to agents’ beliefs). Whenever this is the case, the re-individuation strategy threatens to impose over-demanding requirements on DTs.\(^\text{11}\)

\(^{11}\)The challenge from over-demandingness targets the demands that the re-individuation strategy allegedly makes on DTs. This challenge is to be distinguished from the claim that axiomatic requirements themselves “place enormous cognitive demands on agents” (Hausman 2012, 17; also Gilboa 2009, chapter 12). I do not expand on this latter claim both because such claim does not directly bear on my evaluation of the re-individuation strategy and because discussion of such claim is already well-advanced in the specialized literature (e.g., Angner 2018; and Fumagalli 2020).
The challenge from overdemandingness correctly notes that DTs are frequently unable to identify all the factors that do (or can rationally) make a difference to agents’ preferences between choice options. Still, there are at least two reasons to doubt that the re-individuation strategy imposes overdemanding requirements on DTs. First, identifying all the factors that do (or can rationally) make a difference to an agent’s preferences between choice options does not require DTs to provide descriptions of choice options which designate maximally specific possible worlds, but only requires DTs to provide descriptions that incorporate all the factors that do (or can rationally) make a difference to the agent’s preferences “at the finest level of discrimination at which the agent works” (Pettit 1991, 160, italics added). And DTs are occasionally able to identify all such factors (e.g., section 4 on the tightly controlled experimental settings targeted by some DT analyses). And second, accommodating observed violations of DT’s axiomatic requirements rarely requires DTs to identify all the factors that do (or can rationally) make a difference to agents’ preferences between choice options. To be sure, identifying only some of the factors that do (or can rationally) make a difference to agents’ preferences may not enable DTs to accommodate violations of DT’s axiomatic requirements (e.g., if DTs identify only some of the factors that make a difference to agents’ preferences, then other unidentified factors may offset the difference that the identified factors make to agents’ preferences). Still, this does not ground a general requirement that DTs identify all the factors that do (or can rationally) make a difference to agents’ preferences. For DTs may accommodate several violations of DT’s axiomatic requirements by pointing to some factors that in their view do (or can rationally) make a difference to agents’ preferences and by showing that these factors do (or can rationally) make a difference to such preferences (sections 3-4).

A proponent of the challenge from overdemandingness may grant that DTs may be able to accommodate various violations of DT’s axiomatic requirements by identifying only some of the factors that do (or can rationally) make a difference to agents’ preferences. Still, she may object that DTs are frequently unable to identify enough factors that do (or can rationally) make a difference to agents’ preferences to accommodate observed violations of DT’s axiomatic requirements (e.g., Gilboa 2009, 137, for the claim that “for many problems that we can think of, actually writing down the state-space model is not a practical undertaking”). By way of illustration, consider Sen’s (1993) discussion of the case of an agent who—upon being offered slices of cake $C_1$, $C_2$, and $C_3$—prefers $C_1$ from $\{C_1, C_2\}$ and $C_2$ from $\{C_1, C_2, C_3\}$. Sen notes that whether this pattern of preferences violates independence depends on the agent’s norms, values and objectives (e.g., Sen 1993, 501, on
Some critics of DT take factors such as psychological variables and social norms to ground explanations of choices that compete with preference-based explanations of choices (e.g., Elster 1989). I do not aim here to discuss the relationship between preference-based explanations of choices and explanations of choices grounded in psychological variables or social norms (e.g., Dietrich and List 2013; and Kincaid 2012, for discussions). For my purposes, I note that the preferences figuring in various versions of DT may depend on a wide range of factors (including psychological variables and social norms) and that for at least some versions of DT information concerning such factors can be plausibly taken to deepen (rather than displace) preference-based explanations of choices (e.g., Bicchieri 2000, Bradley 2017, chapter 9).

This objection correctly notes that DTs are occasionally unable to identify enough factors that do (or can rationally) make a difference to agents’ preferences to accommodate observed violations of DT’s axiomatic requirements. Still, one may consistently grant that DTs are occasionally unable to identify enough factors that do (or can rationally) make a difference to agents’ preferences to accommodate observed violations of DT’s axiomatic requirements, yet advocate the re-individuation strategy in those cases where DTs are able to identify such factors (e.g., Savage [1954] 1972, chapters 2 and 5, for similar remarks regarding the distinction between so-called small-world and large-world DT analyses). Moreover, DTs are frequently able to identify enough factors that do (or can rationally) make a difference to agents’ preferences to accommodate observed violations of DT’s axiomatic requirements (e.g., Bicchieri 2006; and Bradley 2017, chapter 9, on psychological variables such as the agent’s desire not to appear greedy and social norms of politeness). That is to say, pointing to specific epistemic and evidential limitations in DTs’ access to what set of factors do (or can rationally) make a difference to agents’ preferences may cast doubt on various applications of the re-individuation strategy, but does not license general skepticism concerning DTs’ ability to accommodate violations of DT’s axiomatic requirements by incorporating additional factors into the description of choice options.12

12Some critics of DT take factors such as psychological variables and social norms to ground explanations of choices that compete with preference-based explanations of choices (e.g., Elster 1989). I do not aim here to discuss the relationship between preference-based explanations of choices and explanations of choices grounded in psychological variables or social norms (e.g., Dietrich and List 2013; and Kincaid 2012, for discussions). For my purposes, I note that the preferences figuring in various versions of DT may depend on a wide range of factors (including psychological variables and social norms) and that for at least some versions of DT information concerning such factors can be plausibly taken to deepen (rather than displace) preference-based explanations of choices (e.g., Bicchieri 2000, Bradley 2017, chapter 9).
A proponent of the challenge from overdemandingness may grant that DTs are occasionally able to identify enough factors that do (or can rationally) make a difference to agents’ preferences to accommodate observed violations of DT’s axiomatic requirements. However, she may object that accommodating such violations frequently requires DTs to ascribe implausibly sophisticated cognitive and computational abilities to the agents they target (e.g., Gilboa 2009, 116, on the “explosion in the cardinality of the set of acts” that agents would have to be able to envision in many applications of Savage’s theory; also Thoma 2020a, on cases where identifying a complete and consistent preference relation requires DTs to incorporate into the description of choice options more combinations of circumstances than those that the targeted agents can be plausibly expected to track). This objection points to a significant plausibility constraint on applications of the re-individuation strategy that target real-world (rather than ideal) agents, but does not undermine the merits of such strategy. For even if one focuses on applications of the re-individuation strategy that target real-world (rather than ideal) agents, DTs can accommodate various violations of DT’s axiomatic requirements without having to ascribe implausibly sophisticated cognitive and computational abilities to such agents (e.g., Dietrich 2018, on some representation theorems for agents with changing awareness of outcomes and/or states which generalize Savage’s representation theorem for agents with fixed awareness of outcomes and states). In fact, several factors that are often invoked to accommodate observed violations of DT’s axiomatic requirements can be reliably tracked by agents with limited cognitive and computational abilities (e.g., section 2 on agents’ menus of available options and feelings of regret).

6. Challenge from Theoretical Incoherence

The challenge from theoretical incoherence holds that the re-individuation strategy may be used to accommodate some violations of DT’s axiomatic requirements, but threatens to hamper DT’s internal coherence (e.g., Sugden 1991). To illustrate this challenge, consider again Savage’s version of DT (see footnote 14 for a variant of the challenge targeting other versions of DT). Savage’s theory focuses on choices between acts, which are formally defined as functions from the set of states of the world to the set of consequences. Savage’s proof of the representation theorem requires both that DTs’ description of the choice problem incorporates all dependences between consequences in different states (state independence) and that the agent’s preference ordering is defined over all acts, i.e. over all functions from the set of states to the set of consequences (e.g., Broome 1991, chapter 5, on the so-called
The challenge from theoretical incoherence targets applications of the re-individuation strategy to both real-world agents and ideal agents with unbounded cognitive and computational abilities (e.g., Alexander 2012, for a demonstration that if specific axiomatic requirements are imposed on ideal agents’ preferences, then these agents must be indifferent between vast ranges of options). My evaluation primarily targets applications of the re-individuation strategy to real-world (rather than ideal) agents since most discussions of the re-individuation strategy target such applications.

The challenge from theoretical incoherence highlights an often-cited tension internal to Savage’s theory (e.g., Sugden 1991). Still, there are at least two reasons to doubt that this challenge undermines the merits of the re-individuation strategy. First, the tension between state independence and the rectangular field assumption does not invariably lead DTs to include in agents’ preference ordering acts that are physically impossible or nonsensical for agents. In fact, Savage himself noted the tension between state independence and the rectangular field assumption (e.g., Savage [1954] 1972, 25) and argued that several choice problems “can be usefully structured in terms of consequences, states, and acts in such a way that [the axioms hold]” (Savage [1971] 1987, 79). And second, even supposing that the tension between state independence and the rectangular field assumption invariably led DTs to include in agents’ preference ordering acts that are physically impossible or nonsensical for agents, DTs have developed generalized versions of Savage’s theory which enable them to accommodate several violations of DT’s axiomatic requirements without having to assume both state independence and the rectangular field assumption (e.g., Bradley 2007, on a representation theorem for preferences defined over prospects that include both factual and conditional possibilities which does not rely on the rectangular field assumption). The availability of these versions of DT does not exclude that some variant of the challenge from theoretical incoherence might be put forward against such versions. However, it nicely illustrates that highlighting tensions internal to a specific version of DT does not per se undermine the merits of the re-individuation strategy. For generalized versions of

rectangular field assumption). Unfortunately, the objection goes, these two requirements make contrasting demands on DTs, which lead DTs to include in agents’ preference ordering acts that are physically impossible or nonsensical for agents (e.g., Aumann [1971] 1987, 76; and Suppes 1960, 163, on acts that yield the same consequences in all states of the world, including those states inconsistent with them). This problem seems particularly pressing for the proponents of Savage’s theory, for it does not result from putative limitations in DTs’ epistemic and evidential access to agents’ choice problems, but rather results from a tension internal to Savage’s theory (e.g., Steele 2006).13

13The challenge from theoretical incoherence targets applications of the re-individuation strategy to both real-world agents and ideal agents with unbounded cognitive and computational abilities (e.g., Alexander 2012, for a demonstration that if specific axiomatic requirements are imposed on ideal agents’ preferences, then these agents must be indifferent between vast ranges of options). My evaluation primarily targets applications of the re-individuation strategy to real-world (rather than ideal) agents since most discussions of the re-individuation strategy target such applications.
the targeted DT may (and often do) have the conceptual and representational resources to address or circumvent such tensions.\textsuperscript{14}

A proponent of the challenge from theoretical incoherence may grant that the tensions internal to specific versions of DT do not prevent DTs from accommodating some violations of DT’s axiomatic requirements by relying on the re-individuation strategy. Still, she may object that DTs’ reliance on the re-individuation strategy conflicts with independently plausible views regarding the extent to which instrumental rationality constrains agents’ preferences. The objection proceeds as follows. Three major competing views regarding the extent to which instrumental rationality constrains agents’ preferences can be distinguished. \textit{Extreme Humeans} hold that “no individual preference can be irrational on its own” and that agents can rationally “have any pattern of preferences whatsoever” (Broome 1993, 51 and 58; also Hubin 1991). For their part, \textit{moderate Humeans} hold that although “no individual preference can be irrational on its own [inconsistent] patterns of preferences are irrational” (Broome 1993, 51; also Hume [1739-1740] 1978, book 2). Finally, \textit{anti-Humeans} hold that not only inconsistent patterns of preferences, but also some individual preferences are justifiably regarded as irrational (e.g., Broome 1993, on preferences contrary to reason; also Parfit 1984, part I, on preferences supported by no reasons).

Now, most DTs endorse moderate Humeanism in that they hold that agents can rationally have any consistent patterns of preference whatsoever (e.g., Savage [1954] 1972, chapter 5; also Bradley 2017, chapter 14; and Dreier 1996). Yet, the objection goes, if one allows DTs to refine the proffered descriptions of choice

\textsuperscript{14}A similar defense may be developed for other versions of DT. To give one example, Jeffrey’s 1965, theory imposes weaker requirements on the description of choice options than Savage’s theory (e.g., Jeffrey’s theory does not require that states be probabilistically independent of acts) and does not rest on the rectangular field assumption (e.g., it includes in agents’ preference ordering only those propositions to which the agent assigns a probability greater than zero). As a consequence, some representation results are harder to derive in Jeffrey’s theory than in Savage’s theory (e.g., think of the failure of Bolker’s 1967, representation theorem to determine a unique representation of the agent’s degrees of belief). Still, DTs have developed generalized versions of Jeffrey’s theory which address or circumvent these tensions (e.g., Bradley 1998; and Joyce 1999, for various representation theorems that provide uniqueness results for Jeffrey’s theory). This does not preclude the critics of Jeffrey’s theory from questioning other tenets of such theory (e.g., Lewis 1981; and Skyrms 1981, for a critique of Jeffrey’s evidentialist measure of options’ choice-worthiness). Yet, the point remains that highlighting tensions internal to a specific version of DT does not per se undermine the merits of the re-individuation strategy. For generalized versions of the targeted DT may (and often do) have the conceptual and representational resources to address or circumvent such tensions.
options, then DT’s axiomatic requirements alone fail to constrain agents’ preferences (e.g., Broome 1993, 55-6). Hence, to constrain agents’ preferences, DTs have to supplement DT’s axiomatic requirements with rational principles of indifference that indicate “which specific differences between [choice options] justify a preference [between such options]” (Broome 1993, 58). However, DTs’ moderate Humeanism prevents them from imposing rational principles of indifference on agents’ preferences. For such principles hold that some consistent patterns of preferences are irrational. As a result, DTs’ moderate Humeanism either collapses into the extreme Humean view that agents can rationally have any pattern of preferences whatsoever—a view which is independently implausible (e.g., Broome 1993, 52, for the claim that extreme Humeanism “leaves [agents] prey to Dutch bookmakers, money pump operators [and means-end incoherence]”)—or must be abandoned in favor of anti-Humeanism (e.g., Broome 1993, 71, for the claim that “the moderate Humean cannot sustain her position. She must either become extreme or cease to be a Humean”). In either case, DTs’ reliance on the re-individuation strategy conflicts with their moderate Humeanism.¹⁵

Let us assume, for the sake of argument, that if one allows DTs to refine the proffered descriptions of choice options, then DT’s axiomatic requirements alone fail to constrain agents’ preferences.¹⁶ Assume further that DTs refuse to

¹⁵One might hold that Broome’s objection against moderate Humeanism is most plausibly regarded not so much as a variant of the challenge from theoretical incoherence, but rather as “a normative version of the ‘non-falsifiability’ [challenge]” since Broome does not claim that DT is theoretically incoherent, but only claims that DT’s axiomatic requirements are “toothless in the absence of [rational principles] of indifference” (Bradley, personal correspondence). I agree that Broome does not explicitly claim that DT is “theoretically incoherent.” Still, he does claim (1993, 71) that DTs’ moderate Humeanism is untenable in the sense that it either collapses into extreme Humeanism (which Broome finds independently implausible) or must be abandoned in favor of anti-Humeanism. In this sense, Broome’s objection against moderate Humeanism can be plausibly regarded as a variant of the challenge from theoretical incoherence.

¹⁶A moderate Humean may grant that DT’s axiomatic requirements alone fail to constrain agents’ practical preferences—i.e. preferences for alternatives between which agents can have a choice (e.g., Broome 1991, 74)—yet object that DT’s axiomatic requirements constrain the combination of agents’ practical and non-practical preferences (e.g., Dreier 1996, 261 and 271). To this objection, an anti-Humean may reply that taking DT’s axiomatic requirements to target the combination of practical and non-practical preferences deprives DT’s axiomatic requirements of “practical significance” on the alleged ground that agents lack reliable epistemic access to their own non-practical preferences (e.g., Broome 1993, 60-69). I do not expand on this issue since my defense of the re-individuation strategy holds also under the supposition that if one allows DTs to refine the proffered descriptions of choice options, then DT’s axiomatic requirements alone fail to constrain agents’ preferences.
abandon moderate Humeanism. Even so, DTs can consistently retain moderate Humeanism and support several applications of the re-individuation strategy. For DTs may be able to constrain agents’ preferences without having to impose rational principles of indifference on such preferences. By way of illustration, consider the proposal to supplement DT’s axiomatic requirements with requirements of indifference deriving from agents’ substantial value commitments (e.g., Bradley 2017, chapter 1, on the commitment to treating others impartially; also Bossert and Suzumura 2009, on a notion of norm-conditional rationalizability which incorporates the constraints that norms external to agents’ choice behavior impose on agents’ own preferences). Standard DT does not perse rest on a specific position as to whether agents should have any substantial value commitments and, if so, which value commitments agents should have. Still, agents frequently have substantial value commitments, and these value commitments—together with DT’s axiomatic requirements—may constrain agents’ preferences (e.g., Bradley 2017, chapter 1, on the constraints deriving from one’s commitment to treating others impartially). That is to say, one may consistently grant that DT’s axiomatic requirements alone fail to constrain agents’ preferences, yet hold that DTs may be able to constrain these preferences without having to impose rational principles of indifference on such preferences. Hence, DTs’ reliance on the re-individuation strategy does not inevitably conflict with their moderate Humeanism.17

7. Conclusion

In recent years, prominent authors have challenged DTs’ attempts to accommodate the reported violations of DT’s axiomatic requirements by modifying

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17Different authors disagree regarding the extent to which instrumental rationality constrains agents’ preferences in the absence of rational principles of indifference. To see this, consider Parfit’s example of an agent who “cares equally about [her future pleasures and pains, but] has Future-Tuesday-Indifference [i.e., never cares about possible pains or pleasures on a future Tuesday]” (1984, 123-4). According to Parfit, the agent’s preferences are irrational, because “the fact that [a pain] will be on a Tuesday [as opposed to some other day of the week] is no reason for preferring it” and “preferring the worse of two pains, for no reason, is irrational” (Parfit 1984, 124). Others respond that showing that such preferences are irrational would require one to show that the day in which a pain or a pleasure is experienced is no reason for preferring it and that Parfit fails to meet this justificatory requirement (e.g., Hubin 1991, 40-1; also Bradley 2017, chapter 2). I mention this issue in passing because my defense of the re-individuation strategy is compatible with different positions concerning the extent to which instrumental rationality constrains agents’ preferences in the absence of rational principles of indifference.
how agents’ choice options are individuated and formally represented. In this paper, I have argued for two claims of general interest to DTs and choice modelers across the decision sciences. First, the proffered challenges pose severe conceptual and practical difficulties to both descriptive and normative DT analyses. And second, these difficulties are not insurmountable, i.e. in spite of the proffered challenges, DTs can provide plausible and precise criteria for individuating and formally representing agents’ choice options. This result does not imply that there is one single version of DT that is generally immune to all the challenges put forward against the re-individuation strategy. Still, it indicates that specific applications of the re-individuation strategy can address the proffered challenges across several choice contexts. In this perspective, the four challenges I have examined in this paper can be regarded as informative adequacy conditions on both proposed and forthcoming applications of the re-individuation strategy.

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