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Asian Disease-type of framing of outcomes as an historical curiosity

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Abstract

This paper discusses the ways by which a certain type of behavioral deviation from expected utility theory has been handled by psychologists and economists. With respect to the historical background of decision theory in economics, it is argued that there are good reasons for more theoretical developments from this behavioral deviation.

JEL: D00, D01, D03, B21, B41;

Keywords: behavioral economics, psychology, decision theory, microeconomics, rationality.

Introduction: historical background of the claim

The recent rise of behavioral economics within the mainstream of economic theory has triggered a set of debates among economists on the topic of rationality (see esp. Gul and Pesendorfer 2008 and Camerer 2008 within Caplin and Schotter 2008; see also McKenzie 2010 and Levine 2012). Reliance on insights from psychology to alter the standard view of economic rationality, identified with either expected utility theory or textbook accounts of consumer choice theory, is indeed a defining characteristic of behavioral economics. Correspondingly, there has been a renewal of attention toward the relationships between economics and psychology from *reflexive* perspectives, *i.e.*, historical, methodological, epistemological and philosophical (see esp. Sent 2004, Hands 2009, 2011, Davis 2011 chap.2, Heukelom 2012b, Hausman 2012 part 3). A shared goal of the reflexive literature on behavioral economics is to investigate the nature of its departures from standard microeconomics, *i.e.*, what behavioral economics is (and is not) actually changing in historical, methodological, epistemological or philosophical terms.

¹ I thank Michel Zouboulakis, André Lapidus, and especially Raphaël Giraud for their comments on earlier versions of this paper. Of course, remaining mistakes are all under my responsibility.

This paper seeks to contribute to these reflections by investigating one of the departures of behavioral economics from standard microeconomics that has not received the attention it deserves – or so I will argue – in both the primary and reflexive literatures. This departure can be identified with the notion of “framing” developed by Amos Tversky and Daniel Kahneman from the 1980s onward. Usually, framing underlies the idea that there can be different yet equivalent ways of presenting one decision problem, and that despite the equivalence, the decision maker may change his preference and choice between the different presentations – if so, we then speak of a “framing effect”. More precisely, the focus will be on what I will call “Asian Disease-type of framing of outcomes”, in reference to a specific type of framing (*i.e.* of outcomes) at play in a famous decision problem (*i.e.*, the Asian Disease). The main claim of the paper is that Asian Disease-type of framing of outcomes stands as an *historical curiosity* within the relationships between economics and psychology constitutive of behavioral economics. Although Asian Disease-type of framing of outcomes is a curiosity in many respects, the expression “historical curiosity” is here meant to highlight how curious are both the few and the nature of existing theoretical attention spent on this type of framing in economics, *despite* the fact that it fits the scientific criteria by which theoretical attention was warranted and eventually shaped the history of decision theory in economics. The remaining of this introduction gives a brief historical background of the scientific criteria that shaped the history of decision theory in economics, from which the claim of the paper will be derived.

From John von Neumann and Oskar Morgenstern [vNM]’s (1947) axiomatization of expected utility, the history of decision theory in economics evolved through a set of issues and debates that can be summarized in three entangled categories, which respectively concerns: (1) the economic meaning of *utility*, (2) the discovery of hidden axioms of *preferences*, and (3) the dual status of economic *rationality*.

The first category – which is elsewhere discussed under the heading “measurability controversy” by Philippe Mongin (1998; see also his 2009) and “two cardinalities problem” by Francesco Guala (2000) – arose as an important interpretational issue, in the 1950s, on the cardinal index given by the function within the expected utility functional derived by vNM. In a nutshell, some theorists argued that its cardinality was to be understood in the Marginalists’ sense of magnitudes of satisfaction derived from introspection about riskless outcomes (*e.g.*, Friedman and Savage 1948, Baumol 1951, Allais 1952/1979a), other argued that it was

another type of cardinality representing attitudes toward risk disconnected from riskless outcomes, the theoretical advantage of which was to represent how an individual could be risk averse and risk seeking on different domains by a single function (*e.g.*, Arrow 1951, Samuelson 1952, Ellsberg 1954, Luce and Raiffa 1957). This latter interpretation eventually established itself as the orthodoxy in decision theory, and some theorists changed their positions (*e.g.*, Friedman and Savage 1952, Baumol 1958).

This position relied crucially on the now well-known independence axiom of preferences. This brings us to the second category because the independence axiom was not explicit in vNM's axiomatization, and this puzzled quite a few theorists who formalized it themselves (*e.g.*, Marshak 1950) until Edmond Malinveau (1952) clarified how it was hidden within vNM's mathematical tools: they defined preferences on equivalence classes of indifferent probabilistic outcomes, not on probabilistic outcomes themselves, which made more economic sense for most economists. It can be argued that, at its broadest conceptual level, the independence axiom guarantees the independence between *preferences* over probabilistic outcomes and *beliefs* about the occurrence of common consequences shared by the probabilistic outcomes (see Fishburn and Wakker 1995 for a detailed account of this episode).

The third category revolves around the work of Maurice Allais (1952/1979b, 1953), who defended cardinality as magnitudes of satisfaction for riskless choices, but all the same criticized vNM's cardinal index as being inappropriate for a theory of decision under risk. His criticisms focused on the independence axiom, and were both positive and normative. On the positive side, he constructed choice problems such as the following one, the structure of which is often referred to as the 'Allais paradox':

What do you prefer between A and B?

A: having €100 million for sure (*i.e.*, with a probability of 1)

B: having either €500 million with a probability of 10/100 (10%), €100 million with a probability of 89/100 (89%), or nothing with a probability of 1/100 (1%)

What do you prefer between C and D?

C: having €100 million with a probability of 11/100 (11%) or nothing with a probability of 89/100 (89%)

D: having €500 millions with a probability of 10/100 (10%) or nothing with a probability 90/100 (90%)

Most people² actually chose A (being risk averse) and D (being risk seeking), yet there is no single function that can give a cardinal index representing these choices within the expected utility functional. On the normative side, Allais had several arguments to assert that such pattern of choices was fully rational and that any theory of decision under risk should entail them (Allais *ibid*, 1979b; see Guala 2000, Jallais and Pradier 2005, and Mongin 2009, 2013 for detailed discussions of Allais' arguments). These arguments were not very well accepted by decision theorists, except for the one that any choice pattern under risk that does not violate stochastic dominance cannot be discarded as irrational, and thus any theory of decision under risk should entail them with axioms that respect preference for stochastic dominance. It can be argued that, at its broadest conceptual level, preference for stochastic dominance is the probabilistic equivalent of monotonicity in consumer choice theory, which roughly states that 'more is better than less', so that preference for stochastic dominance can be seen as stating that 'probabilistically more is better than probabilistically less' (see Starmer 2005 for a detailed discussion of the relationship between decision theory and consumer choice theory around monotonicity; see also the referenced literature and the pedagogical discussions of different types of stochastic dominance in Borch 1979 and Bréban and Lapidus 2012). The rest of Allais' normative arguments started to be accepted by other economists through the work of Kenneth MacCrimmon (1968) and his followers, who conducted what has been called 'normative experiments' (by Guala 2000). Roughly, these consist in presenting individuals with choice problems leading to the same kind of choice pattern as in the Allais paradox, and then providing explanations of the arguments for and against the independence axiom, before the opportunity to revise choices. These contributions are summarized and discussed by Philippe Mongin (2013), who deplores the loss of this experimental tradition in decision theory and calls for its renewal. Nevertheless, they have been influent to motivate decision theorist in developing alternative theories of decision by weakening the independence axiom so as to entail the observed pattern of choices, without violating stochastic dominance. This eventually led to so called rank-dependent expected utility theory initiated by the work of John Quiggin (1982), who, on the one hand, quotes the normative experiments as crucial in the motivation of his paper (p.324), and, on the other hand, weakens the independence axiom through the use of decumulative probability

² Throughout the paper, I will leave aside questions of statistical significance (and experimental design to a certain extent) to focus on the logic of observed behavioral deviations.

distributions, a mathematical tools that was not previously used in decision theory (see Diecidue and Wakker 2001 for a pedagogical discussion). What is important to notice is that Allais did propose an alternative theory of decision making, but it was rejected by other economists because he did not derive his function through the axiomatic method, as Quiggin did (see Mongin 2009). However, rank-dependent utility theory is clearly motivated by Allais' influence on decision theory, especially concerning the requirements of being clear on the subtleties of both (1) the interplay between decision under risk and under certainty, and (2) the duality between positive and normative requirements of economic rationality.

All in all, it can be argued that, at least up until the beginnings of the 1980s, three categories of issues and debates from which two key scientific criteria have guided theoretical developments in decision theory. Rational choices that are worthy of theoretical attention are the ones that *do not violate stochastic dominance*, and that have been *experimentally assessed as being normatively rational by the decision maker himself*.

With this historical background in mind, I will argue that we find the three categories of issues and debates reemerging around Asian Disease-type of framing of outcomes, which respects the two scientific criteria. However, this has triggered little theoretical attention – hence the “historical curiosity”. Therefore, the goal of the paper is to dress this observation by reviewing the literature devoted to Asian Disease-type of framing of outcomes so as to clarify why more theoretical attention is warranted and needed around it, what are the stakes for economic rationality, and why this is not – but should be – discussed in contemporary debates. In other words, the goal is to clarify why Asian Disease-type of framing of outcomes are an *interesting* curiosity. To do so, the paper is structured in three sections. A first section contextualizes Asian Disease-type of framing of outcomes within the work of Kahneman and Tversky. A second one reviews how this type of framing has been received by economists. A third section discusses the extensive work that has been conducted by psychologists on the issue.

1. Asian Disease-type of framing of outcomes in the work of Kahneman and Tversky

The reflexive (mainly historical) literature on Kahneman and Tversky rarely discusses their work on framing and their post 1980s' contributions. In a first subsection, I try to fill this

gap by contextualizing the 1980s work of Kahneman and Tversky on framing effects within their (anterior but mainly posterior) broader research projects (section 2.1). Then, I discuss the peculiarities of Asian Disease-type of framing of outcomes and how they were interpreted by Kahneman and Tversky, along with behavioral economists (section 2.2).

1.1 Asian Disease-type of framing of outcomes within the work of Kahneman and Tversky

Kahneman and Tversky started their collaboration in the 1970s around the behavioral deviations of people from simple axioms of logic and probability theory. In their terminology, people used “heuristics”, *i.e.*, *general* rules of thumb, to answer *specific* (mostly statistical) decision problems. On their account, sometimes heuristics lead to the correct answers, and sometimes it leads to “biases”, *i.e.*, *systematic* deviations from the axioms, when the decision problems are *structured* in a specific way (see Heukelom 2009, chapter 4 and 2012 for a detailed discussion of this period).

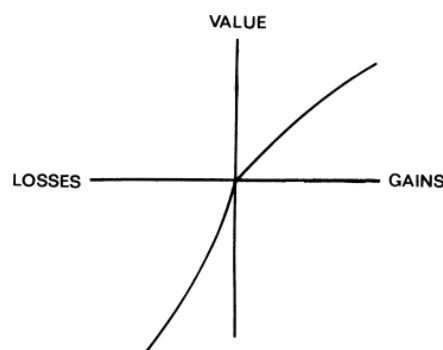
In 1979, Kahneman and Tversky published “Prospect Theory: An analysis of decision under risk” in *Econometrica*, which is the second most cited paper from an economics journal since 1970 (Kim, Morse and Zingales 2006). However this high rate of citation is hardly due to economists, and if at any rate, not for the theoretical part of the paper, as we will see. Basically, the research strategy was the same as the one in their “heuristics and biases”, but instead of simple axioms of logic and probability theory, the behavioral deviations were studied with respect to expected utility theory. They reproduced their traditional results of people following heuristics sometimes leading to biases, but changed the rhetoric – which took most of the five years writing process of the paper according to Kahneman (2002). They did so for mainly two reasons: (1) to fit an economic audience, (2) to organize the results under an overarching descriptive (and one could argue, ‘semi-axiomatized’) theory of decision making. Indeed, there are two distinct parts in the 1979 paper, an empirical/experimental one illustrating several behavioral deviations (discussed below), and a theoretical one, *i.e.*, prospect theory.

1.1.1 Prospect theory in terms of ‘presentation/representation’ and ‘decision modeler/decision maker’

I will start by discussing the theoretical part of prospect theory in a specific way that will be useful to subsequently clarify the main point of the present paper. More precisely, I will use a vocabulary in terms of “presentation/representation” and “decision modeler (or decision theorist)/decision maker” that is not Kahneman and Tversky’s original one, although one could reconstitute it from Kahneman (2000).

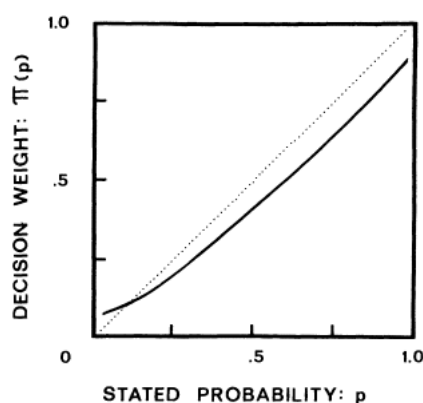
Prospect theory conceptualizes the decision making processes of decision makers in two steps: an “editing phase” where decision makers construct simplified (through ‘heuristics’ one could say) *representation* of the probabilistic outcomes, and an “evaluation phase” where decision makers choose according to their preferences. However, preferences are not defined on the set of outcomes as it is *presented* by the decision modeler (or decision theorist). Rather, preferences are defined on the set of outcomes as decision makers *represent* it to themselves after the editing phase – or as they “perceive” it as Kahneman and Tversky most often put it. Therefore, the behavioral deviations from expected utility theory (the ‘biases’ one could say) correspond to the discrepancy between the presentation of the decision problem (*i.e.* the decision problem as understood by the decision theorist) and the representation of the decision problem (*i.e.* the decision problem as understood by the decision maker). They theorize such discrepancy by two functions: a value function concerning the discrepancy between presented and represented values of the outcomes, and a decision weight function concerning the discrepancy between presented and represented probabilities of the outcomes.

The value function has the following “S shape” (Kahneman and Tversky 1979, p.279)



where the horizontal losses-gains axis refers to the presentation of the outcomes by the decision theorist, and the vertical value axis refers to the related representations of the outcomes by the decision maker. The main feature of the value function with respect to the

link between prospect theory and framing effect discussed below is that subjective representations of gains and losses revolve around a reference point, *i.e.*, where the axis cross, which is not necessarily equal to zero³. As for the decision weight function, it has the following shape (*ibid* p.283)



where the stated probability horizontal axis along with the dotted line refer to the presentation of the probabilities by the decision theorist (or decision modeler), and the decision weight vertical axis along with the plain slightly curved line refer to the representation of the probabilities by the decision maker.

Prospect theory is then the combination of these two functions. An important drawback of prospect theory, acknowledged by Kahneman and Tversky themselves in the 1979 paper, is that some of the mathematical features of their functions (mainly of the decision weight function) allowed for violations of stochastic dominance. This is the main reason why prospect theory never really took off in economics (*e.g.*, Quiggin 1982, Machina 1987; see also Wakker 2010 p.153, and Barberis 2013). This was later corrected by the authors in the so called “cumulative prospect theory” (Tversky and Kahneman 1992), as we will see below. However, with respect to the 1979 paper, it is important to notice that (and to discuss how) most of the specific features of both functions are inductively justified by the empirical/experimental results of the first part of their 1979 paper.

³ The two other important features usually mentioned are: (1) the psychological values of gains are concave (diminishing marginal sensitivity), while they are convex for losses (increasing marginal sensitivity), and (2) the degree of convexity of losses is (usually twice) greater than the degree of concavity of gains – which was subsequently labeled ‘loss aversion’.

1.1.2 Getting clear on Kahneman and Tversky's 1979 empirical/experimental contributions

Although theoretically dismissed, the 1979 paper is well known within decision theory in economics for his first empirical/experimental part, where several behavioral deviations from expected utility theory are illustrated. Kahneman and Tversky's empirical/experimental results are considered as important because (1) they replicated Allais' results with reasonable amounts of money (*i.e.*, not the millions of Francs) and non-monetary outcomes, (2) they showed further behavioral deviations, (3) some of them by manipulating probabilistic outcomes involving (monetary) losses. Regarding the purpose of this paper, it is important to distinguish some of these behavioral deviations because they have been somewhat confused in the literature, especially with respect to the later behavioral deviations related to framing.

Recall that a typical Allais paradox choice problem shows that when people are confronted with the following gambles⁴ (Kahneman and Tversky 1979, p.266, problems 3 and 4):

“A: (4, 000, .80), or B: (3,000)”
[*i.e.*, A: 80% chance of winning €4000 and 20% chance of winning nothing
B: 100% chance of winning €3000 for sure]

they usually choose B; whereas when confronted with those ones:

“C: (4, 000, .20), or D: (3,000, .25)”
[*i.e.*, C: 20% chance of winning €4000 and 80% chance of winning nothing
D: 25% chance of winning €3000 and 75% chance of winning nothing]

they usually choose C, thus exhibiting a pattern of choice consisting of a risk averse attitude when certainty relative to a gain is available, and a risk seeking attitude when only risky choices are available relative to a gain or nothing – this is usually called the *certainty effect*, and cannot be accounted for by expected utility theory. Kahneman and Tversky then conducted further tests of the certainty effect with negative probabilistic outcomes (*i.e.*, monetary losses), leading to what they labeled the *reflection effect*: when gambles involve losses, the typical certainty effect pattern of choice reverses itself, still in a way that cannot be accounted for by expected utility theory. To illustrate this, when people are confronted with the following gambles (Kahneman and Tversky 1979, p.278, problems 3' and 4' in table 1):

⁴ I use Kahneman and Tversky's figures but replace the currency by Euros and some of the letters for better comparisons, and I added brackets indicating how the gambles are to be read; this apply to all experiments from psychologists documented until the end of the paper.

A': "(-4,000,.80)", or B': "(-3000)"
[i.e., A': 80% chance of losing €4000 and 20% chance of losing nothing
B': 100% chance of losing €3000 for sure]

they usually choose A', whereas when confronted with those ones:

C': "(-4000,.20)", or D': "(-3000,.25)"
[i.e., C': 20% chance of losing €4000 and 80% chance of losing nothing
D': 25% chance of losing €3000 and 75% chance of losing nothing]

they usually choose D', thus exhibiting a pattern of choice consisting of a risk seeking attitude when certainty relative to a loss is available and a risk averse attitude when only risky choices relative to a loss or nothing are available – this corroborated previous observations of risk behavior in finance (Markowitz 1952), insurance (Williams 1966), and other domains more generally (Fishburn and Kochenberger 1979). This cannot be accounted for by expected utility theory, but it can be so in prospect theory by virtue of the S-shape of the value function.

Kahneman and Tversky (1979, p.273, problems 11 and 12) went one step further and proposed a new type of choice problem that exhibited a behavioral deviation that they labeled the *isolation effect*. There are two types of isolation effect, one focusing on probabilities and the other on outcomes. I focus on the latter because it is here that the seeds of both the framing of outcomes along with the theoretical confusion around it are contained; it goes as follows:

"In addition with whatever you own, you have been given €1000. You are now asked to choose between"
E: "(1,000,.50)", and F: "(500)"
[i.e., E: 50% chance of winning €1000 and 50% chance of winning nothing
F: 100% chance of winning €500 for sure]

Here, people usually choose F; whereas in the following gamble:

"In addition with whatever you own, you have been given €2000. You are now asked to choose between"
E': "(-1,000,.50)", and F': "(-500)"
[i.e., E': 50% chance of losing €1000 and 50% chance of losing nothing
F': 100% chance of losing €500 for sure]

they usually choose E'. While the preferences underlying this pattern of choices "conform to the reflection effect" i.e., risk aversion for positive prospects and risk seeking for negative prospects, "[n]ote however, that when viewed in terms of final states, the two choice problems are identical" (Kahneman and Tversky 1979, p.273). Prospect theory explains these results by a shift in the reference point (e.g., either €1000 or €2000), and the S-shape of the value function.

1.1.3 Further empirical/experimental contributions: the 1980s framing effects

In the 1980s, Kahneman and Tversky (1984; Tversky and Kahneman 1981, 1986) presented further behavioral deviations from expected utility theory under the broad label of “framing effects”. There are three non-mutually exclusive ways of seeing Kahneman and Tversky’s 1980s work on framing. First, it can be seen as a further investigation of the insight from their (pre-prospect theory) research on heuristics and biases that *the structure* of decision problems influences people’s answer in a systematic way, though applied to decision theoretic problem with expected utility theory as the norm. Second, it can also be seen as seeking to show that violations of stochastic dominance predicted by prospect theory *in principle* actually *occurred*, thus empirically comforting the unbridgeable gap between normative and positive theory of decision making *they* were arguing for from the start (see especially Tversky and Kahneman 1986). Third, it can also be seen as a first step towards a generalization of the editing phase of prospect theory, which was subsequently called “framing phase” in their 1992 cumulative prospect theory, which however, does not entail violation of stochastic dominance anymore.

There are three embedded types of framing in the 1980s work of Kahneman and Tversky, each relating to one dimension of decision problems: the framing of “acts” or “options”, the framing of “outcomes” or “consequences” (of the acts or options), and the framing of “contingencies” or “conditional probabilities” (relating outcomes/consequences to acts/options). The general idea is that two presentations, or “framing”, of a given decision problem that are *equivalent* in terms of these dimensions can nonetheless yield preference reversals, or “framing effects”. In that sense, *the reflection effect illustrated above is not a framing effect* (A’ and B’ do not involve equivalent outcomes as C’ and D’), but *the isolation effect is a framing effect related to the framing of outcomes* (E and F involve equivalent outcomes as E’ and F’).

As mentioned in introduction, the most well known example of a framing effect related to the framing of outcomes is called the Asian Disease; it goes as follows (Tversky and Kahneman 1981, p.453):

“Imagine that the U.S. is preparing for the outbreak of an unusual Asian Disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows”:

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.
“Which of the two programs would you favor?”

Here, subjects usually choose program A. Then, with the same problem description, subjects are confronted with the following two alternative programs:

If Program C is adopted, 400 people will die.
If Program D is adopted, there is a 1/3 probability that nobody will die, and a 2/3 probability that 600 people will die.

In this second version, subjects usually choose program D. The only changes across versions are the *descriptions* (i.e., wordings) of options' outcomes, not their (expected) *values*: A = C = 200 people will be saved and 400 people will die for sure, and B = D = everybody will be saved with probability 1/3 and everybody will die with probability 2/3. Kahneman and Tversky argue that prospect theory can account for this pattern of choice by a shift in the reference point (either 600 people are expected to die hence 200 people being saved is represented as a gain in the first frame, or 600 people are expected to be killed hence 400 people being dead is represented as a loss in the second frame), and the S-shape of the value function.

1.2 The peculiarities of Asian Disease-type of framing of outcomes

In a way that was not obviously clear at the time (as acknowledged by Kahneman 2000), the notion of framing encapsulates both the way the decision modeler presents (i.e., frames) the decision problems and the way the decision maker represents (i.e., frames) the decision problem to himself before making his choices. Furthermore, although the outcomes of the two choice situations are *equivalent*, as in the isolation effect, *the problem description* (“Imagine that ... Asian Disease, which is expected to kill 600 people”) is **identical** in the two choice situations, unlike in the isolation effect (“you have been given €1000” versus “you have been given €2000”). Hence there are two important distinctions that Kahneman and Tversky did not make – beside the decision modeler's framing *versus* the decision maker's framing – which concerns (1) the equivalence *versus* identity of (2) the framing of problem description *versus* the framing of option description (Keren 2011a hints at the same argument). In other words, reference points can be induced by changes in both problem description and option description (e.g., isolation effect), in the description of options *only* (e.g., Asian Disease; see also McNeil *et. al.* 1982), or in the description of the decision

problem *only* (e.g., Quattrone and Tversky 1988, problem 7 p.726⁵). The two latter cases imply, respectively, identical problem description (with equivalent option description) and identical option description (with equivalent problem description). These are quite tricky to design, and not many of Kahneman and Tversky's decision problems are of this sort – although the literature in section 3 contains several examples.

On Kahneman and Tversky's accounts, it was not clear, in the 1980s, whether Asian Disease-type of framing of outcomes were rational or irrational. More precisely, in the original Asian Disease paper, Tversky and Kahneman (1981, p.154) concluded their discussion of framing effects by stressing that, in the Asian Disease, "it is not obvious which preferences should be abandoned" (*ibid*, p.154), and that "the common conception of rationality also requires that preferences or utilities for particular outcomes should be predictive of the experiences of satisfaction or displeasure associated with their occurrence" (*ibid*). This hinges on a distinction that would later be important in the work of Kahneman, between "decision utility", which is the standard conception of utility in decision theory, and "experienced utility", which is as an hedonist conception of utility (e.g., Kahneman 1994; Kahneman, Wakker and Sarin 1997; Kahneman and Thaler 2006). Hence, their concluding remarks on the Asian Disease imply that if the decision maker's experience of an outcome is mold and enhanced by its framing, then such framing effects can be seen as rational. This type of interpretation is at odds with respect to both Kahneman and Tversky's 1979 work on prospect theory, and (especially) their 1970s contributions on heuristics and biases (on which see Heukelom 2012a). Moreover, even if such interpretation is in line with the later work of Kahneman (1994) on experienced utility, it has to be noticed that these researches were not pursued with respect to the framing of outcomes at play in the Asian Disease, and generally not with respect to decisions under risk or uncertainty, but mostly in relation to intertemporal decisions. Kahneman (2000, p.xv) suggests more clearly the framing effects of the 1980s papers are, in general, irrational:

"Framing effects are inherently interesting, but the psychological analysis of these effects is awkward because the object of explanation is something that decision

⁵ The decision problem concerns the arguments of supporters of *versus* opponents to women rights in the Equal Rights Amendment; in the two descriptions of the problem, only the phrasing of the supporters' arguments changes ("help eliminate discrimination against women/improve the rights of women"); the description of options remains the same in both version ("Do you favor or oppose the Equal Rights Amendment? (check one)").

makers do not do: they do not spontaneously generate a common representation for decision problems that they would judge to be equivalent. Why is this so? The unexciting answer is that decision maker are generally quite passive and therefore inclined to accept any frame to which they are exposed. Framing effects are less significant for their contribution to psychology than for their importance in the real world.”

This remark by Kahneman is important for two reasons. First, it is representative of the considerations on the rationality or irrationality of framing effects, and the related potential departures from mainstream economics in the ‘manifesto’ of behavioral economists (e.g., Rabin 1998, 2002; Thaler 2000; Camerer and Loewenstein 2004; Camerer 2006). Second, it highlights how delicate is the use of the term “framing” within his work with Tversky for the following reason. As I argued, one of the purpose of their 1980s work on framing effects was to show that the violations of stochastic initially implied by prospect theory actually occurred empirically (see esp. Tversky and Kahneman 1986, problems 2 and 8). This constituted a crucial argument against the dual status of economic rationality since stochastic dominance was seen as the minimal requirement of rationality from a normative perspective, but was not always respected from a positive perspective. *However*, in cumulative prospect theory (Tversky and Kahneman 1992), the term framing is then used to replace the editing phase, which is thus called the “framing phase”, *but* avoids violations of stochastic dominance though the use of the mathematical tools introduced by Quiggin (1982). Hence cumulative prospect theory can be seen as abiding by the dual status of economic rationality, and was actually better received by economists than their original prospect theory – as witnessed by the full axiomatization of cumulative prospect theory under risk provided by Wakker and Chateauneuf in 1997.

Another peculiarity of Asian Disease-type of framing of outcomes is that when Tversky and Kahneman (1986) tries briefly to identify the implicit axiom of preference violated in the Asian Disease, they use not one but three terms: *extensionality* (in reference to a note by Kenneth Arrow in 1982 discussing framing effects), *invariance* (in reference to Kahneman and Tversky themselves in 1984), and *consequentialism* (in reference to the discussion of consequentialism later published by Peter Hammond in 1988, who, however does not directly relate the issue to framing effects). However, none of these contributions (Arrow 1982, Kahneman and Tversky 1984, Tversky and Kahneman 1986) provide a *serious* axiomatic discussion of the kinds that occurred around the independence axiom with respect to how it was implicitly hidden within the standard formalism. It can be noted that the term “description invariance” is now widely used by behavioral economists to designate what

Asian Disease-type of framing of outcomes violates in the standard framework (*c.f.*, the ‘manifestos’ quoted in the previous paragraph), without providing any serious axiomatic discussion of it.

To summarize this section, Asian Disease-type of framing of outcomes was part of Kahneman and Tversky’s 1980s endeavor to strengthen prospect theory. Their remarks on the notion of framing can be seen as underlying the three categories of issues and debates that shaped the history of decision theory in economics roughly sketched in introduction. The interpretation in terms of experienced utility underlies the concerns on the economic meaning of utility, the change from the editing phase of 1979 for the framing phase of 1992 underlies the concerns on the dual status of economic rationality, and their mention of extensionality, invariance, and consequentialism underlies the concerns on hidden axioms of preferences. Furthermore, the reception of their work by economists clearly highlights the centrality of violation of stochastic dominance as the minimal requirement of rationality in decision theory. It has to be noticed that Asian Disease-type of framing of outcomes does not violate stochastic dominance, and as such respects one of the two scientific criteria mentioned in introduction that have historically warranted theoretical attention in decision theory. With that in mind, let us now turn to the reception of this type of framing by economists.

2. Asian Disease-type of framing of outcomes assessed by economists

From the early 1980s onward, discussions of Asian Disease-type of framing of outcomes by economists are rather sporadic. This may be attributed to the fact that although the underlying decision problems respect one of the scientific criteria of decision theory to warrant theoretical attention in economics – non violation of stochastic dominance – it does not respect the second one – experimental normative assessment, at least from the literature discussed by economists (we will see in section 3 that there has been such experimental normative assessment). This section summarizes existing discussions of Asian Disease-type of framing of outcomes by economists.

Kenneth Arrow (1982) was one of the first (and rare) economists to discuss Kahneman and Tversky's framing effects straightforwardly after their first paper on the topic (*i.e.*, Tversky and Kahneman 1981). Concerning Asian Disease-type of framing of outcomes (the one from McNeill *et. al.* 1982, reproduced in Tversky and Kahneman 1986, problem 1 p.70), Arrow (1982, pp.6-7) stressed that, in logical terms, what was at stake here is the principle of *extensionality*:

“The drawing of inferences depends then on preconceptions, which may be true or false. The cognitive psychologists refer to the “framing” of questions, the effect of the way they are formulated on the answers. A fundamental element of rationality, so elementary that we hardly notice it, is, in logicians' language, its *extensionality*. The chosen element depends on the opportunity set from which the choice is to be made, independently of how that set is described” (Arrow 1982, p.6)

On Arrow's account, extensionality is an “axiom” (*ibid*, p.7) of individual rationality in economics. Despite the influence Arrow had in several areas of economics, his 1982 paper did not trigger the attention and critical axiomatic discussions like the ones around the independence axiom. There might be three non-mutually exclusive explanations to that. First, Arrow was rather ambiguous on the rationality or irrationality of violations of extensionality – when put in perspective of his whole paper, then it surely sounds like it is irrational, thus not in the domain of economics. Second, Arrow was a strong advocate of the ordinal meaning of utility in the 1950s (see esp. Arrow 1951), and he perhaps foresaw that Kahneman and Tversky's suggestions in terms of *experience* would indeed mean something different than the traditional ordinalist meaning, as the literature following Kahneman (1994) does indicate. Third, the consequence of acknowledging the rationality of violations of extensionality might have been (indirectly) too damaging to consumer choice theory and demand theory, as what follows the previous quote suggests:

“To take a familiar example, consider the consumer's budget set. It is defined by prices and income. Suppose income and all prices were doubled. Clearly, the set of commodity bundles available for purchase is unchanged. Economists confidently use that fact to argue that the chosen bundle is unchanged, so that consumer demand functions are homogenous of degree zero in prices and income. But the description of the budget set, in terms of prices and income, has altered” (Arrow 1982, p.6)

As mentioned, Arrow (1982) does not proceed to further critical axiomatic discussion of extensionality. Such discussion is provided by Arnis Vilks (1995). However, Vilks' discussion concerns the set-theoretical foundations of mathematical economics broadly speaking, and it is not focused on decision theory. Thus, despite quoting Arrow (1982) and the link made by the latter with framing effects, these are not at the center of Vilks'

discussion. Still, Vilks claims that extensionality – which he calls “the axiom of substitutivity” (pp.195-199) in “standard extensional mathematics” (p.200) – prevents correct formal treatments of “knowledge, beliefs and preferences” in economics. That knowledge, beliefs and preferences, or more generally ‘propositional attitude’, cannot be characterized extensionally is well known in, and even one could argue the starting point of, analytic philosophy – especially in the conjoint evolution of philosophy of language and mathematical logic. There, extensionality is a relation of equivalence, which states that two propositions are extensionally equivalent if and only if the truth of one entails the truth of the others, or that two sets are extensionally equivalent if they contain the same objects. It is more generally the case that propositional attitudes are only *intensionally* equivalent: they *refer* to the same object with nonetheless different *meanings* (whether the agent knows that the reference is the same or not), the paradigmatic example being ‘the morning star’ and ‘the evening’ star referring to Venus while ‘*seeing* the evening star’ and ‘*seeing* the morning star’ can mean two different things. Similarly, we could say that in the Asian Disease, ‘200 people will be saved out of 600’ and ‘400 people will die out of 600’ can easily be considered as referring to the same event in the world, but ‘*favoring that* 200 people will be saved out of 600’ and ‘*favoring that* 400 people will die out of 600’ can easily mean two different things.

As Vilks points out (fn48 p.196), this claim (*i.e.*, with respect to economics, though not with the Asian Disease) was already made by Kenneth Dennis (1982 pp.1054-1057) and Michael Bacharach (1986) – the latter author is discussed below. The rigorous axiomatic discussion provided by Vilks (1995) seems to have had little impact on its intended audience, decision theorists included – the fact that the paper is practically impossible to get otherwise than asking a copy to his author (who will very kindly send you a paper copy of it) could explain this lack of impact.

In the spirit of Vilks’s (1995) claims, Ivan Moscati (2012) provides a broad methodological discussion of the problem of extensionality for the state-space model in economics introduced by Robert Aumann (1976). He points out that its set-theoretic structure prevents the extension-intension distinction, a distinction that should be relevant for economics for at least two problems according to Moscati. On the one hand, it provides a correct account of framing effects, and especially to make a distinction between rational and irrational framing effects. On the other hand, it provides a correct account of interactive knowledge and beliefs in game theory (believing or knowing that somebody believes or

knows something is not the same as believing or knowing it oneself). However, with respect to the former problem (framing effects), Moscati focuses his discussion on the framing of contingencies (hence not on the type of framing of the Asian Disease) to illustrate that one lottery and an equivalent compounded one might be extensionally equivalent, but not intensionally so (it is however not difficult to extend its claim to Asian Disease-type of framing of outcomes, as argued above). He discusses three potential ways out of the problem, none of them being satisfactory according to him: 1) introducing a set-theoretic operator to block extensional equivalence of knowledge or belief would be inappropriate because this operator will be, by its set theoretic nature, extensional “and therefore cannot distinguish between equivalent sets” (p.18); 2) refining the set of the states of the world so that they contain the subjectively perceived states of the world by the decision makers (*contra* objectively defined states of the world by the decision modeler) is too demanding for the decision modeler, and also entails a loss of analytical tractability for economic analysis (pp.19-20); 3) turning to the resources of epistemic logic is not a straightforward solution because there is no well accepted system of intensional logic among philosophers and the “fixed cost associated with acquiring” familiarity with the formalism of epistemic logic might be too important for economists (pp.21-22).

In some lecture notes subsequently published and entitled “Framing and Cognition in Economics: The Bad News and the Good”, Michael Bacharach (2001/2003) addresses Asian Disease-type of framing of outcomes (like Arrow he takes McNeil *et. al.* 1982) and the isolation effects presented above. Both are, among others, violations of extensionality according to him. In a nutshell and roughly speaking, the bad news is for decision theory, while the good one is for game theory: while, from a decision theoretic point of view, violation of extensionality “appears to be irrational behavior” (Bacharach 2001, p.7), “Human Framing propensities stand behind the well-known ability of people to solve coordination problems by exploiting ‘focal points’” (*ibid*). This claim is not new within the work of Bacharach, who used formal resources from epistemic logic – in line with the recommendations of Vilks (1995) and Moscati (2012) – to avoid “the pitfall of extensionality” (Bacharach 1994, p.14) or “the extensionality trap” (*ibid*, fn17 p.45) in game theory. These contributions were well integrated within the developments of epistemic game theory, though not with respect to problems of framing (on which see Bacharach and Mongin 1994, or Bacharach *et. al.* 1997 for discussions of both epistemic logic and epistemic game theory). Note that Bacharach

(1990) made the same claim with respect to consumer choice theory and decision theory though, again, without discussing framing effects. However, this latter contribution did not trigger much attention from economists. There might be two non-mutually exclusive reasons for that. First, it was published in a philosophy journal, despite its target being economics. Second, the modifications to expected utility theory he proposed were made within Richard Jeffrey's (1965) version of it (who takes preferences as being defined on propositions rather than outcomes), not the most popular within decision theory in economics, in contrast with decision theory in philosophy.

In a serious discussion of the Asian Disease concerned with decision theory in both economics and philosophy, John Broome (1990a) discusses *invariance* as a pre-axiomatic principle, concerned with, in his terms, “substantial” as oppose to “formal” discussion of preferences. More precisely, the substantial issue for Broome is the *individuation* of outcomes, *i.e.*, invariance is a matter of criterion for a classification of outcomes: two outcomes belong to the same class if it is irrational to have different preferences for both. To determine such irrationality, Broome somewhat follows Kahneman and Tversky in appealing to the effects (*i.e.*, the experience) the outcomes have on the decision maker. In another (not incompatible) fashion, Nathalie Gold and Christian List (2004) discuss the rationality of Asian Disease-type of framing of outcomes in a logician framework (a simple one using only first order predicate logic). Although their axiomatization makes the conditions under which the underlying preferences reversals are rational on their accounts (implicit inconsistencies in the agent dispositions and the agent's reasons for choice more broadly speaking), they do not discuss anything related to the meaning of utility or to the localization of the axiom within the standard formalism in decision theory. With respect to the latter issue, it has to be noticed that Gold and List mainly use the term *invariance* (in reference to the dedicated term in behavioral economics “description invariance”), which they briefly equates with extensionality in logic.

This move (equating invariance with extensionality) is also made by Sacha Bourgeois-Gironde and Raphaël Giraud (2009) who take the reversals of preferences in Asian Disease-type of framing of outcomes as rational (they concentrate on the one by Quattrone and Tversky 1988). Their argument is that logically equivalent sentences can convey non equivalent information given a decision – an idea they borrow from a set of work in psychology around Craig McKenzie that will be discussed in the next section. They do provide a thorough investigation concerning the localization of the axiom of extensionality,

which they locate in the nature of the Boolean algebra used in the so-called Bolker-Jeffrey version of expected utility theory – after Ethan Bolker’s (1967) mathematical axiomatization of Jeffrey’s version mentioned above. Again, Bolker-Jeffrey version of expected utility theory is not the most popular within decision theory in economics (Broome 1990b; Harnay 2008 section 3.1). They nonetheless generalize their results within a more standard framework, the biseparable model of Paolo Ghirardato and Massimo Marinacci (2001), which is however concerned with decision under uncertainty and ambiguity. The authors themselves draw attention to this fact when they compare their contribution to another unpublished one from one of them (Giraud 2004b), which

“is very close in spirit to the one we have given here, but the formalization is different, as it is based on a classical set up of decision under risk where objects of choice are lotteries. One major conceptual difference is that in this article [Giraud 2004b] the nature of the missing information is left implicit, whereas here we flesh it out in a rather precise way.” (Bourgeois Gironde and Giraud 2009, p.395).

Giraud (2004b, which is part of his 2004a ph.D dissertation) does indeed provide an axiomatization that rationalizes Asian Disease-type of framing of outcomes within a standard decision theoretic framework (illustrating his results with the original Asian Disease). There, he makes three strong and interesting claims. First, he argues that every violations of independence that have triggered the theoretical developments in decision theory are due to framing effects (2004a, p.132); hence he proposes a weakened version of the independence axiom with respect to framing effects (*ibid*, p.146). Second, on his account, the same individual does not evaluate the outcome of different frames with the same utility functions (but provides arguments that prevent his account to fall into multiple selves) (2004b). Third, he sees the Asian Disease as a “paradox” because of the surprise (“*effet d’étonnement*”) experienced by the reader when he realizes that the two frames are equivalent (2004a, pp.126-127). The main results of his discussion of invariance are clarified in a published paper (Giraud 2005), which however connects invariance with the problems of extensionality (*ibid* p.837 following Vilks 1998, and p.842) and of consequentialism (*ibid* p.840, drawing on Machina 1989). On his account, invariance is a foundational hypothesis of the standard framework in decision theory, which concerns the conditions of possibility to acquire knowledge about reality through models of reality. He argues that invariance can nonetheless be seen as a behavioral principle, which states that:

“Objects of choice have certain *aspects* that are neutral from a decisional point of view. In decisional situation we can thus substitute certain objects to other objects

that only differ by these *aspects* without changing decisional behavior” (Giraud 2005, p.837; my translation and emphasizes)

This definition is close to Broome’s (1990a) discussion mentioned above. Giraud (2005, pp.842-850) goes one step further by formalizing this insight. In a nutshell, he defines two binary relations on the set of decisional alternatives, one called normative equivalence relation (“*relation d’équivalence normative*”) which represent the neutral aspects from the decision modeler’s point of view, the other one being the traditional decision maker’s preferences. Taken together this structure defines what he calls a decision problem with normative equivalence (“*problème de décision avec équivalence normative*”) which allows for clear axiomatic comparisons between the decision modeler’s point of view and the decision maker’s preferences. On his account, *saliency* (of certain aspects) is a key determinant of the discrepancy between the two binary relations.

There is an important paper in decision theory published by Mark Machina in 1987 that does seriously discuss Asian Disease-type of framing of outcomes; without however discussing any of the hidden axiom violated. A title of one of the subsections from the section in which Machina discusses framing effects is very evocative: “framing effects and economic analysis: have we already solved this problem?” (Machina 1987, p.145). Machina argues that no, not yet, but the economists’ “tool box” can certainly handle the problem especially within the economic analysis of “uninformative advertising” (for which he does not provide any references), which consists in “quantifying [a relevant] variable (e.g. air time) and treating it as an additional independent variable in the utility and/or demand function” (p.146). Thus:

“In the case when decision frames can be observed, framing effects can presumably be modeled in an analogous manner. To do so, we would begin by adopting a method of quantifying, or at least categorizing frames. The second step, some of which has of course already be done, is to study both the effect of this new independent variable holding the standard economic theories in conditions where we carefully held the same frame fixed. With any luck we would find that, holding the frame constant, the Slutsky equation still held.” (*ibid*).

Machina’s mention of the importance of ultimately preserving the Slutsky equation echoes Arrows’ discussion of consumer choice theory mentioned above. Both highlight the constraints or limitations that hinges on the conception of individual rationality within decision theory in economics from the microeconomic fields of consumer choice theory and demand theory. Machina (p.147) concludes his discussion on framing by stating that “when psychologists are able to hand us enough systematic evidence on how these effects operate, economists will be able to respond accordingly.” How are we to assess this claim more than

two decades later? It is interesting to notice that Machina seems to have changed his point of view on framing effects in 2011⁶, especially regarding the Asian Disease, as he claims that it is now, after Allais' challenge has been 'resolved', one of the most challenging issues facing decision theory in economics. To a certain extent, the same claim is made by Starmer (2000) and Bardsley *et. al.* (2010, p.129). However, these authors are much more radical than Machina in arguing that even violations of stochastic dominance have to be carefully investigated – a point that has always been explicitly avoided in every decision theory under risk and uncertainty in economics. It has to be noticed that they are also less inclined towards giving a dual status (positive and normative) to economic rationality, in line with the behavioral economics discussed in the previous section. In the same spirit, Yuval Salant and Ariel Rubinstein (2008) do not consider Asian Disease-type of framing of outcomes as underlying rational preferences, but nonetheless dedicate a serious formal axiomatization of the phenomenon (in line with other contributions of Rubinstein). Note that, compared to the literature discussed so far, they are taking a choice function as primitive, without a discussion of the specificity of the preference relation underlying it – which at any rate, on their account, does not *rationalize* it.

As far as I know, the contributions that have been discussed here are the only ones that are related to Asian Disease-type of framing of outcomes by economists in decision theory (*e.g.*, Arrow 1982; Vilks 1995; Moscati 2012; Machina 1987, 2011; Starmer 2000; Bardsley *et. al.* 2010, p.129; Bacharach 2001/2003; Gold and List 2004; Salant and Rubinstein 2008; Bourgeois-Gironde and Giraud 2009; Giraud 2004a, b, 2005). This is not a lot compared to the literature discussing Allais' paradox. Beside this quantitative difference, one can also notice the following qualitative one: the existing axiomatic discussions, mainly of *extensionality*, sometimes of *invariance*, and hardly ever of *consequentialism*, hinge on the appropriateness of the standard formalism, not on the introduction of new mathematical tools within the standard formalism. This is part of what makes Asian Disease-type of framing of outcomes an historical curiosity (along with the diversity of non-standard framework in which it has been discussed). Another part is the explicit resurgence of consumer choice theory and

⁶ I draw this argument from the conclusion of a recent presentation given by Machina, available at: <http://colloque-31mai2011.mines-paristech.fr/#41> ; see the section “The challenge from psychology : framing effects”

demand theory as constraining decision theory. Overall, there is no general consensus over the implications of Asian Disease-type of framing of outcomes for economic rationality. However, there are systematic (theoretical and empirical) investigations of the phenomenon by some psychologists that have remained undiscussed by both decision theorists and behavioral economists (including Kahneman and Tversky). The next section explores the potential implications of these researches for economic rationality.

3. Asian Disease-type of framing of outcomes in (economically undiscussed) psychology

This section discusses a set of contributions within decision theory in psychology that took Asian Disease-type of framing of outcomes seriously. These contributions can be seen as revolving around basically two types of decision theory in psychology that are distinct from the behavioral decision theory of Kahneman and Tversky. This distinctiveness is due to the borrowing of insights from two strands of social psychology: the *social cognition* approach, and the *conversational* approach. For the purpose of this section, it is sufficient to roughly present these two approaches as follows. Social cognition is in some sense the ‘mainstream’ of social psychology, and takes insights from cognitive psychology, including the work of Kahneman and Tversky, to theorize about socially contextualized problems. This theorizing being then refined from applied researches. The conversational approach to psychology emerged within a group of social psychologists (see Schwarz 1994 and Hilton 1995) dissatisfied with the asocial nature of social cognition. It draws on the study of pragmatics in the philosophy of language, especially from the work of Paul Grice (*e.g.*, 1978), and takes his conversational maxims – a set of general principles constitutive of the rationality of daily conversations – as (partly) constitutive of individual rationality. The contributions to be discussed here are neither strictly speaking contributions to social cognition nor to the conversational approach to social psychology. They are inspired by these approaches in doing decision theory. Nevertheless, for chronological reasons, the decision theoretic contributions discussed in this section happen to be organized from the ones that are inspired by social cognition (section 3.1), to the ones that are mildly, and then strongly, inspired by the conversational approach (section 3.2). The purpose of the first subsection is to show that the reversal of preferences underlying Asian Disease-type of framing of outcomes can be

considered as rational on from the scientific criteria of experimental normative assessment discussed in the introduction, and is furthermore a stable empirical phenomenon, the characteristics of which are relevant for economics. The purpose of the second subsection is to discuss further arguments for the rationality of such preference reversals, and further experimental methodology to assess normative claims on individual rationality.

3.1 Asian Disease-type of framing of outcomes in social cognition-inspired approach to decision theory

One of the first important steps within the community of psychologists that took framing effects seriously consisted in clarifying what this effect was really about. An important and often quoted contribution in this respect is Nancy Fagley (1993)'s clarification note about the distinction between reflection effects and framing effects:

“Reflection and framing effects are both predicted in prospect theory by the S shape of the value function: concave for gains indicating risk aversion and convex for losses indicating risk seeking. But framing is a perceptual phenomenon similar to optical illusions, whereas reflection is not. [...] With framing, the outcomes can be viewed from two (or more) perspectives, but the objective outcomes remain unchanged.” (*ibid*, p. 451)

It is important to notice that Fagley's note was referring to a paper (Arkes 1991) who confounded reflection and framing effects, arguing that both were perceptual phenomena, and as such, no possible “debiasing strategies” based on education could prevent them. This is in line with the idea that framing effects exhibit irrational choice behaviors that have to be corrected if possible. A second clarification step was taken by Deborah Frisch (1993) who remarked that:

“The term framing effect has been used in a “strict” and a “loose” sense. The strict definition refers to pairs of problems that involve a redescription of the exact same situation. The loose definition refers to pairs of problems that aren't exactly the same, but which are equivalent from the perspective of economic theory.” (*ibid*, p.399)

By “equivalent from the perspective of economic theory”, Frisch simply means equivalent in terms of final (monetary or other) outcomes. Frisch's distinction hinges on the distinction between the (‘loose’) isolation effect and the (‘strict’) Asian Disease-type of framing of outcomes discussed in the previous section.

Even though the distinction between reflection effect and framing effect eventually became clear and established in the community of psychologists studying framing effects, the same cannot be said for the distinction between “strict” and “loose” framing effect. Despite

attempts to conceptually ground this latter distinction in the 1990s (*e.g.*, Khüberger 1995), confusion remains even up to this date.

Nevertheless, an important second step was taken by Frisch through the normative turn she gave to her paper. Explicitly inspired by the work of MacCrimmon, she subjected individuals to framing effects choice problems and subsequently asked them if they would agree with the theory (*i.e.*, with the principle of invariance). To my knowledge, this is the first study which experimentally tested (*i.e.* not only by thought experiments) framing effects in this way. Depending on the type of framing effect (all reproduced in her appendices pp. 423-428), people actually often disagreed with the principle of invariance and maintained their preferences when the equivalence between the two versions was shown to them.

Frisch then proposed a classification of the reasons given by individuals into four groups: (i) individuals agreeing that the two versions are the same and therefore would change their preferences; (ii) individuals describing an objective difference between the two versions by inferring information that were not present in the problem; (iii) individuals describing subjective differences between the two versions by reference to, for example, “regret, fairness, wastefulness” (*ibid*, p.405) or emotional states; and (iv) individuals not giving any justifications or unclear justifications. Frisch took the existence of (ii) and (iii) to raise serious doubts about the normative meaning of the principle of invariance. Concerning specifically the Asian Disease, she noted that:

“Across all of the problems, the rate of answering [(i)] was surprisingly low. One might have expected that for the strict framing effects, such as [the Asian Disease], there would be a very high rate of agreement that the situations were the same. However, even for that problem, *only* 69% of the subjects who [violated description invariance] stated [(i)].” (Frisch 1993, p.409, my emphasis)

Still for the Asian Disease 10% stated (iii) and 21% stated (iv) (0% stated (ii)). Granted, this rate of rational preference reversals for the Asian Disease is fairly low. Nevertheless, from the perspective of a theory of *rational* decision making with ambitions of generality of the sort of which are exhibited in economics, it could be argued that such results, independently of their interpretations, ought to arise theoretical interest. The solutions proposed by Frisch to weaken or drop the principle of invariance for normative theories of choice stayed within Kahneman’s (1994) perspective of distinguishing between experienced utility and decision utility and used the former as a normative criterion for the latter.

Another set of contribution also seems to be (more empirically) relevant from the vantage point of decision theory in economics. For instance, Nancy Fagley and Paul Miller

(1997) conducted experiments that made it clear that whether the “arenas of choice” were human life or money⁷, framing effects in the strict sense (*i.e.*, Asian Disease-type) still hold – even though it is slightly stronger for human lives than for money. However, they also made it clear that prospect theory was not the perfect theoretical framework to explain and predict the variations in patterns of choices induced by variations within strict framing effects designs. These conclusions were later supported by Anton Khüberger (1998, and Khüberger, Schlute-Mecklenbeck and Perner 1999), and Irwin Levin, Sandra Schneider, and Gary Gaeth (1998), who offered detailed meta-analyses of around 150 referred papers (between 1981 to 1998) each containing several experiments on framing effects. Besides offering refined typologies of framing effects and discarding experimental designs that were not effective, they insisted that prospect theory could not adequately deal with the essence of the framing phenomena. Recall that prospect theory takes into account the subjective distortions of objective probability, and the subjective distortions of objective outcomes relative to a reference point. The distortions are predicted to be in a specific direction, as explained in the previous section. Now, it happens that preference reversals in some Asian Disease-type of framing of outcomes occur in the opposite directions from those predicted by prospect theory. Khüberger (1997) offers a large review of several psychological theories of choice that were susceptible to account for the complex essence of the framing effect, and conclude that none of them can completely account for the framing phenomena, though all of them could account for a specific dimension of it⁸. Khüberger, Michael Schulte-Mecklenbeck and Josef Perner (2002) conducted a series of experiments that are worth mentioning relatively to their implications for economic theory – despite the lack of interest within the economic decision theoretic community for them. Their experiments tested for – among others – the impact of *real*

⁷ They designed an equivalent of the Asian Disease for an economic problem involving the selling of a house, the value of which has gained \$36 000 six month before the selling decision, by the date of the selling decision the market had decline, making the gain being only up to \$12 000. Then they asked in the positive frame whether individuals preferred to sell their house for this \$12 000 gain, or selling the house at an auction with a 33% chance of getting back the \$36 000 previous gain, and a 67% chance of making no gain (*i.e.*, breaking even with the original value); in the negative frame, they asked if they preferred to sell their houses and loosing the \$24 000 gain made between the last six months for sure, or selling the house at an auction with a 33% chance of losing none of the last six months \$36 000 gain and a 67% chance of losing all of the last six months \$36 000. (see Fagley and Miller 1997, p.364)

⁸ Thus his conclusion was to stress the need to mix formal, cognitive and motivational factors into theories of choice.

monetary incentives⁹ on strict framing effects. The results were that real monetary incentives *increased* the magnitude of the framing effects (*i.e.*, more people reversed their preferences when real monetary incentives were at stakes than when they were playing for free). This is one of the rare experimental studies where the presence of real monetary incentives is negatively correlated with the conformity of individuals with the (standard) axiomatic norms of rationality – contrary to the well known battles between economists and psychologists around Slovic and Lichtenstein’s preference reversals (a point to be discussed in the conclusion of the paper).

3.2 Asian Disease-type of framing of outcomes from conversational-inspired approach to decision theory

A further set of contributions around the work of Craig McKenzie (see esp. McKenzie and Nelson 2003, Sher and McKenzie 2006, 2008, 2011) can be seen as relevant for decision theory in economics. To a certain extent, it has already been considered as such by Bourgeois-Gironde and Giraud (2009) although with respect to the Bolker-Jeffrey version of expected utility theory which is not the most commonly used in economics, as already argued above. Moreover, they have not integrated all aspects of the work of McKenzie and colleagues that will be discussed below. McKenzie’s (and his colleagues) work is mildly inspired by the conversational approach in that it conceptualizes choice problems as taking place between a listener (*i.e.*, the traditional decision maker in decision theory) and a speaker (the entity that formulated the decision problem, *i.e.*, the decision modeler or decision theorist). Nevertheless, it explicitly does not propose explanation or rationalization through the Gricean maxims. The research questions tackled by McKenzie and his colleagues concern the determinants of reference points from where outcomes are represented as gains or represented as losses (recall that it is not necessarily zero in prospect theory, *c.f.*, the isolation effect). From a listener-

⁹ It is well known that the two biggest differences between experiments in economics and experiments in psychology revolve around two dimensions of experimental designs. Firstly, nobody in economics would ever deceive their subjects (*i.e.*, trying to make them believe that they are playing for a purpose, which is not, in fact, what the experimenter is trying to test), whereas it is the contrary in psychology. Secondly, it is the norm in economics that subjects get paid according to their performance (to say it roughly, the more rational they are relatively to the standard axiomatic definition of rationality, the more money they get), whereas it is very rare that real monetary outcomes are at stake in psychologists experiments. Thus Khüberger *et. al.* (2002)’s study is an exception within the experimental community in psychology, especially with respect to framing effects.

speaker perspective, they hypothesized that the reference point is usually determined by the three following dimension of a decision problem:

“(1) Speakers’ frame selection is reliably influenced by reference points, (2) listeners make inferences about speakers’ reference points on the basis of presented frames, and (3) the reference points in (1) and (2) – actual and inferred, respectively – match. (McKenzie and Nelson 2003, p.597)

McKenzie and Nelson conjectured that

“the frame [...] chosen by speakers to describe a current situation tends to be *the one that has increased* relative to their reference point. For example, the programs to combat the Asian disease might be more likely to be framed in terms of lives lost if no one had ever died from the Asian disease before (and hence, zero deaths was the reference point) than if the disease had routinely killed 600 people each year” (*ibid*, my emphasis).

The important point they insisted on was that “if reference points reliably influence speakers’ frame selection, then *frames carry information beyond their literal content*” (*ibid*). To test this conjecture McKenzie and his colleagues designed several experiments in order to “provide insight into why framing effects are so robust” (*ibid*, p.600). Their main conclusion is that:

“Frames that are logically equivalent nonetheless convey different information regarding a speaker’s reference point, and listeners are sensitive to this. The obvious benefit of this is that people can communicate efficiently. Describing a glass in terms of how empty (rather than how full) it is [...] conveys information not just about its absolute status, but also about its relative status (*ibid*, p. 600).

They later developed an experimental methodology labeled “embedded creativity” (Sher and McKenzie 2006, p.479) where “subjects have to construct an utterance, rather than merely choose from a set of prefabricated utterances” (*ibid*). For instance, in the case of the Asian Disease:

“[subjects] read the fully described options (i.e., not framed) of the Asian Disease Problem, and then indicated which program they preferred and rated their strength of preference. In this way, we were able to determine participants’ personal preferences independent of framing. The participants were then presented with the following task:

Imagine that your job is to describe the situation, and the programs which have been proposed, to a committee who will then decide which program, A or B, to use. Please complete the sentences below as if you were describing the programs to the committee.

If Program A is adopted, _____ people will	be saved
(write #)	die
	(circle one)
If Program B is adopted,	
there is _____ probability that _____ people will	be saved
(write #)	die
(write #)	(circle one)
and _____ probability that _____ people will	be saved
(write #)	die
(write #)	(circle one)

(Sher and McKenzie 2008, p.90)¹⁰

Basically, their results show that prior preferences and their strengths do not matter for the way subjects frame the gamble (most framed it as 1/3 probability that 600 people will be saved and 2/3 that 600 will die), though it matters for the way they frame the sure-thing:

“Among those who preferred the sure thing, 81% framed the sure thing in terms of lives 'saved', whereas, among those who preferred the gamble, only 48% did so. Furthermore, participants preferring the sure thing were more likely to select the 'saved' label when they rated their preference as stronger. (Those preferring the gamble were equally likely to choose the 'die' label regardless of strength of preference, indicating a possible ceiling effect for 'die' descriptions.)” (*ibid*)

Their interpretation was that:

“when given full flexibility in framing the two options, the attribute framing of the sure thing leaks choice-relevant information about the speaker's preferences.” (*ibid*, pp.89-90)

Broadly speaking, McKenzie's (and his colleagues) framework provide interpretations of framing effects as not necessarily being the consequence of irrationality, and for reasons that are not primarily related to the notion of experienced utility, as it was the case in the few contributions suggesting the same interpretation discussed above. On their account the apparent irrationality rather stems from, one could say, the conception of decision makers as

¹⁰ Embedded creativity is not restricted to the example discussed here. Another one (more restrictive) also on the Asian Disease consists in assigning a goal to subjects: for instance, that the sure option had to be chosen by most people, in which case most speaker chose the positive frame thus corroborating the hypothesis that listener-speaker communication is effective in the Asian Disease problem. The results are in line with the example discussed here.

lonely individuals making decisions against *nature* on the basis of their own, internal or even solipsistic, subjective representations. However, it does not seem irrational anymore when *a part of* the external influences constitutive of these representations are taken into account. In this case, such external influences come from the decision modeler and his choice of frame, *i.e.*, from the *presentation* of the decision problem *chosen by* the decision modeler (or decision theorist). Hence, the decision maker is not only responding to the frame but also to the decision modeler. This amounts, one could argue, to conceive decision makers as a listener whose alternatives among which he has to choose are proposed by a speaker, who, like him (the listener) has human intentionality. An obvious and immediate point raised by these contributions is whether they would not be more relevant for (cooperative) game theory rather than individual decision theory. While this remains an open question, I will try to argue below that it ought to be considered as relevant for the latter.

From these and others experimental results, McKenzie and his colleagues are explicitly questioning the normative status of the principle of invariance, which suppose that logically equivalent frames should entail the same responses. They proposed to weaken it for what they called the principle of *informational invariance*: informationally equivalent frames, in terms of explicit and implicit information, should entail same responses (see Sher and McKenzie 2006, 2008, and especially 2011). By contrast, Kahneman and Tversky (together with behavioral economists) considered decision problems in terms of objective *information* presented and subjective *representations* of those information; the non-matching of the latter with the former being considered as irrational. The conversational-(mildly)-inspired approach discussed here considers decision problems in terms of explicit and implicit information, where the non-recognition of the latter would be irrational¹¹, and rationality as being determined by the interplay between cognition and language.

In more self-identified conversational approach to decision theory (*i.e.*, interpreting results through the Gricean maxims) this means that (i) language is a reflection of the internal representation of our cognitive system, while at the same time, (ii) language actively affects the internal representation of our cognitive system (Keren 2011a p.3). In other words, when we speak, we express what we have in mind, but we also change what we have in mind at the

¹¹In parenthesis, this might be a fruitful (experimental) research path to address Mirowski (2002)'s criticism about economists' fuzzy definition of 'information'.

same time¹². This framework is explicitly inspired from the conception of language developed by so-called Ordinary Language philosophers¹³ – a philosophical tradition that opposed the logical empiricist conception of language in the 1950s, by conceptualizing language as being primarily about *pragmatics*, i.e., the rules enabling communication between a speaker and a listener. Hence, the conversational-(strongly)-inspired approach to decision theory claims that:

“The point to be made in connection with these and other examples [e.g., Frische, McKenzie etc.] is that, regardless of what is framed [...], researchers claim the equivalence of frames based on logical considerations. Perhaps because the scientific endeavor is inherently based on logical considerations, it is often overlooked (i) that the equivalency relation can be defined in more than one way, even under the formal constraints of logic, and (ii) that logical constraints do not necessarily apply (or apply in different ways) to the daily conversation. The study of framing effects may be defined or described as the study of what equivalence means under different conditions.” (Keren 2011a, p.13).

In other words, it is argued that the principle of (description) invariance is not a normatively compelling criterion for rationality since it entails flaws in human communication when it is respected. The nature of the argument can be seen as *primarily social*, in the sense that it derives normative criteria from pragmatic implications in everyday life. An important corollary from such view, if taken seriously, would be that there is no such thing as decision against *nature*, especially when money or lives are involved in the decision problems. Thus it is the very object of study that would be under attack, again, if granted that decision theory under risk can be seen as an independent research program from game theory.

This section has shown that Asian Disease-type of framing of outcomes shared several empirical features that are obviously interesting for economics, and that cannot be accounted for by prospect theory; thus theoretical attention is needed even from behavioral economists. Frisch’s (1993) normative arguments against the irrationality of some preference reversals underlying strict framing effects, seem to be receivable to economists since it was conducted

¹² Here is a very simple example to illustrate this idea that might seem fuzzy at first sight (though not for the reader familiar with theories of speech acts in the philosophy of language). When I say “I want this sombrero”, I have expressed a desire that I had in mind (the desire that I want this sombrero), while at the same time, I have changed what was in my mind, namely I don’t want to express this desire anymore. Usually, this goes further: I have changed what was in my mind in the sense that I wanted to communicate to someone else my desire, and when this is done, the content of what is in my mind has changed: I don’t need to express my desire to this “someone else” anymore, since I just did; and by the same token, I also changed the content of the other’s mind.

¹³ Especially Paul Grice (1978) and John Austin (1962)

within MacCrimmon's (and his followers) normative experimental design. McKenzie's (and his colleagues) experimental methodology of "embedded creativity" has corroborated Frisch's claims by providing further explanatory elements related to the (psycholinguistic) pragmatics of individual rationality – thus going beyond the explanations in terms of experienced utility, though in a non-mutually exclusive way. In that sense, one might suggest that McKenzie's experimental methodology would be an interesting complement to the one inspired by MacCrimmon, in the perspective of reviving the latter's within decision theory, as Mongin (2013) calls for. It is, at the very least, difficult to ignore the former in such perspective.

Conclusion

Asian Disease-type of framing of outcomes can be seen as an interesting and important historical curiosity for the following reasons. On the one hand, it has triggered some reflections by economists around the three categories of issues and debates that shaped the history of decision theory in economics discussed in the introduction (economic meaning of utility, hidden axioms of preferences, duality of economic rationality). On the other hand, it respects the two scientific criteria that have historically warranted theoretical developments within decision theory in economics (non violation of stochastic dominance and normative experimental assessment). Yet, it has triggered no theoretical developments comparable to the rank-dependent expected utility with respect to the Allais' paradox. This is why Asian Disease-type of framing of outcomes can be seen as an historical curiosity.

Now, why is this curiosity interesting? Firstly, some of the few discussion that have been conducted in economics on the topic have made explicit the constraints put on decision theory by consumer choice theory, which are rarely explicitly discussed. Secondly, the discussions of the psychologists in section 3 seem, on the one hand, not to be too much at odds with the ones conducted in sections 1 and 2 in terms of the discrepancy between decision modeler and decision maker, yet, on the other hand, they imply a radical departures in terms of the conception of *nature* against which individuals' choices are undertaken in decision theory – thus the considerations on intentionality and language do seem at odds with the discussions of sections 1 and 2 (Rubinstein 2000 deplores the lack of discussion of language in economics). Thirdly and most importantly, the discussions in section 2 have not focused on the same kind of considerations than what happen around the Allais' paradox: discussions have focused on changing the formalism, or on non-standard theory of decision in economics, rather than introducing new mathematical tools within the standard formalism. Although these

discussions were sporadic and often equated extensionality, invariance, and consequentialism altogether, a little investigation in some other reflexive literature can clarify that: (1) invariance is a methodological and mathematical requirement within the use of axiomatization to *measure* utility – ordinally or cardinally – (see esp. Chaos 2007 and the references therein), (2) extensionality is an epistemological and logical requirement within the adoption of a *set-theoretic* foundation of axiomatization (see esp. Moscati 2012 and the references therein), and (3) consequentialism is a philosophical requirement within the definition of decision and choice theories as being concerned with decisions and choices against *nature* (see esp. Hammond 1988, Anand 2012, and the references therein). All in all, this underlies rather distinct yet foundational aspects of economic rationality the interrelationships of which are an interesting topic of inquiry – this is what makes Asian Disease-type of framing of outcomes an interesting historical curiosity.

Now, to conclude, why is this interesting historical curiosity important? Firstly, it points toward requirements of carefulness in experimental design, by not only controlling that the subjects do understand the task well, but by controlling for the social relationship between subjects and experimenters. Even though such recommendations are not new, even in economics (see Levitt and List 2007, Smith 2008), the results from the conversational approach could be taken as tools to intentionally “frame” or being conscious of the “frame” one is non-intentionally imposing in a social setting – be it the laboratory or more real world settings. Secondly, it is not only concerned with laboratory experiments but underlies real-world phenomena as well (*e.g.*, Samuelson and Zeckhauser 1988 and Johnson *et. al.* 1993). Thirdly and more generally, given the recent rise of behavioral economics in the mainstream of economics along with its interdisciplinary claims, it raises interesting questions as to the type of psychology that is selected by behavioral economists. This is especially important with respect to policy implications. Indeed, framing effects have a very specific role in behavioral economics as central in its emergence (Thaler 1980, 1985/2008) and important in its later normative dimension (*e.g.*, Thaler and Sunstein 2008). However, the rationality or irrationality of framing effects, and their related potential departures from mainstream economics remains a very ambiguous topic in the ‘manifestos’ of behavioral economists, as mentioned in the first section. Nevertheless, the general trend seems to follow Kahneman’s (2000) position that the underlying reversals of preference in strict (*i.e.*, Asian Disease-type) framing effects are most of the time irrational; thus providing a rationale to ‘nudge’ decision

makers. The extent to which such a rationale is weakened by the work of McKenzie and his colleagues remains an open question. Although it has already been addressed by the latter themselves with respect to default options (McKenzie *et. al.* 2006), an alternative rationale for alternative policies remains unclear.

Bibliography

- Allais, M. (1953). Le comportement de l'homme rationnel devant le risque, critique des postulats et axiomes de l'école américaine. *Econometrica*, 21, 503–546.
- Allais, M. (1979a). The foundations of a positive theory of choice involving risk and a criticism of the postulates and axioms of the American school. In M. Allais & O. Hagen (Eds.), *Expected Utility Hypothesis and the Allais Paradox* (pp. 27–145). Dordrecht: Reidel.
- Allais, M. (1979b). The So-Called Allais Paradox and Rational Decisions Under Uncertainty. In M. Allais & O. Hagen (Eds.), *Expected Utility Hypothesis and the Allais Paradox*. Dordrecht: Reidel.
- Amadae, S. M. (2003). *Rationalizing capitalist democracy: the cold war origin of rational choice liberalism*. The University of Chicago Press.
- Anand, P. (1990). Interpreting axiomatic (decision) theory. *Annals of Operation Research*, 23, 91–101.
- Anand, P. (2012). Rational choice and some difficulties for consequentialism. In U. Maki, D. M. Gabbay, P. Thagard, & J. Woods (Eds.), *Philosophy of Economics* (pp. 483–503). Elsevier.
- Anand, P., Pattanaik, P. K., & Puppe, C. (2009). Introduction. In P. Anand, P. K. Pattanaik, & C. Puppe (Eds.), *The Handbook of Rational and Social Choice. An overview of new foundations and applications* (pp. 1–19). Oxford University Press.
- Arkes, H. R. (1991). Costs and benefits of judgment errors. *Psychological Bulletin*, 110, 486–498.
- Arrow, K. J. (1951). Alternative Approaches to the Theory of Choice in Risk-Taking Situations. *Econometrica*, 19(4), 404–437.
- Arrow, K. J. (1965). The theory of risk aversion. In Y. J. Saatio (Ed.), *Aspects of the Theory of Risk Bearing* (pp. 90–109). Reprinted in: *Essays in the Theory of Risk Bearing*, Markham Publ. Co., Chicago, 1971.
- Arrow, K. J. (1982). Risk Perception in Psychology and Economics. *Economic Inquiry*, XX, 1–9.
- Aumann, R. J. (1976). Agreeing to disagree. *Annals of Statistics*, 4(6), 1236–1239.
- Austin, J. L. (1962). *How to Do Things with Words*. Cambridge, MA: Harvard University Press.
- Bacharach, M. O. (1986). The problem of agent's beliefs in economic theory. In M. Baranzini & R. Scazzieri (Eds.), *Foundations of economics: structures of inquiry and economic theory* (pp. 175–203). Blackwell.
- Bacharach, M. O. (1990). Commodities, Language, and Desire. *The Journal of Philosophy*, 87(7), 346–368.
- Bacharach, M. O. (1994). The epistemic structure of a theory of a game. *Theory and Decision*, 37(1), 7–48.

- Bacharach, M. O. (2001). Framing and Cognition in Economics: The Bad News and the Good.
- Bacharach, M. O., Gérard-Varet, L. A., Mongin, P., & Shin, H. S. (1997). Introduction. In M. O. Bacharach, L. A. Gérard-Varet, P. Mongin, & H. S. Shin (Eds.), *Epistemic Logic and the Theory of Games and Decisions* (pp. xiii–xxxiii). , Theory and Decision Library, Series C: Game Theory, Mathematical Programming and Mathematical Economics Volume 20 (Boston, MA: Kluwer Academic).
- Bacharach, M. O., & Mongin, P. (1994). Epistemic logic and the foundations of game theory. *Theory and Decision*, 37(1), 1–6.
- Barberis, N. C. (2013). Thirty Years of Prospect Theory in Economics: A Review and Assessment. *Journal of Economic Perspectives*, 27(1), 173–196.
- Bardsley, N., Cubitt, R. P., Loomes, G., Moffatt, P., Starmer, C., & Sugden, R. (2010). *Experimental Economics: Rethinking the Rules*. Princeton University Press.
- Baumol, W. J. (1951). The Neumann-Morgenstern Utility Index: An Ordinalist View. *Journal of Political Economy*, 59, 61–6.
- Baumol, W. J. (1958). The Cardinal Utility Which is Ordinal. *Economic Journal*, 68, 665–72.
- Behavior, O., & Processes, H. D. (1998). The Influence of Framing on Risky Decisions :, 75(1), 23–55.
- Bolker, E. (1967). A simultaneous Axiomatization of Utility and Subjective Probability. *Philosophy of Science*, 34(4), 333–340.
- Borch, K. (1979). Utility and stochastic dominance. In M. Allais & O. Hagen (Eds.), *Expected Utility Hypothesis and the Allais Paradox* (pp. 193–201). Dordrecht: Reidel.
- Bourgeois-Gironde, S., & Giraud, R. (2009). Framing effects as violations of extensionality. *Theory and Decision*, 67(4), 385–404.
- Bouyssou, D., & Vansnick, J.-C. (1990). “Utilité cardinale ” dans le certain et choix dans le risque. *Revue économique*, 41(6), 979–1000.
- Bréban, L., & Lapidus, A. (2012). Smith on lotteries, *working paper*.
- Broome, J. (1990a). Comment: Should a rational agent maximize utility? In K. S. Cook & M. Levi (Eds.), *The Limits of Rationality* (pp. 132–145). University of Chicago Press.
- Broome, J. (1990b). Bolker-Jeffrey expected utility theory and axiomatic utilitarianism. *Review of Economic Studies*, 57, 477–502.
- Camerer, C. F. (2006). Behavioral Economics. In R. Blundell, W. Newey, & T. Persson (Eds.), *Advances in Economics and Econometrics* (pp. 181–214). Cambridge University Press.
- Camerer, C. F. (2008). The case for mindful economics. In A. Caplin & A. Schotter (Eds.), *The Foundations of Positive and Normative Economics* (pp. 43–69). Oxford University Press.
- Camerer, C. F., & Loewenstein, G. (2004). Behavioral economics: Past, present, future. In *Advances in Behavioral Economics* (Princeton., pp. 3–51). Princeton: Colin F. Camerer, George Loewenstein et Matthew Rabin.

- Caplin, A., & Schotter, A. (2008). *The Foundations of Positive and Normative Economics : A Handbook: A Handbook* (p. 416). Oxford University Press.
- Davis, J. B. (2003). *The theory of the individual in economics: identity and value*. (Routledge, Ed.). New York: Routledge.
- Davis, J. B. (2011). *Individuals and identity in economics*. New York: Cambridge University Press.
- Dennis, K. (1982). Economic Theory and the problem of translation. Part two. *Journal of Economic Issues*, XVI(4), 1039–1062.
- Diecidue, E., Schmidt, U., & Wakker, P. P. (2004). The Utility of Gambling Reconsidered. *The Journal of Risk and Uncertainty*, 29(3), 241–259.
- Edwards, W., Miles, Ralph, F. J., & Winterfeld, V. D. (2007a). *Advances in decision analysis. From foundations to applications*. (W. Edwards, F. J. Miles, Ralph, & V. D. Winterfeld, Eds.). Cambridge University Press.
- Edwards, W., Miles, Ralph, F. J., & Winterfeld, V. D. (2007b). Introduction. In W. Edwards, F. J. Miles, Ralph, & V. D. Winterfeld (Eds.), *Advances in decision analysis. From foundations to applications* (pp. 1–10). Cambridge University Press.
- Ellsberg, D. (1954). Classic and Current Notions of “Measurable Utility.” *Economic Journal*, 64, 528–556.
- Fagley, N.S, & Miller, P. M. (1997). Framing Effects and Arenas of Choice: Your Money or Your Life? *Organizational Behavior and Human Decision Processes*, 71(3), 355–373.
- Fagley, Nancy S. (1993). A Note Concerning Reflection Effects Versus Framing Effects. *Psychological Bulletin*, 113(3), 451–452.
- Fishburn, P. C. (1989). Foundations of Decision Analysis: Along the Way. *Management Science*, 35(4), 387–406.
- Fishburn, P. C., & Wakker, P. (1995). The Invention of the Independence Condition for Preferences. *Management Science*, 41(7), 1130–1144.
- Friedman, M., & Savage, L. J. (1948). The Utility Analysis of Choices Involving Risk. *The Journal of Political Economy*, 56(4), 279–304.
- Friedman, M., & Savage, L. J. (1952). The Expected-Utility Hypothesis and the Measurability of Utility. *The Journal of Political Economy*, 60(6), 463–474.
- Frisch, D. (1993). Reasons for Framing Effects. *Organizational Behavior and Human Decision Processes*, 54, 399–429.
- Gigerenzer, G. (1996). On narrow norms and vague heuristics: A reply to Kahneman and Tversky. *Psychological Review*, 103(3), 592–596.
- Gilovich, T., Griffin, D., & Kahneman, D. (2002). *Heuristics and Biases: The psychology of intuitive judgment*. (T. Gilovich, D. Griffin, & D. Kahneman, Eds.). Cambridge University Press.
- Giraud, R. (2004). Framing under risk: Endogenizing the Reference Point and Separating Cognition and Decision. *working paper*

- Gold, N., & List, C. (2004). Framing as Path Dependence. *Economics and Philosophy*, 20(2), 253–277. doi:10.1017/S0266267104000203
- Grice, P. (1978). No Title. In P. Cole (Ed.), *Syntax and Semantics*, vol.9 (pp. 113–128). New York: Academic Press.
- Guala, F. (2000). The logic of normative falsification: rationality and experiments in decision theory. *Journal of Economic Methodology*, 7(1), 59–93.
- Gul, F., & Pesendorfer, W. (2008). The case for mindless economics. In A. Caplin & A. Schotter (Eds.), *The Foundations of Positive and Normative Economics*. Oxford University Press. pp. 3–40.
- Hacking, I. (1975). *The emergence of probability*. Cambridge: Cambridge University Press.
- Hammond, P. J. (1988). Consequentialist foundations for expected utility theory. *Theory and Decision*, 25, 25–78.
- Hands, D. W. (2011). Back To the Ordinalist Revolution: Behavioral Economic Concerns in Early Modern Consumer Choice Theory. *Metroeconomica*, 62(2), 386–410. doi:10.1111/j.1467-999X.2010.04115.x
- Hands, W. D. (2001). *Reflections Without Rules*. Cambridge: Cambridge University Press.
- Hands, W. D. (2010). Economics, psychology and the history of consumer choice theory. *Cambridge Journal of Economics*, 34(4), 633–648.
- Hands, W. D., & Mirowski, P. E. (1998). Harold Hotelling and the neoclassical dream. In R. E. Backhouse, D. M. Hausman, U. Maki, & A. Salanti (Eds.), *Economic Methodology: Crossing Boundaries* (pp. 322–397). St. Martin's Press.
- Hausman, D. M. (2012). *Preference, Value, Choice, and Welfare*. Cambridge Books. Cambridge University Press.
- Herfeld, C. S. (2013). Axiomatic Choice Theory Traveling between Mathematical Formalism, Normative Choice Rules and Psychological Measurement, 1944-1956. *working paper*
- Heukelom, F. (2009). *Kahneman and Tversky and the Making of Behavioral Economics (phD thesis)*. Amsterdam.
- Heukelom, F. (2011). What to Conclude from Psychological Experiments: The Contrasting Cases of Experimental and Behavioral Economics. *History of Political Economy*, 43(4), 649-681.
- Heukelom, F. (2012a). Three explanantions for the Kahneman-Tversky Programme of the 1970s. *The European Journal of the History of Economic Thought*, 19(5), 797–828.
- Heukelom, F. (2012b). Behavioral economics. In John B. Davis & W. D. Hands (Eds.), *The Elgar Companion to Recent Economic Methodology* (pp. 19–38). Edward Elgar Publishing.
- Hilton 1995 The social context of reasoning (conversational inference and rational judgment).pdf. (n.d.).
- Jeffrey, R. (1965). *The logic of decision*. University of Chicago Press.
- Johnson, E. J., Hershey, J., Mezaros, J., & Kunreuther, H. (1993). Framing, Probability Distortions, and Insurance Decisions. *Journal of Risk and Uncertainty*, 7(1), 35–51.

- Jallais, S., & Pradier, P.-C. (2005). The Experiment in the History of Economics. In P. Fontaine & R. J. Leonard (Eds.), *The Experiment in the History of Economics*. New York: Routledge.
- Jullien, D., & Vallois, N. (2013). A probabilistic ghost in the experimental machine.
- Kahneman, D., & Tversky, A. (1996). On the reality of cognitive illusions. *Psychological review*, 103(3), 582–91; discussion 592–6.
- Kahneman, D. (1994). New Challenges to the Rationality Assumption. *Journal of Institutional and Theoretical Economics*, 150(1), 18–36.
- Kahneman, D. (2000). Preface. In A. Tversky & D. Kahneman (Eds.), *Choices, Values and Frames*. New York: Cambridge University Press.
- Kahneman, Daniel. (2002). Autobiography. In *Nobel Prize Awarding*. Retrieved from http://www.nobelprize.org/nobel_prizes/economics/laureates/2002/kahneman.html
- Kahneman, D. (2011). *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux.
- Kahneman, Daniel, Slovic, P., & Tversky, A. (1982). *Judgment Under Uncertainty: Heuristics and biases*. (Daniel Kahneman, P. Slovic, & A. Tversky, Eds.). New York: Cambridge University Press.
- Keren, G. (2011a). On the Definition and Possible Underpinnings of Framing Effects: A Brief Review and a Critical Evaluation. In G. Keren (Ed.), *Perspectives on Framing* (pp. 3–34). Taylor & Francis.
- Keren, G. (2011b). *Perspectives on Framing*. (G. Keren, Ed.). Taylor and Francis.
- Klaes, M. (2008). Rationality and its Bounds: Re-Framing Social Framing. In M. C. Galavotti, R. Scazzieri, & P. Suppes (Eds.), *Reasoning, rationality and probability*. CSLI Publications.
- Kühberger, A. (1995). The framing of decisions: A new look at old problems. *Organizational Behavior and Human Decision Processes*, 62, 230–240.
- Kühberger, A. (1997). Theoretical conceptions of framing effects in risky decisions. In R. Ranyard, R. W. Crozier, & O. Svenson (Eds.), *Decision Making. Cognitive models and explanations* (pp. 128–144). London and New-york: Routledge.
- Kühberger, a, Schulte-Mecklenbeck, M., & Perner, J. (1999). The Effects of Framing, Reflection, Probability, and Payoff on Risk Preference in Choice Tasks. *Organizational behavior and human decision processes*, 78(3), 204–231. doi:10.1006/obhd.1999.2830
- Kühberger, A., Schulte-Mecklenbeck, M., & Perner, J. (2002). Framing decisions: Hypothetical and real. *Organizational Behavior and Human Decision Processes*, 89(2), 1162–1175. doi:10.1016/S0749-5978(02)00021-3
- Leinfellner, W., & Booth, E. (1979). The naturaistic versus intuitonistic schools of values. In M. Allais & O. Hagen (Eds.), *Expected Utility Hypothesis and the Allais Paradox* (pp. 303–332). Dordrecht: Reidel.
- Levin, I., Schneider, S., & Gaeth, G. (1998). All Frames Are Not Created Equal: A Typology and Critical Analysis of Framing Effects. *Organizational behavior and human decision processes*, 76(2), 149–188. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9831520>

- Levine, D. K. (2012). *Is Behavioral Economics Doomed?: The Ordinary versus the Extraordinary* (p. 152). Open Book Publishers.
- Levitt, S. D., & List, J. A. (2007). what do laboratory experiments measuring social preferences reveal about the real world ? *Journal of Economic Perspectives*, 21(2), 153–174.
- Lichtenstein, S., & Slovic, P. (2006a). *The contruction of preference*. (S. Lichtenstein & P. Slovic, Eds.). Cambridge University Press.
- Lichtenstein, S., & Slovic, P. (2006b). The construction of preference: an overview. In S. Lichtenstein & P. Slovic (Eds.), *The construction of preference* (pp. 1–40). Cambridge University Press.
- Luce, R. D., & Raiffa, H. (1957). *Games and Decisions*. New York: Wiley.
- MacCrimmon, K. R. (1965). *An Experimental Study of the Decision-Making Behavior of Business Executives*. University of California, Los Angeles.
- MacCrimmon, K. R. (1968). Descriptive and Normative Implications of the Decision Theory Postulates. In K. Borch & J. Mossin (Eds.), *Risk and Uncertainty* (pp. 3–23). MacMillan.
- MacCrimmon, K. R., & Larson, S. (1979). Utility Theory: Axioms vs Paradoxes. In M. Allais & O. Hagen (Eds.), *Expected Utility Hypothesis and the Allais Paradox*. Dordrecht: Reidel.
- Machina, M. J. (1981). “Rational decision making” versus “rational decision modeling”? *Journal of Mathematical Psychology*, 24, 163–175.
- Machina, M. J. (1987). Choice Under Uncertainty : Problems Solved and Unsolved. *Economic Perspectives*, 1(1), 121–154.
- Malinvaud, E. (1952). Note on von Neumann-Morgenstern’s Strong Independence Axiom. *Econometrica*, (4), 679.
- Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance*, 7(1), 77–91.
- Marschak, J. (1950). Rational Behavior , Uncertain Prospects , and Measurable. *Econometrica*, 18(2), 111–141.
- McClennen, E. F. (2009). The normative status of the independence principle. In P. Anand, P. K. Pattanaik, & C. Puppe (Eds.), *The Handbook of Rational and Social Choice. An overview of new foundations and applications* (pp. 140–154). Oxford University Press.
- McKenzie, C. R. M., & Nelson, J. D. (2003). What a speaker’s choice of frame reveals: reference points, frame selection, and framing effects. *Psychonomic bulletin & review*, 10(3), 596–602.
- McKenzie, C. R. M., Liersch, M. J., & Finkelstein, S. R. (2006). Recommendations Implicit in Policy Defaults. *Psychological Science*, 17(5), 414–420.
- McKenzie, R. B. (2010). *Predictably Rational?* Berlin, Heidelberg: Springer Berlin Heidelberg.
doi:10.1007/978-3-642-01586-1
- McNeil, B. J., Pauker, S. G., Harold C. Sox, J., & Tversky, A. (1982). On the Elicitation of Preferences for Alternative Therapies. *New England Journal of Medicine*, 306, 1259–1262.
- Mongin, P. (1988). Problèmes de Duhem en théorie de l’utilité espérée. *Fundamenta Scientiae*, 9, 2989–313.

- Mongin, P. (1998). Expected Utility Theory. In John B. Davis, W. D. Hands, & U. Mäki (Eds.), *The Handbook of Economic Methodology* (pp. 342–350). Edwa.
- Mongin, P. (2003). L'axiomatisation et les théories économiques. *Revue Economique*, 54(1), 99–138.
- Mongin, P. (2009). Duhemian Themes in Expected Utility Theory. In A. Brenner & J. Gayon (Eds.), *French Studies in the Philosophy of Science* (pp. 303–357). Dordrecht: Springer Netherlands.
- Mongin, P. (2013, June 30). Le Paradoxe d'Allais: Comment lui rendre sa signification perdue? (Allais's Paradox: How to Give It Back Its Lost Meaning?). *SSRN Electronic Journal*.
- Moscatti, I. (2012). Intension, extension and the model of belief and knowledge in economics. *Erasmus Journal for Philosophy and Economics*, 5(2), 1–26.
- Munier, B. (1984). Quelques critiques de la rationalité économique dans l'incertain. *Revue Economique*, 35(1), 65–86.
- Pratt, John, W. (1964). Risk aversion in the small and in the large. *Econometrica*, (January-April), 122–136.
- Quattrone, G. A., & Tversky, A. (1988). Contrasting rational and psychological analyses of political choice. *The American Political Science Review*, 82(3), 719–736.
- Quiggin, J. (1981). Risk Perception and Risk Aversion among Australian Farmers, *Australian Journal of Agricultural Economics*, 25, pp. 160-9.
- Quiggin, J. (1982). A Theory of Anticipated Utility. *Journal of Economic Behavior & Organization*, (3), 323–343.
- Rabin, M. (1998). Psychology and Economics. *Journal of Economic Literature*, 36(1), 11–46.
- Rabin, M. (2002). A perspective on psychology and economics. *European Economic Review*, 46, 657 – 685.
- Rubinstein, A. (2000). *Economics and Language. Five essays*. Cambridge University Press.
- Sahlin, N.-E., & Vareman, N. (2008). Three types of decision theory. In M. C. Galavotti, R. Scazzieri, & P. Suppes (Eds.), *Reasoning, rationality and probability* (pp. 37–59). CSLI Publications.
- Salant, Y., & Rubinstein, A. (2008). Choice with frame. *Review of Economic Studies*, 75, 1287–1296.
- Samuelson, P. A. (1950). Probability and the Attempts to Measure Utility. *Economic Review*, (July), 169–170.
- Samuelson, P. A. (1952). Probability, Utility, and the Independence. *Econometrica*, 20(4), 670–678.
- Samuelson, W., & Zeckhauser, R. (1988). Status quo bias in decision making. *Journal of Risk and Uncertainty*, 1(1), 7–59.
- Santos, A. C. (2006). *The social epistemology of experimental economics*. Erasmus University Rotterdam.
- Savage, L. J. (1954). *The Foundations of Statistics* ., Wiley Publications in Statistics .,
- Schervish, M. J., Seidenfeld, T., & Kadane, J. B. (1990). State-Dependent Utilities. *Journal of the American Statistical Association*, 45(411), 840–847.

- Schmeidler, D. (1989). Subjective Probability and Expected Utility without Additivity. *Econometrica*, 57, 571–587.
- Schwarz, N. (1994). Judgment in a social context: Biases, Shortcomings, and the logic of conversation. In M. P. Zanna (Ed.), *Advances in Social Psychology* vol.26 (pp. 123–162). San Diego: Academic Press.
- Seidenfeld, T. (1988). Decision theory without “independence” or without “ordering”. What’s the difference? *Economics and Philosophy*, 4, 267–290.
- Sent, E.-M. (2004). Behavioral Economics: How Psychology Made Its (Limited) Way Back Into Economics. *History of Political Economy*, 36(4), 735–760.
- Sher, S., & McKenzie, C. R. M. (2006). Information leakage from logically equivalent frames. *Cognition*, 101(3), 467–94.
- Sher, S., & McKenzie, C. R. M. (2008). Framing Effects and Rationality. In N. Chater & M. Oaksford (Eds.), *The Probabilistic Mind: Projects for Bayesian Cognitive Science* (pp. 79–96). Oxford University Press.
- Sher, S., & McKenzie, C. R. M. (2011). Levels of Information: A Framing Hierarchy. In G. Keren (Ed.), *Perspectives on Framing* (pp. 35–64). Taylor & Francis.
- Siakantaris, N. (2000). Experimental Economics under the Microscope. *Cambridge Journal of Economics*, (24), 267–281.
- Slovic, P., & Tversky, A. (1974). Who Accepts Savage’s Axiom? *Behavioral Science*, 19(6), 368–373.
- Starmer, C. (2000). Developments in Non-Expected Utility Theory: the hunt for a descriptive theory of choice under risk. *Journal of Economic Literature*, XXXVIII, 332–382.
- Starmer, C. (2005). Normative notions in descriptive dialogues. *Journal of Economic Methodology*, 12(2), 277–289.
- Thaler, R. H. (1991). Introduction. In *Quasi Rational Economics* (pp. xi–xiii). Russell Sage Foundation.
- Thaler, R. H. (2000). From Homo Economicus to Homo Sapiens. *Journal of Economic Perspectives*, 14(1), 133–141. doi:10.1257/jep.14.1.133
- Thaler, R. H. (2008). Mental Accounting and Consumer Choice. *Marketing Science*, 27(1), 15–25.
- Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving Decisions About Health, Wealth, and Happiness* (p. 293). Yale University Press.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, (4481), 453–458.
- Tversky, A., & Kahneman, D. (1987). Rational choice and the framing of decisions. In R. M. Hogarth & M. W. Reder (Eds.), *Rational Choice. The Contrast between Economics and Psychology*. Chicago: University of Chicago Press.
- Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(4), 297–323. Retrieved from <http://www.springerlink.com/content/lwr6176230786245/>
- Tversky, A., & Kahneman, D. (2000). *Choices, Values, and Frames*. (A. Tversky & D. Kahneman, Eds.). New York: Cambridge University Press.

- Vilks, A. (1995). On mathematics and mathematical economics. *Greek Economic Review*, 17(2), 177–204.
- Von Neuman, J., & Morgenstern, O. (1953). *Theory of Games and Economic Behavior* (3rd ed.). Princeton: Princeton University Press.
- Wakker, P. P. (1994). Separating marginal utility and probabilistic risk aversion. *Theory and Decision*, 36, 1–44.
- Wakker, P. P. (2010). *Prospect theory for risk and ambiguity*. Cambridge University Press.
- Williams, A. C. (1966). Attitudes toward Speculative Risks as an Indicator of Attitude toward Pure Risks. *Journal of Risk and Insurance*, 33, 577–586.

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