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Who are the Behavioral Economists and what do they say?

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Who are the behavioral economists and What do they say?

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Abstract
The most important financial source for behavioral economics is the Russell Sage Foundation (RSF). The most prominent behavioral economists among the RSF's twenty-six member Behavioral Economics Roundtable (BER) are Kahneman, Tversky, Thaler, Camerer, Loewenstein, Rabin, and Laibson. The theoretical core of behavioral economics made up of the work of these seven researchers is positioned in opposition to Adam Smith/Hayek type of economics, as exemplified by experimental economists Vernon Smith and Plott; and what is referred to as 'mainstream' or 'traditional' economics, meaning the neoclassical economics that roughly builds on Samuelson. On the basis of an overview of the work of these seven behavioral economists, a theoretical division can be observed within behavioral economics. The first branch considers human decision-making to be a problem of exogenous uncertainty, which can be analyzed with decision theory. It employs traditional economics as a normative benchmark and favors a normative-descriptive(-prescriptive) distinction for economics. The second branch considers human decision-making to be a problem of strategic interaction, in which the uncertainty is endogenous. Its main tool is game theory. It rejects traditional economics both positively and normatively.

I wonder how much economic theory would be changed
if [..] found to be empirically untrue. I suspect, very little.
Paul Samuelson[1]

Introduction

This overview paper asks two questions: 1) Who are the behavioral economists?, and 2) What do they say? The first section answers the first question. The second section provides an overview of the research of the most prominent behavioral economists, from which a general categorization is inferred in the third section. Concluding remarks end the paper.

1. Who are the behavioral economists?

The principal financial source for behavioral economics is the Russell Sage Foundation (RSF), which from halfway the 1980s has been a stable sponsor of behavioral economics research.[2] It is furthermore the publisher of a number of influential books in behavioral economics. The RSF describes behavioral economics and its relation to it as follows:

> "The Behavioral Economics program began in 1986 as a joint activity with the Alfred P. Sloan Foundation with the aim of strengthening the accuracy and empirical reach of economic theory by incorporating information from neighboring social science disciplines, especially psychology and sociology. [..] Since 1992 the Foundation has supported two principal activities in behavioral economics: the Behavioral Economics Roundtable, a forum for discussing new ideas and encouraging younger social scientists to enter the field, and a series of workshops run by the National Bureau of Economic Research (NBER)."[3]

The RSF's Behavioral Economics Roundtable (BER), "made up of prominent researchers in the field", plays a vital role in behavioral economics. It "sponsors two main activities:

[1] Samuelson (1963), p.117
[2] *Advances in Behavioral Economics* (2004), is along Kahneman, Thaler, and Tversky dedicated to Eric Wanner: "Our dedication includes one other person who played an unusual and vital role –Eric Wanner., the president of the Russell Sage Foundation." (Camerer et.al. 2004, p.xxii)
[3] http://www.russellsage.org/programs/other/behavioral/

a two-week summer workshop taught by Roundtable members for graduate students and junior faculty interested in entering this new interdisciplinary field, and a small grants program for younger scholars undertaking behaviorally oriented research". An overview of the theoretical core of behavioral economics thus best begins with the members of the BER.

The BER consists of the following people: Henry Aaron, Brookings Institution; George Akerlof, University of California at Berkeley; Linda Babcock, Carnegie Mellon University; Nicholas C. Barberis, Yale University; Marianne Bertrand, University of Chicago; Roland J. M. Benabou, Princeton University; Colin Camerer, California Institute of Technology; Peter Diamond, Massachusetts Institute of Technology; Jon Elster, Columbia University; Ernst Fehr, University of Zurich; Robert H. Frank, Cornell University; Christine Jolls, Harvard University; Daniel Kahneman, Princeton University; David Laibson, Harvard University; George Loewenstein, Carnegie Mellon University; Brigitte Madrian, University of Pennsylvania; Sendhil Mullainathan, Massachusetts Institute of Technology; Edward D. O'Donoghue, Cornell University; Terrance Odean, University of California at Berkeley; Drazen Prelec, Massachusetts Institute of Technology; Matthew Rabin, University of California, Berkeley; Thomas Schelling, University of Maryland; Eldar Shafir, Princeton University; Robert Shiller, Yale University, Richard Thaler, University of Chicago; Jean Tirole, Universite des Sciences Sociales at Toulouse, Richard Zeckhauser, Harvard University; and until his death Amos Tversky, Stanford University[4].

Going through the affiliations of the members of the BER, behavioral economics seems to be a predominantly American phenomenon. This may have to do with the nationality of the RSF. Because the RSF is an American foundation it may favor and have favored American researchers, as a result of which behavioral economics is predominantly American. It can also be that American behavioral economics have access more easily to the RSF. That said, there is no reason to assume that important behavioral economists outside the USA have been excluded from the BER.

Not all of the twenty-six scientists of the BER are equally important for behavioral economics, for some it is a more important part of their research than it is for

[4] http://www.russellsage.org/programs/other/behavioral/

others. To get a rough estimate of the impact of the particular scientist on behavioral economics I have computed the number of Google hits for the scientist and behavioral economics. To be able to compare this with the impact of the scientist on economics and of the scientist in general, I also looked at the number of hits of the scientist and economics and of the scientist alone. This yields the following results.

	"behavioral economics" and "[name of scientist]"	"economics" and "[name of scientist]"	"[name of scientist]"
George Akerlof	855	55.700	73.600
Linda Babcock	290	16.200	39.300
Nicholas (C.) Barberis[1]	160	12.000	14.200
Roland (J. M.) Benabou[1]	140	20.300	29.000
Colin Camerer	10.900	35.800	43.300
Peter Diamond	258	41.500	129.000
Jon Elster	386	60.300	157.000
Ernst Fehr	821	79.300	105.000
Robert (H.) Frank[1]	627	114.600	898.400
Christine Jolls	434	16.300	17.700
Daniel Kahneman	26.200	132.000	245.000
David Laibson	9.600	45.000	62.700
George Loewenstein	12.400	37.100	50.700
Brigitte Madrian	230	10.600	14.500
Sendhil Mullainathan	713	39.900	51.100
Edward D. O'Donoghue[2]	321	9.770	10.700
Terrance Odean	301	19.000	31.700
Drazen Prelec	371	11.800	14.700
Matthew Rabin	13.000	39.800	44.000
Thomas Schelling	381	56.100	129.000
Eldar Shafir	408	932	13.600

Robert Shiller	558	65.900	122.000
Richard Thaler	15.100	58.600	75.100
Jean Tirole	611	155.000	203.000
Richard Zeckhauser	353	46.100	65.300
Amos Tversky	16.900	68.700	124.000

1. Names with and without initials have been used.
2. Edward D. O'Donoghue is much better known as Ted O'Donoghue. "Edward D. O'Donoghue" yields only 11 hits. Hence Ted O'Donoghue is used.

Despite a number of obvious disadvantages, some interesting facts can be induced from this analysis. When looking at the second and the third column it seems first of all that some scientists have their names in common with other individuals frequenting the web. This is an explanation for the sometimes large difference between the second and third column. Most clearly this problem occurs in the case of Robert Frank, who has the privilege of sharing his name with amongst others a famous photographer. However, a large difference between the second and the third column may also be an indication that the scientist is known for other things besides (behavioral) economics. This is for instance probably the case with psychologists Daniel Kahneman and Amos Tversky, and game theorist Thomas Schelling. In the case of Daniel Kahneman, Thomas Schelling and George Akerlof a large part of the difference may also be explained by their Nobel prizes.

More interesting for our purpose here is the difference between the first and the second column. Differences there explain how much of the impact of the scientist in economics has to do with his or her impact on behavioral economics. A large difference indicates that the scientist is relatively famous in economics, but not so much because of his or her work in behavioral economics. It seems that for instance George Akerlof, John Elster, Thomas Schelling, and Jean Tirole, although well-known in economics, have relatively little to do with behavioral economics.

Given all this, when we look at the first column a clear picture arises of who are the most important scientists in behavioral economics. The differences are quite striking: scientists have either fewer than 856 hits in combination with "behavioral economics", or more than 9.600. It is in other words clear which scientists form the core of behavioral economics: Colin Camerer, Daniel Kahneman, David Laibson, George Loewenstein,

Matthew Rabin, Richard Thaler, and Amos Tversky. To get an idea of the theoretical core of behavioral economics we thus need to look at these seven psychologists and economists. The next section provides an overview of the work of these behavioral economists from halfway the 1980s onwards. The emphasis is on the distinguishing characteristics of each author. Therefore, the frequent collaboration between two or more of these seven researchers has been relatively de-emphasized.

2. A theoretical overview of behavioral economics' most prominent researchers

Daniel Kahneman

As can be seen from the table below, Kahneman's work in the 1980s and 1990s is characterized by a gradual shift from publications in predominantly psychological journals and books to a relatively larger focus on an economic public. In the 1990s Kahneman published in a more diverse range of journals and relatively shifted his focus to economics. Of course, this does not say anything about the causal direction of the relation. It may for instance be that Kahneman always tried to publish in economic journals but that only in the 1990s these journals became more susceptible to Kahneman's work. The relative shift does after all occur in the same period in which behavioral economics gained increasing acceptance. It may also be that in the 1990s Kahneman was more often invited or pressed to co-operate with economists and publish in economic journals. But irrespective of the exact cause, the relative shift is a noteworthy. It shows that Kahneman partly shifted his energy to economics, but also that to a significant extent he remained a psychologist.

	Psychology publications	Economics publications	Total
1970s	15	2	21
1980s	16	3	24
1990s	14	14	45

Note: For the first two columns only publications have been counted that clearly fall in one of the two categories, for instance *Psychological Review*, *Cognition* and *Journal of Experimental Psychology* for Psychology and *American Economic Review*, *Econometrica* and *Quarterly Journal of Economics* for Economics. Typical border-cases like *Journal of Risk and Uncertainty* and *Journal of Behavioral Decision Making* have been excluded from both categories.

A first interesting article of Kahneman related to behavioral economics is an article from 1986 by Tversky and Kahneman in a special edition of *The Journal of Business* called *The Behavioral Foundations of Economic Theory*[5]. The purpose of the article is to provide a historical framework for the prospect theory the two published seven years earlier[6]. It provides a meta-account of modern decision theory and seeks to position prospect theory in this historical taxonomy. In doing so it reads as an authoritative account of the field. The historical analysis starts with a clear idea of what modern decision theory is and when it started:

> "The major achievement of the modern theory of decisions under risk is the derivation of the expected utility rule from simple principles of rational choice that make no reference to long run considerations (von Neumann and Morgenstern 1944)."[7]

The foundations of this axiomatic approach to the theory of rational choice consist of four "substantive assumptions". The first and most interesting assumption is what is labeled "Cancellation", which is the idea that the choice is independent of irrelevant alternatives. This assumption has been formalized in different ways and has received different names. In von Neumann and Morgenstern (1944) it is called the substitution axiom, in Savage (1954) the sure-thing principle, and in Luce and Krantz (1971) the independence axiom. All these formalizations and names cover in one way or another the idea that if an individual prefers *A* over *B* she will not change her preference if, say, it will rain tomorrow. If *A* is preferred over *B*, then also *A plus it will rain tomorrow* is preferred over *B plus it will rain tomorrow*. The second assumption is the well-known transitivity assumption which states that if *A* is preferred over *B* and *B* over *C* than also *A* is preferred over *C*. The third assumption is that of dominance, which states that if one option is preferred to another than that option should be chosen. The fourth assumption identified by Tversky and Kahneman (1986) is that of invariance, which says that the preference is independent of the formulation of the options. When formalized, these four

[5] Tversky and Kahneman (1986)
[6] As such it is of course as much part of Tversky's contribution to behavioral economics.
[7] Tversky and Kahneman (1986), p.S252

assumptions can be combined into an axiomatic system for a normative rational choice theory. A number of closely related such systems exist. The already mentioned von Neumann and Morgenstern (1944) and Savage (1954) are examples.

It has often been shown that people in the real world violate one or more of these four assumptions. Especially the 'cancellation' assumption is famous for the number of violations it gives rise to (the Allais and the Ellsberg paradoxes amongst others). As a result, a number of descriptive models have been proposed that attempt to offer a better description of actual human decision behavior with respect to the normative model. Tversky and Kahneman (1986) distinguish four categories of these descriptive models: i) Nonlinear functionals, which eliminate the cancellation assumption altogether, ii) The expectations quotient model, which weakens the cancellation requirement, iii) Bilinear models with nonadditive probabilities, which assumes amongst others a restricted version of cancellation, and iv) Nontransitive models, which attempt to find another representation of preferences. Given this taxonomy, Kahneman and Tversky's (1979) prospect theory falls neatly into category iii.

What is important is that the paper continues the distinction made earlier between normative and descriptive theories of rational choice. In fact, the article emphasizes even stronger than earlier work by Kahneman and Tversky that the normative and descriptive theories are two different programs. Nevertheless, the two are bound by the fact that both give a rationalization of choice behavior, the first in the normative, the second in the descriptive domain.

> "The main theme of this article has been that the normative and the descriptive analysis of choice should be viewed as separate enterprises. This conclusion suggests a research agenda. To retain the rational model in its customary descriptive role, the relevant bolstering assumptions must be validated. Where these assumptions fail, it is instructive to trace the implications of the descriptive analysis."[8]

One branch of behavioral economics, on which more below, is that research agenda.

[8] Tverksy and Kahneman (1986), p.S275

Another article worth mentioning is a co-publication of Kahneman, Knetsch and Thaler in the same 1986 special issue of *The Journal of Business. Fairness and the Assumptions of Economics* is an early example of a central issue in behavioral economics: fairness. The problem is that according to standard economics individuals do not act fair when they have the possibility to increase their profit or utility by behaving unfair. Human beings in economics are always assumed to be purely self-interested agents. Yet, in experimental situations people often behave fair, or at least do not behave entirely unfair. The typical example is the dictator game in which a subject has to divide, say, 10 euros between herself and an unknown other participant. Even in situations where the subjects will never know who the other participant is, they do not keep all the money for themselves but give a small amount to the other subject. According to the authors, this finding corresponds to many real-life situations in which we do not behave (entirely) selfish[9].

Kahneman, Knetsch and Thaler (1986) offers two possible solutions for these findings, formulated for the case of the behavior of firms:

> "The radical hypothesis is that owners and managers of firms have a preference for acting fairly. The alternative hypothesis is that transactors may be willing to punish an offending firm by withholding their current and future business."[10]

Because in many cases the possibility of punishment is absent the authors conclude that although a satisfying explanation cannot be given, people have some preference for fairness. As fairness is not part of the traditional economic paradigm and can neither be made part of it, this calls for a descriptive theory of economic behavior that fundamentally parts with the traditional account. As before, also this paper by Kahneman is formulated as a guide for a research agenda to build a descriptive theory for (economic) decision behavior.

In *Experimental Tests of the Endowment Effect and the Coase Theorem* (1990), published in *The Journal of Political Economy*, the same three authors take up another of

[9] See for an overview of this particular kind of decision theory and EUT generally de Boer (2006)
[10] Kahneman, Knetsch and Thaler, (1986), p.S292

standard economics' core assumptions: the Coase theorem. The Coase theorem says that to attain an efficient allocation of goods (the standard example is property rights), the initial endowment of the goods is irrelevant. Due to the fact that different agents have different willingnesses to pay, the goods will always end up with the agents that *a priori* value the good most[11]. But because of the endowment effect this is not true. The endowment effect is a phenomenon and term that has been introduced by Thaler[12] and basically is an economic implication of the framing effect as described by Kahneman and Tversky. If one randomly endows half a group of subjects in an experiment with a trivial good such as a coffee mug, it turns out that the subjects who have received the mugs on average are willing to sell the mug for a minimal amount that is significantly higher than what subjects who did not receive the mug are maximally willing to pay for it. That is, human beings seem to have a preference for 'having' (as opposed to 'not-having'), regardless of the good. By implication, the final allocation of goods in an efficient market depends upon the initial endowments of the good. The endowment effect therewith is a falsification of the Coase theorem. Despite all the normative appeal and usefulness of this core assumption of standard economics, it is according to the authors not a good basis for descriptive theories of human behavior.

Over the past ten years Kahneman has gone one step beyond showing how traditional economics descriptively fails. Especially prominent, both in the number of publications Kahneman devotes to it and in the attention it receives, is his re-interpretation of the notion of utility.[13] For Kahneman, the main reason that people do not make their decisions in accordance with the normative theory is that their valuation and perception of the factors of these choices systematically differ from the objective valuation of these factors. This is what amongst many articles Kahneman and Tversky (1979) shows. People's subjective perception of probabilities and their subjective valuation of utility differ from their objective values.

A theory that attempts to describe people's decision behavior in the real world should thus start by measuring these subjective values of utility and probability. It should

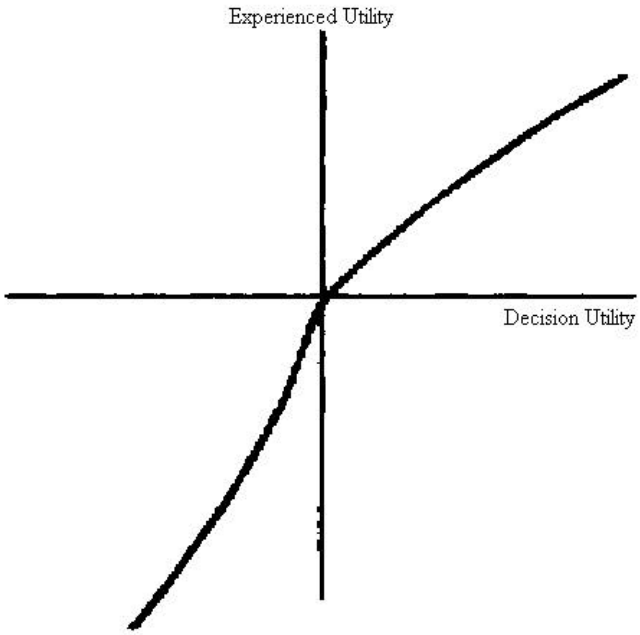
[11] With the assumption of efficient markets, here implicit.
[12] Thaler (1980)
[13] The following account draws on Kahneman (1994, 2003), Kahneman and Sugden (2005), Kahneman, Wakker, and Sarin (1997), and Kahneman and Thaler (1991).

in other words start by investigating the relation between the magnitude of the objective stimulus and the perceived magnitude of the stimulus (in psychophysical terms the sensation) by the individual. This research question takes Kahneman back to the period before the behaviorist revolution in psychology and economics, straight to Jevons and Edgeworth, the psychophysicists of Benthamite utility[14]. (Behavioral) economics according to Kahneman should go back to those nineteenth century economists who attempted to measure the (dis)utility arising from pleasure and pain[15].

The distinction Kahneman draws, then, is a distinction between what he labels 'decision utility' and 'experienced utility'. Decision utility is the utility as it is used by standard normative economics and psychology since the 1930s. It is the objective utility derived from a choice. Although Kahneman remains vague on the precise origins of decision utility, or perhaps consciously avoids it, decision utility can safely be equated with the von Neumann-Morgenstern definition of utility. Thus, in the case of monetary choices about gambles, lotteries and insurances, decision utility is the monetary gain of the choice. In cases where money is not directly involved, the decision utility is the objective monetary representation of the choice[16].

The utility people actually perceive is called the experienced utility. Just like the psychophysical relation between the objective magnitudes of the stimulus and the perceived magnitude, experienced utility is the subjective perception of the objective stimulus of decision utility. Thus we can draw the famous curve

[14] However, these authors seem to serve especially as famous ancestors who strengthen the argument. In contrast to for instance Loewenstein (see below) their work is not extensively discussed or cited.
[15] The subjective perception of probabilities is further elaborated upon by Tversky in a range of publications.
[16] I leave aside the question of how this representation in monetary terms is or should be established. Most of Kahneman's experiments involve monetary decisions, perhaps to avoid this problem.



To some extent this is a simple extension of the work in Kahneman and Tversky (1979) and others. What in prospect theory on the x-axis is called 'losses' (left) and 'gains' (right) is now labeled decision utility. The 'value' that in prospect theory is placed on the y-axis is now called experienced utility. However, we have to be somewhat cautious here as Kahneman, as far as I can tell, has (as yet?) not provided a graphical representation of the relation between decision utility and experienced utility. For this, I do not have an explanation. Suffice it to say that at least for the case of monetary choices it is difficult to see which other then Kahneman and Tversky's famous curve could be implied[17].

As a basis for a descriptive theory of real-world human decision behavior psychologists and economists thus need experienced utility, not decision utility. Making this argument of abandoning seventy years of research in psychology and economics is only the first step into a research program that poses a range of difficult issues. Immediate questions that arise, for instance, are which different causal factors contribute to experienced utility and how one is to measure experienced utility. Does the experienced utility for instance depends only upon the decision utility or also on the amount of experienced utility (wealth?) the individual already possesses? And is the experienced utility only a function of the immediate action of making the choice, or do

[17] A reason may be that when this curve is drawn, framing has already taken place.

people also derive utility from remembering making the choice? These and other questions related to experienced utility as a basis for a descriptive theory of human decision behavior are nicely summed up in an overview article on the subject by Kahneman, Wakker, and Sarin (1997). The article presents the following figure.

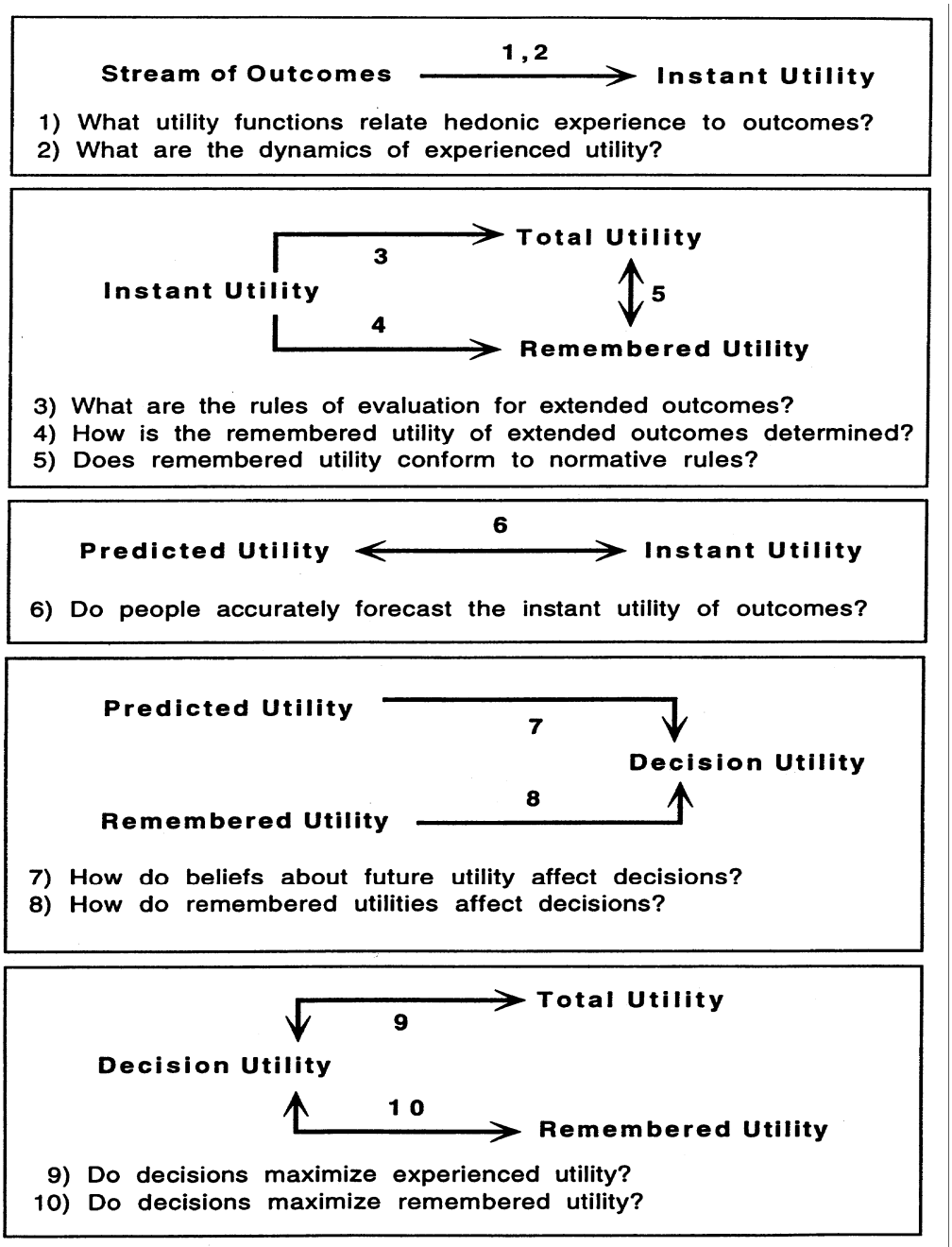


FIGURE I
Research Designs for the Study of Experienced Utility

Source: Kahneman, Wakker, and Sarin (1997), p. 378

Besides (behavioral) economics Kahneman's research on experienced utility also forms an important part of his recent contributions to psychology, see for instance *Well-Being, The Foundations of Hedonic Psychology* (1999). As a result, the relations between economics and psychology in this research become increasingly blurred. Kahneman for example works on the subject with economists such as Wakker and Sarin, and *Well-Being* contains among others a contribution of economist van Praag. Yet *Well-Being* is explicitly and repeatedly presented as a contribution to psychology. In Kahneman's work, and in the behavioral economics that elaborates upon his work, both psychology and economics are about human behavior and a distinction between the two is therefore difficult to draw.

Amos Tversky

When we count the number of psychology and economics publications for Tversky in the same manner as was done for Kahneman, a number of differences can be observed (see the table below). Firstly, Tversky has in each of the three decades counted produced a somewhat larger number of publications. Secondly, the share of clearly psychology and economics publications is substantially smaller than in the case of Kahneman. For Kahneman psychology and economics publications make up roughly 75% of the total number of publications, for Tversky this figure is about 50%. Going through Tversky's publication list, the reason seems to be that Tversky more than Kahneman published in journals and books that are difficult to put in either the psychology or economics category, or would even form part of other categories such as mathematics. Examples include *Journal of Risk and Uncertainty*, *Medical Decision Making*, and *Advances in Applied Probability*. Given this disclaimer, we can see that Tversky only slightly shifted his focus to economics in the 1990s, and did so substantially less that Kahneman. Furthermore, half of the ten economics publications are collaborations with Kahneman. It seems therefore that Tversky's fame in behavioral economics is the sole result of a number of co-publications with Kahneman. This adds to the admiration of Tversky's academic abilities, but also relatively de-emphasizes his importance for an account of behavioral economics.

	Psychology publications	Economics publications	Total
1970s	13	2	27
1980s	22	1	40
1990s	16	7	50

Note: For the first two columns only publications have been counted that clearly fall in one of the two categories, for instance *Psychological Review*, *Cognition* and *Journal of Experimental Psychology* for Psychology and *American Economic Review*, *Econometrica* and *Quarterly Journal of Economics* for Economics. Typical border-cases like *Journal of Risk and Uncertainty* and *Journal of Behavioral Decision Making* have been excluded from both categories.

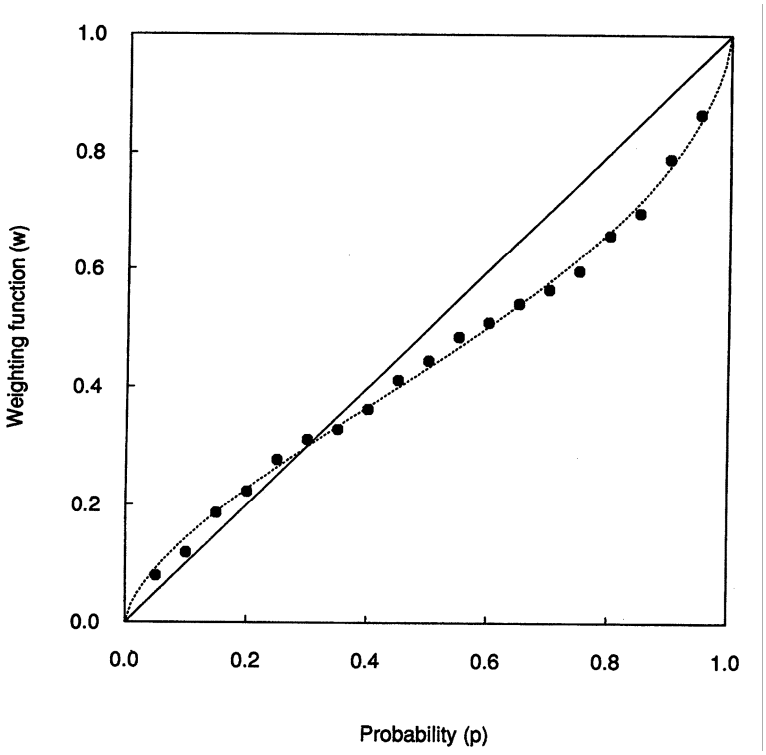
After 1979 Tversky, like Kahneman, concentrates his work on building a better descriptive theory of rational human decision behavior. Also Tversky does not see such a descriptive theory as a replacement of the traditional normative model, but as an addition to research that attempts to describe decision behavior in mathematical terms. The normative model always is, and remains the direct point of reference. The distinction that is made, although, admittedly, this is nowhere made explicit, is that the normative theory is a mathematical account for rational decision behavior in the normative domain, and the descriptive theory a mathematical account of rational decision behavior in the descriptive domain. The descriptive theory is not seen as a theory about irrational behavior, but as a theory describing rational individual behavior, *given* individuals' perceptions of (objective) utilities and probabilities. The division of labor between Kahneman and Tversky after prospect theory is that Kahneman measures and finds a good explanation for utility in the descriptive domain (as set out above), and that Tversky takes up the challenge of describing and explaining the subjective perception of probabilities.

Two lines of research can be distinguished in Tversky's work from the beginning of the 1980s until his death in 1996. Firstly, there is a continuation of research showing that decision behavior of people in the real world systematically deviates from the predictions made by the normative theory. An example is Tversky, Slovic and Kahneman (1990), which shows that the condition of invariance does not hold. When the same choice is formulated differently individuals often change their preferences, a phenomenon known as 'preference reversal'. Tversky presents this descriptive 'anomaly' also in a co-publication with Thaler in the latter's anomalies column for *The Journal of Economic*

Perspectives[18]. Another example of this research is the so-called 'money illusion'[19]. In the traditional economic theory, including expected utility theory, people are supposed to use the real[20] monetary value of money to base their decisions upon. It can be shown in experiments, however, that in reality individuals base their decisions on the nominal value. Thus, it is once again shown that people systematically violate the assumptions of traditional economics.

A second line of research of Tversky focuses on how to build a (mathematical) descriptive theory of individual human decision behavior[21]. The main issue Tversky is working on in this research is how to measure the perceived probabilities of human beings and how to build a model out of the experimental data thus gathered. A recurring finding, which for the first time is mentioned in Kahneman and Tversky (1979), is that people overestimate small probabilities and underestimate large probabilities. It is furthermore repeatedly found that the step from certain to probable at both extremes is relatively large with respect steps of equivalent size in the middle of the spectrum. The following curve of how human beings perceive probabilities can thus be drawn.

[18] Tversky and Thaler (1990)
[19] Shafir, Diamond and Tversky (1997)
[20] That is, corrected for inflation.
[21] The following three paragraphs draw on Tversky and Wakker (1995), Quattrone and Tversky (1988), Simonson and Tversky (1992), Tversky and Kahneman (1992), Fox and Tversky (1995), and Wakker, Thaler, and Tversky (1997).



Source: Tversky and Wakker (1995), p.1257. The line and dots refer to the results of a specific experiment. It is, however, an instance of a repeatedly observed phenomenon.

An important difference is that in contrast to Kahneman and Tversky (1979) the perceived probabilities in Tversky's later work are additive (as opposed to non-additive). Additivity means that the perceived probabilities, or 'decision weights' as they are often called, by definition add up to one. Thus, if an individual judges the probability of an event *q* to be *p*, she *by definition* judges the probability of ¬*q* to be *1-p*.

Having distinguished descriptive from normative theories of human decision behavior and having defined and gathered data on how people perceive probabilities, the main part of Tversky's work consists of building mathematically coherent models for rational human decision behavior in the descriptive domain. The different publications and versions of prospect theory are the most prominent examples of this research[22]. As this literature involves a lot of subtle developments in rather detailed mathematical models I leave a discussion of this research for another occasion.

[22] Tversky and Kahneman (1986, 1991)

Richard Thaler

During the beginning of the 1980s, there is a growing interest in economics for (cognitive) psychological work that might be relevant to economics. Grether and Plott (1979) and Grether (1980), for instance, critically review the relevant literature and, much to their own surprise, reproduce some of the main findings. As early as 1982 Arrow writes "I hope to have made a case for the proposition that an important class of intertemporal markets shows systematic deviations from individual rational behavior and that these deviations are consistent with evidence from very different sources."[23] Yet, Thaler is the first economist to make drawing economic implications from the psychological findings the central focus of his work. Thaler is the great promoter of Tversky and Kahneman's work in economics, elaborate references to their work occur in almost every publication by Thaler. By 1990 Thaler has collected enough material to publish a book, under the title of *Quasi Rational Economics*, consisting of sixteen of his papers testing the traditional economic models and offering alternatives. In 1993 Thaler edits a book on *Advances in Behavioral Finance* for the RSF, which in 2005 is followed by a second volume under the same title. If Kahneman and Tversky are behavioral economics' theoretical founding fathers, than Thaler is its earliest and strongest advocate.

Specifically, Thaler builds on two lines of Kahneman and Tversky's research. Firstly, Thaler continues Kahneman and Tversky's focus on the biases of EUT, labelling them 'anomalies'. His anomalies column for the *Journal of Economic Perspectives* is the prominent example. Among the anomalies Thaler finds and reproduces from Tversky and Kahneman especially the so-called 'endowment effect' has his main attention. This effect is best seen as an application of the framing effect of Kahneman and Tversky. The idea, as mentioned above, is that individuals' preferences are subject to an initial framing process, that in other words individuals' preferences depend on the initial endowment of their means. The famous and often repeated experiment is the following. Divide a group of subjects randomly in two sub-groups and give one of the two sub-groups a standard coffee mug. Subsequently, ask which price the sub-group with the mug would minimally want to sell the mug for. Also ask subjects of the sub-group without mugs what they would maximally want to pay for the mug. Typically, the willingness to accept (WTA)

[23] Arrow (1982), p.8

will be about twice the willingness to pay (WTP). Apparently, people reframe their preferences upon receiving the mug. In economics this endowment effect can serve for instance as an explanation for the often observed fallacy of taking into account sunk costs[24]. The sunk costs reframe the preferences and because of loss aversion lead to the endowment effect. The endowment effect furthermore falsifies the Coase theorem, which says that for attaining the efficient market allocation the initial endowment of the goods is irrelevant[25].

A second line of research Thaler takes from Tversky and Kahneman is the normative-descriptive distinction. Indeed, Thaler explicitly advocates the introduction of this distinction in economics. In an article on the future of economics Thaler predicts that

> "**Economists will Distinguish Between Normative and Descriptive Theories**
> Psychologists distinguish between two kinds of theories: normative and descriptive. To them, normative theories characterize rational choice: examples would include the axioms of expected utility theory and Bayes' rule. Descriptive theories try to characterize actual choices. [..] Economists have traditionally used one theory to serve both the normative and descriptive purposes. Expected utility theory and the life-cycle theory of saving are rational (normative) models that economists have used as descriptive models."[26]

According to Thaler further theoretical advancement of the normative theory is perfectly fine, but because economists have so long ignored the fact that real-world behavior of individuals does not agree with this theory, they should also pay more attention to building a descriptive theory of economic behavior.

This re-interpretation of economics has (at least) three related implications. Firstly, it leads to a discussion on rationality. Because the normative theory is about rational behavior, the question is what the descriptive theory is about. And here Thaler is not very specific, or at least does not offer a conclusive answer. Behavior that deviates from the normative solution is on a number of occasions referred to as "irrational" or

[24] e.g. Thaler (1980,1987), Tversky and Kahneman (1981)
[25] Kahneman, Knetsch, and Thaler (1990)
[26] Thaler (2000)

"non-rational". A few sentences below the above quote, for instance, Thaler remarks about deviations from the normative theory: "I would not want to call such choices rational"[27]. On another occasion Thaler refers to the normative-descriptive distinction as rational versus emotional[28]. The descriptive theory is also sometimes referred to as a theory of bounded rationality. Most frequently, however, real-world deviations from the normative theory are referred to as 'quasi rational' behavior. Quasi rationality is nowhere precisely defined, but used in opposition to rationality and conceived to be related to bounded rationality. It is perhaps best understood as the failed attempt of people to be rational, which is exemplified by the one definition of the term that I could find: "quasi rational, meaning trying hard but subject to systematic error"[29]. On another occasion it is characterized as "less than fully rational"[30].

A second implication of the appropriation of the normative-descriptive distinction for economics is that revealed preferences are not necessarily the same as true preferences[31]. True preferences are the same as revealed preferences when individuals behave according to the normative theory. However, because of limited cognitive capacities, willpower and so on people fail to act according to the normative theory and by implication their revealed preferences are not necessarily the same as their true preferences. As a result, the revealed preferences may lead to lower welfare compared to the situation in which the true preferences would have been acted upon.

> "we clearly do not always equate revealed preference with welfare. That is, we emphasize the possibility that in some cases individuals make inferior choices, choices that they would change if they had complete information, unlimited cognitive abilities, and no lack of willpower."[32]

Because of their limited cognitive abilities etc., individuals deviate from what they actually want to do.

[27] Thaler (2000), p.138
[28] Shefrin and Thaler (1988), p.611
[29] Thaler (2000), p.136
[30] Thaler (1991), p.xviii
[31] This is my term. Thaler does not have a term for 'non revealed preferences'.
[32] Thaler and Sunstein (2003), p.175

Thirdly, Thaler derives together with Kahneman the implication that for economics the normative-descriptive distinction should be extended with a third, prescriptive part. Building on the previous point, the argument runs as follows. Because revealed preferences are not the same as welfare, the task of the policy maker is to think of policy that induces people to behave more in accordance with their true preferences, and thus more in accordance with the normative theory. The prominent example here is pension saving in the USA[33]. It is known that individuals want to save for retirement. Yet, at the same time it can be observed that people save far less for retirement than they would like to. The task of the policy maker is thus to design a pension plan that induces people to save more, a plan thus that induces individuals to behave more in accordance with their true preferences. One could for instance design a plan in which people pre-commit themselves to invest an increasing share of future wage-rises in their pension funds. A theory that tells the policy maker on a more general level how to make people behave more in accordance with the normative theory is a prescriptive theory. The prescriptive extension of the normative-descriptive theory in economics is defended by Thaler under the heading of "Libertarian Paternalism"[34].

Thaler's main focus is to show that traditional economic theory is descriptively false and to derive economic implications from these findings. A notable exception to this research agenda can be found in the frequently cited Thaler and Shefrin (1981). In this paper, a model is proposed that can explain the discrepancies in the observed intertemporal decision behavior of individuals. This is done by considering the individual as an organization consisting of a farsighted planner and a myopic doer. The myopic doer wants to consume all her income during the month in which she receives it, the planner wants to spread saving and consumption rationally according to the life-cycle hypothesis. The resulting conflict between these two agents is taken to be the same as the conflict between the manager(s) and the owner(s) of a firm. Like the owner in the case of the firm, the planner tries to control the behavior of the doer by a myriad of techniques: she may change the incentive structure (promising to deliver a paper for a conference, paying the manager partly in company shares), she may change the rules (setting a credit limit on

[33] e.g. Cronqvist and Thaler (2004)
[34] Thaler and Sunstein (2003), see also Kahneman and Sugden (2005)

the bank account), and so on. The apparent paradox in intertemporal choice of individuals who want to spread their income more equally over time but at the same time cannot be observed to do so can thus be explained by an economic theory of self-control. In this theory, the individual consists of two agents, a planner and a doer, and in that respect functions similar to the strategic interaction between the owner and the manager of a firm[35].

Thaler distinguishes his work, and behavioral economics generally, from experimental economics of for instance Vernon Smith and Charles Plott. Although Thaler's remarks in this respect are scattered and mostly made in passing, two recurring arguments can be observed. Firstly, Thaler rejects experimental economics' suggestion that the market (institutions) will correct the quasi-rational behavior of the individual. Simply put, if one extends the coffee-mug experiment described above with an (experimental) market in which subjects can trade their mugs, the endowment effect doesn't change one single bit. Furthermore, there is no way in which a rational individual could use the market system to exploit quasi-rational individuals in the case of this endowment effect[36]. The implication is that quasi-rational behavior can survive. As rational agents cannot exploit quasi-rational behavior, and as there seems in most cases to be no 'survival penalty' on quasi-rational behavior, the evolutionary argument doesn't work either.

Secondly, experimental economics' market experiments are not convincing according to Thaler. It makes two wrong assumptions. First of all, it assumes that individuals will quickly learn from their mistakes and discover the right solution. Thaler recounts how this has been falsified in numerous experiments. On the contrary, it is often the case that even when the correct solution has been repeatedly explained to them, individuals still persist in making the wrong decision. A second false assumption of experimental economics is to suppose that in the real world there exist ample opportunity to learn. This is labeled the *Ground Hog Day* argument[37], in reference to a well-known movie starring Bill Murray. According to Thaler, experimental economics' experiments

[35] More on violations of standard economics' account of intertemporal choice follows below. For a critical review of this literature see Davis (2003)
[36] According to Thaler firms on the other hand can correct quasi rational behavior by for instance changing the incentive structure.
[37] The name seems to be coined by Camerer.

are much like the situation of endlessly reliving the same day as it happens to Bill Murray in the movie. Subjects in (market) experiments who have to play the exact same game for tens or hundreds of rounds may perhaps be observed to (slowly) adjust to the rational solution. But real life is more like a constant sequence of the first few round of an experiment. The learning assumption of experimental economics is thus not valid.

Matthew Rabin

Rabin starts his career in the early 1990s. His research circles around the question how to incorporate findings from cognitive psychology into economics. The strategy he mostly follows is to take a standard model from economics, mostly EUT or game theory, show with references to other (behavioral economic) research that the model is descriptively incorrect; and to mathematically adjust the model in such a way that it again is descriptively correct. Let me consider a few examples.

In Rabin (1994), *Cognitive dissonance and social change* it is first set out how the traditional EUT model does not account for moral behavior. Choices in EUT, as Rabin explains, are determined by preferences and beliefs, and all too often economists only regard the preferences. However, also beliefs determine which choices are made. More specifically, the focus of Rabin in this paper is on how morality constraints choice behavior through the belief structure. The recurring example in the paper is that individuals may have a preference for fur coats but still do not buy fur coats because they feel bad about animals being killed for their fur. In the adjusted EUT model Rabin proposes, the moral constraint enters as a quantity threshold above which the individual finds it immoral to buy the good. An outcome of the model is that when preferences and beliefs contradict (that is, when there is a preference for buying a quantity of the good that lies above the threshold) there are two ways to increase overall utility. Either the individual can (try to) change her preferences, or she can (try to) change her beliefs. According to Rabin, the latter will be more difficult. A further implication is that the worse individuals feel about behaving immorally because of social pressure, the more they will attempt to change their beliefs, and the higher will be the consumption of the immoral good. Thus Rabin concludes that a surprising result of his analysis is that social

pressure may, contrary to its purpose, actually increase immoral behavior. Rabin puts his application of EUT to questions outside its direct domain in the tradition of Becker.

> "This paper uses the rational-choice approach traditional among economists to model a largely non-economic issue. Since Becker's (1981) seminal work, rational choice analysis has become more popular as a means of studying phenomena not traditionally studied by economists."[38]

Rabin (1993), *Incorporating Fairness into Game Theory and Economics* does what its title promises, it attempts to adjust the structure of game theory in such a way that it can account for the phenomenon of fairness as observed by for instance Kahneman. The inclusion of fairness is achieved through an adjustment of the pay-off function. One can assume for instance a utility function that partly depends on the pay-off received by others, or one can suppose that individuals receive extra utility if they perceive that the socially beneficial outcome is reached. Rabin shows that when fairness is thus incorporated into well known games like the 'Battle of the sexes' or the 'Prisoner's dilemma' this will change the properties of the equilibria.

Rabin (1998), *Psychology and Economics* is a well-known and often cited overview of the relevant psychology for behavioral economics. It extensively treats psychological research that shows where and how traditional economics goes wrong in describing individual human behavior. Kahneman, Tversky but also Thaler are often cited as examples of researchers who have shown in experiments that people in the real world to not behave according to the traditional theory of economics. Rabin in turn discusses findings that violate 1) stable preferences, 2) unbiased judgments, and 3) the maximization assumption. The recurring message is that economists should incorporate these findings into their models.

A more implicit point of view in the article is that despite all its merits for economics, economics distinguishes itself from psychology in that it is much more rigorous than the latter. That is, Rabin (1998) seems to argue that economists should use the findings from psychology, but then do some rigorous model building and some proper

[38] Rabin (1994), p.189

experimental testing, suggesting that psychology fails in this respect. So Rabin writes in the final lines

> "While none of the broad-stroke arguments for inattention to psychological research are compelling, obviously not all psychological research will be both confirmed by field data and proven to be of great economic importance. Indeed, abandoning the view that hypotheses departing from rationality, self-interest, or other habitual assumptions are methodologically illicit can free us to evaluate these hypotheses with the same rigorous standards that our discipline, at its best, applies elsewhere."[39]

O'Donoghue and Rabin (2003) is a contribution to behavioral economic research on paternalism. The authors start their paper by observing that "A great deal of evidence suggests [..] that in some contexts people make errors that lead them not to behave in their own best interests"[40]. Subsequently they develop a model of a two goods (potato chips and carrots) economy in which the individual as a result of weak self-control consumes more of the not-so-good good (potato chips) than she would want to. In traditional economics, a government that needs to impose a tax should tax both goods equally, or even tax the good with the lowest price-elasticity. In a situation where the individual has weak self-control, however, the authors show that society is best off taxing the not-so-good good, and the government may in some situation even increase overall welfare this way.

Eyster and Rabin (2005), a lengthy *Econometrica* article, introduces a new sort of equilibrium to the already extensive list of equilibria in the game theory literature. The so-called 'cursed equilibrium' occurs when players correctly predict the (distribution of) the other players' actions, but underestimate the value of the private information of the other players this reveals. More specifically, the cursed equilibrium "assumes that each player incorrectly believes that with positive probability each profile of types of the other players plays the same mixed action profile that corresponds to their average distribution

[39] Rabin (1998), p.41
[40] O'Donoghue and Rabin (2003), p.186

of actions, rather than their true, type-specific action profile"[41]. The contribution of the cursed equilibrium is that it "explains many behavioral departures from Bayesian Nash equilibrium that existing alternatives cannot [explain]"[42]. Consider the example of a possible transaction of 1000 euros in a lemon market for a car that is worth 0 euros to both buyer and seller if it is a lemon, and 2000 euros to the seller and 3000 euros to the buyer if it is a peach. Assume furthermore that the buyer considers the probability of a lemon or peach to be ½. A fully rational buyer would never agree to trade, knowing that the seller would only agree to sell if the car were a lemon. However, as soon as the buyer beliefs with positive probability *?* that the seller will sell with probability ½ irrespective of the car's type, she will whish to buy the car when *?* > 2/3.

George Loewenstein

Loewenstein finishes his PhD at Yale in 1985 and publishes his first article in 1987[43]. From his first publications onwards he has been a strong proponent of more psychology in economics. In contrast to some other behavioral economists he is relatively little directly influenced by the work of Tversky and Kahneman. Instead, an important theoretical influence comes from the work of Jon Elster, with whom he writes a few articles and edits a book for the behavioral economics series of the RSF, called *Choice over Time* (1992)[44]. Loewenstein expresses a relatively extensive knowledge of the history of economic thought. Throughout his work there are along the more usual Adam Smith and Alfred Marshall citations extensive discussions of Jeremy Bentham, John Rae, Nassau Senior, father and son Jevons, von Böhm-Bawerk, and Irving Fischer. Loewenstein's main theoretical interests are time-discounting and phenomena that I summarize here under the most frequently employed term: self-serving bias. Of the behavioral economists Loewenstein is the most explicit critic of experimental economics.

Loewenstein's historical publications[45] are on the history of psychological and economic explanations of intertemporal choice and utility. These publications reveal a

[41] Eyster and Rabin (2003), p.1624
[42] Eyster and Rabin (2005), p.1633
[43] http://sds.hss.cmu.edu/faculty/Loewenstein/vitae_5.pdf
[44] See for a discussion on Elster's work on decision-making Davis (2003)
[45] e.g. Loewenstein (1992), Elster and Loewenstein (1992), and Frederick, Lowenstein, and O'Donoghue (2002)

relative extensive knowledge of the history of economic thought and employ the historical discussion for the advancement of a theoretical argument. That is also the major drawback of this work. Loewenstein's historical publications could easily be dismissed as Whig-history: they employ historical discussions to show how great and fundamentally necessary behavioral economics is. At the risk of simplification, Loewenstein's historical argument may be summarized as follows.

Since the eighteenth century numerous economists, philosophers and psychologists have discussed the phenomenon of intertemporal choice. In a comment on, and extension of Adam Smith's work, John Rae discussed a number of factors that influence (economic) decision making over time, such as differences in the accumulation of capital (depended on the surplus of labor devoted to the production of capital as opposed to consumption), brevity and uncertainty of human life, and abstinence, "the psychological discomfort of deferring gratification"[46]. Also for instance Nassau Senior and Stanley Jevons were well aware of the fact that different factors influence the process of intertemporal choice and that this may differ across situations and goods. The number of factors influencing intertemporal choice was reduced in the work of von Böhm-Bawerk and Fisher but still allowed for some flexibility in factors influencing intertemporal choice. In close relation, there were in the eighteenth and nineteenth centuries extensive discussions of the precise meaning and content of the concept of utility. Bentham famously discussed seven[47] factors influencing the utility derived by the individual. After that, economists such as Nassau Senior, Jevons, Marshall and even Keynes extensively discussed the different psychological characteristics of utility. Both things changed with Samuelson. Although Samuelson did not believe in the normative and descriptive merits of his model he reduced (normative and descriptive) intertemporal discounting to one, sole possibility: exponential discounting. In a related move the concept of utility was stripped of all its psychological connotations and behavioristically defined as the ordinal measurement of revealed preferences. Therewith, the exponential discounting utility model (DU) was born. From the 1970s onwards, however, an increasing flow of empirical and theoretical work in psychology and economics showed

[46] Loewenstein (1992), p.6
[47] Or eight, or nine? There seem to be some discrepancies in Loewenstein's accounts.

that the DU model is both normatively and descriptively false. Behavioral economics builds on and extends this work.

For Loewenstein the problem of the DU model is not just that individuals (also) discount hyperbolically, but goes further. For instance, individuals can be shown to sometimes use a negative discount rate.[48] When individuals prefer an increasing real-wage over a constant real-wage, even when the present value of the latter is higher than the former they effectively employ a negative discount rate. But perhaps even more destructive for economics is the fact that individuals' intertemporal choices can be shown to be fundamentally inconsistent[49]. People who prefer *A now* over *B now* also prefer *A in one month* over *B in two months*. However, at the same time they also prefer *B in one month and A in two months* over *A in one month and B in two months*. When faced with an intertemporal choice individuals in other words like to save the best for last, which is in fundamental disagreement with economic theory. Another, by now famous descriptive falsification of the DU model is the research on New York City Cab drives who judge their income "one day at a time"[50].

But the DU model fails not only descriptively, also normatively it does not work. There does for example not seem to be a good reason to suppose that somebody who is indifferent between oranges and apples today also should be indifferent between 1) apples today, oranges tomorrow, and apples the day after and 2) apples three days in a row. Despite its aesthetic merits of mathematical simplicity and consistency, there is little normative and descriptive reason to hold on to the DU model. Loewenstein is ambiguous on how to proceed from these problems with the DU model. On the one hand a number of publications show the rather fundamental problems with the DU model and the associated problems with utility[51], on the other hand Loewenstein tries on different occasions to extent the DU model so that it again (normatively and descriptively) works. For instance, he builds a mathematical model that can accommodate a lot of the observed behavior[52]. The discount factor here is generalized to $1/(1+at)$, where a can be exogenously given or

[48] Loewenstein and Prelec (1991)
[49] e.g. Prelec and Loewenstein (1997). Here a reference is made to Friedman and Savage (1948,1952) who face an analogous problem in explaining both gambling and insurance behavior.
[50] Camerer, Babock, Loewenstein, and Thaler (1997)
[51] Loewenstein (1992, 1999), Loewnestein and Prelec (1991), Prelec and Loewenstein (1997), Frederik, Loewenstein and O'Donoghue (2002)
[52] e.g. Loewenstein and Prelec (1992)

determined by another function. He has also turned his attention to neuroscience as a possible (theoretical) solution[53]. A general theory or conclusive answer, however, is as yet lacking.

Loewenstein's second main theoretical interest is the self-serving bias[54]. The key idea of this research is that people overestimate their own judgment capacities; and that the judgment of one's position is (partly) dependent on the situation and circumstances in which the choice is made. These biases can explain a number of phenomena. It explains why defendant and plaintiff often have such difficulty in negotiating a fair solution, and why unions and government representatives need so much time to negotiate a fair rise in wage. In a slightly different way it also offers an explanation for the fact that more than 50% of the people think they are better-than-average drivers. This happens because people have different standards of good driving[55].

Throughout his work and in one publication explicitly[56], Loewenstein positions behavioral economics in oppositions to experimental economics. He formulates this critique in the "psychological distinction" of external versus internal validity. Under the heading of external validity, Loewenstein sees four problems with experimental economics. Firstly, experimental economics puts a great emphasis on the use of auctions in its experiments. As people in reality hardly ever find themselves in an auction situation it is doubtful how much these experiments tell us about economic behavior in the real world. Secondly, Loewenstein disagrees with experimental economics' use of repetition. This is the *Ground Hog Day* argument, as mentioned above. In reality, people do not have to make the exact same decision forty times in a row. Real world behavior is much more like the first few rounds of an experiment than the last. Thirdly, Loewenstein criticizes experimental economists on their tendency to reduce real-world content to the absolute minimum possible. Apart form the fact that a content-free[57] experiment is an illusion, it also greatly reduces the external validity of the experiments. Economists should instead, like Loewenstein himself, make the experimental situation as congruent

[53] e.g. McClure, Laibson, Loewenstein, and Cohen (2004), discussed below.
[54] e.g. Babock, Loewenstein, Issacharoff, and Loewenstein (1995), Babock, Wang, and Loewenstein (1996),van Boven and Loewenstein (2003), Loewenstein (2005)
[55] Interestingly, this falsifies the same often employed example of Thaler.
[56] Loewenstein (1999)
[57] Loewenstein both uses 'context' and 'content' in this context.

with reality as possible; hence make the experiment "context-rich". Fourthly, experimental economists wrongly assume that monetary rewards results in strict control over incentives. It has been shown in numerous experiments that this is not the case. Also with monetary incentives, subjects are likely to be (also) driven by other motives than profit maximization. Finally, a problem of internal validity that Loewenstein sees is the fact that experimental economists are far too careless in not using randomization and in comparing experimental results that were obtained under different circumstances.

Colin Camerer

Camerer finishes his PhD in behavioral decision theory in 1981 at the age of twenty-two[58]. To some extent he is an example of the stereotypical (American) economist. Firstly, Camerer is a champion of the 'publish or perish' culture pervading contemporary economics. During his now twenty-five years career he has published seventy-six articles in mostly top journals, has contributed with thirty chapters to different books, and has written one and edited four books of his own[59]. Secondly, Camerer almost explicitly looks down on the other social sciences and portrays economics as their queen. For instance, in a methodological comment on sharing data or experiment instructions with other researchers he notes: "If you asked a psychologist for data or instructions he or she might be insulted, because the convention in that field is to give the writer the benefit of the doubt"[60]. When discussing the results of the interdisciplinary project on the ultimatum game in fifteen small-scale societies Camerer remarks: "interdisciplinary research is hard work but worthwhile. The project came together only after Boyd, Henrich and other anthropologists learned enough about game theory and experimental methods to produce clean data. The anthropologists repay the debt by producing surprises and broadening economists' vision"[61]. Thirdly, Camerer regularly uses Whig-hirstorical arguments that do so little justice to actual historical development that the reader is left to suppose that Camerer is intentionally naïve. Experimental economists, according to Camerer, "test the Adam Smith/Hayek hypothesis that, even if players knew only their own values, they

[58] His thesis supervisor is Robin Hogarth, decision theorist, moderate critic of Kahneman and Tversky and nowadays allied with Gigerenzer in an 'ecological rationality' approach towards human decision making.
[59] http://www.hss.caltech.edu/~camerer/5-06vita.doc
[60] Camerer (2003a), p.34/35
[61] Camerer (2003a), p.74

could still converge to a Pareto-efficient equilibrium"[62]. As far as the history of game theory is concerned, Camerer asserts: "Game theory was created to provide a mathematical language for describing social interaction. Since then, game theory has become the standard tool in economics"[63]. In another example, the counterfactual history is coupled with the typical joyous writing style Camerer often employs. If George Mason in 1787 had not assured equal status for every new state, "I might be writing this in the great *country* of California, under the political aegis of California President Arnold Schwarzenegger and Vice-President Shaquille O'Neal, rather than under the rule of George Bush, the minority choice of voters in the impoverished neighbor country America, to our east."[64]

Camerer's work circles around game theory. After his PhD Camerer continued for some time to write papers in behavioral decision research, but from halfway the 1980s on his use of game theory has been steadily growing to the all embracing conceptual framework it has been over the last ten years. Camerer coined the term *behavioral game theory* in 1990, and his research in this field culminated in 2003 in a book under the same title. It is probably no exaggeration to say that where for Kahneman and Tversky there are no situations that can *not* be understood as decision-making under uncertainty, Camerer considers everything that involves human beings to be basically a problem of strategic interaction.

Camerer divides the social sciences into three approaches that are connected by their use of game theory[65]. Firstly there is the normal, or what he sometimes calls "rational" game theory. This is the game theory that governments use to design the most profitable auction for telecommunication licenses, and which consultants hired by the companies use to get the licenses for the lowest price possible. Secondly, there is behavioral game theory, which uses game theory to model the behavior of real-world individuals. In practice this means that it tries to find ways to accommodate individuals' deviating behavior from the rational solution within the game theoretical framework[66]. A common strategy is to adjust the utility function. For instance, when individuals are

[62] Camerer (2003a), p.36
[63] Camerer (2003a), p.465
[64] Camerer (2003a), p.44
[65] Briefly and clearly spelled out in Camerer (2003b)
[66] Rabin and Laibson can be considered examples that fall in this category.

modeled to derive utility from being fair to others, it becomes 'rational' to not give the optimal minimum in the ultimatum game. Another solution used is to let go of the idea that preferences are exogenous, on which more below. Thirdly, there is evolutionary game theory "which explains equilibration in animal populations by natural selection, and imitation among humans (social selection)"[67]. An important reason to use game theory in all these approaches is that it links economics to "other sciences" that use "the same tools to model interactions" at "different scientific levels (genes, firms, nation-states)"[68].

A number of examples could be given of behavioral game theory studies that solve real-world deviating behavior by relative innocent solutions such as incorporating social considerations in the utility function[69]. However, a study that deserves extra attention because it goes a step further than the standard behavioral economics is the large interdisciplinary study of the ultimatum game in fifteen small-scale societies[70]. The motivation for the study is the following. The ultimatum game (player one proposes a division of a fixed sum of money, player two either accepts (the money is divided according to the proposed division), or rejects (both players get nothing)) has been played all over the world and leads always to the result that individuals do not play the 'optimum' (player one proposes the smallest amount possible to player two and player two accepts), but typically divide the money about half-half. The phenomenon is remarkably stable around the globe. However, the experiments have only been done with university students in advanced capitalist economies. The question is thus whether the results hold when tested in other environments.

The surprising result is not so much that the average proposed and accepted divisions in the small-scale societies differ from those of university students, but how they differ. Roughly, the average proposed and accepted divisions go from [80%,20%] to [40%,60%]. The members of the different societies thus show a remarkable difference in the division they propose and accept. Camerer and his fellow researchers correlate these differences with two economic characteristics of the small-scale societies. Firstly, they

[67] Camerer (2003), p.1674
[68] Camerer (2003), p.1673
[69] e.g. Camerer and Weigelt (1988), Fehr and Gächter (2001), Rabin (1993)
[70] The research has been published in a number of journals. The most extensive discussion can be found in the book devoted to it, see Henrich, Boyd, Bowles, Camerer, Fehr and Gintis (2004). An interesting reflection on the research summarized by Henrich can be found in Gigerenzer and Selten (2001).

document how much a group's (normally the family) economic welfare depends on co-operation with other groups within the small-scale society. In this respect the societies differ sharp from almost none to almost completely. Secondly, the researchers investigate how much the group's economic welfare depends on market exchange. There also turn out to be differences in the level of market integration. The researchers conclude that differences in the behavior of individuals of the different societies in the game should be attributed to differences in the environment in which they live. Preferences are hence not exogenous, but determined by the environment. In a brief summary of their research for the *The American Economic Review*, Camerer and his collaborators state this explicitly:

> "preferences over economic choices are not exogenous as the canonical model would have it, but rather are shaped by the economic and social interactions of everyday life. This result implies that judgments in welfare economics that assume exogenous preferences are questionable, as are predictions of the effects of changing economic policies and institutions that fail to take account of behavioral change."[71]

Giving up the exogeneity of preferences has far reaching implications, if only because it is a clear distinction from such behavioral economists as Tversky, Kahneman, and Thaler. For the moment, however, the theme has not been worked out. What can be noted is that it brings Camerer close to 'ecological rationality' research of for instance Gigerenzer. A further indication in this direction is that Boyd, one of the researchers of small-scale societies study, is generally conceived to be closely related to Gigerenzer's work.

Unlike for instance Loewenstein, Camerer has not put together his criticisms of experimental economics. Yet, they frequently pass by if the opportunity occurs. Camerer's critique is similar to Loewenstein's and can perhaps best be summed up with the conclusion that for Camerer there is no invisible hand. That is, for Camerer nothing mysterious happens between the behavior of the individual and the behavior of the market. If you know the behavior of the individuals, you can add up these behaviors to

[71] Henrich et.al. (2001), p.77

obtain the behavior of the market. In Anderson and Camerer (2000), for instance, it is shown that even when one allows learning to take place, a key issue for experimental economics, the game does not necessarily go to the global optimum, but as a result of path-dependency may easily get stuck in a sub-optimum. Camerer (1987) shows that, contrary to the common belief in experimental economics, decision biases persist in markets. In a laboratory experiment Camerer finds that a market institution does not reduce biases but may even increase them. As a final example, Camerer and Kunreuther (1989) conclude in a thorough overview of Kahneman and Tversky style decision research that:

> "It is usually presumed in economics that competition and other forces make market outcomes more rational than individual choices. Camerer (1987) found, however, that the tendency to overgeneralize from a small sample of data (as people often do after unusual accidents) was not reduced by market forces. More generally, it is unclear how policy tools like incentive mechanisms and regulations affect individual behavior in a market context when there is uncertainty and information asymmetry."[72]

David Laibson

Laibson finishes his PhD and therewith starts his academic career in 1994. He has been working at Harvard University since 1994. Laibson is the only one appearing in our list of prominent behavioral economists, but there are in fact a number of well-known behavioral economists from Harvard University. Along with Laibson, for instance Andrei Shleifer and Sendhil Mullainathan are mostly interested in the implications of behavioral economics for finance[73]. All three use a mathematical approach. As an example of this research, I will consider a number of prominent articles of Laibson.

[72] Camerer and Kunreuther (1989), p.585

[73] An earlier generation of Harvard economists interested in the same topic include Larry Summers, who appears with a number of publications in Thaler (1993).

The primary research aim of Laibson is violations of the traditional economic idea of exponential discounting[74]. His articles are a mix of experimentally corroborating this phenomenon, building mathematical economic models that account for the observed systematic deviations, and investigating the psychological and neurobiological substrates of the observed behavior. In Laibson (1997), *Golden Eggs and Hyperbolic Discounting*, Laibson builds a mathematical model of agents with hyperbolic discount functions that can explain a myriad of dynamically inconsistent preferences of individuals observed in experiments. "Golden Eggs" refers to the traditional, rational economic individual decision model. In Laibson's model, the individual is faced with an "imperfect commitment technology", which working has to be initiated one period before it starts to work. Together with the hyperbolic discount function this model "predicts" that individuals' consumption will closely track the progress of their income, but that with the "imperfect commitment technology" individuals are capable to correct their hyperbolic discount functions by committing themselves in advance to their desired savings behavior. Ipso facto the model predicts that with "financial innovation" savings rates will go down because commitment technology needs no longer be started up one period in advance. This may according to Laibson provide an explanation for the ongoing decline in U.S. saving rates. "Financial innovation" should be interpreted broadly here. It does not only comprise new saving plans by banks, but also changes in "social commitment devices" such as marriage, work and friendship. The idea, which goes back to Laibson's PhD thesis, is that a decrease in the strength of the structure and/or duration of long-term social commitments increases the possibility to act according to the short term, hyperbolic discount function.

Furthermore, the model predicts that independent of the individual's wealth, Ricardian equivalence is violated. Ricardian equivalence is the postulate that an increase in government spending will be off-set by an increase in households' saving rates due to the latter's anticipation of necessary future tax increases. Finally, the dynamically inconsistent preferences resulting from hyperbolic discounting may lead to a welfare reduction after financial innovation. Financial innovations allows individuals' short term,

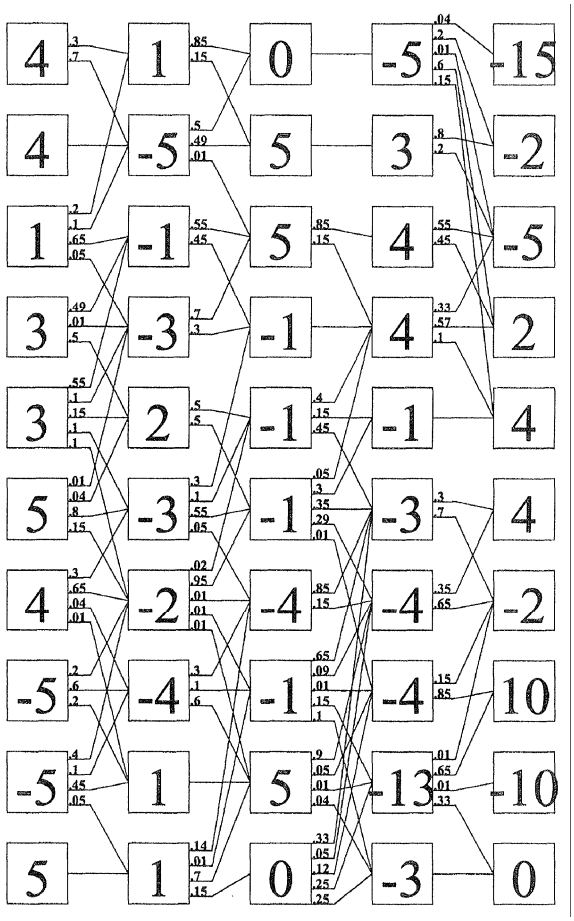
[74] This is of course strongly related to Loewenstein's work, although Loewenstein places less emphasis on hyperbolic discounting as a solution for the observed violations of the traditional explanation.

hyperbolic discount functions to override their long term, rational discount functions. Under certain conditions, the result may be a reduction in welfare (from a rational, long-term perspective).

Glaeser, Laibson, Scheinkman and Soutter (2000), *Measuring Trust*, sets itself to the task of experimentally testing and measuring trust and trustworthiness. Knowledge of these phenomena is a "great lacuna" in the "research agenda" investigating the role of "social capital" in "economic and political phenomena". The authors provide many details about their two different experimental set ups and give an extensive discussion and analysis of their findings. Firstly, they find that "trusting behavior has a stable individual-specific component", which is positively correlated with both level of education and age. The relation runs in two directions. Both the older and the better educated an individual, the more trusting and trustworthy she will be. Secondly, also trustworthiness is a stable phenomenon and is strongly correlated with "attitudinal survey questions". "In summary, to determine whether someone is trusting, ask him about specific instances of past behaviors. To determine whether someone is trustworthy, ask him if he trusts others."[75]

In Gabaix and Laibson (2000), a *Boundedly Rational Decision Algorithm* is developed and its results compared with a "fully rational" algorithm. The following simulation is constructed. Consider a five-level decision tree that at each level (including the first) has ten different pay-off boxes and between one and five connections to the next level. Each of the pay-off boxes' possible connections to the next level has a certain probability, with the added probability of the connections of one box always amounting to one. An example of such a randomly generated decision tree looks like this.

[75] Glaeser, Laibson, Schinkman and Souter (2000), p.840



Source: Gabaix and Laibson (2000), p.434

A fully rational decision algorithm that has to choose in which of the ten first level boxes to start would calculate the expected pay-off of each box and then make the decision. However, this would require a considerable amount of computational capacities and time. The authors take it from Simon that both are often not available. They consider three 'boundedly rational' alternative algorithms: i) FTL, which ignores probability paths of less than 0.25, ii) column cut-off, which ignores one or more of the last columns, and iii) discounting, which discounts the values of later columns. Of these three alternatives, FTL comes closest to the fully rational outcome. Furthermore, it closely matches behavior of subjects in an experiment who were faced with the same task. Thus it is concluded that individuals' behavior may be explained in terms of this boundedly rational algorithm.

Harris and Laibson (2001), *Dynamic Choices of Hyperbolic Consumers*, further elaborates the idea of hyperbolic discounting. It tries to link the short term, hyperbolic

discounting with the long term (rational) exponential discounting and shows how individuals may act as if they prevent their own future overconsumption. The paper starts with the traditional discounting function for individuals and replaces the constant discount factor *d* with an "effective discount factor". This effective discount factor consists of the sum of two components, the "long-run discount factor *d*" and the "short-run discount factor *ßd*", where hyperbolic discounting implies *ß* < 1. The traditional discount factor is hence explicitly decomposed in a long-run, exponential component, and a short-run, hyperbolic component. The assumption is that individuals, faced with "stochastic income" and a "borrowing constraint", anticipate their future inclination to hyperbolically discount (and thus to overconsume), and want to act against it.

> "Since ß<1, the effective discount factor is negatively related to the future marginal propensity to consume (MPC). To gain intuition for this effect, consider a consumer at time 0 who is thinking about saving a marginal dollar for the future. We assume that this consumer acts strategically in an *intra*personal game where the players are temporally situates "selves." The consumer at time zero –'self 0'- expects future selves to overconsume relative to the consumption rate that self 0 prefers those future selves to implement. Hence, on the equilibrium path, self 0 values marginal saving more than marginal consumption at any future time period. From self 0's perspective therefore, it matters how a marginal unit of wealth at time period 1 will be divided between savings and consumption by self 1. Self 1's MPC determines this division. Since self 0 values marginal saving more than marginal consumption at time period 1, self 0 values the future less the higher the expected MPC at time period 1."[76]

In the equilibrium, self 0 will reduce her savings rate (and therewith here future income) to the point where her preference for self 1's savings rate will be equal to self 1's actual savings rate. In other words, because individuals know they will discount hyperbolically in the future, they will also discount hyperbolically now. In the equilibrium the two selves have maximized the combination of their preferences. The effective discount rate is a function of a "time preference" (the difference between

[76] Harris and Laibson (2001), p.936

preferences of self 0 and self 1) and an anticipation of future MPC. Hyperbolic discounting is thus explained as resulting from a strategic game with future selves.

As the title suggests, Glaeser, Laibson and Sacerdote (2002), *An economic approach to social capital*, provides an explanation for the phenomenon of social capital in economic terms. Social capital is defined as "a person's social characteristics – including social skills, charisma, and the size of his Rolodex- which enables him to reap market and non-market returns from interactions with others."[77] Drawing on characteristics of social capital appearing from empirical studies, the authors show that the investment of individuals in the accumulation of social capital is consistent with the traditional economic ideas of investment. Individuals invest in social capital when the expected gains are higher than the costs. That said, the authors content that it is rather difficult to measure the accumulation and pay-off of social capital and express the hope that future (economic) research will further explore this issue.

Laibson (2003) is a summary of his work on hyperbolic discounting for the *Encyclopedia of Cognitive Science*. This entry is interesting because Laibson, like Loewenstein, explicitly rejects the traditional economic theory both positively and normatively.

> "[The theory of exponentially discounted utility] has normative and positive content. It has been proposed as both a description of what people *should* do to maximize their well-being, and to describe what people *actually* do when faced with intertemporal decisions. Both applications of the model are controversial."[78]

A final article worth mentioning is McClure, Laibson, Loewenstein, and Cohen (2004), *Separate Neural Systems Value Immediate and Delayed Monetary Rewards*. The research described in the article looks for, and finds evidence for neurobiological substrates for the two components of the effective discount factor as described above. When faced with delayed monetary rewards while in a MRI-scanner, subjects' brains show peaks of activity in parts of the brain associated with rational behavior (in this case

[77] Glaeser, Laibson, and Saccerdote (2002), p.F438
[78] Laibson (2003), p.3

the lateral prefrontal cortex and the posterior parietal cortex); when faced with immediate rewards the limbic system associated with the midbrain dopamine center is especially active. The authors take their findings as evidence that when faced with the choice between an immediate reward and a higher future (thus 'expected') reward, the two parts of the brain strive for dominance. The limbic system is especially sensitive to immediate rewards and will signal to choose the immediate reward. The prefrontal cortex is more sensitive to the higher expected pay-off and will signal for the delayed reward. In other words, the experimental results are taken as evidence for the difference between the short-term, hyperbolic discounting; and the long-term, rational exponential discounting.

The two faces of American behavioral economics

Now that we have investigated who the most important behavioral economists are and what they think, the question is what general story emerges from this account. A first observation is the important role of the Russell Sage Foundation in the development of behavioral economics. Researchers and books that are now considered to be part of the core of behavioral economics all extensively acknowledge their debt to the long-term financial support of the RSF. When in turn we look at who according to the RSF are the most important behavioral economists it is clear that at least the core of behavioral economics should be seen as primarily an American movement. Most of the members of the BER are American and/or have been working at American universities and institutes for the largest part of their academic careers.

Looking at the research of the seven most visible scientists of this roundtable, the picture that emerges is that what defines behavioral economics is the view that economics is primarily about rational[79] individual human beings that have to make decisions in an uncertain world. As a rough estimate, behavioral economics in that sense can be distinguished from economics of the Adam Smith/Hayek/Vernon Smith type, which is about the behavior of markets. Behavioral economics furthermore positions itself in opposition to traditional economics, by which we may understand the neoclassical economics that is based upon Samuelson. However, given this clear distinction from

[79] I leave aside here a discussion on what rationality in this context exactly means, on which exists an extensive literature. Suffice it to say that the behavior (behavioral) economics is interested in is at least not fair, emotionally distressed, or mentally impaired etc. behavior.

other types of economics, two relatively different theoretical branches can be distinguished within behavioral economics.

The first theoretical branch is organized around the work of Tversky, Kahneman and Thaler. It argues that the uncertainty the individual is faced with is of a fixed, or exogenous nature. This uncertainty can be found in the flipping of a coin, the weather broadcast for tomorrow and disposable income five years hence. The theory to analyze this decision behavior under uncertainty is decision theory. Modern decision theory finds its origin in post World War Two research in applied mathematics, psychology and economics and celebrates as its most important founding father Savage and his *Foundations of Statistics* (1954). Behavioral economics of the first branch favors Kahneman and Tversky's normative-descriptive distinction. Normative here is best understood as the objective, psychophysical benchmark with which the researcher compares human behavior[80]. Following Kahneman and Tversky, the first branch of behavioral economics strives to build a descriptive theory of individual human decision behavior under exogenous uncertainty. Because it is shown, again following earlier work of Tversky and Kahneman, that the normative and the descriptive decision often are not the same, an implication that the first branch of behavioral economics draws is that the revealed preferences of individuals are not always the same as their underlying real preferences. Or, as Thaler and Sunstein (2003) put it, revealed preferences are not necessarily the same as welfare. From this follows an urge to policy makers to implement or change policies in such a way that it induces individuals to behave more in accordance with (their) normative decision. The research that investigates how the policy maker should do this is summarized under the heading of prescriptive economics. The first branch of behavioral economics thus wants economics to adopt a normative-descriptive-prescriptive distinction.

The second branch of behavioral economics is organized around Camerer, Loewenstein, and Laibson. It considers the uncertainty of the decision behavior to be of an endogenous or strategic nature. That is, the uncertainty depends upon the fact that, like the individual, also the rest of the world tries to make the best decision. The most important theory to investigate individual decision behavior under endogenous

[80] Heukelom (2006)

uncertainty is game theory. The second branch of behavioral economics draws less on Kahneman and Tversky. What it takes from them is the idea the traditional Samuelson economics is plainly false. It argues, however, that traditional economics is both positively/descriptively *and* normatively wrong. Except for a few special cases, it neither tells how the individuals behave, nor how they should behave. The main project of the second branch is hence to build new positive theories of rational individual economic behavior under endogenous uncertainty. And here the race is basically still open. Prominent literature in the second branch by for instance Rabin, Camerer and Laibson incorporates the experimental findings into game theoretic models, where the main approach is to adjust the utility/pay-off function in such a way that the experimental results can be explained as a game-theoretic equilibrium. But the rapid rise of neuroeconomics, another defining characteristic of the second branch, perhaps points in a different direction. The second branch, in other words, knows that traditional economics is positively and normatively false, and that the best tool to build new theories is probably game theory. Bu where to go from there remains as yet an open question.

Conclusion

Samuelson's claim at the beginning of this paper that a falsification would have little effect on his economics remains largely an open question. On the basis of the overview provided in this paper, however, two developments can be observed. With respect to the first branch of behavioral economics, Samuelson is probably right. Although the first branch proposes some radical changes to traditional economics, it protects Samuelson's economics by labeling it a normative theory. Kahneman, Tversky, and Thaler propose a research agenda that sets economics off in a different direction, but at the same time saves traditional economics as the objective anchor by which to stay on course.

The second branch in behavioral economics is potentially much more destructive. It rejects Samuelson's economics both as a positive and as a normative theory. By doubting the validity of the exogeneity of preference assumption, introducing the social environment as an explanatory factor, and promoting neuroscience as a basis for economics, it offers a range of alternatives for traditional economics. With game theory it

furthermore possesses a powerful tool that is increasingly used in a number of related other sciences.

Much will depend on the direction in which behavioral economics will develop and how much will be taken up by the economic community at large. From the sight of it, it seems that despite the importance of Kahneman and Tversky's work and the promotion of their work by Thaler, the second branch in behavioral economics has become the dominant part. As far as the rest of the economic community is concerned, it may be guessed that as long as behavioral economics does not have a theory for market behavior and macroeconomic phenomena, it will at most be integrated with existing theories.

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