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CONSENT AS A RATIONAL CHOICE

PHILOSOPHICAL, INSTITUTIONAL AND EMPIRICAL APPROACHES

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To my loving husband

who supported and encouraged me

in every thinkable way,

and without whom

none of this would be possible.

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PREFACE & ACKNOWLEDGMENTS

The subject of the rationality of individuals attracted my interest since my graduate studies in cognitive sciences. The research for my master's dissertation was with patients that suffered from aphasia – a kind of language and communication disorder - as a consequence of brain lesions and it was mainly conducted in neurological clinics and hospital environments, where one could witness all sorts of brain and cognitive impairments (Foka-Kavalieraki et al. 2008; 2014). What was shocking to me then was how a tiny physical damage in the brain could result in major cognitive and behavioral disabilities. But what was even more amazing was how the brains of many patients could recover from such serious ailments and regain partial or full functionality. My scientific interest thus started shifting from pathological to healthy brains and minds until I focused on the studying of higher reasoning, decision making and problem solving. When does rationality succeed and when does it fail? Individual consent, as a fundamental condition of so many important aspects of human choice, public and private, helped me focus even more on the understanding of choice and rationality.

I was lucky enough to win a most prestigious scholarship for Ph.D. candidates in Greece (Heracleitus II), which was co-financed by the European Union and Greek national funds, and which helped me financially through the difficult years of the ongoing economic crisis. I am very grateful for this.

For the completion of my thesis I would like to express my sincere gratitude to my advisors Prof. Dionysios Anapolitanos (chair), Prof. Stavros Drakopoulos and Prof. Andreas Papandreou for their support and guidance of my Ph.D study and research.

As a PhD candidate, I have presented my work in decision making and consent in numerous conferences, seminars and workshops in Greece and abroad. I truly wish to thank all those participants, professors, senior and junior scientists and fellow researchers that have encouraged my research with their useful comments and discussion through the years. I am also thankful to all the students, undergraduate and graduate, who suffered my enthusiastic presentations and enlightened me with their insightful discussion in the seminars I have taught at the University as a teaching assistant. Special thanks to Prof. Michel Zouboulakis for giving me the manuscript of his book *The Varieties of Economic Rationality* before its publication.

I would also like to thank Prof. Aristides Hatzis for his continuing support, guidance and cooperation in many parts of my research and especially for the collaboration which resulted in the ideas presented in sections 2.3 (a section which draws heavily from a joint paper we wrote) and 3.5 (a section which briefly presents a series of preliminary experiments we ran in various of his classes).

On a more personal note, I would like to thank all my family and friends who encouraged me through the years of my PhD studies.

ABSTRACT

Consent is a fundamental concept of political and moral philosophy and a cornerstone for social sciences such as economics and the law. Genuine consent is assumed to be given by rational individuals, so rationality is perhaps the most important condition for any consensual activity. If we consider consent to be a voluntary choice among available alternatives, then genuine consent is a rational choice. As we examine the question of human rationality, we explore the various aspects of the concept of rationality, the theories that have been suggested and the evidence that have been documented by social and behavioral scientists in the field of decision making and problem solving. For the purposes of our analysis we use an economic approach and we follow the discussion of economic rationality within the broader sense of choice behavior. We also present a series of preliminary experiments where we report the presence of an Intellectual and Moral Attribution Bias. When participants are asked to assess their own behavior and that of others, for the same matter, they tend to attribute rational motivation to self and irrational or immoral motivation to others, thus indicating that people are biased against the rationality and authenticity of the consent of others. We further present the criticism of axiomatic and instrumental rational choice theory by behavioral economics and we discuss the issues of social planning and individual consent in the private or public sphere. We then go on to

present evidence from other social, behavioral and psychological sciences that are critical of the findings and assumptions of behavioral economics. The defenses of rational decision making in real life seem to be overwhelming and economic or social models should be informed of a more inclusive framework of rationality. Nevertheless, consent, even when it fulfills the condition of rationality and adequate information, can never be unconstrained. However, this does not mean that the presence of constraints equals with coercion. In order to distinguish between coerced consent and consent among hard - but desirable - choices, we begin our thesis by presenting an easy-to-use criterion.

He alone is free who lives with free consent under the entire guidance of reason.

Baruch Spinoza, *A Theologico-Political Treatise* (1670) V.XLVIII

We're all pretty rational. It's quite a robust thinking system that we've got between our ears. But what's going to happen, and has been happening for several millennia now, is we're going to develop more and better thinking tools and we're going to identify more weaknesses in our rationality. […] We probably can't repair them with any technology. We might not want to repair them. The cost might be too great; might stunt us in some other way. But at least we can nail them.

Daniel Dennett (*The Big Idea*, March 2009)

INTRODUCTION

Consent, a uniquely human cognitive and behavioral trait, is one of the most significant concepts in philosophy, law and social sciences because it pertains to so many common and very important public and private settings of the social, political and economic life. This makes consent a fundamental cornerstone for political and moral philosophy and for social sciences like economics and the law, since it represents the most essential condition for a democratic political order, market transactions and legal contracts. On the other hand, rationality is one of the most important conditions for consent, since irrational individuals can hardly be assumed to participate in genuine consensual activities both under a philosophical and a legal point of view.

Chapter 1 of this thesis is mainly concerned with the conceptual distinction of various types of consent and with a comprehensive analysis of the conditions that define genuine consent. For the purposes of our analysis we use an economic approach since we see consent as a voluntary choice among real alternatives. In other words, we understand genuine consent as a rational choice. A market economy creates wealth through exchange, especially through market transactions and contracts and these exchanges, transactions and contracts help individuals to realize their wishes and at the same time they increase society's wealth through surpluses created by the mechanism of the efficient allocation of resources. However, for these market mechanisms

to create wealth, three conditions should be met: they should be based on the consent of the parties, the latter being rational, informed and non-coerced.

Therefore, we define rationality, information and freedom as the basic conditions for genuine consent. Nevertheless, rationality, information and freedom do not have to be perfect or unlimited. A reasonable amount of information is the amount where the marginal cost of an additional piece of information equals its marginal benefit, because even then the agent can maximize her utility by carefully considering her scant options using the limited information she has access to. In addition, the full range of information that an individual possesses about her own preferences is not always known or observable to others, which makes the characterization of her consent as genuine or not an even trickier endeavor.

Similarly, freedom of choice is never unlimited because there are always present some sort of constraints, if only for the scarcity of time and (all kinds of) resources, as well as some sort of trade-off among available choices. Freedom of contract and consent is the best way to ensure that both parties will benefit from a transaction and it is also the only way to achieve a Pareto efficient outcome as long as there are no negative externalities. We discuss Sen's paradox of the impossibility of Paretian liberal, in order to show that freedom of choice is not incompatible with the maximization of utility. However, constrained choice does not necessarily mean coerced choice. In order to identify the presence of real coercion in cases of consent, we propose an easy-to-use criterion which distinguishes between choices where consent

is essentially absent and hard choices between alternatives which the individual would rather have available than not have at all. Finally, the rationality of individuals, as the most important of the three conditions of consent, according to our view, is thoroughly examined in the rest of the thesis, through the study of the processes of decision making and its limitations.

In Chapter 2 we attempt to clarify the concept of rationality and to define rational decision making in the framework that is used today in economics and other social sciences. We identify that it is a complicated and multidimensional concept whose many and different aspects depend on several factors, such as historical and methodological. The type of rationality that mainstream economics use can be both positive and normative because, up to a certain degree, it is expected to describe, explain, interpret and, most importantly, predict the actual choices people make in economic markets and other environments that involve choice, and it is normative, or prescriptive, because, at the same time, it suggests a set of ideal standards and norms of behavior that best lead to the attainment of individual and subjective goals. Rationality is therefore instrumental, since an individual is assumed to be rational when she chooses those actions that satisfy her preferences with the employment of the best possible means in the best possible way. Her preferences or aims are not judged as rational or irrational as long as her actions provide the appropriate outcomes. Additionally, the rational individual does not act out of the social and institutional context and consequently she can have altruistic or other-regarding preferences as a part of her utility function as well.

In order to examine how this model of rationality was formed, we briefly explore the development of the concept through the history of economic thought, from Adam Smith to the Marginalists and Austrian economists, when the claims for theoretical or empirical plausibility invariably changed and thus influenced economic science accordingly. Most interestingly, we identify and describe perhaps the most important source of misunderstanding, concerning the concept of rationality, which can be found in the historical development of two distinct traditions of rational choice theory.

During the second world war period and especially during the cold war, two schools of rationality emerged simultaneously in two distant - geographically and ideologically - academic institutions in the United States. The first is the tradition of axiomatic rational choice theory, born at Princeton University during the war, together with Game Theory. It was connected, if not identified, from the very beginning with the American government which funded it generously. The other is the tradition of empirical rational choice theory, born at the University of Chicago in the late 1940s when Milton Friedman and George Stigler returned to the Department of Economics as Professors and dominated it for the next forty years. It was identified with its classical liberal ideology and its distrust to government intervention in the economy. It was funded mostly by small liberal foundations and businessmen who didn't have dealings with the U.S. government and behaved as outsiders in the corporatist economy of the post-war years. Most economists, psychologists and other social scientists

today confuse these two traditions, even though their differences were always numerous, and, as a consequence, much of the criticism targeted against the rationality model, is also tangled among different kinds, aspects and definitions of rationality.

In Chapter 3 we present the main criticism of the rationality model which comes from behavioral economics. First, we explore the current relationship between psychology and mainstream economics in general and we detect the influences of the former to the latter. These influences range from the philosophical view of hedonism and the utility maximization principle to the simplistic and folk-psychological concepts of rationality and the behavioristic approach of revealed preference theory. The emergence of behavioral economics was yet another attempt to provide a better descriptive model of human decision making, something that many neoclassical economists had purposefully overlooked for the benefit of powerful prediction. The former tried to discredit the neoclassical model of axiomatic rationality by criticizing mostly its lack of empirical support. They benefited mainly from the useful insights of cognitive psychology and they designed tasks of their own in order to examine the process of decision making in the context of economic choices in the laboratory.

For the purposes of our presentation we distinguish between old and new behavioral economics. Old behavioral economics is mostly characterized by the work of early psychologists and cognitive scientists, mainly George Katona and Herbert Simon, who worked in the field of decision making and had an interest in the economic

framework of choice. Especially the theoretical work of Simon in artificial intelligence and his concept of "bounded rationality", which entered the discussion of rationality in economics, was very influential for the further development of behavioral economics. Simon maintained that people are not perfectly rational, but on the contrary, their decision making is restricted by mental and environmental constraints and they are not capable of optimizing behavior. Instead they succeed only in satisficing their choices, by choosing "good enough" alternatives.

New behavioral economics were essentially initiated with the work of Daniel Kahneman and Amos Tversky in the 1970's who further elaborated, mainly experimentally, on the work of Simon. They proposed Prospect Theory as an alternative to rational choice theory and they launched the heuristics-and-biases program, where a number of cognitive biases were identified as impediments to rational thinking. We describe the most important of these phenomena which are all caused by three basic categories of heuristics that lead to flawed behavior: the representative, the availability and the anchoring heuristic. The work of behavioral economists in decision making has also led to a series of policy proposals based on the assumption of systematic irrationality. The most celebrated work on this field is the program of "nudges" and "choice architecture" that has been proposed and in some cases implemented by authorities, firms and organizations in the public or private sector. As we show, the effectiveness of such policies remains controversial.

In the final section of this chapter, we briefly present a series of experiments that we conducted in order to see whether people tend to be biased against the rationality of others. Indeed, when participants were asked to assess their own performance and that of others in two different settings of important decisions, most of them attributed their own attitude to rational reasons and motivations, whereas they attributed the behavior of others to emotional and especially irrational or even immoral causes and motivations. We call this the Intellectual-and-Moral Attribution Bias and we suggest that these results imply that there is a natural tendency in humans to consider themselves smarter, more rational and more moral than the average person. The disposition of people towards the rationality of others can have a great impact in cases where individual consent is or should be required and this should be a serious caution against attempts for social planning that are based on the assumption of global irrationality.

In Chapter 4 we examine the rich theories and evidence form other social and behavioral sciences, which offer substantial criticism against behavioral economics and, according to our view, enough evidence to defend the assumption of rational decision making. Since the emergence of behavioral economics, a lot of experimental research has been focused on testing the empirical findings of prospect theory either from economists or from behavioral scientists. In the sections that comprise the chapter we present a substantial amount of experiments that show how a lot of the cognitive

biases that are documented by behavioral economists, tend to diminish or even disappear under the influence of framing or learning effects. We also discuss issues concerning methodological and theoretical matters.

Meanwhile, the concept of "ecological rationality" has been developed somewhat separately in experimental economics and the psychology of decision making. The common characteristic that they share stems more or less from the basic principles of evolutionary theory and the notion that behavior is always relevant to the environment and, thus, decision making is adapted to the particular environment's constraints, either as a mechanism built in by evolution or as a skill acquired by learning or both. Through a very long period of environmental pressures, specific conscious, but mostly unconscious, cognitive mechanisms were selected which constantly led to successful choices that enhanced fitness in an uncertain and varying environment. Brains have always had to cope with the scarcity of their two most important resources - time and energy - just like the organisms that carry them have to deal with scarcity of resources in the external physical and social world. So, the mind often uses fast and easy heuristics to effectively make decisions and solve problems since it needs to economize its energy within a specified time-frame. We examine the concept of "ecological rationality" as it emerged from different behavioral approaches and researchers and we show how all this work has enriched the theories of choice.

We also attempt to highlight the most important contributions of the new field of neuroeconomics and the promising insights it offers in relation with the physical

(neural) counterparts of the cognitive processes that are involved in decision making. This line of research also informs us that emotions are inseparably connected to reasoning and rational thinking and their usefulness is far more effective than we previously thought, as their main role is to attach values to alternative choices and thus facilitate decision making. Although it is apparent that the concept of rationality should be appropriately extended so as to include and explain the presence of cognitive limitations, an abundance of experimental findings and insights, mainly from evolutionary and cognitive sciences, show that humans are potentially and actually far more rational in real life than behavioral economists describe them to be, and that varying models of rationality are considered as best approximations of actual behavior. This literature is curiously ignored by economists despite their declared interest to inform the economic model with more psychologically plausible descriptions. Through this chapter we show how evolutionary sciences offer a theory for the historical or ultimate causes of behavior and cognitive and brain sciences provide the present or proximate causes of behavior. The combination of both can lead our research in decision making and rationality toward interesting and very promising directions.

Finally, we summarize our conclusions about rationality, in general, and consent as a rational choice. We conclude that the issue about whether people are rational is an ongoing debate, although we believe that the evidence in defense of real-life rationality is far more in quantity and quality than the opposite. In any case, we are positive that economics has a lot to gain from the insights and theories of other social and

behavioral sciences. Furthermore, if we accept that individuals are systematically irrational, as behavioral economics presume, and so incapable of making the right decisions for themselves for the most part of their personal or public life, then paternalistic and authoritarian policies seem to be justified in superseding people's choices and genuine consent. But, as we will show in the rest of this thesis, this is not only a normative but a descriptive issue as well.

CHAPTER ONE

CONSENT AS A RATIONAL CHOICE

1.1 CONSENT AS A PHILOSOPHICAL, POLITICAL, LEGAL AND ECONOMIC CONCEPT

Consent is not simply a legal concept. Lawyers, but also lay people, identify consent with the legal requirement for a valid contract or a legal act. Consent is way more than that. Consent is, maybe, the most important concept in political philosophy. It's also the most important concept in a market economy – more important even than property rights. Consent is thus a fundamental concept in philosophy, law and economics. It is fundamental because it represents the most essential condition and at the same time the cornerstone of the democratic political order, the market transaction and the legal contract. In this chapter we will focus on the economic function of consent and we will discuss briefly, and mostly parenthetically, the political and the legal function of the concept. Not because these issues are unrelated – quite the opposite, but because these issues are so central in political philosophy and legal theory and so complex - and entangled with such major issues as political obligation or the basis of contract - that one cannot treat them fairly in a thesis chapter (see Miller &

Wertheimer 2010 for an excellent comprehensive and recent treatment of all the major issues concerning consent).

The connection of consent with rationality is straightforward. Consent requires rationality. Rationality is a major condition for any consensual activity. "Irrational consent" is an oxymoron, a contradiction in terms. The rationality requirement is instrumental not only for political consensus but also for any legal contract. One would not characterize a contract as legal if it is based on consent by people behaving in a manifestly irrational way. Likewise, one cannot imagine a social contract as the outcome of the deliberation of irrational people binding themselves, founding a government, establishing a constitutional order, building institutions and organizing a political community or a civil society (Boucher & Kelly 1994; Morris 1999). Rationality has always been an implicit requirement for social contracts in every political theory, from Plato's *Republic* and *Criton* (4th century BC) to Locke's *Second Treatise of Government* (1689).

However, John Rawls was the one who made it more than explicit in his celebrated work, *A Theory of Justice* (Rawls 1999: 123): "I have assumed throughout that the persons in the original position are rational."[1] By "rationality", as a condition of a valid consent, Rawls means economic rationality as he clearly states: "the concept

[1] It is the beginning sentence of Chapter 25 ("The Rationality of the Parties"). Rawls' behind-the-veil-social-contract is based on "the principles that free and rational persons concerned to further their own interests would accept in an initial position of equality as defining the fundamental terms of their association." (Rawls 1999: 10)

of rationality must be interpreted as far as possible in the narrow sense, standard in economic theory, of taking the most effective means to given ends." (1999: 12). He is even more specific in the version of rationality he is using: "The theory of justice is a part, perhaps the most significant part, of the theory of rational choice." (1999: 15). Actually, Rawls believes that every social contract theory (not only in political but also in moral philosophy) should be a "part of the theory of rational choice", since this is an "inevitable consequence" (1999: 149). His theory is based on a model of choice under complete uncertainty (*behind the veil of ignorance*). According to Rawls (1999: 124):

> *[A] rational person is thought to have a coherent set of preferences between the options open to him. He ranks these options according to how well they further his purposes; he follows the plan which will satisfy more of his desires rather than less, and which has the greater chance of being successfully executed. The special assumption I make is that a rational individual does not suffer from envy. He is not ready to accept a loss for himself if only others have less as well. He is not downcast by the knowledge or perception that others have a larger index of primary social goods. Or at least this is true as long as the differences between himself and others do not exceed certain limits, and he does not believe that the existing inequalities are founded on injustice or are the result of letting chance work itself out for no compensating social purpose.*

It is not a coincidence that Rawls' *A Theory of Justice* is the first political philosophy work in the 20th century that economists read widely, discussed extensively and cited numerously. After Rawls, it is not a coincidence, that the modern social contact tradition emphasizes rationality and rational choice. The leading figures in this tradition

are very familiar with economic theory and rational choice theory.[2] From Hobbesian versions such as James Buchanan's (1975) and David Gauthier's (1986) to Kantian versions like Robert Nozick's (1974), these theories are economically sophisticated since the authors employ the techniques of modern economic analysis. Buchanan is a leading figure in economics - he was awarded a Nobel prize in 1986 for his work on the economics of politics and constitutions - Nozick has written one of the most celebrated papers on Austrian economics methodology (Nozick 1977) and Gauthier's use of economics is innovative and impressive.[3]

In social contract theories the consent of the governed is the basis of political obligation and of the legitimacy of the government in both Kantian contractualism (Scanlon) and Hobbesian contractarianism (Gauthier, Buchanan, Narveson). But consent is a force for legitimatization in moral philosophy too. Personal autonomy doesn't have much sense without the concept of consent. If the individual is autonomous and governs herself, then any interference in her sphere of autonomy can be justified with explicit or tacit consent, otherwise it will be wrongful. Explicit consent can be given commonly in exchange for something else, in a contractual setting. Implicit consent can be given hypothetically in a social contract setting which maximizes equal liberty. This Kantian framework assumes that people are rational beings:

[2] Mostly the version we call axiomatic – not to be confused with the Chicago School version of rationality. See below under section 2.3.

[3] "Morality arises from market failure." (Gauthier 1986: 84). See esp. Vallentyne (1991) for an exploration of the relations between contractarianism and rational choice theory in Gauthier's work and Hatzis (2015a) for an example of the use of economics (Coase theorem) to the discussion of a problem in moral and legal philosophy (the legal regulation of morality).

morality is a matter of rationality. A theory of rationality is thus a prerequisite for any theory of moral/ethical rationalism (Herman 2016).

Moral and political theories usually treat consent as an issue of universal aspects. Moral rationalism and contractualism emphasize hypothetical consent and *a priori* rationality. They are not really interested, but only incidentally, in more mundane instances of consent where the agent decides to buy an insurance policy, a motorcycle or some pounds of vegetables. This doesn't mean that moral and political theories cannot be useful in answering questions about the micromanaging of consent. However legal theory is usually considered as the appropriate apparatus for resolving questions about the presence or absence of consent in a particular contractual situation, in interpersonal relationships - with legal consequences - or even in applying a social-contract ideal by reconstructing the meaning of an aging constitutional text.

The legal conception of consent has almost always to do with individual decision making. Consent in a legal framework is more pragmatic, it has a down-to-earth meaning and visible characteristics, usually assuming the form of speech or written acts, at least for the lawyers. Nevertheless, an explicit or implicit condition is rationality. Behind every legal theory about consent there is a stated or unstated, complex or simplistic, theory of rationality. Consent in a contract cannot be the outcome of irrational behavior – contracting parties should be rational or at least "reasonable".[4]

[4] In many instances the standards of reasonableness in legal theory reminds us of bounded rationality. See below under section 3.2 but also Hatzis (1999) for a broader discussion and Miller & Perry

The standards of rationality upheld by courts and legal theory are not very sophisticated or invincible to a rather easygoing scrutiny. However, the law is loaded with appeals to rationality, with different, and sometimes contradictory, notions in various fields (contracts, torts, criminal law).

The ways lawyers and economists use the concept of rationality have many similarities but also many differences. Lawyers and judges apply reason to law through rules. This kind of reasoning has its clear limits as we are going to see in detail in chapter 4. Sometimes law is permeated by flawed conceptions of rationality when rational is identified with rule-following. Especially in legal systems with a strong element of legal formalism a lot of relevant information is excluded from the legal system and it cannot be used to elucidate motives, incentives, practices, acts. Of course, there have been numerous attempts to liberate legal reasoning from the confines of legal formalism, from the American and Scandinavian legal realism of the early 20th century to the recent behavioral science of law influenced by behavioral economics in the early 21st century. Nevertheless, no attempt has been so successful and influential as the "economic approach to law" (Posner 1992) which is based on the Chicago School version of rational choice theory (see below under section 2.3). Law & economics is also the most successful example of the paradigm-shift power of rational choice theory in bordering social sciences.[5]

(2012) for a useful discussion on the question of the nature of reasonableness as a normative or a positive notion.

[5] Equally successful is the example of the influence public choice theory exerted in political science. See e.g. Mueller (2003).

1.2 CONSENT AS AN ECONOMIC CONCEPT

A market economy creates wealth through exchange, especially through market transactions and contracts. These exchanges, transactions and contracts do not only help the market participants realize their wishes; they also increase society's wealth through surpluses created by the mechanism of the efficient allocation of resources. However, for these market mechanisms to create wealth a condition is necessary: they should be based on the consent of the parties, the latter being rational and informed.

In the rest of this chapter we are going to discuss the concept of consent as an economic concept, as the most important condition of a mutually beneficial agreement/exchange/transaction. In economics, as in philosophy and law, the agent should be rational to be able to consent to an action or omission. We will discuss what this condition entails and why rationality seems to fail in a number of settings where agents seem to "consent". However, we will also put into question the cognitive-limitations-arguments originated by some cognitive psychologists and the behavioral economists.

The main goal of this chapter is thus to explore the conditions for consent as a rational choice, i.e. a genuinely voluntary choice among alternatives. The concept of consent

is going to be used narrowly in this context, as an assent to some choice. Since consent is a state of mind in order for it to be genuine it should also be rational. We will discuss the rationality assumption for consent in different contexts: in market situations where two parties conclude a contract but also in non-market situations where an agent assents to some action which might seem irrational and/or immoral. In the following chapters we are going to present a version of rational choice, informed by the criticism of philosophy and psychology, but also economics, which can function as a basis for genuine rational consent. We will also try, in this chapter, to answer the second major objection against theories based on consent: that quite often consent is a result of coercion disguised as hard but voluntary choice. We will attempt to provide a criterion of distinguishing coerced from voluntary consent. For consent to be a rational choice it should also be a *real* choice. We will try to discern the real consent that a hard choice entails from the coerced consent which is a result of threat, i.e. to distinguish economic from physical duress. We will provide an easy to use criterion which is based on a thought experiment we introduce.

There is a number of questions we will try to answer in this chapter but also in the chapters that are following:

• Even in cases where rationality fails, does this imply that agents should be protected paternalistically against themselves or is it better for them in the long-run to be let alone to develop rational responses to their cognitive constraints?

• Is this concept of rationality adequate for a setting where a real assent to a choice or action is instrumental?

• What happens when preferences and desires are “irrational” and/or immoral?

• When consent is rational does this mean that it is also voluntary?

• Is there a clear cut criterion to help us distinguish hard choices from choices under coercion or duress?

1.3 AN ECONOMIC APPROACH OF CONSENT

As we emphasized in the previous section, a market economy creates wealth through market transactions but also through any kind of exchange based on mutual consent, since these exchanges and transactions do not only help the market participants realize their wishes but they also increase society’s wealth through surpluses created by the mechanism of the efficient resource allocation. This mechanism is the cornerstone of a market economy. According to Milton Friedman, “[t]he possibility of coordination through voluntary cooperation rests on the elementary – yet frequently denied – proposition that both parties to an economic transaction benefit from it, provided the transaction is bilaterally voluntary and informed (Friedman 1962: 13). Friedman emphasizes not only the importance of the economic transaction for mutual

advantage and social welfare but also its most fundamental condition: consent as a rational informed choice. Without genuine consent the allocation of resources won't be necessarily efficient. Without adequate information and a minimum of rationality, consent cannot be characterized as adequate.

For economists the way that the mechanism of efficient resource allocation works is straightforward. In a given transaction, when *ex ante,* A values a widget €100 and B €150, if a transaction between them takes place, both will end up better-off *ex post*. If the agreed price is €125, then A ends up with a €125 instead of owning a widget that she values only €100. B owns now a widget that she values €150 – plus €25 (her consumer surplus) totaling €175. They both, jointly, became €50 richer – €50 being the surplus created by their transaction, which also equals the difference in their subjective valuation of this widget. The society is also €50 richer ("society's wealth", before the transaction, was €250 and after the transaction it's €300) because we have a better allocation of resources (B *had* to have this widget) based on consent. A transaction based on consent will place the parties into position that it is Pareto superior from the no-transaction option, as long as there are no serious market failures. If the parties have enough information and there are no high transaction costs the performance of their agreement can lead them to a Pareto optimal point, especially if their contract is perfect. According to Steven Shavell, "A contract [...] is called *Pareto*

efficient if the contract is impossible to modify [...] so as to raise the expected utility of both of the parties to it."[6]

One could argue that since B values the widget more than A, a forced transfer would also increase efficiency; since it would lead to a better allocation of resources, consent is redundant. This is a major mistake for many reasons: people express their idiosyncratic values by consenting to a transfer of a resource (revealed preferences). A forced transfer is necessarily based on an arbitrary assumption about valuations, usually an assumption by a third party which is not omniscient (Hayek 1945). In addition, a system of act utilitarianism which would justify such arbitrary transfers would undermine property rights, contracts and the rule of law in the long run. Such a system would collapse due to legal uncertainty, extravagant transaction costs and political illegitimacy.

Consent is thus not only a condition but also a safeguard for a mutually beneficial, value- and utility-enhancing agreement, a positive-sum game. For this wealth-creation mechanism to function smoothly in a market economy, contracts should be encouraged and should also be enforced by the law.[7] Specifically, law's main function in this case is to encourage contract as a wealth creation mechanism but also as a risk

[6] See Shavell (1998: 436, emphasis by the author). See also Foka-Kavalieraki & Hatzis (2009) for further elaboration on the conditions of the perfect contract as related to the problem of market failures.

[7] In some cases, enforcement is not necessary if market forces have mechanisms for ensuring contractual performance, e.g. trust, reputation, bonds, etc. (Klein & Leffler 1981). However, all contracts in modern societies, even those in markets with the highest levels of trust are concluded and performed under the shadow of the law.

allocation mechanism. However, as we saw, for a contract to create wealth, a condition is necessary: it should be based on the consent of the parties, the latter being rational and informed.

As we will see there are three conditions for consent to be genuine: Rationality, Freedom and Information. We will discuss these three conditions separately but we will also realize that they are in a great degree interconnected.

1.4 The Three Conditions for Genuine Consent

Let's examine these three conditions separately first:

Rationality. According to rational choice theory, especially the Chicago School version, the contracting parties are presumably rational utility maximizers. Their decisions, promises and actions should be constructed under this light. They are utility maximizers in the sense that they try to satisfy their preferences in the best possible way given the constraints. Their preferences are given. Economists don't judge the rationality, the morality or the quality of these preferences (Stigler & Becker 1977). Most of the time economists cannot even elicit the real preferences by observing the actions. They assume that the revealed preferences are not very far from the actual preferences. They only judge the means that the agents employ to better satisfy their preferences. But even when economists observe actions that seem "irrational", in the

sense that they are not the best means to given ends, they are very reluctant to characterize them as such. Adam Smith's (1776: 4.2.10) dictum is still valid for the majority of economists: "[E]very individual, it is evident, can, in his local situation, judge much better than any statesman or lawgiver can do for him."[8] We will return to the problem of rationality in the rest of the chapter and the thesis.

Freedom. In every exchange there is a trade-off. A person pays for a good or a service or promises that she will pay for them in the future. Alternatively, she transfers, or promises to transfer, the property rights of a good or delivers a service. She acts or refrains from acting. She has to limit her future actions by promising an act or omission. The reason that she transfers property rights, she pays an amount of money or she promises to limit her options in the future is that she believes that the trade-off is positive for her, i.e. the expected cost of her actions and/or promises is less than the expected benefit. This is a paradox. A person limits her freedom, by limiting her options in the future, as a requirement for consent, and at the same time consent should be free in order to be genuine. We will realize in the following sections that this paradox has preoccupied legal and political theory a great deal.

Information. The quality of a rational choice but also of consent is directly linked to the amount of information gathered. A reasonable amount of information is the

[8] One could safely argue that Adam Smith would have added economists to lawgivers and statesmen. See the discussion in section 2.2 and especially the Posner (2003: 97) quote ("[E]ven if the goal of contract law is to promote efficiency rather than to enforce promises as such [...] enforcing the parties' agreement insofar as it can be ascertained may be a more efficient method of attaining this goal than rejecting the agreement when it appears to be inefficient.")

amount where the marginal cost of an additional piece of information equals its marginal benefit (Stigler 1961). This equilibrium point (MCi=MBi) can function as the standard for genuine consent. Requiring more information than the amount that is optimal would trivialize the concept of consent, creating at the same time barriers for mutually beneficial agreements. Nevertheless, we should also accept as a fact that information can only be optimal *ex ante*. Most economic transactions, especially long-term contracts, have a strong element of uncertainty about the future. This is due to the "sequential character of economic activity" (Posner 1992: 90). In most cases there is no real uncertainty but predictable risk situations with a very low probability of happening, making thus precaution unreasonably expensive *ex ante* (see Posner & Rosenfield 1977 for a model of efficient precaution under risk and uncertainty).

1.5 Consent as a Rational Informed Choice

In the matter of consent, we cannot - and should not - disentangle “rationality” from freedom and information. A rational choice, is a choice which is well-informed. It is also a free choice. Of course a choice can be characterized as rational even when it is based on limited information and it is severely constrained. Even then the agent can maximize her utility by carefully considering her scanty options using the limited information she has access to.

Let’s imagine the following scenario. A soldier is under arrest by a militant extremist group and she is confined in a maximum security cell. She doesn’t know where she is, she can’t see her captors, since she’s wearing a hood, and she is unable to estimate the probability of her comrades being in the neighborhood looking for her – they might think, as well, that she is dead and there is no ongoing rescue mission or they might be looking for her in a totally different area, very far from her prison. She has even lost the track of time after losing her senses for many hours – or even days – she can’t say. In such conditions and while she is still giddy from the hit, the militant group’s leader offers her the following option: if she cooperates with them and accepts their proposal to be videotaped, reading a pre-written propaganda statement on camera renouncing her country, she will be spared or at least (she hopes) she would avoid cruel torture before her execution.

The prisoner is apparently not free. She is constrained in an almost maximum degree. She doesn't know what her real options are and she can't weigh the probabilities because she lacks vital information. Apparently, if she accepts to be videotaped, accepting, this way, their offer, one cannot seriously argue that her consent would be genuine. It will be, obviously, a clear case of consent under duress – and duress nullifies consent almost automatically. It is also consent with information below a decent threshold. Such a limited information also nullifies consent. Is a rational decision possible under such circumstances? Apparently, yes.

Actually the very scarcity of information and the oppressive constraints makes the use of reason imperative. This is not a case of consent but is definitely a case of maximizing, given the constraints, using the tools of reason. Her decision-making can even be hyper-rational, observing all the requirements of axiomatic rational choice theory (completeness, transitivity, reflexivity, etc.). This is her only option, after all, for survival. It goes without saying that rational behavior in such a strenuous stressful situation is not a given. She might be overcome by fear and anxiety or perplexed by overoptimism and strongly adaptive preferences. Nevertheless, one cannot disagree with our main point: rational behavior does not guarantee genuine consent; the absence of consent does not signify, necessarily, irrational behavior.

The opposite is also true. Free and informed consent is not a guarantee of rational consent (see e.g. Merz & Fischhoff 1990 on patient's informed consent). A person can be free to choose, she has many alternatives and she gathers enough information.

Does this mean that her decision is automatically rational? Not necessarily. Let's say that a person is free to buy (or not buy) a car. She has an adequate amount of money to buy a decent new car. She doesn't gather information but she fills a computer form, part of a software program which essentially elicits her preferences, needs and constraints in detail. The computer program suggests then to her 3 different options, which maximize her utility given the information she gave as input. However, after studying the three options she decides to buy a different car, not among the three suggested, because it has her favorite color, mindaro chartreuse. She doesn't care to check any other characteristics.

Even though all the elements for a rational decision are there, freedom, information, relatively few constraints, she makes a choice that one could characterize hastily as irrational. The choice seems not to correspond to her preferences. However, even though her choice might not look consistent and it might violate some principles of axiomatic rational choice theory, even transitivity[9], it is not necessarily so. Under a different approach to rational behavior (originated at the Chicago School of Economics), her choice is a better proxy to her real preferences than the stated preferences she registered to the computer. Under this approach, when she will buy the mindaro chartreuse car, her consent will be genuine.

[9] One can imagine how a money pump operation can despoil her (Ramsey 1928).

1.6 Consent as a Rational Free (or at least Non-Coerced) Choice

Apparently consent needs also an adequate amount of freedom. How much is enough? We know that every decision is restricted by a number of constraints. One doesn't have to be a determinist to accept that there is no such thing as a genuine, pure free choice. Even metaphysical libertarians admit that the existence of alternative possibilities do not make a choice, necessarily, free (Nozick 1981). A great number of constraints burden every kind of choice; even choices we generally characterize as free: from the physical, time and cognitive constraints to social, institutional and moral constraints. This doesn't mean that consent is a mirage. This is a major issue in philosophy that comes to the question of freedom of will and the problem of the degrees of freedom (O'Connor 2009). How much freedom do we need before we characterize a choice consensual? Or rather, when do the constraints transmute themselves to coercion?

If we demand that the parties must be constrained only by the factors of scarcity, as these are generally applied to the majority of similarly situated people, this might not be enough. One could argue that with such a general statement we can accommodate many instances of coercion. On the other hand, one could wonder if the Marxist argument, that every transaction in a capitalist economy is the result of economic coercion, is justified (Elster 1985: 166-233). You don't have to be a Marxist to acknowledge that parties often feel 'forced' to enter into a transaction, especially

when they don't have any real alternatives. Is that coercion? Is there a criterion to determine when consent is not genuine but the result of coercion?

We will propose a very simple, easy-to-use criterion: the "vanishing button." This is based on a thought experiment we will briefly present here (for the first introduction of this criterion, see Foka-Kavalieraki & Hatzis 2009). Let's take three marginal cases:

(a) While walking in an alley, a masked robber points a gun at you, demanding "your money or your life." Apparently there is a choice here. You can always give her the money and save your life. There is also a trade-off and at least four distinct alternatives (money, life, attempt to neutralize her, attempt to escape).

(b) You are in a desert, dehydrated, in a very bad shape but you happen to have on you €1,000. Out of the blue you find an oasis with a small grocery shop, where the merchant is selling 1lt bottles of cold water for (surprisingly!) €1,000 each. This is also a situation with several alternatives (buy, die, steal, bargain, beg, continue searching, etc.)

(c) You are not creditworthy and you desperately need money for a vital surgery. You are in a hurry, your doctor is pressuring you since your condition is critical, but nobody is willing to lend you, not even your close relatives and

friends – since you are not creditworthy, the amount of money is outrageous and there is always a high probability of you not being able to pay them after a failed surgery. It seems you have only one real option, to borrow the money from a loan shark with a 200% interest. Of course this is also a situation with several options, not only the one you think you have (die, steal, pray).

In these three cases your life is at stake. So, your decision is literally a life-and-death decision. Let's say, for the shake of the argument, that in these three cases you decide to cooperate because you value your life more than money and you are risk-averse. You accept the offers, the three tradeoffs (life, water, loan). However, you feel that your choice was a choice under duress. Actually you think that a life-and-death decision is a paradigmatic case of a choice under duress. Your consent is not genuine, as any consent under duress. You had a choice, even in the first example, but your choice is the result of coercion and it should be annulled in a court of law.

- We agree that in case (a) consent is absent (see the famous test in Nozick 1969). But it is apparent that cases (b) and (c) are different. The difference with case (a) is that (b) and (c) are choices that are very hard but you would nevertheless prefer to have than to not have available. If you could press a button which would vanish the thief in case (a) you will certainly do it. The elimination of this hard choice leaves you with more and better options.

Obviously you would not press the button in the other two cases:

- You prefer to have the hard choice in the desert. If the seller was a mirage that would be very disappointing to you. You don't want her vanishing, that would be fatal! You wish to have (than not to have) the hard choice she offers. The elimination of this hard choice leaves you with less and worse options.

- You prefer to have the hard choice in the loan shark office. If the police enter the room suddenly and arrest her for usury you would be very disappointed if she has not lent you the money before her transfer to the police quarters. You don't want her in jail, you wish to have the hard choice she offers (and then she can go to jail for all you care). The elimination of this hard choice leaves you with less and worse options.

In none of these two cases would you press the "vanishing button", because these are choices you prefer to have than not. They are hard choices but the hardship was not caused by the same people who are now trying to exploit your dreadful situation (without threatening you). These people are adding to your options by offering expensive alternatives. Not the alternatives that you wish to have but real, valuable alternatives, nevertheless.

Moreover, there is a difference between case (b) and case (c). The choice in (b) is constrained by the existence of a monopoly. It's a problematic choice *per se* and a court should not enforce a contract with huge monopoly rents (or violate the Lockean

Proviso – Nozick 1974: 175). But this doesn't mean that the contract should be rescinded. The court should limit compensation to the competitive level, prohibit the extracting of monopoly rents but covering the marginal cost for the seller, ensuring that it doesn't destroy the incentives of the merchant to offer a product in such a low supply area.

In the third scenario there is no coercion and there is no monopoly. You are just a very bad risk and this is why only the loan shark is willing to "help" you. If the law "protects" you from her "help", eliminating her offer, your situation will be much worse and this would be a result of coercion by the government, the worst kind of coercion. A prohibition of bargains which are considered unfair, unconscious or abusive without any additional independent characteristic (like gross asymmetry of information, monopoly rents etc.) will most certainly harm the very people wishing to protect.

The argument for the prohibition is based on the infamous "degradation" argument: there is no genuine consent in cases of extreme degradation. People in a state of degradation don't have real options. They are exploited by predators who take advantage of their victim's lack of alternatives and the urgency of their situation. These bargains are exploitive but also immoral and that is why they should be prohibited by the law and not enforced by the courts. The elimination of these derogatory alternatives by the government is both authoritarian and immoral. It is authoritarian be-

cause it limits choices that people wish to have. It is also immoral because the government does not supply a better alternative to the people who is trying to protect – because if the government had provided a better alternative in the first place, the same people would have chosen it instead of their current "degrading" choice. The elimination of a choice from someone who cannot or does not want to offer an alternative is immoral. Because the end result will be that people will find resort to a much worse alternative than the one offered by the predators and shunned by the government. If the government, on the other hand, does offer a "better alternative" but the people involved prefer the "abusive" option, because, apparently, they value it more, the "degradation" argument simply cannot stand. The prohibition though, is again authoritarian and immoral. In both cases consent is genuine, even when it is costly and disturbing.[10]

1.7 IS FREEDOM INCOMPATIBLE WITH THE MAXIMIZATION OF UTILITY?

Our view of consent is clearly consequentialist and welfarist. People are trying to satisfy their preferences by participating in economic activities. The best way to ensure that their preferences are going to be satisfied is to let them free to decide if they want to participate in exchanges and transactions and use consent as a safeguard.

[10] See the first formulation of the argument with commercial surrogacy as the case discussed, in Hatzis (2003; 2009). See also Roth (2007) and Trebilcock (1993) for a comprehensive review of similar issues.

Who is to judge if a transaction is welfare enhancing? The people themselves. According to the Marshall/Posner criterion of efficiency (Hatzis 2015b), freedom of contract and consent is the best way to ensure that both parties will benefit from a transaction. It is also the only way to achieve a Pareto efficient result as long as there are no negative externalities, i.e. third parties adversely affected by the transaction. According to this view any activity that is the product of consent could maximize utility, provided the information is adequate – and there is no some unforeseen change in circumstances (as in the problems contract law theory categorizes as cases of "commercial impracticability"; see Posner & Rosenfield 1977).

However, consent is not only a safeguard for welfare enhancement but also for freedom enhancement. Consent guarantees that an agreement is free and increases utility. However, for the leading economist and political philosopher Amartya Sen this is not necessarily so. According to Amartya Sen there is a paradox here since liberal values (freedom of choice) cannot be compatible with utilitarian values (Pareto principle) (Sen 1970: 157):

> *If someone takes the Pareto principle seriously, as economists seem to do, then he has to face problems of consistency in cherishing liberal values, even very mild ones. Or, to look at it in another way, if someone does have certain liberal values, then he may have to eschew his adherence to Pareto optimality. While the Pareto criterion has been thought to be an expression of individual liberty, it appears that in choices involving more than two alternatives it can have consequences that are, in fact, deeply illiberal.*

To illustrate this, Sen uses his famous "*Lady Chatterley's Lover* example": There are two individuals, the Lewd (L) and the Prude (P) and apparently L is lewd and P is prude. They have a disagreement over the reading of D.H. Lawrence's controversial novel *Lady Chatterley's Lover* (1928). P believes that the book's message is immoral and disgusting, so nobody should read it. L hopes that the book is as kinky and provocative as its fame, so everybody should read it.

Apparently there are four alternatives:

1. Both (P + L) read the book
2. Only P reads the book
3. Only L reads the book
4. No one (0) reads the book

The two persons of the example have, of course, different preference ordering.

Prude's preference ordering is the following:

$$4 > 2 > 3 > 1$$

The reason that Prude prefers 2 to 3 is that "he would prefer that he read the book himself rather than exposing gullible [Mr. L] to the influences of Lawrence. (Prudes, I am told tend to prefer to be censors rather than being censored.)" (Sen 1970: 155).

Lewd's preference ordering is the following:

$$1 > 2 > 3 > 4$$

The reason that Lewd prefers 2 to 3 is that "he takes delight in the thought that prudish [Mr. P] may have to read Lawrence" (Sen 1970: 155).

It is obvious that 2 is Pareto superior to 3. Even though 3 seem to be a reasonable state of affairs (L wants to read the book and he reads it, P doesn't want to read the book and he doesn't read it), both parties prefer 2 to 3 (L wants to read the book but he doesn't read it, P doesn't want to read the book and he does read it)! This is a very awkward outcome: the book is read by someone who hates it and not read by someone who loves to read it. But, as Sen notes (1970: 155):

> *[S]omeone with liberal values may argue that […] preference[s] should count; since the prude would not like to read it, he should not be forced to. […] Similarly […] since [L] is clearly anxious to read the book he should be permitted to do this. […] Thus, in terms of liberal values it is better that no one reads it rather than person 1 being forced to read it, and it is still better that [L] is permitted to read the book rather than no one reading it. […] Every solution that we can think of is bettered by some other solution, given the Pareto principle and the principle of liberalism, and we seem to have an inconsistency of choice.*

The solution for Sen (1970: 155-156) is a change in preferences, by eliminating "nosy" preferences ("The ultimate guarantee for individual liberty may rest not on rules for social choice but on developing individual values that respect each other's personal choice.") Otherwise "a principle reflecting liberal values even in a very mild

form cannot possibly be combined with the weak Pareto principle […] Society cannot then let more than one individual be free to read what they like, sleep the way they prefer, dress as they care to, etc. *irrespective* of the preferences of others in the community." (Sen 1970: 157; emphasis by the author).

Sen makes a strong case for the incompatibility of a certain version of liberalism with a certain version of utilitarianism: a perfectionist version of liberalism is contradictory with a crude act utilitarianism that gives too much emphasis on moral externalities (Hatzis 2015a). Under this very narrow view a social planner could increase utility by satisfying the preferences of a moral majority. However, under our broader view, this is a mistake. There is no contradiction between liberal neutrality, which is not perfectionist, and a version of rule-utilitarianism which identifies utility with preference satisfaction, adopting John Stuart Mill's preference ordering in this utilitarian calculus (Mill 1859: 4.12):

> *There are many who consider as an injury to themselves any conduct which they have a distaste for, and resent it as an outrage to their feelings; […] But there is no parity between the feeling of a person for his own opinion, and the feeling of another who is offended at his holding it; no more than between the desire of a thief to take a purse, and the desire of the right owner to keep it. And a person's taste is as much his own peculiar concern as his opinion or his purse. It is easy for any one to imagine an ideal public, which leaves the freedom and choice of individuals in all uncertain matters undisturbed, and only requires them to abstain from modes of conduct which universal experience has condemned.*

Apparently Mill's argument is strong but controversial. One cannot avoid the balancing between social welfare and freedom, even in the most liberal society. Nevertheless, Sen's argument doesn't apply when state 2 of the world (only the Prude reads the book) is the result of a contract. In this contract P and L decide to mutually limit their freedom in order to better satisfy their preferences. Is their decision self-contradictory? Are the limits to freedom that a contractual clause requires self-defeating? Not necessarily. Not if the two parties consent to the result.

In the case of L & P it is apparent that a contract that prohibits L to read the book and makes P to read it, is both welfare enhancing *and* freedom enhancing since the two parties decide to limit their future actions with their own will. Nobody makes them to limit their freedom, this is their own decision that satisfies their preferences. So their decision to limit their future actions is a manifestation of their freedom of choice. If it was the other way around, if these parties didn't have the right to limit their future actions (e.g. because of a paternalist and/or moralist social planner), that government should have been called illiberal and at the same time disutility enhancing.

Brian Bary makes a similar point, making at the same time a very crucial distinction for our purposes (Barry 1986: 19, emphasis by the author):

> *[Sen's argument] confuses two quite different ideas: that people should never fail to act on their personal preferences in what "directly concerns" them, and that people should not be* required *to violate their personal preferences*

> *in what "directly concerns" them. The second is, indeed, an authentically liberal idea. But the first is not, as Sen suggests, an essential part of every reasonable conception of liberalism. It might even be said to be antithetical to a conception of liberalism that emphasizes the freedom of individuals to make their own choices with as few constraints as possible. For surely we are more free to choose if we can trade a decision over something we have a right to control in return for control over a decision that we value more, which some other person has a right to take, that we are if some agent of the social welfare function restrains us from doing so. […] Liberalism is, indeed, a principle that picks out a protected sphere, but one that is protected against unwanted interference, not against use in trading with others.*

The reasons Sen didn't avoid making this mistake[11] were two: (a) Sen's conception of liberalism was very narrow. He almost admits it in Sen (1971: 1406): "[the] practical importance [of the theorem] will depend on the exact interpretation of liberalism" emphasizing at the same time that liberal neutrality collapses to Paretianism ("the what *does* the liberal assert?" – Sen 1971: 1407, emphasis by the author). (b) Sen didn't give much emphasis on consent as a proxy for both freedom and welfare.

1.8 TYPES OF CONSENT

We have tried so far to establish the importance of consent for economic activity but also for any kind of exchange. We discussed the elements of consent but we didn't refer yet to the categorization of consent and the most important problem about the

[11] James Buchanan made a similar argument in an "apocryphal" note written in 1976 and not published for 20 years (Buchanan 1996: 124): "If however, someone else places a higher value on this person's reading habits than he does himself, the Pareto norm would suggest the mutuality of gains from a transfer. In the end, the 'meddlesome preferences' may prevail, but only if those who hold them are willing to pay for their exercise." See also Gibbard (1974).

concept. How is consent manifested? If consent is such an essential safeguard for freedom and welfare, how can we assure that it exists in a given situation?

The problem is that consent can take many forms. Consent can be explicit or tacit, actual or hypothetical, mental or objective, and of course valid or invalid.

(a) The difference of explicit from implicit consent is a major issue in contract law but also in social contract theories. Since it is connected to the discussion of hypothetical consent, we will discuss these categories together.

When consent is explicit this doesn't mean that there are no problems in its use as justification of an agreement. First of all, explicit consent isn't necessarily actual consent. Sometimes consent is just a façade of an agreement which is not the outcome of bargaining and it is not mutually beneficial. The most powerful party in the agreement, which is usually also better informed, persuades with legal or even illegal means the weaker party, to consent to a contract she can't even understand (the wording, the clauses, the implications). This is a standard issue in contract law. But even when consent is genuine, even when the party who consented into a highly unequal agreement, did so with no coercion or pressure, the asymmetry of information can be so huge that her consent is the product of mistake, deception or outright fraud. Thus, explicit, even actual, consent is not always a guarantee of a mutually beneficial, social welfare-enhancing, agreement. The interesting thing is that, in these

cases, the concept of hypothetical consent can help us evaluate actual explicit consent.

Hypothetical consent is the consent that one could expect by rational parties who bargained on relatively equal terms with no gross asymmetries of information. The legal standard of hypothetical consent (which has been successfully used by Richard Posner in his attempt to give substance to the normative version of the Coase theorem; see Hatzis 2015b) can offer a benchmark for us to assess actual explicit consent or to elicit tacit consent from the agreement, even on issues where the contract is silent because the parties didn't predict their occurrence or chose not to bargain on them.

Hypothetical consent is, of course, a very dangerous concept for many reasons. It is initially empty of content, ready to be filled by preferences, values and choices which are alien to the contracting parties themselves. The risk of a paternalistic intervention from a supposedly benevolent social planner or a judge is high. However, one cannot resist easily the idea of a perfect contract designed behind a veil of ignorance by rational and equal parties in an original position of a blank slate. However, to employ this tool as a measuring stick in the numerous actual agreements, transactions and contracts, is not only impossible, it is also ill-advised. Not only because it is politically dangerous and economically costly, in transaction and administrative costs, but also because it is a major epistemological mistake (see Hayek 1945 for a very persuasive argument).

Nevertheless, hypothetical consent is a very successful idea in social contract theories. Since there are no actual, but only fictional social contracts, hypothetical consent of rational beings seems to be the only option. Even if we consider constitutional texts as the closest version of a social contract or a proxy to an implicit social contract, hypothetical consent is an essential legitimizing argument when consent is apparently tacit and almost never explicit. Of course there are as many versions of hypothetical consents as there are social contract theories - or even more. However, the framework John Rawls (1971) – and John Harsanyi (1953; 1955) before him – established, seems the more appropriate. But even this framework does not necessarily lead to similar social contract terms, not even to similar civil societies. Because under the veil of ignorance there are no values and preferences for the participants but there dominate, more powerful than ever, the values and the preferences of the philosopher or, in the case of the microcosm of economic contracts, the values and preferences of the social planner, the government, the courts.

(b) Therefore a most important distinction is the one between consent as a mental state and consent as a performative - most commonly speech - act. It is the most important distinction because it is crucial in everyday contracts. Even though the actual "meeting of the minds" is desirable, this is very difficult to be established. From the behaviorists' attempts to purify psychology from any metaphysical concept, including their refusal to acknowledge any internal or mental states that could not be directly observed to Samuelson's "revealed preferences theory" (see below

under sections 2.4 and 3.1 for further elaboration), social science is very reluctant to base its conclusions to invisible objects.

That is why the most reliable theories of consent in contract law are the theories that emphasize performative acts, mostly speech acts and written documents but also established and widespread business practices (for a detailed elaboration and defense of objective theories of contracts, see Hatzis 1999, ch. 5). Otherwise consent might become a trivial concept conflating serious intent and frivolity.

1.9 Are People Rational?

There is a number of challenges, coming mostly from behavioral economics to the above description. The parties are not rational utility maximizers – they behave very often irrationally or suboptimally (bounded-rationality, bounded will-power, bounded self-interest). Their decisions are not free – they are constrained, if not coerced, by a number of factors. Their information is not adequate – they are systematically misinformed or underinformed. In addition, their preferences are formed in ways that should be disturbing even for the economists who are supposed to be indifferent (Jolls, Sunstein & Thaler, 1998; Korobkin & Ulen 2000).

Behavioral economics and a number of cognitive psychologists have seriously disputed the economists' credo since Adam Smith: a person knows her preferences, her

interests and the best ways to satisfy them, better than anybody else. For example, decision-making is often subject to framing effects: alternative but equally informative descriptions of the same options elicit different choices, undermining the authority of consent (Hanna 2011). According to some of these critics of the economic model of rationality, a benevolent social planner can protect people from themselves, she can choose for them, she can make choices of better quality, and she can guide them to the best available alternatives (Akerlof & Shiller 2015).

We are going to discuss in depth, in the following chapters, the arguments and the evidence that behavioral economists present. It is an impressive amount of evidence which was accepted generously but also hastily from economists and lawyers. We characterize the reception as generous because economists accepted the challenge to their orthodoxy with the minimal resistance and with no skepticism (lawyers are always ready to accept any justification of paternalism). It was also impetuous and superficial because economists didn't bother to examine alternative views on rationality and rational behavior in psychology. As a result, they never found out that the science of cognitive psychology behind behavioral economics has been seriously challenged, criticized, even rejected by numerous psychologists and evolution theorists. This observation doesn't diminish the importance of the literature and its usefulness for economics and law. However, it emphasizes that the discussion is far from over.

One of the most discussed but also quite controversial application of behavioral economics was the so called “libertarian paternalism” or “asymmetric paternalism”. It is a kind of soft paternalism based on hypothetical consent: what would people have chosen if they were rational maximizers of their utility - based on their preferences as would have been formed if they had only “rational” desires - with the mental capacity of a wise benevolent social planner and with almost perfect information? Since people are not really rational - or at least as rational as the economists romanticize them to be - and they make systematic mistakes, libertarian paternalism will make sure that they do the right thing with a little unoffending, unobtrusive, almost libertarian “nudge”. We will arrange some crucial choices, from what they eat to the retirement savings, in a way that they won’t have to bother to decide. They can only change the default choice, which is prearranged by the benevolent social planner, only if they wish to change it. Otherwise they consent tacitly to the choice the social planner made for them. It is paternalistic but at the same time it is libertarian since people are free to not accept the default choice. It is not an authoritarian decision; it is just a “nudge” (Sunstein & Thaler 2009).

The idea is interesting and useful. However, like any kind of paternalism, it is epistemologically weak and politically dangerous. It is epistemologically weak because policymakers in the “nudge” factory have a one-dimensional model of a human being with only one interest worthy of protection, the very interest social planners are willing to protect in each case. However human beings have numerous and contradicting

interests, preferences and values. Their decisions reflect this richness. A social planner cannot gather this information, process it and make a choice which will satisfy these diverse interests. As Mark White notes in a powerful critique of libertarian paternalism, "[i]n the end, libertarian paternalism is not about helping people make better choice – it's about getting people to make the choice policymakers want them to make." (White 2013: iv).

Every kind of paternalism is also politically dangerous. It educates people to surrender everyday choices to wise social planners, who are supposedly more rational than the average citizen and invincible to the cognitive quirks of the average citizen. It undermines personal responsibility, personal autonomy (White 2009; Hausman & Welch 2010) and the rights of self-ownership and self-determination. It creates a homogeneous society with as less diversity as possible with a majority of followers and a minority of irrational outcasts: the people who do not accept the default choice. Most importantly, it undermines a major mechanism of improving everyday decision-making by trial and error which is based on learning and adapting to new environments. Paternalism always creates more demand for paternalism or, to paraphrase Jean-Baptiste Say, the supply of paternalism creates its own demand.

In the following chapters we will examine in depth this particular discussion of economic rationality, its history in economic thought, its current status and the criticism it has received from behavioral economics. We will then explore the criticism that

behavioral economics has received in return from other social and behavioral sciences and we will see what kind of defenses there are for rational decision making and effective problem solving.

CHAPTER TWO

REASON, RATIONALITY AND RATIONAL CHOICE THEORY

2.1 CONCEPTS AND MEANINGS

Reasoning and rationality, as fundamental and sophisticated components of human behavior, have engaged generations of philosophers and scientists throughout the eons of human thought and across various fields of study, resulting in several theories of rationality. This fact complicates the distinction of the relevant concepts, their definitions and analyses. Especially within the boundaries of economics much clarification is needed in order for economists and other social scientists to integrate the ever-accumulating empirical evidence and advancement of theories that characterize the contemporary interdisciplinary study of reasoning, individual choice, decision making and purposeful behavior (Sugden 1991; Nozick 1993; Nussbaum 1997; Zouboulakis 2001; Anand, Pattanaik & Puppe 2009). For this reason, an attempt will be made to briefly distinguish some particular basic features of the concept of rationality regarding the methodology and philosophy of social sciences in general, before moving on to the more specific description of the type of rationality that concerns economics today.

The concept of reason has taken diverse forms since antiquity, but it has long been understood as a higher characteristic of human nature and something that is always opposed to passions when it comes to deliberation. Rational choice, on the other hand, treats rationality as a purposeful behavior that is motivated by sufficient reasons. These reasons are the beliefs, the desires and the values of the individual and their formation can generate from internal or external factors. So, rationality can be seen as the way an individual responds to her reasons.

Rational thinking in general, i.e., the ability of reasoning and the use of knowledge in order to understand the world and choose suitable means to an end, is not challenged in serious arguments. According to the famous maxim by one of the leading economists of the first part of the 20th century, Lionel Robbins, "they are so much the stuff of our everyday experience that they have only to be stated to be recognized as obvious" (1935). Rather, the theories of rationality, that are occasionally proposed, are under discussion and dispute (Searle 2001; Weiss 2008; Gorham 2009). The concept of rationality depends enormously on the accompanying normative criteria that one chooses to use in order to test whether a behavior is rational or not. Accordingly, for instance, philosophers and mathematicians use the principles of formal logic (Anapolitanos 1991), statisticians use the theory of probabilities and experimental psychologists prefer syllogistic reasoning and conditional inference. Economists use the model of rational choice theory and the assumption of expected utility maximization. These normative theories are also prescriptive since they simultaneously suggest an optimal way for individuals to think, judge and make decisions in order to be more

rational (i.e., in economics, to realize their preferences). Some descriptive theories, such as the ones found in experimental psychology, make observations about how individuals actually behave. Based on these observations, one can discern whether actual behavior conforms to the assumptions of the specific theory of rationality she chooses to employ, and, consequently determine if a person or a behavior is indeed "rational" (Over 2004; Schooler 2001).

Elster (2009) asserts that rational behavior must adhere to some conditions, such as unbiased beliefs that are based on an optimal amount of information and the absence of emotional complications that hamper the realization of initial desires, such as *akrasia* (for a discussion of *akrasia* see under section 2.4). Elster (2009: 68) paints a very colorful picture of the different functions of reason and rationality in human behavior:

> *They are the functions, respectively, of the prince's tutor and his councilor. The tutor teaches the prince to promote the public good in the long term. The councilor tells him how to act in order to achieve his goals, whatever they might be, in the most efficient way. It is not incumbent upon the councilor to impose the demands of reason; but if the tutor has done his job well, the prince will make them his own.*

Furthermore, there is a distinction between epistemic or theoretical rationality and rationality of action or practical rationality. The former has to do with the rationality of an individual's beliefs and reasoning and the latter with the rationality of her actions. The beliefs are supposed to be rational when they are based on reliable cognitive processes that yield information which is provided by memory, perception,

learning, observation, experience and the senses. Our reasoning is supposed to be rational when it arrives to true (or almost true) conclusions given the existing premises which are derived from the beliefs. On the other hand, the actions are rational when they help the individual to achieve the goals she sets, given her beliefs and her reasoning while making decisions based on those (Over 2004; Hogarth & Reder 1987). An instrumental theory, such as rational choice theory, deals with the rationality of action and more specifically with the validity of the means rather than the validity of premises or the ends. The rational evaluation of the personal goals (desires/preferences) of an individual is outside the scope of the model of rational choice theory, unlike with most other theories in social sciences (Becker & Stigler 1977; Hogarth & Reder 1987). Ludwig von Mises pointed out (1949: 39.2.6), in his defense of economics, albeit his criticism of the neoclassical model, that:

> *Economics does not assume or postulate that men aim only or first of all at what is called material well-being. Economics, as a branch of the more general theory of human action, deals with all human action, i.e., with man's purposive aiming at the attainment of ends chosen, whatever these ends may be. To apply the concept rational or irrational to the ultimate ends chosen is nonsensical. We may call irrational the ultimate given, viz., those things that our thinking can neither analyze nor reduce to other ultimately given things. Then every ultimate end chosen by any man is irrational. It is neither more nor less rational to aim at riches like Croesus than to aim at poverty like a Buddhist monk.*

Economic rationality is instrumental in its essence. The use of an instrumental rationality suggests that we are more concerned with using our model of rationality as a tool to better understand and function in the world rather than with accurately describing how this world really is (Hindmoor 2006; Peterson 2009). So, an individual

is rational when she chooses those actions that satisfy her preferences with the employment of the best possible means in the best possible way. Her preferences or aims are not judged as rational or irrational as long as her actions provide the appropriate outcomes. The rational individual does not act out of the social and institutional context. Gemtos (1995: 149) emphasizes that the "economic man does not indulge in destroying other people (he is not the man of an economic jungle), but seeks to satisfy his needs with the appropriate means, leaving space for others to do the same."[12]

This concept of instrumental rationality, not surprisingly, comes from philosophy and goes back to David Hume and his famous maxim of how reason is "the slave of the passions" (Hume 1739: 217; Zouboulakis 2014). Hume's insightful remark asserts that action is driven by one's preferences, i.e. desires, and reason is just the means to satisfy them. In another passage of the *Treatise*, Hume also refuses to determine which choices are rational or not, as long as an individual achieves her ends (1739: 217):

> *'Tis not contrary to reason to prefer the destruction of the world to the scratching of my finger. 'Tis not contrary to reason for me to chuse my total ruin, to prevent the least uneasiness of an Indian or person wholly unknown to me. 'Tis as little contrary to reason to prefer even my own acknowledg'd lesser good to my greater, and have a more ardent affection for the former than the latter.*

[12] All the translations from Greek to English were made by the authoress, unless otherwise indicated.

For the empiricist Hume, who aspired to establish a "science of Man" according to the methods of the natural sciences that, at the time, were propagated by Newtonian physics, this notion of instrumental rationality offered a scientific approach to human thinking and psychology that endures even today.

Petros Gemtos (1995: 147) discusses the methodological status of Homo Economicus as follows:

> *First, it is obvious that the construction of homo economicus has no deontological aspect: the pursuit of self-interest is not applauded or recommended and other types of behavior are not rejected. The premise of rational behavior has an epistemic and informational purpose: it aims at offering a general theoretical principle that, with the appropriate specialized and institutional additions, can lead to the explanation of the phenomena of economic life. The criticism that this premise contradicts the empirical evidence – and thus must be abandoned – is based on extreme empiricist positions that have already been outdated by modern epistemology. […] It could be said that – depending on the methodological approach – economic rational behavior comes under the "as-if" assumptions (Friedman), the hard core of economic theory (Lakatos, Machlup), or that it provides sufficient theoretical foundation for principal explanations (Hayek, Popper).*

But rational choice theory can be both positive and normative in a different sense. It is positive because, up to a certain degree, it is expected to observe, describe, explain and, most importantly, predict the actual choices people make in economic markets and other environments that involve choice. In its simplest form, it is supposed to prescribe some necessary and sufficient requirements for rational behavior. In the following chapters we will try to show that rational choice describes real life choices in a higher degree than it is broadly believed. And it is normative, i.e. prescriptive,

because, at the same time, it suggests a set of ideal standards and norms of behavior that best lead to the attainment of individual and subjective goals. This normative aspect doesn't have to include any kind of ethical evaluation (Sen 1987; Drakopoulos 1991; Hausman & McPherson 2006).

Finally, it must be pointed out that microeconomics is concerned with the aggregate behavior of rational agents in the sense that even though its methodology is individualistic, its object of study is not the specific choices and actions of particular or single individuals. Economists base their assumptions on a "representative" individual behavior and then explain the regularities that will occur on the total population under study as the average performance of all the individuals. Their predictions have value only for the aggregate behavior not necessarily for specific individuals. The dominance of methodological individualism led many scholars to expect from economics accurate predictions for specific individual behavior. Their disappointment stems from this confusion and a disregard of the obvious: economics is a social science, not a branch of psychology. But even the most advanced theories in contemporary psychology or mathematics cannot offer the perfect algorithm of decision making tailored to each individual. The same applies for rational choice theory and any theory of rationality for that matter; they can only help us understand how rational thinking is structured, not which specific rational decisions to make.

This mix up of concepts and analyses, concerning rational behavior in economics, is due to other reasons as well, such as the simultaneous development of two different

but most defining schools of thought that can be labelled the "Chicago" and the "Princeton" tradition accordingly (see below under section 2.3). Nevertheless, a brief historical review of rationality in economic thought will also be helpful for the purposes of disentangling the mix up of concepts, ideas and methodologies.[13]

2.2 A Brief History of Rationality in Economic Thought

The concept of economic rationality, in the sense of a fundamental theoretical framework for explaining and predicting behavior, either in the limited scope of economic life or in the broader area of choice, can be found in seminal form in the texts of classical economists as far back as Adam Smith. However, Gary Becker was the one who suggested and applied a thorough economic approach to human behavior – even non-market behavior – in the mid-20th century, based firmly on the Chicago tradition of rational choice theory (Becker 1962; 1976; 1993). Since Becker, rational choice theory is an effective set of tools economists have at hand in order to work their assumptions and make their predictions not only on the "everyday business of life" (Marshall 1890) but also on human behavior in general without any visible limits. Becker was the one to realize Lionel Robbins' (1935) vision of economics as "the science which studies human behavior as a relationship between scarce means which have alternative uses".

[13] For a recent and comprehensive history of rationality, see Zouboulakis (2014).

Of course Adam Smith never used the term "rationality",[14] but he provided a theory of individual motivation for choice and action based on "self-interest" and "self-love", that foreshadowed many traits of the future concept of the rational maximizer (1776: 4.2.9; see also 4.2.10: "every individual, it is evident, can, in his local situation, judge much better than any statesman or lawgiver can do for him"). However, according to Smith, human behavior and consequently the way some individual pursuits her aims, are both bounded and motivated by moral and legal rules and social norms, other than selfish drives and the forces of competitive market, such as the internal "impartial spectator", fear of God, concern for others and consent to laws (Zouboulakis 2014).

Most remarkably, Smith recognizes another kind of strong moral motivation which generates from an innate degree of sympathy that all humans demonstrate towards another person's situation. Smith uses the term "sympathy" to describe what is widely known today as "empathy" from psychological and neurological evidence in primates and humans. Rizzolatti and his colleagues (Rizzolatti et al. 2001; 2004) were the first to discover a neurophysiological neuron mechanism, the much-discussed *mirror-neuron system*, responsible for action understanding and imitation. Through extensive research and growing evidence, mirror neurons are believed to

[14] There are however two instances he uses the word "rational" – in "rational conversation" (1776: 5.1.178 and "rational religion" (1776: 5.1.197). Earlier, in the *Theory of Moral Sentiments* (1759) there are seven references to "rational creatures" and "rational beings". It is interesting that he doesn't use the expression anymore in his later book about economics.

explain not only learning by mimicry but also why humans empathize with others, sharing their emotions and sensations (Keysers et al. 2009). It has been further investigated that the hormone *oxytocin* also facilitates attachment to others and enhances empathy (Zak 2007). Smith articulates this capacity as follows in the opening of *Moral Sentiments* (1759: 1.1.1):

> *How selfish so ever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it. Of this kind is pity or compassion, the emotion which we feel for the misery of others, when we either see it, or are made to conceive it in a very lively manner. That we often derive sorrow from the sorrow of others, is a matter of fact too obvious to require any instances to prove it; for this sentiment, like all the other original passions of human nature, is by no means confined to the virtuous and humane, though they perhaps may feel it with the most exquisite sensibility. The greatest ruffian, the most hardened violator of the laws of society, is not altogether without it.*

While Smith sees both selfish and altruistic sentiments as generators of human behavior within a well-structured institutional environment, he foreshadows yet another aspect of modern theory of economic behavior, the fact that incentives matter significantly (1776: 1.2.4):

> *The difference of natural talents in different men is, in reality, much less than we are aware of; and the very different genius which appears to distinguish men of different professions, when grown up to maturity, is not upon many occasions so much the cause as the effect of the division of labour. The difference between the most dissimilar characters, between a philosopher and a common street porter, for example, seems to arise not so much from nature as from habit, custom, and education. When they came into the world, and for the first six or eight years of their existence, they were, perhaps, very much alike, and neither their parents nor playfellows could perceive any remarkable difference. About that age, or soon after, they come to be employed in very*

> *different occupations. The difference of talents comes then to be taken notice of, and widens by degrees, till at last the vanity of the philosopher is willing to acknowledge scarce any resemblance.*

This assumption of a shared human nature and the role of the institutions in the behavior of individuals and the fate of nations is picked up by John Stuart Mill who examines economic behavior more thoroughly in his works and tries to set a higher scientific standard to the investigation of the human mind, psychology and social science (Zouboulakis 2014: ch. 2). This is very clear in both *A System of Logic* (1843) and *Principles of Political Economy* (1848): "For every individual is surrounded by circumstances different from those of every other individual; every nation or generation of mankind from every other nation or generation; and none of these differences are without their influence in forming a different type of character." (Mill 1843: 6.3). In the same vein five years later (Mill 1848: 2.9):

> *Is it not, then, a bitter satire on the mode in which opinions are formed on the most important problems of human nature and life, to find public instructors of the greatest pretensions, imputing the backwardness of Irish industry, and the want of energy of the Irish people in improving their condition, to a peculiar indolence and insouciance in the Celtic race? Of all vulgar modes of escaping from the consideration of the effect of social and moral influences on the human mind, the most vulgar is that of attributing the diversities of conduct and character to inherent natural differences.*

Mill further examines the philosophical, psychological and social principles of behavior in his utilitarian theory. He rejects Bentham's fundamental assumption about the predominance of pleasure over pain. Mill goes on to recognize other-regarding preferences and self-sacrifice as possible sources of an individual's happiness who

is also a member of society, thus incorporating altruism in rational behavior (Screpanti & Zamagni 2005; Zouboulakis 2014): "The utilitarian morality does recognize that human beings can sacrifice their own greatest good for the good of others; it merely refuses to admit that the sacrifice is itself a good. It regards as wasted any sacrifice that doesn't increase, or tend to increase, the sum total of happiness." (1863: ch. 2). Mill even formulates an early description of modern economics' subjective theory of value and the problems of interpersonal comparison of utility (*id.*):

> *What means are there of determining which is the acutest of two pains, or the intensest of two pleasurable sensations, except the general suffrage of those who are familiar with both? Neither pains nor pleasures are homogeneous, and pain is always heterogeneous with pleasure. What is there to decide whether a particular pleasure is worth purchasing at the cost of a particular pain, except the feelings and judgment of the experienced?*

Furthermore, Mill answers Smith's "diamond/water paradox" by asserting that: "The use of a thing, in political economy, means its capacity to satisfy a desire, to serve a purpose." (1848: 3.1.9).

The concept of economic rationality was more clearly manifested during and after the Marginalist Revolution and the ongoing effort of economists to offer to their field a more rigorous status according to positivism and the natural sciences paradigm. Marginalists based their approach on Bentham's calculus and psychological hedonism (Drakopoulos 2011). Jevons contributed to the mathematization of economics

and created the axiomatic nature of rationality through the introduction of maximization of utility under constraints.[15] Jevons recognizes that utility is not an "intrinsic quality" but "*a circumstance of things* arising out of their relation to man's requirements" (1888: ch. 3). He considered the individual as a rational maximizer in terms of maximizing pleasure and reducing pain, thus directly linking his theory to Bentham's utilitarianism and more likely having in mind a cardinal sense of measurement (*id*.):

> *Pleasure and pain must be regarded as measured upon the same scale, and as having, therefore, the same dimensions, being quantities of the same kind, which can be added and subtracted; they differ only in sign or direction. Now, the only dimension belonging properly to feeling seems to be intensity, and this intensity must be independent both of time and of the quantity of commodity enjoyed. The intensity of feeling must mean, then, the instantaneous state produced by an elementary or infinitesimal quantity of commodity consumed.*

He notes earlier (1871: ch. 2) that:

> *The algebraic sum of a series of pleasures and pains will be obtained by adding the pleasures together and the pains together, and then striking the balance by subtracting the smaller amount from the greater. Our object will always be to maximise the resulting sum in the direction of pleasure, which we may fairly call the positive direction. This object we shall accomplish by accepting everything, and undertaking every action of which the resulting pleasure exceeds the pain which is undergone; we must avoid every object or action which leaves a balance in the other direction.*

[15] Vilfredo Pareto is more known for his contributions in welfare economics, but see Zouboulakis 2014 (ch. 4) for the steps he made in relieving the economic analysis of any psychological variables and shaping the economic model in the form of instrumental rationality.

For Jevons this "[p]leasure and pain are undoubtedly the ultimate objects of the Calculus of Economics. To satisfy our wants to the utmost with the least effort-to procure the greatest amount of what is desirable at the expense of the least that is undesirable-in other words, to maximise pleasure, is the problem of Economics." (1888: ch. 3).

In the midst of the Marginalist Revolution, which brought mathematical rigor and growing formalization in economics, Alfred Marshall, partly revived the Smithian assumptions of what motivates behavior in a social context. He acknowledged higher motives and altruistic sentiments against the already existing prejudices for the "evils" of competition (1890: 1.1.4):

> *In every age poets and social reformers have tried to stimulate the people of their own time to a nobler life by enchanting stories of the virtues of the heroes of old. But neither the records of history nor the contemporary observation of backward races, when carefully studied, give any support to the doctrine that man is on the whole harder and harsher than he was; or that he was ever more willing than he is now to sacrifice his own happiness for the benefit of others in cases where custom and law have left him free to choose his own course.*

Although of course he contributed to a lot of theoretical groundwork to economics and recognized that economics was "more exact than any other branch of social science", he cautioned against the excessive mathematization of human behavior and the desire to simulate the way of natural sciences: "But, of course, economics cannot be compared with the exact physical sciences: for it deals with the ever changing and subtle forces of human nature." (Marshall 1890: 1.2.1).

Marshall furthermore developed some core concepts of the modern neoclassical model, such as the "willingness to pay" as a measure for peoples' motives but he had also more than deep insights about "revealed preferences" (1890: 1.2.1):

> *The advantage which economics has over other branches of social science appears then to arise from the fact that its special field of work gives rather larger opportunities for exact methods than any other branch. It concerns itself chiefly with those desires, aspirations and other affections of human nature, the outward manifestations of which appear as incentives to action in such a form that the force or quantity of the incentives can be estimated and measured with some approach to accuracy; and which therefore are in some degree amenable to treatment by scientific machinery. An opening is made for the methods and the tests of science as soon as the force of a person's motives – not the motives themselves – can be approximately measured by the sum of money, which he will just give up in order to secure a desired satisfaction; or again by the sum which is just required to induce him to undergo a certain fatigue. It is essential to note that the economist does not claim to measure any affection of the mind in itself, or directly; but only indirectly through its effect.* […] *If the desire to secure either of two pleasures will induce people in similar circumstances each to do just an hour's extra work, or will induce men in the same rank of life and with the same means each to pay a shilling for it; we then may say that those pleasures are equal for our purposes, because the desires for them are equally strong incentives to action for persons under similar conditions.*

Marshall points out later on that "the same price" can of course "measure different satisfactions even to persons with equal incomes", but he understands those differences to "counterbalance one another", "when we consider the average of large numbers of people."

A contemporary to Marshall, but not as much studied by today's economists, Philip Wicksteed, deserves special reference in this brief historical review, for the role his

ideas played in the formation of economic methodology. Wicksteed was considerably influenced by the marginalists and especially by Jevons and he largely influenced the great 20th century economist, Lionel Robbins (for an in depth analysis of Wicksteed's work and his impact on Robbins' thought, see Drakopoulos 2011). According to Drakopoulos (2011), Wicksteed, who was much influenced by positivism, wished to clear economics of the normative and metaphysical elements that were provided by hedonism and utilitarianism. He also wished to defend economics from the assumptions of egotistical motives of human action and accepted that a realistic model of the economic man could quite well combine selfish and altruistic behavior. At the same time, he followed the marginalist approach of mathematical and scientific methods in economic thought and maintained that the model of the economic man is rooted in real psychological assumptions that are true for humans in general. He also maintained that human behavior is basically rational, although much of our rational decisions are made unconsciously: "That is to say, if we are moderately wise we pretty generally act without reflection in the manner which reflection would have dictated." (1933: 36).

Although he goes on to assert "but these unconscious and automatic processes are far from being infallible", we believe this last point was an insightful peek in future psychological and cognitive approaches of the intelligence of the unconscious (see chapters 3 and 4 for an in depth analysis of these approaches regarding economic rationality).

Wicksteed foreshadowed Becker and Stigler's neoclassical economic way of thinking in his distinction between "economic relations" and "economic motives" (McKenzie 2010), where he pointed out how economists should first study "the psychology of choice" in general and then apply this knowledge to the study of behavior in economic transactions (1910: 4):

> *Accordingly, I shall try to shew that it is time frankly and decisively to abandon all attempts to rule out this or that "motive" from the consideration of the Economist, or indeed to attempt to establish any distinction whatever between the ultimate motives by which a man is actuated in business and those by which he is actuated in his domestic or public life. Economic relations constitute a complex machine by which we seek to accomplish our purposes, whatever they may be. They do not in any direct or conclusive sense either dictate our purposes or supply our motives. We shall therefore have to consider what constitutes an economic relation rather than what constitutes an economic motive. And this does away at a stroke with the hypothetically simplified psychology of the Economic Man which figured so largely in the older books of Political Economy, and which recent writers take so much trouble to evade or qualify. We are not to begin by imagining man to be actuated by only a few simple motives, but we are to take him as we find him, and are to examine the nature of those relations into which he enters, under the stress of all his complicated impulses and desires – whether selfish or unselfish, material or spiritual, – in order to accomplish indirectly through the action of others what he cannot accomplish directly through his own.*

Finally, one of the most important elements in Wicksteed's thought is the introduction of the significant concept of the "scale of preferences" and the fundamental principle of transitivity between different choices that he wanted to ascribe to all behavior – even the non-economic one. This idea, which greatly influenced the contemporary neoclassical model and especially its imperialistic and empirical expansions at explaining behavior beyond the market economy, is clearly and vividly described in the following passage (1933: 32):

We have thus arrived at the conclusion that all the heterogeneous impulses and objects of desire or aversion which appeal to any individual, whether material or preference spiritual, personal or communal, present or future, actual or ideal, may all be regarded as comparable with each other; for we are, as a matter of fact, constantly comparing them, weighing them against each other, and deciding which is the heaviest. And the question, "How much of this must I forgo to obtain so much of that" is always relevant. If we are considering, for example, whether to live in the country or in the town, such different things as friendship and fresh air or fresh eggs may come into competition and comparison with each other. Shall I "bury myself in the country", where I shall see little of my dearest friends, but may hope for fresh eggs for breakfast, and fresh air all the day? Or shall I stay where I am, and continue to enjoy the society of my friends? I start at once thinking "how much of the society of my friends must I expect to sacrifice? Will any of them come and see me? Shall I occasionally be able to go and see some of them? The satisfactions and benefits I anticipate from a country life will compensate me for the loss of some of their society, but not for the loss of all of it. The price may be too high. In such a case as this the terms on which the alternatives are offered are matter of more or less vague surmise and conjecture, but the apparent dissimilarity of the several satisfactions themselves does not prevent the comparison, nor does it prevent the quantitative element from affecting my decision. Using the term price then in its widest extension, we may say that all the objects of repulsion or attraction which divide my energies and resources amongst them are linked to each other by a system of ideal prices or terms of equivalence. We may conceive of a general "scale of preferences or "relative scale of estimates" on which all objects of desire or pursuit (positive or negative) find their place, and which registers the terms on which they would be accepted as equivalents or preferred one to the other.

Lionel Robbins, whose work had a huge impact on mainstream economic methodology, was indeed much influenced by Wicksteed and he elaborated fully on the above idea of the ordering of preferences and of the interpersonal utility comparisons: "For each individual, goods can be ranged in order of their significance for conduct; and that, in the sense that it will be preferred, we can say that one use of a good is more important than another." (1932: 122).

Robbins is famous for his very comprehensive definition of economics, as has already been mentioned above, in which he stated that "economics is the science which studies human behavior as a relationship between scarce means which have alternative uses" (1935). This same definition could as easily describe Robbins' view of rationality, as the ability of individuals to deal with scarcity, different wants and limited means. But unlike Wicksteed, Robbins did not believe that the model of the economic man represented actual behavior (Drakopoulos 2011). One of his strong convictions was that economics should be freed from the influence of psychology (1932: 86):

> *Why the human animal attaches particular values in this behaviouristic sense to particular things, is a question which we do not discuss. That may be quite properly a question for psychologists or perhaps even physiologists. All that we need to assume is the obvious fact that different possibilities offer different stimuli to behaviour, and that these stimuli can be arranged in order of their intensity.*

Economics, therefore, should not rely on experimental psychology and empirical verification, because economics "proves to be a series of deductions from the fundamental concept of scarcity of time and materials" (1932: 76). It is a science following logical deductions after its initial, simply observable and given, principles (1932: 75):

> *Our proposition rests upon deductions which are implicit in our initial definition of the subject-matter of Economic Science as a whole. Economics is concerned with the disposal of scarce goods with alternative uses. That is our fundamental conception. And from this conception we are enabled to derive the whole complicated structure of modern Price Theory. That goods are*

> *scarce and have alternative uses is a fact. Economic analysis consists in elucidating the manifold implications thereof.*

Economics, finally, according to Robbins (and Wicksteed), should be a positive science, cleared of any normative issues and concerned only about "what is" and not about what "ought to be", an influential idea that is still maintained by a lot of contemporary economists (1932: 136):

> *Faced with the problem of deciding between this and that, we are not entitled to look to Economics for the ultimate decision. There is nothing in Economics which relieves us of the obligation to choose. There is nothing in any kind of science which can decide the ultimate problem of preference. But, to be rational, we must know what it is we prefer. We must be aware of the objective implications of the alternatives of choice. For rationality in choice is nothing more and nothing less than choice with complete awareness of the alternatives rejected. And it is just here that Economics acquires its practical significance. It can make clear to us the implications of the different ends we may choose. It makes it possible for us to will with knowledge of what it is we are willing. It makes it possible for us to select a system of ends which are mutually consistent with each other.*

Robbins greatly admired Friedrich von Hayek, the prominent economist of the "Austrian School", and it was he who invited him to teach at the London School of Economics in the early 1930's. Hayek, and other proponents of Austrian Economics, like Ludwig von Mises, played a role in the formation of the concept of economic rationality, although they opposed the perfect rationality model that was constructed by the neoclassical methodological approach. Hayek believed that the preferences of an individual – which can be selfish or not - and the values he attached to goods were subjective in a way that could never be truly assessed or predicted by any other individual or group of individuals. According to Hayek, who was very preoccupied with

the "socialist calculation debate" of the era (Boettke 2000), people are rational in the sense that each will try to improve their situation in the social environment they inhabit and thus, if left free to achieve their goals, satisfy their preferences and engage in voluntary exchange relations, a spontaneous order of efficient allocation of resources will arise. This order, which is reminiscent of Adam Smith's "individual hand", cannot be predicted a priori by any central designer and can only be partly observed by the system of prices that occur in a free market economy. The economists, therefore, can never practice their science in the way of the natural sciences, but can only establish a few theorems about economic life. As Hayek observes (1952: 69):

> *If social phenomena showed no order except insofar as they were consciously designed, there would indeed be no room for theoretical sciences of society and there would be, as is often argued, only problems of psychology. It is only insofar as some sort of order arises as a result of individual action but without being designed by any individual that a problem is raised which demands a theoretical explanation.*

Hayek remained skeptical of constructivism and rationalism, especially in the last period of his career (1988: 76):

> *If we had deliberately built, or were consciously shaping, the structure of human action, we would merely have to ask individuals why they had interacted with any particular structure. Whereas, in fact, specialised students, even after generations of effort, find it exceedingly difficult to explain such matters, and cannot agree on what are the causes or what will be the effects of particular events. The curious task of economics is to demonstrate to men how little they really know about what they imagine they can design*.

During the 1940's the concept of rational behavior became more and more entrenched in economic theory. During the second war world period and especially during the cold war, two schools of rationality emerged simultaneously in two distant - geographically and ideologically - academic institutions in the United States. Most economists, psychologists and other social scientists today confuse these two traditions, even though their differences were always numerous. The first is the tradition of axiomatic rational choice theory, born at Princeton University during the war, together with Game Theory. It was connected, if not identified, from the very beginning with the American government which funded it generously. The other is the tradition of empirical rational choice theory, born at the University of Chicago in the late 1940s when Milton Friedman and George Stigler dominated the Department of Economics. It was identified with its strong classical liberal ideology and its distrust to the American government. It was funded mostly by small liberal foundations and businessmen who didn't have dealings with the government and behaved as outsiders in the corporatist economy of the post-war years. These two separate schools and their proponents were focused on different research programs and developed two distinct models of rationality. The distinction is very important for the study of economic thought and methodology and it is necessary for the purposes of this thesis as we are mainly concerned with the model of rationality and the theory of rational choice which is the product of the Chicago School of Political Economy (Stigler 1988; Samuels 1993).[16]

[16] Behavioral economics and every interaction of economics with psychology will be the subject matter of Chapters 3 and 4.

2.3 THE TWO TRADITIONS OF RATIONAL CHOICE THEORY: DECISION THEORY IN PRINCETON AND NEW POLITICAL ECONOMY IN CHICAGO[17]

For many scholars (including some experts) Rational Choice Theory (RCT) has been identified with the University of Chicago School of Economics. Even though some of the major developments of the theory are connected with economists and social scientists working on other institutions, in different academic traditions and political environments and with clearly diverse research agendas from those of the Chicago School of the "golden era",[18] there is considerable confusion if not clear ignorance of the fact that there are at least two distinct and separate traditions in RCT: The axiomatic and the empirical tradition.

[17] This chapter draws heavily from Foka-Kavalieraki & Hatzis (2015b).

[18] We characterize as "Golden Era" for the Chicago School, the period from the late 1940s to the early 1990s. During this period Milton Friedman and George Stigler dominated the department of economics after the retirement of Frank Knight and Jacob Viner; the "Chicago School of Political Economy" emerged and its leading members were at the peak of their careers (Stigler 1988a, 1988b; Samuels 1993). The influence of Chicago School climaxed in the early 1990s when some major figures working on the premises and nature of rationality were active and very influential (Gary Becker, Richard Posner, James Coleman, Jon Elster, Russell Hardin and many other). Its success in greatly influencing the mainstream led to its decline. In the late 1990s Chicago school was not heretical anymore and it was not considered radical by the new mainstream. For example, by the late 1990s every major law school in the United States had a strong and well-funded Law & Economics program and at least one economist in its faculty, when in early 1980s "law & economics" were rejected by most leading legal theorists, almost unanimously.

The axiomatic tradition of RCT was born during the 1940s at Princeton University[19] and grew up during the Cold War in places like Carnegie Mellon, Stanford and RAND Corporation. It is highly mathematized, concentrated in Game Theory and identified with "decision theory" and government planning. The Princeton school of RCT was generously funded by the U.S. Government (and especially the military during World War II and the Cold War) and it was interdisciplinary (economists, psychologists, mathematicians, statisticians, logicians and of course game theorists).

On the other hand, the new political economy developed at the University of Chicago (and later the University of Virginia, UCLA and George Mason University) as "the economic approach to non-market behavior". Its approach was empirical, with an emphasis on price theory, and politically liberal. The Chicago School was funded by small private pro-free market foundations and outsider-businessmen[20] and almost all its members were economists.

The way each school was funded was instrumental for several reasons: their research agenda, their methodology, their relationship with other sciences, especially psychology, and the use of their research were influenced by the sources of funding.

[19] In Princeton University's Institute for Advanced Study the new theory was born after the publication of the foundational work on game theory by von Neumann & Morgenstern (1947). See Leonard 2010: 185-292 (game theory became part of a general wartime reorientation of scientific work). However, this tradition is more closely identified with RAND Corporation.

[20] Like the William Volker Fund, a charitable foundation established in 1932 by the Kansas City businessman who made his fortune in home-furnishings.

Amazingly enough, the dialogue and the collaboration between the two schools was rather non-existent or even inimical. It is not a coincidence that the major critique to RCT emerged from the academic institutions of the first group against axiomatic RCT but it was disguised as a critique to the new political economy of the Chicago school which was represented as a straw man of the RCT of the first group Posner (2002: 2).

In the following paragraphs we are going to describe the two schools, their research agendas, their methodologies and their differences in order to describe more accurately what Rational Choice Theory really is and most importantly what is not.

2.3.1 Rational Choice without Chicago

For the past 15 years a number of monographs have been published exploring the relationship between social scientists and cold war politics.[21] Some of these books are of a very low quality, shallow, written by authors without scientific integrity, with a minimal understanding of theories and concepts, usually defending conspiracy theories.[22] However, even the monographs written by scholars who are polemical and very critical of RCT share the same characteristic: they do not include the Chicago School in their story. They describe RCT as a product of government planning

[21] The first major work was Mirowski (2001). The objectives of Mirowski are broader than the ones of Amadae (2003; 2016) and Erickson (2013; 2015). Nevertheless, all five books implicitly agree that this is a story where Chicago School is literally absent.

[22] See particularly Klein (2008); *cf.* Norberg (2008) for a devastating critique.

and targeted funding in major academic and research institutions from the early 1940s to the end of Cold War. RCT is described as a weapon used by the U.S. government during the cold war (but also before and after) and at the same time a theory identified with neoliberalism. This is very odd. Since neoliberalism is usually identified with Chicago economics, how come Chicago is absent?[23]

The most important work in the field are two monographs of historian of science, S.M. Amadae (2003; 2016). Amadae narrates the story of the birth and development of RCT as an "intellectual bulwark of capitalist democracy". According to Amadae (2003), RCT grew out of the RAND Corporation's efforts to develop a science of military and policy decision making. In her story the leading figures in the first generation of rational choice theorists are the political scientist William Riker and economists (and later Nobel laureates) Kenneth Arrow and James Buchanan. RCT had three functions to serve:

(a) to generate a science of military strategy to aid leaders in making superior decisions.

[23] Even in the paranoid theory of Klein (2008), the Chicago school is conspicuously absent. Klein targets Milton Friedman as an "isolated figure" with minimal references to Chicago school of economics. It is characteristic that in a book of more than 700 pages there is not even a reference to George Stigler. The book was shunned by Chicago school historians, even the ones who are very critical of Chicago economics (see Hatzis 2011 for details and Emmett 2010 and Van Horn et al. 2011 for examples).

(b) to "transfer" the science to the domestic front by helping the American government design a "decision technology" for social control in order to supersede the limits of classical liberal democracy, especially majoritarianism and institutional safeguards for the protection of individual rights.

(c) to secure the "philosophical basis of free world institutions", to defeat "idealist, collectivist, and authoritarian social theories" (Amadae 2003: 12-13).[24]

It is more than remarkable that in her 400-page monograph on the history of RCT Amadae doesn't even mention[25] the Chicago School of Economics! Apparently Amadae believes that the intellectual developments in Chicago during this period are not part of the history of RCT. There is no discussion (not even a reference) to Milton Friedman or Gary Becker. It is not a coincidence. Amadae's thesis is that axiomatic decision making (or axiomatic RCT) is not a refinement of marginalist economics but an innovative approach to decision making quite far from the premises and objectives of Chicago economics (Amadae 2003: 240-248). It is a science of control, not a science of choice.

[24] Amadae criticizes post-war RCT for undermining the very notion of individual liberty it was created to defend by overemphasizing self-interest and undermining other human sentiments such as sympathy (Amadae 2003: 193-219).

[25] There is actually one passing reference (Amadae 2003: 135) to Chicago School of Economics as the school James Buchanan graduated and was influenced from. However, James Buchanan methodological differences with the Chicago School are well-known. He is not considered a member of the school and his approach is fundamentally different (Buchanan 1964; McCloskey 2011).

Ten years later, another very interesting story of cold war rationality collectively written by six scholars from different disciplines (Erickson et al. 2013), reaches a similar conclusion about RCT - for our purposes. According to the authors, RCT was developed by game theorists and social psychologists in almost everywhere, except Chicago.[26] Oskar Morgenstern, Thomas Schelling, Herbert Simon, Herman Kahn and Anatol Rapoport are the protagonists in this story of a creation of a science of decision making which is formalistic, algorithmic and mechanically rule-bound and is heavily funded by the U.S. Defense department. Economists are only a part of this story since RCT is an interdisciplinary endeavor by experts in mathematics, logic, game theory, systems analysis, computer science, operations research, Bayesian probability, nuclear strategy and experimental social psychology.[27] The outcome of this was a theory (RCT) where "[rationality] could be captured by a finite, well-defined set of rules to be applied unambiguously" (Erickson et al. 2013: 29). According to the authors, even old-behavioral scientists, like Herbert Simon, reinforced this approach by adopting the framework and working in it. The same happened with Amos Tversky and Daniel Kahneman. They are essentially part of the same tradition in social science research.[28]

[26] The most important institutions for the development of RCT (according to the authors) are the Center for Advanced Study in the Behavioral Sciences at Stanford University, the Council on Foreign Relations in New York and of course RAND Corporation.

[27] The work of psychologists, especially of Charles Osgood, Robert Freed Bales, Irving Janis and Morton Deutsch is extensively discussed.

[28] For a recent history of Behavioral Economics as a continuum from Behavioral Axioms in von Neumann & Morgenstern (1947) to Prospect Theory of Kahnemann and Tversky, see Heukelom (2014).

Chicago school is again notoriously absent. There is not even a reference.[29] This is again not a coincidence. For the authors, RCT's objective was to replace human judgment with formalistic rationality, stripped of subjective perception, reasoning and emotion. How can this be accommodated with the empirical, subjective emphasis on real choices of the Chicago School? The following excerpt by Richard Posner, discussing the case where contracting parties in actual markets agree on something which an economist finds inefficient, is illustrative (Posner 2003: 96-97):

> *Now consider what to do about cases in which the parties' intentions, as gleaned from the language of the contract or perhaps even from testimony, are at variance with the court's notion of what would be the efficient term to interpolate into the contract? If the law is to take its cues from economics, should efficiency or intentions govern? Oddly, the latter. The people who make a transaction – thus putting their money where their mouths are – ordinarily are more trustworthy judges of their self-interest than a judge [...] who has neither a personal stake in nor first-hand acquaintance with the venture on which the parties embarked when they signed the contract. So even if the goal of contract law is to promote efficiency rather than to enforce promises as such [...] enforcing the parties' agreement insofar as it can be ascertained may be a more efficient method of attaining this goal than rejecting the agreement when it appears to be inefficient.*

Every attempt to connect Chicago in this story of cold war politics is rather futile or ridiculous. Starting with the futile: Mirowski (2001) tries very hard to connect the dots in his book. Being himself very hostile to Chicago economics,[30] he emphasizes

[29] With one exception: the Cowles Commission. For the tumultuous relation of Cowles Commission to the Chicago School see our discussion below.

[30] His hostility leads him even to *ad hominem* attacks: "When Donald McCloskey had a sex change operation and wrote a real-time diary about the experience for all to empathize on the Internet, then economists got a premonition of where rational choice theory Chicago-style was really headed." (Mirowski 2001: 442). Despite the absurdity of the argument, this is one of the instances that Mirowski explicitly makes the distinction between the two traditions.

the connection of some of the figures of the economics department with the Statistical Research Group (SRG) at Columbia University, a group that was established in the spring of 1942 by Harold Hotelling. However, this was a group of Columbia economists helping the U.S. government war effort by dealing with the statistical problems of ordinance and warfare - it was dissolved right after the end of the war in 1945 (Wallis 1980). Milton Friedman and George Stigler worked there as young economists before they got tenure at Chicago, essentially as research associates, not as senior scholars. His conclusions are illuminating: "Although no profound engineering or theoretical breakthroughs on a par with the atomic bomb or radar occurred at the SRG, it was nevertheless the occasion for the consolidation of what later became known as the 'Chicago school' of economics in the postwar period." (Mirowski 2001: 203).[31] The chasm between cold war RCT and Chicago was huge: "[Chicago] simply ignored von Neumann and the cyborgs"[32] (Mirowski 2001: 227).

One of the reasons of the Chicago isolation from RCT research and government funding was that the University of Chicago was tolerant to communist scholars and students and protective of academic freedom even in the early period of Cold War,

[31] The SRG years are the only instance of Chicago young economists' military experience during the second world war. Mirowski's meticulous research cannot find a single instance of Chicago School economists implicated in Cold War research agendas funded by the U.S. Government. See Mirowski (2001: 202-207) for the whole story. At the end of the section Mirowski briefly describes the fight of the newly established school with the Cowles Commission, the representative of the axiomatic RCT at the University of Chicago campus (see below for more details).

[32] For Mirowski, "cyborg science" is essentially military RCT. He borrows the term from Donna Haraway (cyborg as a kind of artefactual [*sic*], machinic [*sic*] relationship with human beings – Haraway cited by Mirowski 2001: 5, n.2). He includes in it cold war RCT, "bounded rationality", behavioral economics, experimental economics etc.

when red scare was mainstream. Herbert Simon had difficulties to be accepted by the cold war RCT circles because he was a graduate of Chicago: “By 1948, Communists and supposed Communists were being discovered under every rug […] Any graduate of the University of Chicago, with its reputation of tolerance for campus radicals, was guaranteed a full field investigation before he could obtain security clearance.” (Simon 1991: 118). In the early sixties the Chicago School was identified with the anti-(Vietnam)war libertarian movement, the abolition of the draft (an idea supported publicly by Milton Friedman himself) and pro-market ideas (Doherty 2007: 297-307, 454-463). These ideas ensured that the Chicago school would remain an outsider in major Department of Defense programs in social sciences and decision theory.

Bordering the ridiculous is the connection Abella does in his book on RAND Corporation. Abella narrates (somewhat superficially) the story of RAND’s involvement in Cold War with many references to RCT. Again there is no reference to Chicago, with one exception at the conclusion of his book when he feels obligated to attack Milton Friedman out of the blue. After decrying “RAND’s rational choice” as denying “cooperation, self-sacrifice and abnegation,”, giving birth “to a world shaped by decisions made in the dark, outside the realm of public debate – justified by false objectivity […] and biased scientific bases that denigrate collective responsibility” and discarding “previous social commitments of companies to employees, government, and community” he adds the following footnote to give an example: “Among other things, that is why we have a volunteer army – a concept espoused and driven

by laissez-faire economist Milton Friedman, a firm believer in the trade-offs of rational choice theory." (Abella 2008: 308-309).

There is no doubt that there is no connection between the two traditions. Axiomatic rational choice theory was a product of scholars and institutions totally separated from the Chicago School of Economics. This was not only separation, it was a clear-cut exclusion.[33] Nevertheless, it's difficult to understand not only the reasons that this separation was not observed earlier by experts but most importantly the reasons why Chicago was identified with the more extreme formalistic versions of RCT. Versions that were totally alien to Chicago[34] as we are now going to see.

2.3.2 Rationality Chicago-style

The distinctive Chicago School of Economics emerged in the late 1940s, after the end of the war, when three young economists returned to Chicago with tenure: Milton Friedman, George Stigler and Allen Wallis. All three were students of Frank Knight[35] and classical liberals. Together with Aaron Director and Henry Simons,

[33] Even when University of Chicago scholars from different fields (especially behavioral sciences) were supported by government funds or Ford's foundation funding of Behavioral Sciences. See details in Erickson (2015: ch. 5, the title of the chapter being self-explanatory: "The Brain and the Bomb").

[34] See e.g. the review article of Cohen-Cole (2008) which describes the cold-war social science as something way broader than RCT. It was a joint research program by cybernetics, information sciences, systems analysis and RCT to create a new interdisciplinary social science, to be exploited in Cold War politics. He calls it the Cybernetic project. Of course this project should not be reduced to national security imperatives of the era (Erickson 2010).

[35] The "Knight affinity group" (Reder 1982). See also Stigler (1988a: 148-169) and Friedman & Friedman (1998: 183-207) for more personal perspectives.

they formed the first generation of the Chicago School. For Friedman economics was a science "to the extent that neoclassical price theory[36] and empirical verification were combined" (Van Overtveldt 2007: 26). Friedman was from the very beginning very critical of the formalism of the axiomatic RCT. He, as early as in 1949, protests strongly against empty formalistic reasoning (Friedman 1949: 490):

> *Economic theory […] has two intermingled roles: to provide "systematic and organized methods of reasoning" about economic problems; to provide a body of substantive hypotheses, based on factual evidence, about the "manner of action of causes." In both roles the test of the theory is its value in explaining facts, in predicting the consequences of changes in the economic environment. Abstractness, generality, mathematical elegance – these are all secondary, themselves to be judged by the test of application. The counting of equations and unknowns is a check on the completeness of reasoning, the beginning of analysis, not an end in itself. […] But our work belies our professions. Abstractness, generality, and mathematical elegance have in some measure become ends in themselves, criteria by which to judge economic theory.*

This doesn't mean that Friedman was not a positivist (Hands 2009). In his very influential methodological article (Friedman 1953: 4) he emphasizes that positive economics can be "an 'objective' science in precisely the same sense as any of the physical sciences."[37] Nevertheless, the ambition of Friedman was not to sponsor a new approach to economics and of course it was not to shape a distinctive RCT (see e.g.

[36] See the illuminating Friedman-Stigler correspondence in Hammond & Hammond (2006). Their priorities, their methodology and their objectives are miles away from the cold war axiomatic RCT. See also the very interesting and comprehensive survey by Hammond (2006).

[37] See generally Friedman (2007) for his views on economics but also Hirsch & Marchi (1990) and Mäki (2009).

Friedman & Savage 1952). His objective was to protect the school from formalistic rationality[38] without becoming antiquated and outdated, like the Austrian school.

Friedman's best doctoral student, Gary Becker was the one who created a new approach to economics. He was the one who successfully expanded the domain of economics to a science studying choice in a variety of "markets" (from politics to crime, mating, fertility and marriage; Becker 1976; 1993). The fact that this new approach to human behavior, with the help of microeconomics, is still identified with an RCT developed in the cold war academic/military complex is remarkable but also puzzling. It is mostly the result of intellectual laziness, ignorance and polemical attitudes. One of the best historians of the development of the concept of rationality in RCT theory, Nicholas Giocoli makes the record straight (2003: 112, emphasis by the author):

> *Becker's way out was grounded upon the traditional notion of rationality as reasoned pursuit of one's own interest. Yet, the latter was broadened to encompass not only self-interest, but, more generally, any notion of welfare as individuals conceived of it, so behavior was assumed to be driven by a much richer set of values and preferences – namely, "selfish, altruistic, loyal, spiteful, or masochistic" ones (Becker 1993, 386). To behave economically simply meant choosing according to one's own preferences the best option in the perceived opportunity set. Differing from the early marginalists therefore, rationality became a method of analysis, rather than a specific hypothesis concerning human motivations.*

[38] See also Friedman (1946: 631) on the "escape of the shackles of formalism" and in particular the introductory paragraph of the article. However, economists working on "rational expectations", most importantly Robert Lucas and his followers were much less empirical and became more theoretical over the years (Van Overtveldt 2007: 28).

Giocoli (2003: 115) is one of the few scholars who emphasize the essence of Chicago's hostility to "cold-war RCT" (without naming it). Chicago school reacted to "the creation of a purely logical theory, a deductive exercise with little if no empirical significance." For Chicago "the criterion of robustness being the possibility of undertaking a rigorous empirical validation of theoretical statements."[39] Nobody described the difference of the two traditions better than Friedman (1953: 282-283) when he accused the formalistic highly-mathematized approach for giving two much emphasis on the formal structure of the theory and considering as unnecessary to test the validity of this theoretical structure except for conformity with the canons of formal logic. "The theory provides formal models of imaginary worlds, not generalizations about the real world." (Friedman 1953: 283).

The hostile attitude towards almost everything that axiomatic RCT represents led to conflict with Cowles Commission which resided at the University Chicago from 1939 to 1955. The struggle for the nature of the economics science that took place in the department after the arrival of Friedman to the final ousting of the Cowles Commission is very well documented (Mirowski 2001; Van Overtveldt 2007: 36-39, Düppe & Weintraub 2014: 465-466, Ebenstein 2015: 92: 107, for more details and further references). Karl Brunner was a young economist when he arrived in Chicago

[39] Even Mirowski (2001: 203-204) seems to agree (Chicago's school "rough-and-ready" pragmatism).

and became a witness of the struggle between the "increasingly mathematical flavor"[40] of the Cowles commission and the infant Chicago school which "emphatically advanced the relevance of economic analysis as an important means of understanding the world, in a manner that I had never encountered before." (Brunner in Van Overtveldt 2007: 38).

The incident with the Ronald Coase report on the radio frequency allocation ordered by RAND is characteristic. Coase, in his report for RAND in 1963, repeated his idea (first formulated in the controversial Coase 1959) that the best way to allocate broadcasting rights was through market-based auctions instead by the Federal Communications Commission administrative fiat. RAND circulated the report only internally. The reaction against Coase's idea and report was extremely negative. RAND decided not to publish the report because it differed markedly from the work of RAND economists[41] and it was vetoed as undermining RAND's "interests" (for the details see Van Horn & Klaes 2011). RAND published the report 30 years after it was submitted, when R.H. Coase received the Nobel Prize!

The free market economics of Chicago, its empiricism and hostility to government planning intensified by the two-dimensional geographical isolation of the school (see

[40] The Cowles Commission was according to the biographer of Herbert Simon, "the single most important institution in the mathematical metamorphosis of modern economics" (Crowther-Heyck cited by Ebenstein 2015: 107). For details see Christ (1994).

[41] Coase coauthored the report with two economists who had studied at the University of Chicago and worked for RAND during the 1960s: William H. Meckling and Jora R. Minasian.

Van Overtveldt 2007: 42-44). The support of this research and political agenda didn't thus come from the U.S. Government. If someone reads the acknowledgments section of the published papers and books by the Chicago economists in comparison with those of the cold-war RCT will see a dramatic difference in funding and resources (see Foka-Kavalieraki & Hatzis 2015b for details). Chicago scholars received sporadically funds from private institutions with a pro-free market and anti-government agendas. However, the funding was too low to shape a particular research agenda.

The Chicago school is regularly identified with "neoliberalism" (Van Horn & Mirowski 2006), a pseudoscientific word - it is extremely problematic if we apply it to scientific theories.[42] Not only because the meaning of the term is super-fuzzy but also because it is used always polemically by its critics. This is a strong indication that this is not a concept but a "straw man". It has all the characteristics: (a) nobody describes herself as neoliberal, (b) it is a term coined by adversaries of various theories collectively stamped as "neoliberal", (c) there is no shared meaning between the different users, even when their political views are identical, (d) the concept is employed in ways that are contradictory, (d) the range of targets is so broad that it becomes trivial and nonsensical. According to Venugopal (2015) neoliberalism as a concept "has proliferated well beyond its conceptual crib in political economy and

[42] See Barry (1986) for one of the best philosophical introductions to classical and modern liberal theory. For recent histories of "neoliberalism" see Burgin (2012) and Jones (2012).

has as a result become stretched to the point where widespread concerns have been raised about its viability and relevance".

One wonders why the employment of the term is so popular, not only in superficial political discourse but also in scholarly work. According to Venugopal (2015):

> *In effect, neoliberalism serves as a rhetorical tool and moral device for critical social scientists outside of economics to conceive of academic economics and a range of economic phenomena that are otherwise beyond their cognitive horizons and which they cannot otherwise grasp or evaluate. It has as a result ended up, as Bob Jessop describes, 'more as a socially constructed term of struggle (Kampfbegriff) that frames criticism and resistance than as a rigorously defined concept that can guide research.'*

But even if we accept the term as legitimate, for the sake of the argument, the Chicago School cannot be accommodated in it as it is obvious by all the major and very recent works on Chicago economics published in the past decade (Rajan & Zingales 2003; Zingales 2012). But this is an issue beyond the objectives of this thesis.

2.4 THE RATIONALITY MODEL IN ECONOMICS TODAY

Given everything that has been discussed until now, a concise description of the Chicago-style rationality model as it is generally acknowledged today by its major proponents is given below (see Becker 1976, 1993; Posner 1992; Coleman 1990; Hirsh-

leifer 1985; Lazear 2000; but also Elster 2007; Harsanyi 1977; von Neumann & Morgenstern 1947; Savage 1972). The fundamental assumption of the theory is rationality. By this it is roughly meant that the individual has:

(a) stable preferences over time which are also ranked on a subjective and ordinal scale, thus defining her utility function, and

(b) a maximizing behavior toward the realization of these ends, given the scarcity of resources, the constraints of means (external or internal), time, social and institutional context and often under conditions of risk or (worse) uncertainty.

Also, the rational individual:

(c) thinks at the margin (she compares the marginal cost and benefit of her moves),

(d) maximizes expected net benefit, and most importantly

(e) responds to incentives, not always in a clearly predictable "stimulus-response" manner, but in a more interactive and complicated way.

More particularly, it is assumed that the preferences of the rational individual are complete, transitive and continuous. Complete are the preferences for A and B, where the individual may either (i) prefer A to B, or (ii) prefer B to A, or (iii) is

indifferent between them. Transitive are the preferences, when, between A, B and C, if the individual prefers A to B and B to C, then she prefers A to C. Note here that this form of rationality admittedly requires some sort of elementary reasoning. Moreover, completeness and transitivity guarantee the ordinal ranking of the preferences (Heap 2004; Hausman & McPherson 2006). Continuous preferences mean that for any bundle of two goods there is at least another bundle of the same goods in different proportions offering the same utility for the individual (see however Drakopoulos 1994). Some economists further assume that preferences should also meet the requirement of reflexivity, which means that a bundle is always as good as itself (Hindmoor 2006). Actually this requirement is quite important for the maximization hypothesis since in combination with the non-satiation requirement (x is always < x + y when y is positive) it essentially says that people prefer more to less.[43]

These assumptions about the behavior of the individual, which partly belong to the descriptive aspect of the rationality model, are quite similar to the notions of folk psychology: behavior is caused by mental processes which are the reasons for the actions. Folk psychology is something humans naturally employ in everyday life when they infer about the beliefs, desires and preferences of other individuals through a bundle of quick and easy – and usually unconscious – specialized cognitive

[43] For some early criticism of the formalized axioms of expected and subjective expected utility, there are of course the seminal papers by Allais (1953) and Ellsberg (1961) who pointed out some anomalous implications. These implications can be explained much better under a theory of rationality closer to the Chicago School approach. See for Foka-Kavalieraki & Hatzis (2015b)

procedures of the mind (Duchaine, Cosmides & Tooby 2001). We will discuss the implications of folk psychology in rational thinking in the next chapter.

The utility of a good is the subjective, and relative to other goods, satisfaction that the individual derives from it. This utility is what the rational person is expected to maximize under conditions of risk or uncertainty, i.e. when she is not completely sure of the outcomes of her choices. Nevertheless, the rational individual, while choosing among available alternatives, making decisions and taking actions, she takes under consideration the marginal utility; she is not only concerned with the total or average utility of her final choices but with the gains or losses of the steps she takes along the way, such as the cost of each piece of additional information in comparison to the marginal benefit of the better informed decision. This means that there is not an objective optimal means for someone to arrive to her final end that satisfy her desires, but that the individual uses her personal overall evaluation and understanding of the world and then acts accordingly in order to achieve her goals.

A very successful definition which includes almost all the above elements is the one given by the Nobel laureate Reinhard Selten (1991: 3): “Rational economic behavior is the maximization of subjectively expected utility”.

There is a lot of discussion about the phenomenon of “akrasia”, or weakness of will, as an impediment to rational behavior: a person knows that choice A is better than

choice B but goes on to choose B against his better judgment. This is usually observed in experiments about "hyperbolic discounting" phenomena. For example, when subjects are asked whether they would receive €100 today or €120 a month from today, they usually prefer the immediate lesser gain than the distant higher gain. But, when they are asked whether they would accept €100 a year from today or €120 a year and one month from today, they often prefer to wait out for the higher gain. Individuals who make these time-inconsistent decisions are supposed to suffer from *present bias*, and make choices that they will later regret (Laibson 1997, 1998; Thaler 1981).

At first sight this seems inconsistent but it does not have to be. There are philosophers of reason and rationality as early as Socrates (see Foka-Kavalieraki & Hatzis 2015a for a discussion of the Socratic Paradox in choice theory), who argue very convincingly that weakness of will is something that naturally arises in decision making and that it has nothing to do with irrationality or absurdness, but merely with the fact that an individual may have multiple reasons for action that are not all discernible to an external observer, or a wide set of available choices at any given time that may make him change his mind (Davidson 1970; Searle 2001). Indeed, each available choice may have more than one desirable trait that usually competes with one another and with the traits of another choice. So every decision that is actually made is a trade-off between multiple alternatives that correspond to different preferences. Becker & Murphy (1988) developed a theory of "rational addiction" in order to explain cases

of addiction (smoking, drugs, alcohol, etc.) in terms of utility maximization: a rational addict prefers the present benefits of indulging in his addiction and accepts the known future costs (money loss, health problems and the growing impact of addition), thus maximizing her discounted utility.

In addition, the rational person is motivated by self-interest in the way that she sets her goals and she seeks to optimize her wellbeing by satisfying her preferences. Her concern is the maximization of her utility with consideration of other people's interests when and if they somehow enter her utility function (i.e. if she has other-regarding preferences – and usually she has). She uses the available resources in order to calculate the costs and benefits of her choices according to her preferences (but she also economizes by investing in information-gathering and decision-making only if it's marginally beneficial). Of course, this is not to say that the rational individual is fundamentally selfish (see Rachels 2003: 71 for a distinction between selfishness and self-interest) or ethically egotistic (see Rand 1964, for rational egoism). The individual has preferences for altruism, dignity, morality and social norms that might be quite strong. These preferences have a similar nature with the preferences for goods and services.[44] They do not have infinite value for her and they are antagonistic to other more mundane preferences and subject to the above requirements (Becker 1976).

[44] See Drakopoulos (1994) for a distinction of wants/needs and substitutability among preferences and Drakopoulos & Karayiannis (2004) for the history of the idea of unlimited substitutability of preferences based on a common denominator (utility).

In any case the rationality model has nothing to say about what is the content of people's preferences and so it does not aspire to assess the quality or even the rationality of these preferences (or desires). More simply put, the rational person makes choices consistent with her own preferences, preferring usually more of a good than less.

In fact, cognitive psychologists and neuroscientists have experimentally established these basic two, very similar to the above, dimensions of human behavior and choice, in order to describe humans' affective experiences, such as preferences and desires in qualitative and quantitative terms: valence, which ranges from worse to better states, and arousal, which ranges from lower intensity to higher intensity states (Watson et al. 1999; Knutson & Peterson 2005). But more of these findings in neuroeconomics will be discussed in more detail in chapter 4.

During the years a number of economists and social scientists offered powerful critiques of the economic methodology (see esp. Veblen 1898; Allais 1953; Allais 1997: 5-6; Simon 1955; Sen 1977; Arrow 1987). This criticism was widely discussed, especially by scholars with an interest in philosophy and methodology of economics or the history of economic ideas (Weintraub 2007). However, the rest of the profession remained indifferent – as the scarcity of chairs in philosophy and methodology of economics but also in the history of economic ideas in North America and Europe aptly illustrates – or even hostile to the philosophical and methodological challenges

of the neoclassical model despite the growing disillusionment with the economic science after major economic crises or the inability of economists to provide accurate predictions worthy of a hard science. The main reason for the adherence to "discredited" neoclassical economics was the absence of a serious alternative and the wide consensus among practicing economists that the tools of neoclassical economics are the only tools available for doing their everyday work.

This consensus was recently being attacked by the emergence of behavioral economics. Behavioral economists initially attempted to provide a better descriptive model of human decision making, something that neoclassical economists had purposefully overlooked for the benefit of powerful prediction (Friedman 1953). The former tried to discredit the traditional neoclassical model of rationality by criticizing mostly its lack of empirical support. They benefited mainly from the useful insights of cognitive psychology (Ross 2005) and they designed tasks of their own in order to examine the process of decision making in the context of economic choices in the laboratory. Today, behavioral economics do not only dispute the rationality assumption of the economic model but for the first time there are a number of mainstream economists who seem to adopt their concepts and tools (Akerlof & Kranton 2010: 28; Camerer, Loewenstein & Rabin 2004; Diamond & Vartiainen 2007; Akerof & Shiller 2015). There are even some, rather extreme, behavioral economists arguing that individuals are systematically irrational (Ariely 2008; 2010).

In the following chapter we will discuss the primary theoretical criticism against the neoclassical model of rationality which comes mainly from behavioral economics. But first, it is important to illustrate the overall impact of psychology on the present mainstream model of rationality so as to better understand the degree to which behavioral economics contributed to the improvement of the model.

CHAPTER THREE

CRITICISM OF RATIONALITY

3.1 THE RELATIONSHIP BETWEEN PSYCHOLOGY AND ECONOMICS

The study of mind and behavior – that in more recent centuries in the history of science has been called "psychology" – and economics, have been interacting for a long time. We have already seen, in the previous chapter, how economists, as back as Adam Smith, have been concerned with what motivates and explains economic and moral behavior. This is only natural, as humans have lived in social and economic environments since the dawn of civilization, where they've always have had, in one way or another, to engage in transactions and be troubled with ways to allocate their scarce resources. So, even before these two sciences became distinct scientific fields, with specific research agendas – with economics achieving this long before psychology – philosophers have been thinking about each of them and the relationship between them. In this section, we will show how the economic model of behavior, in its current form and as it was presented in the previous chapter, has been influenced by specific ideas from psychology that culminated in the emergence of the interdisciplinary branch of Behavioral Economics, where the primary criticism of the RCT model of rationality comes from.

But first we should point out that both psychology and economics are broad fields of scientific study and each consists of a variety of sub-disciplines and branches. This is especially true of psychology, which has so many different schools, perspectives, theories, methods and tools, often contradicting each other, that we should never consider it as a single, unified approach to mind and behavior or believe that it enjoys such a degree of consensus like economics does.[45] This is a major source of misunderstanding when it comes to the assessment of the impact of psychology on economics in the recent decades. For example, as we will see, Behavioral Economics, is about a particular research program (the study of errors and biases in judgment under uncertainty) of a specific branch (the study of decision making) of an independent subfield of psychology (cognitive psychology) which is also one of the basic contributing scientific fields of an interdisciplinary science (cognitive science), which in turn includes several fundamental theoretical approaches (such as the computational model, the connectionist model, etc.). This is the reason that there is a substantial amount of criticism against Behavioral Economics that comes directly from other branches of behavioral sciences, which is little or not at all known to economists. Therefore, it is obvious that it is a bit of a stretch to see Behavioral Economics as the

[45] Especially in microeconomics where there is a mainstream core. The debates are very few, especially for a social science. According to a recent study of the U.S. Economics Departments, there is remarkably high degree of consensus and very few disagreements even in macroeconomics. There are "no detectable systematic differences in views across departments, or across school of PhD." (Gordon & Dahl 2013)

overall contribution of psychology in general to economics. The reason that Behavioral Economics has earned this grand role and why the criticism against it is being overlooked will be discussed in the following pages.

Psychology, as we understand it in a broad academic sense today, is the scientific study of behavior and mental processes. According to Crider et al. (1989), "behavior is any activity that can be observed, recorded and measured" and mental processes "include thoughts, memories, emotions, motivations, dreams, perceptions and beliefs". The methods of psychological research can be natural observation, case studies, surveys, correlational studies and experimentation. But of course this is a very recent and contemporary definition and description of the science of psychology because, as we've already mentioned, for centuries, psychology did not exist as a distinct scientific field but it was a small and indistinguishable part of philosophy. In antiquity, philosophers like Aristotle, were partly concerned with some psychological matters but did not go any further than to attribute behavior to internal beliefs and desires.

This simplistic view of psychology dominated more or less any approach to the mind and behavior until the first psychological laboratories and Chairs in European and American universities were established and the first academic journals were founded in the late 19th and early 20th century. Before that time, the only psychological "theory" that prevailed, without any serious challenge from anybody, was the unsophisticated dictation of "common sense psychology" or "folk psychology": behavior is

caused by internal processes. “Folk psychology” (or “theory of mind”, as is often called by psychologists and cognitive scientists) was not just the naïve notion philosophers have had about psychological events in the previous centuries, but it is also what everyday people adopt as a theory in order to explain and predict behavior by attributing mental states to themselves and to others. In fact, there exists a substantial amount of research that shows that small children and even some animals have this same ability (Nguyen & Frye 1999; Astington & Edward 2010; Call & Tomasello 2008). This happens with other fields of science and the way people naively, but sufficiently, perceive them in everyday life. To better illustrate how “folk psychology” works, Daniel Dennett (1987: 7) draws a very suitable analogy from the term “folk physics.”

> *Folk physics is the system of savvy expectations we all have about how middle-sized physical objects in our world react to middle-sized events. If I tip over a glass of water on the dinner table, you leap out of your chair, expecting the water to spill over the side and soak through your clothes. You know better than to try to sop up the water with your fork, just as you know that you can’t tip over a house or push a chain. You expect a garden swing, when pushed, to swing back.*

Not surprisingly, rational choice theory employs this simple “common sense” theory to its basic psychological assumptions concerning the rational agent, as we already saw in the previous chapter. A rational agent’s actions and choices are caused by his preferences and the goals he tries to achieve, based on his beliefs about the world and other people. In fact, rational choice theory can be seen as folk psychology formalized by the supplementation of refined axioms of optimization, which offers

some predictive, but little explanatory, power (Rosenberg 2008). However, according to the instrumentalist view, rational choice theory maintains these plain assumptions, not out of scientific weakness, but because they are not within the scope of its research interest. Economists are mainly interested in the consequences that the choices of individuals bring about in economic and social environments and not so much in their causes. Besides, these simple and few assumptions provide parsimony to the model of the economic agent.

The philosophical view of hedonism, which has its roots in the thought of ancient and medieval philosophers, like Plato, Aristotle, Epicurus and Aquinas, and which later found its proponents in the 18th century British moral philosophy, sees the maximization of pleasure over pain as the ultimate aim in life and the single motivational power. Epicurus declares to his letter to Menoeceus: "For this reason we call pleasure the beginning and the end of a happy life. Pleasure is our first and most familiar good we know. It is the starting-point of every choice and of every aversion, and to it we come back, as we make it the rule by which to judge every good thing."[46] As we have seen in the previous chapter, hedonism influenced many scholars of economics in the 18th and 19th centuries and especially the marginalists in the formation of the maximization utility model. Bentham articulates this view in the beginning of his book *The Principles of Morals and Legislation* (1789):

[46] "Καὶ διὰ τοῦτο τὴν ἡδονὴν ἀρχὴν καὶ τέλος λέγομεν εἶναι τοῦ μακαρίως ζῆν. Ταύτην γὰρ ἀγαθὸν πρῶτον καὶ συγγενικὸν ἔγνωμεν, καὶ ἀπὸ ταύτης καταρχόμεθα πάσης αἱρέσεως καὶ φυγῆς, καὶ ἐπὶ ταύτην καταντῶμεν ὡς κανόνι τῷ πάθει πᾶν ἀγαθὸν κρίνοντες."

> *Nature has placed mankind under the governance of two sovereign masters, pain and pleasure. It is for them alone to point out what we ought to do, as well as to determine what we shall do. On the one hand the standard of right and wrong, on the other the chain of causes and effects, are fastened to their throne. They govern us in all we do, in all we say, in all we think.*

Although, after the marginalists' revolution, attempts were made by leading economists, like Robbins, Pareto, Hicks and Samuelson, to abandon any elements of subjectivity and psychologism in order to render economics a more positivistic aspect (for an analysis of the hedonistic influence on microeconomics see Drakopoulos 1990; 1991), its impact can be still seen in the utility maximization principle of RCT and the calculus of costs and benefits among undesirable and desired outcomes. But, of course, contemporary RCT does not use the term "utility" in the Benthamite sense. For economists, utility is not an object of choice but a particular terminology, meaning the representation of the individual's preferences on an ordinal scale.

Nevertheless, Gary Becker identifies the influence and historical continuity of the idea of the utility function approach with Bentham's measuring of pleasure and pain (1976: 137):

> *Although the household production function approach represents a fundamental reformulation of the theory of consumer demand, it is less of a break with the historical development of the theory of choice than it may seem. Jeremy Bentham's* Principals of Legislation *in 1789 set out a list of fifteen "simple pleasures" which he argued was "the inventory of our sensations." These pleasures, which were supposed to exhaust the list of basic arguments in one's pleasure (i.e., utility) function are of senses, riches, address, friendship, good*

> *reputation, power, piety, benevolence, malevolence, knowledge, memory, imagination, hope, association and relief of pain. Presumably these pleasures are "produced" partly by goods purchased in the market sector.*

The dependence of psychology from philosophy began to break off when psychology emerged as an academic discipline and independent program of university studies. Wilhelm Wundt founded the first laboratory dedicated exclusively to psychological research at the University of Leipzig in 1879, which attracted students and researchers from all over Europe and America. Wundt applied the method of introspection to record subjective thoughts and emotions with an aim to break down the elements of consciousness and the mind. His method and findings did not endure as psychology started to advance in rapid pace, but his major contribution was that of establishing the foundations for scientific psychological research.

As psychology developed into a science and continued to expand, various perspectives emerged. Until the middle of the 20th century, two broad and completely opposed schools of psychology dominated the field: Psychoanalytic theory, established by Sigmund Freud and his followers, and Behaviorism, with Edward Thorndike, John Watson and B.F. Skinner as its major proponents. Freud's methods and ideas will not concern us here, as they did not have any impact on economic theory, despite their huge and lasting influence on our culture. Freud's theory of suppressed needs, sexual drives and forgotten childhood traumas as causes of behavior, have long been considered controversial if not discredited (Vosniadou 2001; Wilson 2002; Hastie & Dawes 2010). But his major contribution to behavioral sciences, that applies even

today, was the discovery of the subconscious (Freud 1915; 1926). Indeed, unconscious mental processes play a very important role for the overall function of the brain and mind and especially for decision making in the form of subconscious information processing and heuristic mechanisms. We will see and in-depth analysis of heuristics in the following sections and chapter.

Behaviorism was a reaction to the centuries-long tradition of explaining mental and psychological events in metaphysical or subjective terms. Behaviorist psychologists wished to provide a rigorous scientific and methodological framework for psychology. In order to achieve this, they introduced objective and controlled experimentation and maintained to investigate only what could, according to them, be directly observed, i.e. behavior. They denied the significance or even the existence of mental entities and connected behavioral responses directly to external stimuli. As B.F. Skinner put it (1969: 288): "The real question is not whether machines think but whether men do". Soon they discovered that by manipulating environmental stimuli they could elicit the desirable behavior. Thorndike's *law of effect* held that when a behavior is rewarded it will tend to be repeated and when it is punished it will tend to be eliminated. Behaviorism has influenced all social sciences and although its theory was abandoned eventually, its rigorous methodology remains to date the most significant legacy to psychology and its following development.

Behaviorism had a very important impact on economics as well, within the broader demand of social sciences to become as rigorous as possible. In the late 1930's Paul

Samuelson introduced the *Revealed Preference Theory* in order to explain consumer's choices in a way that would not involve psychologism and introspection, like the marginalists' utility maximization model, but would rely solely on objective observation. Samuelson suggested that consumers' preferences are revealed through the actual choices they make in the market, the only observable patterns from which economists can derive their conclusions about demand curves. Samuelson stated that "The individual guinea-pig, by his market behavior, reveals his preference pattern – if there is such a consistent pattern." (1948: 243). As a behaviorist psychologist would reject any internal reference to preferences and desires, but would observe directly the behavior of a subject, so should an economist assume that the preference of an individual in market exchanges is identical with the choice we see him make. So if an economist wants to know whether consumers prefer one good from another, she does not have to reply based on their stated preferences, since she can safely infer it from what they will actually choose in real life. In other words, the theory of "revealed preference" freed economics from the need to explain individual action in terms of what causes it and contented itself only with the study of the consequences of choices and the minimal prerequisite that these choices are consistent, in order to be rational (Rosenberg 2008).

Although *Revealed Preference Theory* received sufficient criticism, it is still incorporated, in various degrees, in today's rationality model. It is true that people can have different preferences than what their actual choices reveal and the distinction between preferences and choices is important for the explanation and prediction of

several cases, like in strategic behavior, stock exchanges, government bureaucracies, voting behavior etc. (Sen 1982, 2002; Hausman 2006; Hindmoor 2006). Evidently, the revealed preference theory sounds unrealistic as it seemingly disregards the mind and almost always treats any mental states as identical to physical behavior. The emergence of cognitive science, neuroscience and modern psychology has long vitiated this claim. Moreover, the revealed preference theory is apparently tautological and it has been accused as effectively trivial. It has no explanatory power whatsoever as far as the internal reasons and causes of actions are concerned. It says little about how the preferences, beliefs and desires are formed. Revealed preference theory suggests that the preferences and their ordering can be inferred merely by the actual choices that individuals make, as these can be observed in actual market behavior, and given the knowledge of the existing constraints that affect them. Thus the preferences are essentially identical to the choices (which are revealed preferences) and there is no need to establish causal links any further. The assumption that there are sophisticated internal states (assumed by folk psychology) will only complicate the simplicity of the model's predictability without any noticeable practical gain. Amartya Sen writes (1982: 71):

> *Much of the empirical work on preference patterns seems to be based on the conviction that behaviour is the only source of information on a person's preferences. That behavior is a major source of information on preference can hardly be doubted, but the belief that it is the only basis of surmising about people's preferences seems extremely questionable. While this makes a great deal of sense for studying preferences of animals, since direct communication is ruled out (unless one is Dr Dolittle), for human beings surely information need not be restricted to distant observations of choice made.*

But neoclassical economists support the position that the premise of "revealed preferences" is not an adherence to the principles of psychological and philosophical behaviorism, as the existence of motivational or cognitive processes are not denied, but a useful method of measurement at least for a significant range of choices. Mainstream economics deal with the rationality of the means not that of the ends. That is to say the rationality model is primarily concerned with how ends are achieved and not how these ends have been formed or chosen in the first place (Stigler & Becker 1977; Hogarth & Reder 1987; but see Cowen 1989). George Stigler and Gary Becker (1977) have famously argued that for an economist "de gustibus non est disputandum" as far as the content of people's preferences and tastes is concerned. On the contrary, as they developed their model of utility maximizing behavior, they assert that "the economist continues to search for differences in prices or incomes to explain any differences or changes in behavior." (Stigler & Becker 1977: 76).

Nevertheless, not all criticism against the revealed preference theory is based on firm scientific arguments. The theory merely suggests that we can infer the preferences from the attitudes. As empirical economist Steven Levitt suggests, "Don't listen to what people say; watch what they do" (Levitt & Dunbar 2014: 112). But this is not any novelty as far as the empirical social sciences are concerned. In fact, as we try to collect our data from observing the behavior of people (or even animals), whether by looking, listening, asking or experimenting in general, we are always inferring desires, beliefs and preferences from certain behaviors, i.e. actions, non-actions and

attitudes. Most certainly, we cannot "read" someone's mind – even the recent technological advances in observation of the neurons' activities in the brain constitute observation of the physical and chemical behavior of cerebral cells. Seen from this perspective, the mind-body problem of the philosophy of mind remains one of the hardest and insoluble problems for philosophy and cognitive science and its solution is certainly not expected from economists.

The scientific reaction to behaviorism was the reintroduction of the mind in the discussion of behavior and the ultimate rise of Cognitive Science in the mid-1970's, an interdisciplinary but unified scientific field with established societies and journals and with a common research and theoretical interest in how the mind works and what constitutes thinking. Several scientists contributed to the final emergence of cognitive science as early as the 1930's. The most important forerunners came from the fields of experimental psychology, mathematical logic and theoretical linguistics, like Edward C. Tolman and Charles H. Honzik, Alan Turing and Noam Chomsky (with his early linguistic theory), who all assumed that cognition is constituted of some kind of information processing (Bermudez 2010).

An important milestone in the birth of cognitive science was the second day of a symposium organized by the "Special Interest Group in Information Theory" at the Massachusetts Institute of Technology in 1956, where scientists from various fields presented their work about cognition and soon realized the need for closer collaboration as they started to conceive the common ground of their theories. Among the

contributors of that conference were Alan Newell and Herbert Simon, who presented their "logic machine" and how they used computers to simulate cognitive processes, Noam Chomsky, who presented his transformational grammar using information theory and George Miller, who presented his theory about the limits of working memory in his paper "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information" (Bechtel et al. 2001). Miller later reported about that conference: "I left the symposium with a conviction, more intuitive than rational, that experimental psychology, theoretical linguistics, and the computer simulation of cognitive processes were all pieces from a larger whole and that the future would see a progressive elaboration and coordination of their shared concerns." (Miller 2003: 143).

Today, cognitive science (or sciences), with researchers from psychology, linguistics, artificial intelligence, neuroscience, anthropology and philosophy are concerned with how the mind works. Although there are a number of different theoretical approaches proposed by different cognitive scientists (such as images, concepts, analogies, rules, connections, etc.), each with various explanatory power and practical applicability, they all converge on a common cognitive theory, which assumes that the mind processes information through mental representations and computational procedures that produce behavior (Thagard 2005).

Economics was greatly influenced by cognitive science and cognitive psychology in particular, in the second half of the 20th century, as this impact led to the emergence

of the interdisciplinary field of Behavioral Economics. One of the most prominent founders of cognitive science, Herbert Simon, criticized the neoclassical economic model of the rational agent and in 1956 he introduced the term of "bounded rationality" to describe more accurately the cognitive limitations that decision-makers face when they acquire and process information. For his theory of bounded rationality, Simon was awarded the Nobel Prize in Economics in 1978. The second and most important contribution of cognitive psychology to the criticism of the mainstream economic model, which actually gave birth to behavioral economics, was the publication of the seminal paper of cognitive psychologists Daniel Kahneman and Amos Tversky in 1979, "Prospect Theory: An Analysis of Decision under Risk". Kahneman and Tversky used extensive psychological experiments in their laboratory in order to disprove the basic assumptions of perfect rationality. Their research focused on demonstrating the various cognitive biases and errors that occur in decision-making, and as it was developed through the following years, it won Kahneman the Nobel Prize in Economics in 2002 (actually this Nobel Prize was shared with Vernon Smith and it would have been awarded to Tversky too, had he not died in 1996) (Wilkinson & Klaes 2012).

The rationality model, of course, can be further improved and even more ambitiously applied (see Gilboa 2009; 2010a and 2010b), but the discussion about whether people are rational or not, in economics, the law and other social and political domains, is far from being resolved and it involves serious implications about individual consent. It is true that it is almost impossible for a scientific model to have both a perfect and

realistic description of the facts under study and to offer at the same time accuracy of prediction based on assumptions about the same facts (Hawking 2001: 31). Although Friedman (1953) insisted on the importance of prediction over description and this was welcomed by economists as a desirable trade-off for an ambitiously rigorous science, the lack of a more realistic description of the classical model remains a disconcerting issue for economists. Obviously, humans are not perfectly rational in the sense that they never hold erroneous beliefs or never make mistakes at some types of calculations. People can sometimes miss or misunderstand the available information, lack the willpower to attain their goals and/or fail to find the optimal means to achieve their ends (Elster 1986; Wilkinson 2008; Schwartz 2008; also Searle 2001). There is no doubt that the human brain is confined by certain internal constraints – neural and broadly cognitive – and has limited capacities compared to "perfection". All the above constitute a key aspect of real human decision-making which the classical model deliberately overlooks in order to maintain a parsimonious theory (the as-if assumption of Friedman 1953). Nevertheless, it remains a subject in question whether these constraints on rationality are enough in quantity and frequency or even quality as to build a case for universal irrationality (of a kind, for example, suggested by Ariely 2008); a subject that will be a major theme of discussion in chapter 4.

The model of perfect rationality has inevitably been the target of many scientists as a false – or a very poor or simplistic at best – hypothesis. This is the reason that

behavioral economics emerged as an interdisciplinary approach that challenged rational choice theory, aspiring to provide tools that can supposedly replace the analytical tools of the former (Rabin 1998, 2002; Frey & Stutzer 2007). Behavioral economists – contrary to neoclassical economics – work almost exclusively in the laboratory, designing behavioral tasks in order to study the choices of their subjects in controlled environments. Their main concerns are the process of preference formation (Slovic 1991) and the process of realizing these preferences (Rizvi 2001). The outcomes of their experiments seem to show that individuals employ certain heuristic methods to help themselves with decision making. These heuristics are simple and fast mental mechanisms that surface often intuitively when people are faced with problem-solving. Several cognitive "biases" that have little to do with external constraints and more with the cognitive limitations, seem to accompany these heuristics and influence negatively the choices that are made toward the "wrong" way (wrong meaning here a result away from the set goal). All of these will be discussed more thoroughly later in this chapter.

In the following section, we will explore in detail the contributions of behavioral economics to neoclassical economics and how they enriched the discussion about economic rationality through their critique of rational choice theory. We will distinguish between the influence of old behavioral economics, mainly through the theoretical work of Herbert Simon and new behavioral economics, through the experimental research of Kahneman and Tversky, Richard Thaler and others. The relationship of psychology and economics does not end with behavioral economics though.

In chapter 4 we will explore the contemporary literature of those branches of cognitive and evolutionary sciences of the brain and mind that demonstrate substantial evidence and construct interesting theories about decision making and problem solving, mostly in defense of the rationality premise. Unfortunately, most economists are unfamiliar with this literature.

3.2 OLD BEHAVIORAL ECONOMICS

Behavioral economics is considered by many historians of economics "a product of cognitive revolution" (Angner 2012: 6) as its key demand has always been to increase the psychological realism of the traditional economic model. As we described in the previous section, cognitive sciences emerged as a reaction to behaviorism and the latter's denial to acknowledge and investigate mental and psychological entities, such as thoughts, emotions, desires, and beliefs. Behavioral economics similarly arose as a reaction to some economists' persistence to avoid speculation on psychological traits and internal processes of decision making. Scattered scientists in different Universities, like Carnegie Mellon, Michigan, Yale, Oxford and Stirling, got interested in economic psychology in the broader sense, thus igniting the birth of behavioral economics (Sent 2004). Some historians also believe that we should distinguish between "old behavioral economics", with George Katona and Herbert Simon as the most prominent proponents and "new behavioral economics" that was mainly introduced by the work of Kahneman and Tversky, Thaler and others (Sent 2004;

Hosseini 2011; Angner & Loewenstein 2012). We will also make this distinction here in order to explore the seminal work of Herbert Simon, who had a lasting influence on every attempt to combine psychology and economics ever since, and the later laboratory experimental work of the others that made a ground-breaking shift in the study and methodology of contemporary economics.

The most significant precursors of behavioral economics were George Katona and Herbert A. Simon. George Katona was a Hungarian *Gestalt* psychologist who emigrated in the United States from Germany before WWII. He was one of the first psychologists to insist that economics should collaborate more closely with psychology, but he believed that the domination of behaviorism and psychoanalysis of the 1920's was a serious impediment to this collaboration (Jefferson 2014). In 1951 he published a book called *Psychological Analysis of Economic Behavior* and he was critical of the neoclassical model, whereas he maintained that the tools of psychology could contribute to the investigation of economic behavior (Katona 1951 as quoted in Angner & Loewenstein 2012):

> *Unlike pure theorists, we shall not assume at the outset that rational behavior exists or that rational behavior constitutes the topic of economic analysis. We shall study economic behavior as we find it. In describing and classifying different reactions, as well as the circumstances that elicit them, we shall raise the question whether and in what sense certain reactions may be called "rational." After having answered that question and thus defined our terms, we shall study the fundamental problem: Under what conditions do more and under what conditions do less rational forms of behavior occur?*

Hosseini (2011) emphasizes that Katona did not only think that economics was to benefit from the findings and theories of psychology, but psychology had also a lot to gain by cooperating with economics. According to Katona (1951 as quoted in Hosseini 2011: 979):[47]

> *[T]he basic need for psychology in economic research consists in the need to discover and analyze the forces behind economic process, the forces responsible for economic actions, decisions and choices.* […] *Economics without psychology has not succeeded in explaining important economic processes and psychology without economics has no chance of explaining some of the most common aspects of human behavior*.

In fact, some prominent contemporary economists also make the same insightful point today, that economics can inform psychology by explaining aggregate phenomena like the market as, for example, Chicago-school economist Edward Glaeser (2004: 409):

> *The economic approach to psychological phenomena starts with the psychology that documents the malleability of human perceptions and emotional states […]. The economic approach then asks how, in equilibrium, those perceptions and states end up being manipulated. If psychology has improved economics by providing a richer understanding of the individual, economics can improve psychology by giving it a better understanding of aggregation into a market.*

[47] See also Katona (1960).

As it has already been mentioned, Herbert Simon won the Nobel Prize in 1978 for his decades-long work on decision making and problem-solving. Simon was a versatile scientist, involved in various fields, but he was first and foremost a pioneering cognitive scientist, who had a life-long interest in the exploration of the mind. As a psychologist he had a great interest in decision making and problem-solving, especially in administrative environments. He was also a distinguished computer scientist who, along with his colleagues, used ground breaking models of artificial intelligence to simulate and investigate problem-solving behavior and the mechanisms that enable it (Newell & Simon 1956, 1972; Newell, Shaw & Simon 1958, 1959).

Among economists, he is generally known for the terms "bounded rationality" and "satisficing" as a criticism towards instrumental rationality and the optimizing economic model: people are not perfectly rational as the traditional model suggests. On the contrary, their decision making is restricted by certain constraints and they are not capable of optimizing behavior. Instead they succeed only in satisficing their choices, by just coming to choose some "good enough" alternatives.

Simon criticized the traditional economic model for its unrealistic assumptions of rationality although he never supported a theory of global irrationality and he perfectly understood that the optimizing model was used for instrumental purposes. According to Simon, "it is no novelty in those (social) sciences to propose that people behave rationally […] Assumptions of rationality are essential components of virtually all the sociological, psychological, political and anthropological theories with

which I am familiar." (1978: 2). For him, bounded rationality was just rationality that "falls short of omniscience" (1979: 502).

Nevertheless, he distinguished between substantive and procedural rationality as two different ways of approaching rational behavior by economics and formal decision theories on the one hand and psychology on the other. Substantive rationality, according to Simon, is concerned with the "achievement of given goals within the limits imposed by given conditions and constraints" (1976: 130). Procedural rationality is the study of the processes that generate the outcomes of choices and this is what psychologists are interested in; the cognitive processes that take place in situations such as learning and problem solving. Simon believed that the best way to approach a real life form of rationality is to assume that the perceptional and computational abilities of humans are limited in how they cope with problems and learning and how they gather and store a limited amount of information in long-term memory.

Simon maintained that decision-making behavior is often sequential as it is in computers. Humans use a step-by-step procedure in order to achieve one or multiple goals by seeking and searching through a set of alternatives, calculating the consequences by the limited information they can gather in the present, resolving any uncertainties by using their past experience and evaluations, and ending this search with satisficing, i.e. when they reach a good enough solution. This heuristic mechanism is called "satisficing" rather than "optimizing", because, as Simon declares, since human "like those [organisms] of the real world, has neither the senses nor the wits to discover an

"optimal" path – even assuming the concept of optimal to be clearly defined – we are concerned only with finding a choice mechanism that will lead it to pursue a "satisficing" path, a path that will permit satisfaction at some specified level of all of its needs." (1956: 9). Simon was among the first scientists to speak about *heuristics* as simple rules, instead of complex algorithms, that we follow in order to reach satisfactory solutions to complicated problems and he saw two ways in which we could construct decision making models, "either by finding optimum solutions for a simplified world or by finding satisfactory solutions for a more realistic world" (1979: 498).

This specified level is what Simon calls the "aspiration level" which is the point that the search of desired alternatives will end because it will be satisfactory enough for the agent. The boundedly rational agent, who is a complex system that acts in a continually changing environment, does not have the computational skills to search all the possible alternatives until he finds the optimal one, because usually, in real-life situations, there is a considerable gap between the real environment of a decision and how the agent perceives it (Simon 1978). The heuristic method of satisficing and its serial structure, based on trial-and-error procedures, resembles that of a computer. Simon describes this analogy thus (Simon 1976: 135):

> *Like a modern digital computer's, Man's equipment for thinking is basically serial in organization. That is to say, one step in thought follows another, and solving a problem requires the execution of a large number of steps in sequence. The speed of his elementary processes, especially arithmetic processes, is much slower, of course, than those of a computer, but there is much*

> *reason to think that the basic repertoire of processes in the two systems is quite similar. Man and computer can both recognize symbols (patterns), store symbols, copy symbols, compare symbols for identity, and output symbols. These processes seem to be the fundamental components of thinking as they are of computation.*

As Simon himself admits (1979) his theory of the aspiration-like mechanisms in the search of alternatives was greatly inspired by the work of the German *Gestalt* psychologist, Kurt Lewin and his motivational theory of the levels of aspirations. Lewin maintained that a person perceives reality according to the degree he is able to achieve his goals. A successful person will set the goals that he believes are within his abilities to achieve and then, if he succeeds, he will raise his aspiration level to a more difficult goal. A less effective person will lower his aspiration level to an easy goal or a completely unattainable one (Lewin et al. 1944). Simon believed that a similar motivational and dynamically adjusted mechanism takes place in choice environments: "The aspiration level, which defines a satisfactory alternative, may change from point to point in this sequence of trials. A vague principle would be that as the individual, in his exploration of alternatives, finds it easy to discover satisfactory alternatives, his aspiration level rises; as he finds it difficult to discover satisfactory alternatives, his aspiration level falls." (Simon 1955: 111)

However, in a noteworthy critique of this procedure, Elster (1989: 35) argues that satisficing merely shifts the burden of explanation from the vague point of maximization to the equally undetermined point of satisficing, since we cannot determine the levels of aspiration for each individual. Interestingly enough, George Stigler, in

1961, developed a search theory in his very influential paper, “The Economics of Information”, accommodating it perfectly into the utility maximization model. Stigler argued that the optimum amount of the search of information in economic life can be reached when the cost of the search becomes equal to its expected marginal return. Prices on goods, reputation of sellers and advertisement, as a means of providing knowledge to buyers, are all important elements that economize on the search (Stigler 1961). In other words, Stigler assumed that a rational agent will achieve the optimum search while he keeps searching the available alternatives until he reaches the point where the cost of continuing the search will exceed the benefit of the additional gathered information.

Simon was very insightful when it came to the concepts of information gathering and the computational abilities for solving complex problems. He postulated that the two most important resources that are in scarcity, and therefore should be seriously considered by economists, are the computational capacity of the mind and attention to information, rather than information itself: “In a world where attention is a major scarce resource, information may be an expensive luxury, for it may turn our attention from what is important to what is unimportant. We cannot afford to attend to information simply because it is there.” (1978: 13). Simon and his colleagues developed theories of heuristic search using computer simulation and tools from artificial intelligence and information processing psychology, in order to demonstrate exactly how difficult decisions could be reached and hard problems could be solved by systems with limited computational capacities (Newell & Simon 1972; 1976).

Finally, one of Simon's most significant contributions was his often overlooked insight into the role of the environment in decision making. He saw decision making as a dynamic process in which humans always try and adapt in the environment that surrounds them through learning procedures, continual inventions and the progressive development of their thinking tools. From the very beginning Simon insisted upon the issue that anyone who studies the choice mechanisms of any organism, should equally take into account the internal constraints, physiological or psychological, of the organism, (such as sensory and neural characteristics, or limited capabilities like maximum speed, etc.) as well as the structure of the particular environment in which it necessarily adapts (Simon 1955; 1956).

More recently, evolutionary economists and psychologists, as well as cognitive scientists (like Vernon Smith, Gerd Gigerenzer, Leda Cosmides, Steven Pinker and others) have benefited from this very idea, producing substantial evidence and theories of decision making, which we will explore in detail in chapter 4. As Simon aptly put it: "Human rational behavior (and the rational behavior of all physical symbol systems) is shaped by a scissors whose two blades are the structure of task environments and the computational capabilities of the actor." (Simon 1990: 7). Consequently, a complete theory of decision making and problem solving should involve the description of both, the cognitive processes of the system and the environment to which it

adapts. Unfortunately, many researchers and theorists of decision making, more often than not, forget about the second blade of Simon's scissors, the determining role of the environment.

In the following section we will see how the seminal and very influential work of Simon (Sargent 1993) and the models of bounded rationality passed to the experimental research of cognitive psychology that led to the emergence of behavioral economics as a prominent interdisciplinary field with a more specific research agenda that directly contradicts the basic assumptions of the rationality model of maximization.

3.3 New Behavioral Economics

As early as the 1950's, a few pioneering economists had already attempted to use experimental procedures in order to test the validity of the rationality model. At the meeting of the Econometric Society which was held in Chicago in December 1952, Kenneth O. May and Andreas G. Papandreou independently presented the first experiments on the transitivity principle of axiomatic rational choice theory. Moscati (2007) reports that May's findings showed that individuals exhibited some intransitive patterns, but Papandreou's results indicated instead that there was no evidence to contradict the transitivity axiom. It is interesting to note that both May and Papandreou, who published his research in an article under the title "A Test of a Stochastic

Theory of Choice" in 1957, conducted their experiments in the form of questionnaires with students from undergraduate and graduate classes. This form of experiment was extensively adopted 20 years later by behavioral economists and is still used today as a principal method of behavioral economics and other psychological experiments. Papandreou, despite the preliminary results of his experiment, which confirmed the transitivity axiom of the mainstream economic model, persisted on his strong conviction that economists should further empirically test the basic assumptions of their model and should enrich it with evidence and theories from other social sciences.

Nevertheless, the most important breakthrough for behavioral economics took place in the 1970's when cognitive psychologists worked under a new branch of psychology called "behavioral decision making" or "behavioral decision research" and started to test the assumptions of formal decision theories in carefully designed experiments (Schwartz 2008; Angner & Loewenstein 2012). Among the first were Lichtenstein and Slovic (1971; 1973) who studied preferences between gambles and experimented both in their laboratory, with their students and hypothetical payoffs, and in a Las Vegas casino, with real money as payoffs and with experienced casino players as their unknowingly subjects (the croupier was the experimenter). Their results showed that in both occasions and under certain conditions, there was a reversal of preferences in a short time and a violation of the transitivity principle. When subjects were presented with a choice between one gamble that offered a high probability of winning a modest sum of money and another that offered a low probability of

winning a relatively large amount of money, most of them chose the first bet over the second. However, when asked to state their lowest selling price, the majority stated a higher price for the second bet than for the first bet (Tversky, Slovic & Kahneman 1990).

During the same time, psychologists Daniel Kahneman and Amos Tversky worked separately and then in collaboration in studying heuristics and cognitive errors in decision making. In their first co-authored paper in 1971 they tested professional psychologists for their ability to estimate statistical outcomes regarding consequences of their hypothetical research and to give correct answers according to the normative theory. These trained subjects in statistics seemed to make the same mistakes as laypeople. Kahneman and Tversky concluded that "Our thesis is that people have strong intuitions about random sampling; that these intuitions are wrong in fundamental respects; that these intuitions are shared by naive subjects and by trained scientists; and that they are applied with unfortunate consequences in the course of scientific inquiry." (Tversky & Kahneman 1971).

Kahneman and Tversky continued to develop their thesis and enriched their research in cognitive biases by providing questionnaires with hypothetical problems involving probabilistic questions to various and numerous subjects. Until 1973 they had published six papers in psychological journals supporting their *Heuristics and Biases* theory that people often make errors about probabilities of events and deviate from the rules of normal logic when faced with choices under uncertainty. In 1974 they

published their findings in *Science* where they demonstrated that "people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors." (Tversky & Kahneman 1974: 1124). These three heuristics were the *representative* "which is usually employed when people are asked to judge the probability that an object or event A belongs to class or process B", the *availability*, "of instances or scenarios, which is often employed when people are asked to assess the frequency of a class or the plausibility of a particular development", and the *adjustment from an anchor*, "which is usually employed in numerical prediction when a relevant value is available."

However, all this research remained largely unnoticed by economists until Kahneman and Tversky decided, after five years, in 1979, to submit a paper under the title "Prospect theory: An Analysis of Decisions under Risk" to *Econometrica*. Prospect Theory, an extended version of Heuristics-and-Biases, purposely adjusted for economists, aspired to substitute expected utility theory in decision making under risk based on certain anomalies that occur in behavior: people's decisions are not always optimal but they heavily depend on how the choices are framed. This was the most important milestone in the history of behavioral economics because the experimentally confirmed cases where people deviated from the normative model of axiomatic rationality finally attracted the interest of economists around the world who were

concerned with establishing a more realistic model of economic behavior. Thus, behavioral economics was launched as an on-going effort to further develop the Heuristics-and-Biases program through experimental research. Kahneman and Tversky continued to work together on Prospect Theory until Tversky's untimely death in 1996. Kahneman received the Nobel Prize for Economics on behalf of both of them in 2001 and continues to work on the same agenda.

Richard Thaler, the prominent American economist, started to work on prospect theory with Kahneman and Tversky since the late 1970's. He is largely known for several contributions in behavioral economics and behavioral finance, especially for the establishment of a cognitive bias called *endowment effect*, "the fact that people often demand much more to give up an object than they would be willing to pay to acquire it" (Thaler 1980) and the concept of *mental accounting*, as a substitute for the standard theory of consumer choice behavior, "as a set of cognitive operations used by individuals and households to organize, evaluate and keep track of financial activities", which of course is subject to logical fallacies and biases (Thaler 1999).

More importantly, in 2008, Richard Thaler collaborated with Cass Sunstein and published the book *Nudge: Improving Decisions About Health, Wealth, and Happiness*, where, based on all the literature of behavioral economics so far about various cognitive biases, they discuss and recommend policies of *choice architecture* that can "alter people's behavior in a predictable way without forbidding any options or sig-

nificantly changing their economic incentives" (Thaler & Sunstein 2009). Their theory of *nudges* and *libertarian paternalism* has been already discussed in the first chapter and it will also be discussed in more detail in the following section whereas a criticism of it will be presented in the next chapter since these issues are fundamentally linked to individual consent and rationality.

After thirty years since Kahneman and Tversky' s ground-breaking work, a lot of prominent academics, scholars and researchers work in the interdisciplinary field of behavioral economics, coming either from an economic or a behavioral science background. Prominent behavioral economists, Colin Camerer and George Loewenstein describe what behavioral economics tries to do (Camerer & Loewenstein 2004: 3):

> *At the core of behavioral economics is the conviction that increasing the realism of the psychological underpinnings of economic analysis will improve the field of economics on its own terms – generating theoretical insights, making better predictions of field phenomena, and suggesting better policy. This conviction does not imply a wholesale rejection of the neoclassical approach to economics based on utility maximization, equilibrium, and efficiency. The neoclassical approach is useful because it provides economists with a theoretical framework that can be applied to almost any form of economic (and even noneconomic) behavior, and it makes refutable predictions.*

Below we will examine the most important findings of behavioral economics and how they contribute in informing the descriptive aspect of the economic model of decision making by highlighting some psychological limitations of human rationality.

It is important to note here that almost all of the fundamental findings of behavioral economics stem from the development of Kahneman and Tversky' s Prospect Theory (1979) and its principal idea that the way people make decisions and assess options depends largely on reference-point phenomena, like framing effects, representativeness, anchoring, availability, loss-aversion and endowment effect, where a reference point manipulates the perception of the outcomes (Hastie & Dawes 2010: 281). We will also examine cognitive biases that have been established independently by psychologists, like the *confirmation bias* and *cognitive dissonance*, or some instances of social preferences, like *reciprocity* and *inequity aversion*, that have been extensively used in behavioral economics studies. We believe that, although there is a rich literature of different names of biases that are being "discovered" continuously, they ultimately all fall under these main categories that we have chosen to illustrate here. Furthermore, all these phenomena, which we will discuss below, are obviously linked to the concept of consent, a point that will be more thoroughly examined in the next section and chapter.

The general psychological approach to the mind that behavioral economists use as a framework is the distinction of two systems of thinking. System 1 or Automatic System is the intuitive, faster and unconscious part of the mind and System 2 or Reflective System is the deliberate, slower and conscious part (Thaler & Sunstein 2009; Kahneman 2011). Humans use the Automatic system when there is a need to make quick and effective decisions as is the bulk of our everyday behavior. It requires less energy and almost no attention and it can relieve us of the need to use a large amount

of information and calculations about trivial and habitual actions, such as walking, reading, recognizing sounds, estimating distances, comprehending language, etc. The Reflective system, on the contrary, is responsible for decisions that require our attention and deliberation. It takes more energy and time to operate and it usually concerns issues that are important to us, like listening to someone we care, following a logical argument, doing a test, filling out our tax forms, trying to park in a difficult spot, etc.

According to behavioral economists, the Automatic system deploys a set of *rules of thumb* in order to help with fast decision making but it often leads us to commit a lot of cognitive biases and errors. These rules of thumb are called *heuristics*, simple cognitive mechanisms that allow us to make judgments about various outcomes concerning our choices, but very prone to logical and statistical errors. Tversky & Kahneman (1974) identified three fundamental heuristics that underlie judgment under uncertainty, the *representativeness heuristic*, the *availability heuristic* and the *anchoring and adjustment heuristic*. These heuristics, especially in combination with the *framing* of choices, can help us make effective and fast decisions but they more often than not lead us to an array of cognitive fallacies, such as these that we will examine in the following pages. Kahneman and Tversky's Heuristic-and-Biases program essentially launched the experimental field of behavioral economics, which has exactly this goal: to detect and study cases of cognitive biases in decision making environments. We will start with exploring the importance of framing effects in decision making.

Framing effects. The way that information about the available choices is presented to an individual can lead to different decisions and consequently "reveal" different preferences even for identical choices. According to behavioral economists, the framing effect depends on whether the information is presented in a positive or in a negative aspect, thus misleading individuals to perceive the outcomes as gains or losses respectively, demonstrating incoherencies in decision making.

Kahneman and Tversky's original experiment was the Asian Disease problem (Tversky & Kahneman 1981) where they tested students at Stanford University and at the University of British Columbia with a questionnaire in a classroom setting. Depending on whether the outcomes of a decision, about which policy to follow in order to deal with a disease outbreak, where described on the basis of lives saved or lives lost, the subjects shifted between risk aversion and risk taking behaviors, although the choices were identical.

As part of the development of prospect theory (Kahneman & Tversky 1979), framing effects have been identified in a number of experiments and approaches (Levin, Schneider & Gaeth 1998). For example, in one study, consumers' evaluations for ground beef framed as "75% lean" were more favorable than for ground beef framed as "25% fat" (Levin & Gaeth 1988). Similarly, when professional decision makers, such as engineers, scientists, and managers in a high-technology international engineering firm were asked to assess financial allocations to research and development

(R&D) teams, they allocated more funds to the teams whose performance rates were framed as successful rather than unsuccessful, even though statistically the success ratio was the same for both cases (Duchon et al., 1989). Framing effects have been used more extensively in marketing by sellers in order to influence buyers' behavior. For instance, in an experiment by North, Shilcock & Hargreaves (2003), customers in a restaurant reported that they were willing to spend more, and actually spent more, when classical music was played in the background instead of pop music or no music at all.

Behavioral economists believe that framing effects are powerful because people are innately lazy decision makers who systematically don't make use of their Reflecting system and so don't bother to check whether their choices have been framed in a certain way that would influence their judgment or they are not sure what to make of various framings even if they detect the differences (Thaler & Sunstein 2009).

Loss-aversion. Kahneman and Tversky (1979) aptly described this effect with the expression "losses loom larger than gains". The pain of losing (money or commodities) is greater than the pleasure of gaining so that people are willing to assume more risks in order to avoid greater losses than to settle for smaller losses with certainty.

Loss-aversion suggests that consumers dislike price increases in products more than they like price cuts and researchers have found this to be true in some cases, like eggs and orange juice (Hardie et al. 1993; Wilkinson & Klaes 2012). In more extensive

research, loss-aversion phenomena have been applied in motivating people towards particular behaviors by manipulating penalty and reward framings. When half of the participants of a scientific conference were told that there is a "penalty" of $50 for registering after the first deadline and the other half were told that there is a "discount" of $50 for registering before the first deadline, almost everyone in the "penalty group" were motivated to register early, although the effect was stronger in junior scientists than in seniors (Gächter, Orzen, Renner & Starmer 2009).

According to behavioral economists, loss-aversion is also strongly connected with the Automatic system and a kind of inertia (or tendency to inaction) that continuously urges decision makers not to incur any losses to their current position.

Endowment effect. People are willing to pay (WTP) less in order to buy something than they are willing to accept (WTA) in order to sell the same thing. In other words, when people own something, especially something with emotional or symbolic value, they tend to value it more than they would price it in the market.

Endowment effect is the best demonstration of loss-aversion and, as we have already mentioned, it was established by Richard Thaler and further investigated by him particularly in behavioral finance (Thaler 1980). In his famous experiment, that has been replicated numerous times by other experimenters, when half of his students were given coffee mugs and the other half was given tokens so that they could bid them to buy the mugs, the mug owners placed much higher selling prices than the buying

prices of those who didn't own mugs (Kahneman, Knetsch & Thaler 1991). Interestingly, the endowment effect is not only present in exchanges between goods and money but also between goods.

In another experiment, Knetsch (1989) offered half of his students a coffee mug as a reward for the completion of a short questionnaire and the other half a bar of Swiss chocolate. To a third group he simply offered a choice between receiving a candy bar or a mug. When participants of the first and second group were asked whether they wished to exchange their mugs for candies or their candies for mugs, most of them stuck with their initial entitlements, whereas participants of the third group were indifferent between the mug and the chocolate. These results show that the initial endowment of a good serves as a strong reference point and influence the subsequent valuations of goods even without the effects of income or wealth constraints.

Status Quo Bias. When people have to choose among alternatives they will display a bias towards their status quo situation. Status quo bias is partly a psychological expression of inertia and is the basic cognitive bias that generates both loss-aversion and endowment effect phenomena as it presents an initial reference point that influences choices. Experiments in laboratories and studies on health and retirement plans, public policy, and marketing have shown that status quo bias is persistent in decision making and can be present even in situations where there are no explicit framings of gains versus losses (Samuelson & Zeckhauser 1988).

Some behavioral economists believe that status quo bias is caused by lack of attention combined with an indifference attitude towards many every-day decisions (Thaler & Sunstein 2009: 38). Others propose the *Regulatory focus theory* (Higgins 1997; 2001) as an explanation of both status quo bias and loss-aversion. According to the Regulatory focus theory there are two separate motivational systems that guide decision making and risk taking, the *prevention system* and the *promotion system.* The prevention system focuses on goals that will maintain needs like safety, responsibility and security and it is sensitive to losses versus non-losses. The promotion system focuses on goals that encourage accomplishments and advancement needs and it is sensitive to gains versus non-gains.

Finally, Ellen Langer (1975), in a series of experiments, described that sticking to status quo choices gives an *illusion of control* over the outcomes of lotteries. Participants that were permitted to choose the card they would hold out of a number of cards that would be drawn for a lottery, placed an 8 times higher price to it when they were asked to give it up before the lottery, than the participants who were randomly assigned a card.

Sunk-cost fallacy. "The tendency to continue an endeavor once an investment in money, effort, or time has been made. The prior investment, which is motivating the present decision to continue, does so despite the fact that it objectively should not influence the decision" (Arkes & Blumer 1985).

The sunk-cost fallacy is closely related to status quo bias and it has been shown to explain a number of seemingly irrational behaviors, like why people stick to bad decisions if they have invested (money, time or emotions) in them instead of changing them or why members of a health club or theatergoers will attend more diligently the sessions or performances that have already been paid for in advance (Gourville & Soman 1998; Arkes & Blumer 1985). Thaler, who has tried to model sunk costs in his mental accounting theory, believes that although historical costs should be irrelevant to decision making, "paying for the right to use a good or service will increase the rate at which the good will be utilized, *ceteris paribus*." (Thaler 1980: 47).

Anchoring and adjustment. Peoples' responses are influenced by an exposure to an irrelevant reference point (usually a number). Tversky and Kahneman (1974) proposed the anchoring heuristic as a basic rule of thumb in decision making that occasionally leads to errors in predictions and estimation. When subjects were shown a number by a spinning wheel of fortune, their estimation of the percentage of African countries in the United Nations was closer to the initial number they had been randomly exposed to. Similarly, when two groups of high school students were asked to quickly estimate the result of the multiplication 1x2x3x4x5x6x7x8x9 or 9x8x7x6x5x4x3x2x1 respectively, the first group's estimation was lower and the second's higher due to the lower and higher result of only the first numbers' multiplications seen.

In another series of famous experiments, Ariely, Loewenstein & Prelec (2003; 2006), asked a group of students to write down the last two digits of their security number and then they were asked to estimate the price of products like computer accessories, wine bottles, luxury chocolates, and books. Students with above-median social security numbers stated prices from 57 percent to 107 percent greater than did students with below-median numbers. Ariely and his colleagues propose a *theory of coherent arbitrariness* in order to explain anchoring effects (Ariely, Loewenstein & Prelec 2003: 74):

> *Prior to imprinting, valuations have a large arbitrary component, meaning that they are highly responsive to both normative and non-normative influences. Following imprinting, valuations become locally coherent, as the consumer attempts to reconcile future decisions of a "similar kind" with the initial one. This creates an illusion of order, because consumers' coherent responses to subsequent changes in conditions disguise the arbitrary nature of the initial, foundational, choice.*

Representativeness. Individuals judge the probability of an event by the degree to which that event is representative (Tversky & Kahneman 1972; Tversky & Kahneman 1971, 1982). Representativeness is another basic heuristic of prospect theory that has been extensively studied by behavioral economists. Tversky and Kahneman (1972: 430) describe this heuristic according to which "the subjective probability of an event, or a sample, is determined by the degree to which it: (i) is similar in essential characteristics to its parent population; and (ii) reflects the salient features of the process by which it is generated."

When people ignore the basic rules of probability theory, the representativeness heuristic may often lead to certain cognitive biases and errors such as the *hot hand fallacy*, where sports fans erroneously believe that a basketball player's chance of hitting a shot are greater following a hit than following a miss on the previous shot (Gilovich et al. 1985). Similarly, in financial markets, Benartzi (2001) found that employees who want to invest in their company's stocks might conclude that abnormally high past performance is representative of future performance, even though stock returns are largely unpredictable.

Base rate fallacy and the *conjunction fallacy* are maybe the most important examples of the representativeness heuristic. An illustration of this problem can be observed in the famous *Linda problem* by Tversky and Kahneman (1983) when they asked a group of students to estimate the probabilities of Linda being a bank teller, or both a bank teller and feminist, after they were given the following description: "Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations." The majority of students answered that Linda is most likely to be both a bank teller and a feminist, contrary to the theory of probabilities which dictates that the probability of two events occurring together is always less than or equal to the probability of either one occurring alone. Thaler and Sunstein (2009) cite Stephen Jay Gould once saying about the Linda problem: "I know the right answer, yet a little homunculus in my head continues to jump

up and down, shouting at me – 'But she can't just be a bank teller; read the description!'". Thaler and Sunstein assert that this homunculus is the Automatic system, through the representativeness heuristic, advising us how to estimate probabilities.

This heuristic, when unknown outcomes are based on similarity, applies to many areas of every day economic decisions, as well. Kardes, Posavac, & Cronley (2004) found that when the package of a generic brand product is similar to the package of a name brand product, consumers infer that the generic brand product will perform similarly as the name brand product.

Availability. People assess the frequency of a class or the probability of an event by the ease with which instances or occurrences can be brought to mind (Tversky and Kahneman 1974). The availability heuristic is another aspect of the representativeness heuristic which also can lead to systematic errors in judgment.

So, for example, a person may estimate a high risk of airplane accidents judging by a recent crash that he saw at the news, because this event came readily to mind and messed with the real likelihood of the event. Tversky and Kahneman (1974: 1128) assert that

> *in general, instances of large classes are recalled better and faster than instances of less frequent classes; that likely occurrences are easier to imagine than unlikely ones; and that the associative connections between events are strengthened when the events frequently co-occur. As a result, man has at his disposal a procedure (the availability heuristic) for estimating the numerosity*

> *of a class, the likelihood of an event, or the frequency of co-occurrences, by the ease with which the relevant mental operations of retrieval, construction, or association can be performed. However, this valuable estimation procedure results in systematic errors.*

Related to the availability and representativeness heuristics is the *hindsight bias*, a kind of memory distortion, where people erroneously judge the probability of an event's occurrence because they think that they would have predicted its past outcome (Mazzoni & Vannucci, 2007). Hindsight bias can have substantial implications in the legal system. For example, it can affect the judgment of jurors and judges when they try to assess the defendant's pre–outcome actions (Harley 2007).

Herd behavior also seems to be related to the availability and representativeness heuristics as people sometimes tend to do what they see others doing without using their own information or judgment. The mass behavior of others in this case functions as a reference point, often leading to disadvantageous circumstances. So, people will queue behind other people, even if they don't have to, or they will follow a crowd towards a perceived path without checking if it is actually the right course. There is a large theoretical literature about herd behavior in financial markets (Bikhchandani & Sharma 2001) and politics, esp. voting behavior (Banerjee 1992).

Overconfidence bias. People often overestimate their abilities contrary to their actual performance and are overly optimistic about future events. The overconfidence bias is closely related to the availability heuristic. Moore and Healy (2008) distinguish

among three kinds of overconfidence bias, (1) overestimation of one's actual performance, (2) overplacement of one's performance relative to others, and (3) excessive precision in one's beliefs. Vosgerau (2010) also clarifies that overconfidence describes people's overoptimism with respect to their own performance and *wishful thinking* denotes people's overoptimism about future events that are unrelated to their performance.

Unrealistic optimism can account for a lot of risk taking behaviors in the market and the financial markets or in everyday life, like when people overestimate their chances of getting sick or hurt and fail to take the appropriate precautions. However, other experimental findings suggest a seemingly paradoxical bias, the *underconfidence bias,* which describes people's tendency to underestimate their abilities and performances under some specifiable conditions: (Fu et al. 2005; Larrick et al. 2007).

Vosgerau (2010) tries to explain this paradox by offering a theory of *misattribution of arousal* to suggest that "people can be both overly optimistic and pessimistic in their beliefs about future events, depending on whether they focus on success or on failure. More specifically, people judge the likelihood of desirable and undesirable events to be higher than similar neutral events because they misattribute the arousal those events evoke to their greater perceived likelihood."

Confirmation bias. People notice, search, interpret or evaluate information selectively so it can fit with their existing beliefs, thinking, expectations and preconceptions. For example, in a famous experiment by Charles Lord, Lee Ross, and Mark Lepper (1979), both proponents and opponents of the death penalty were presented with ambiguous arguments about the efficacy of capital punishment, first with one study confirming their initial beliefs and then with one study disconfirming their initial beliefs. Both groups interpreted the information as supporting their beliefs and, in addition, they were led to increased polarization, as they further solidified their existing beliefs and opinions about the matter. Related to confirmation bias is the phenomenon of *cognitive dissonance* (Festinger 1957), where people tend to change their beliefs in order to reconcile them with past behavior or events. Jon Elster has called this behavior "*adaptive preference formation*" (Elster 1982).

Confirmation bias is so strong and pervasive that it was noted by philosophers a long time ago. Francis Bacon (1620: I.XLVI) recognized it and asserted that

> *the human understanding, when any proposition has been once laid down (either from general admission and belief, or from the pleasure it affords), forces everything else to add fresh support and confirmation; and although most cogent and abundant instances may exist to the contrary, yet either does not observe or despises them, or gets rid of and rejects them by some distinction, with violent and injurious prejudice, rather than sacrifice the authority of its first conclusions.* […] *All superstition is much the same, whether it be that of astrology, dreams, omens, retributive judgment, or the like, in all of which the deluded believers observe events which are fulfilled, but neglect and pass over their failure, though it be much more common. But this evil insinuates itself still more craftily in philosophy and the sciences, in which a settled maxim vitiates and governs every other circumstance, though the latter be much more worthy of confidence. Besides, even in the absence of that eagerness and want*

> *of thought (which we have mentioned), it is the peculiar and perpetual error of the human understanding to be more moved and excited by affirmatives than negatives, whereas it ought duly and regularly to be impartial; nay, in establishing any true axiom the negative instance is the most powerful.*

Inequity aversion. People are averse to "unfair" outcomes and they are often willing to forgo a gain or incur a loss in order to even out an inequitable result. Inequity aversion has been applied in business and marketing (Barone & Tirthankar 2010), in the behavior of firms and monopolies (Kahneman, Knetsch & Thaler 1986) and in experimental games, such as the Ultimatum Game and the Dictator Game (Fehr & Schmidt, 1999). Contrary to the perceived premise of standard game theory models, where a rational person is assumed to maximize solely his material self-interest, findings concerning these games have shown that the subjects show cooperative behavior driven by fairness considerations (Camerer 2003).

In the Ultimatum game, one player, the Proposer, is given a sum of money from which he has to offer a portion to a second player, the Responder. If the Responder accepts the offer, then both players get to keep the agreed allocated amounts. If the Responder rejects the offer, neither of the players takes any money at all. Game theory suggests that a rational Responder will accept any amount of money, even the minimum unit of currency involved, since she is an income maximizer. However, in many cases of experimental gaming, offers less than 20% are usually rejected while they typically average 30-40% (Camerer & Thaler 1995).

The demonstration of the inequity aversion, as it is observed in experimental Ultimatum games, can be explained with the concepts or *reciprocity* and *altruistic punishment*. Reciprocity and cooperation is not just about altruism and the consideration of other people's well-being, but it also depends on how we perceive other people's intentions regarding fairness and injustice. Individuals are often willing to punish defectors and misusers, although the punishment is costly for them and yields no material gain (Fehr & Gächter 2002). Matthew Rabin, a scholar who has tried to build reciprocity models in game theory, states that altruistic behavior in general is complex (Rabin 1993: 1281):

> *People do not seek uniformly to help other people; rather they do so according to how generous these other people are being. Indeed, the same people who are altruistic to other altruistic people are also motivated to hurt those who hurt them. If somebody is being nice to you, fairness dictates that you be nice to him. If somebody is being mean to you, fairness allows – and vindictiveness dictates – that you be mean to him.*

In the following section we will see how the findings of behavioral economics have actual applications in the planned settings of choice environments and particularly how they have become the basic theoretical framework of *choice architecture*, i.e. policies specifically designed with the intention to help people make better choices in private and public life. These policies are called *nudges*, a term coined by behavioral economist Richard Thaler and law professor Cass Sunstein in their popular book published in 2008. Apart from instances of private life and applications in businesses and the market, various nudges by behavioral economists have been adopted by the governments of the United States and Great Britain. The importance and efficiency

of these policies are fundamental to the theoretical discussion of individual consent as a rational choice, since the basic premise of behavioral economics, as we have already seen, is the systematic irrationalities of human decision making.

3.4 NUDGE THEORY AND CHOICE ARCHITECTURE

Behavioral economics' core ideas have been variously applied to domains like finance, marketing, organizations, public choice, health, energy, the environment, well-being, welfare politics and other areas of public and private life (Diamond & Vartiainen 2007). Since the law, either in the form of legislation or in the form of judicial decisions, has a major influence on individual behavior, institutions, markets, public policy and social welfare, it has greatly benefitted from the insights and tools of standard microeconomic theory (Coase 1960; Calabresi 1961; Posner 1973). A behavioral approach to the field of the economic analysis of law was more recently suggested by law professors Cass Sunstein and Christine Jolls and behavioral economist Richard Thaler, in order "to advance an approach to economic analysis of law that is informed by a more accurate conception of choice, one that reflects a better understanding of human behavior and its well-springs." (Jolls et al. 1998).

The programmatic research agenda of behavioral law and economics was founded on three pillars, bounded rationality, bounded willpower and bounded self-interest, as a set of more relaxed and more psychologically informed assumptions about actual

human behavior, in accordance with behavioral economics ideas and contrary to those of the traditional economic model. Thus, bounded rationality refers to judgment errors, as departures from Bayesian reasoning and decision making, as departing from expected utility theory (Allais 1953; Ellsberg 1961; Tversky & Kahneman 1979). Bounded willpower refers to decision making by individuals against their better judgment and long-term interests (Laibson 1997). And finally, bounded self-interest refers to people's interest in other people's welfare and their reactions to fair and unfair behaviors (Rabin 1993).

Behavioral law and economics also suggests that one of the most serious behavioral constraint for litigations is the phenomenon of the endowment effect (Thaler 1980; Kahneman, Knestch & Thaler 1991), as an instance of bounded rationality. According to this view and contrary to the assumptions of the Coase theorem (Coase 1960), endowment effects can distort the outcomes of bargains between the parties after the assignment of legal entitlements by legislation and courts, even when transaction costs are zero. This may occur because, when a person is entitled a legal right, her initial evaluation of the right will change and she will ascribe a higher value to something that she presently owns than the value she would have paid when she didn't own it before. This attitude, paired with the hindsight bias, will also make her believe that she deserved the assigned right all along. Bounded self-interest will further affect negotiations between parties especially in the usual case of mutual animosity and lack of essential communication after arduous procedures.

Another important consideration of the behavioral analysis of law is overoptimism, where people tend to underestimate the likelihood of bad things happening to them and to believe that they generally perform better than others (Moore & Healy 2008). Jolls et al. (1998) believe, for example, that a good prescription for a government campaign would be one that, instead of focusing on the drivers' own performance, would focus on the fact that most people tend to believe that they are better and safer drivers than others. Such a campaign advertises: "Drive defensively: Watch out for the other guy."

Loss aversion, as the tendency of people to value their losses more than they value their gains, has also been an issue in the behavioral analysis framework. Prescriptions for framing choices in a way that the negative consequences are stressed rather than the positive ones are usually proposed. For example, in a particular study, women who read a pamphlet with arguments framed in loss language about breast self-examination (BSE), manifested more positive BSE attitudes, intentions, and behaviors than did women who were exposed to a gain-frame pamphlet, or a no-arguments pamphlet (Beth Meyerowitz & Shelly Chaiken 1987).

In their programmatic paper, that launched the field of behavioral law and economics, Jolls, Sunstein and Thaler, despite their suggested prescriptions for coping with the various cases of irrational behavior, they were at the same time very cautious about the philosophical and ethical implications of supporting paternalistic policies based on the findings of behavioral economics and the assumed bounded rationality

of consumers and citizens. Instead they claim (Jolls, Sunstein & Thaler 1998: 1545) that

> *from the perspective of behavioral law and economics, issues of paternalism are to significant degree empirical questions, not questions to be answered on an a priori basis. No axiom demonstrates that people make choices that serve their best interests; this is a question to be based on evidence. Of course the case for intervention is weakened to the extent that public institutions are likely to make things worse rather than better. What we are suggesting is that facts, and assessment of costs and benefits, should replace assumptions that beg the underlying questions.*

In more recent years, the attempt to introduce the insights of behavioral economics in the discussion of the analysis and design of rules and institutions has moved from behavioral law and economics to nudge theory and choice architecture. Two of the three authors mentioned above, that initiated the study of behavioral law and economics, law professor Cass Sunstein and behavioral economist Richard Thaler, published in 2008 the very influential book *Nudge: Improving decisions about health, wealth and happiness*. The book is a series of policy proposals, for private institutions or even for the government, that are meant to help people "make their lives longer, healthier and better" (Sunstein & Thaler 2009: 5). They base these policy proposals on the findings and ideas of behavioral economics and particularly on the false, according to them, assumption that "almost all people, almost all of the time, make choices that are in their best interest or at the very least are better than the choices that would be made by someone else." (Sunstein & Thaler 2009: 10). So, a nudge "is any aspect of the choice architecture that alters people's behavior in a pre-

dictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates." (Sunstein & Thaler 2009: 6).

Sunstein and Thaler start their book by introducing the seemingly oxymoron term "libertarian paternalism" in order to justify the policies they propose throughout the rest of the book (Sunstein & Thaler 2009: 6). They call their paternalism libertarian because it is based on hypothetical consent:

> *Libertarian paternalism is a relatively weak, soft, and nonintrusive type of paternalism because choices are not blocked, fenced off, or significantly burdened. If people want to smoke cigarettes, to eat a lot of candy, to choose an unsuitable health care plan, or to fail to save for retirement, libertarian paternalists will not force them to do otherwise – or even make things hard for them. Still, the approach we recommend does count as paternalistic, because private and public choice architects are not merely trying to track or to implement people's anticipated choices. Rather, they are self-consciously attempting to move people in directions that will make their lives better. They nudge.*

The anchoring and adjustment heuristic along with the availability heuristic can explain why people tend to buy insurance for natural disaster when there is a very recent similar event that easily comes to mind. Accessibility to memory and salience of a certain event or feature influences risk-related behavior in the public and private sector. Biases due to similarity can also be caused by the representativeness heuristic, especially in the case of falsely recognizing a pattern out of random sequences, like the "hot hand" fallacy in sports, where fans tend to believe that a player can demonstrate a "shooting streak". Overconfidence bias, loss aversion, status quo bias, herd

behavior, weakness of will and framing effects are also among the fundamental biases and errors upon which the authors base their nudge proposals about how to save more, how to increase organ donations, how to endorse environmental policies, how to improve marriage relationships, how to avoid gambling and others.

A famous nudge example is the rearrangement of food in school cafeterias in order to help students make healthier choices. Fruits and salads can be put at eye-level and at the start of the lines. In another example, with charitable donations, people will give more if the options are $100, $250, $1000 and $5,000 than if the options are $50, $75, $100 and $150, because they are influenced by the anchoring effect, whereby an initial exposure to a number serves as a reference point and influences their subsequent judgments about value. In order to increase organ donations, the authors suggest that the default option should be that everybody is an organ donor unless they explicitly choose to opt out. The requirement of explicit consent usually constitutes a deterrence to people due to inertia and the status quo bias, despite any expressed willingness to become organ donor.

Sunstein and Thaler's book had a large impact on policy making issues and the "nudge theory" has since influenced business management, organizational culture as well as state policies. The Obama administration in the United States appointed Cass Sunstein as administrator of the Office of Information and Regulatory Affairs and the Prime Minister of Great Britain, David Cameron, has set up a "nudge unit" in the Cabinet office, called "Behavioural Insight Team", whose goal is to test and trial

interventions in collaboration with government departments about health and consumer policy, energy, labor markets and growth, based of course on behavioral economics insights. Finally, the government of New South Wales in Australia recently established a similar team.

Nevertheless, nudges and choice architecture, based on the assumptions of systematic irrationality, have drawn a lot of criticism concerning either their actual effectiveness or the ethical implications of manipulation of individual choice and issues of autonomy. These practical and philosophical considerations will be explored in the next chapter where we will attempt a general criticism of the ideas, the findings and the methods of behavioral economics.

3.5 Intellectual-and-Moral Attribution Bias – Two experiments

Folk psychology or common-sense psychology is the capacity of humans to predict and explain the behavior of other humans by attributing to them mental states. Philosophers have been studying this capacity for a long time, but it was more systematically studied by social psychologists and cognitive scientists in the middle of the previous century. Fritz Heider, a social psychologist related to the *Gestalt* school and opposed to Skinner's psychological behaviorism of the era, worked on the psychology of social perception and cognition and was a pioneer of *attribution theory*, which

describes how people explain – what causes they attribute to – other people's behaviors and events (Heider 1958). Other researchers elaborated on Heider's theory and distinguished between "dispositional" and "situational" attributions, depending on whether people attributed internal (beliefs, emotions, etc.) or external (due to natural or social environment) causes to behaviors (Jones & Davies 1965; Kelley 1967; Jones & Harris 1967).

Expanding on his own work on object perception, Heider (1958) thought that our ability to perceive physical objects is similar to our ability to perceive social interactions. The way we perceive a physical object is through the information of our sensory processes that reconstruct the traits of the object. So, for example, the red color of a rose is not an inherent characteristic of the rose but the manner our brain perceives the way white light hits this particular object. Nevertheless, sensory information about physical objects can often produce sensory illusions, such as optical illusions. Similarly, then, according to Heider, the way we perceive the behavior of other humans passes through our sensory system and can also lead to biases, even more so, because the observational data of social interactions are more complicated than those of the physical objects.

Lee Ross (1977) introduced the *fundamental attribution error* in order to describe the tendency of people to overestimate the importance of internal characteristics (such as personality traits) and to underestimate the relevant environmental influences when they explain someone else's behavior. Similarly, Jones and Nisbett

(1972) coined the term *actor-observer bias* to describe the tendency of people to over-emphasize the role of environmental conditions in their own behaviors and under-emphasize the role of their own personal motives, whereas, to attribute other people's behavior to dispositional factors rather than situational.

Self-serving attribution bias describes the tendency of people to attribute their failures to negative external factors - like task difficulty, bad luck or uncooperative others - but their successes to positive internal factors - like their own skills, intelligence or determination (Campbell & Sedikides 1999). As seen above, when *self-serving attribution bias* is applied to explain the behavior of others, the reverse reasoning is employed; other people fail because of negative internal factors – like foolishness or laziness – and they succeed because of positive external factors – like good luck, help from others, etc. In accordance with *self-serving attribution bias* is also the *third-person effect* which was originally articulated by W. Philips Davison in 1983 and described as thus: "an individual who is exposed to a persuasive communication via the mass media will see this communication as having a greater effect on other people than on himself or herself".

Davison initially tested the *third-person effect* with four small experiments in the form of surveys. In the first survey, Davison asked 33 graduate students on a course of mass communication to estimate the effects on others and on themselves of a campaign theme about a recent New York gubernatorial election. The questionnaire was divided into two sections, one with "questions about New Yorkers in general" and

one with “a few questions about your own experiences.” In the second survey, he asked 25 graduate students about the effects of television advertising on children. This time the students were asked first about the effects on themselves and then on others. In the third survey, he asked a group of 25 adults, who were attending a lecture series at the Museum of Broadcasting in New York, about the influence of early presidential primaries on voting intentions on themselves and on others. Finally, in the fourth survey, Davison asked a different group of respondents at the Museum of Broadcasting to evaluate the effect on their own votes and the votes of other people in general of certain campaign messages that Ronald Reagan would pursue a particular foreign policy. In all four experiments subjects estimated on average that others were more influenced by mass communicated media messages than they were personally.

Since then, the *third-person effect* has been excessively tested in many domains of media context and it has been proved to be a reliable and persistent phenomenon, not influenced by variations in research procedures (Perloff 1999, 2002; Sun et al. 2008). Apart from the influence of self-serving bias, the effect could be explained by the fact that individuals have more knowledge about the self than about others. The *social distance corollary theory* states, that the more ‘‘distant’’ the “other” is perceived to be, in geographical or social terms, the greater will be perceptual gap between self and other (Cohen, Mutz, Price & Gunther, 1988). According to a meta-analysis of 60 papers and 106 studies from Sun, Pan and Shen (2008), the most important moderator of the *third-person effect* is the desirability of the presumed message influence.

That is, the more a message is perceived to have undesirable or ambiguous social influences, the more people believe that it will have a greater effect on others than on themselves.

Michael Shermer (2006) and Frank Sulloway identified another attribution error when they surveyed 10,000 Americans about their faith in God. Among other things, they asked their subjects two questions and allowed them to provide written answers: "Why do *you* believe in God?" and "Why do you think *other people* believe in God?" After they classified the answers into broad categories they found that the five most common answers given to the question referring to self were: (a) Arguments based on good design / natural beauty / perfection / complexity of the world or universe (28.6%), (b) The experience of God in everyday life / a feeling that God is in us (20.6%), (c) Belief in God is comforting, relieving, consoling, and gives meaning and purpose to life (10.3%), (d) The Bible says so (9.8%), (e) Just because / faith / or the need to believe in something (8.2%). Similarly, the six most common answers regarding other people fell under the following categories: (a) Belief in God is comforting, relieving, consoling, and gives meaning and purpose to life (26.3%), (b) Religious people have been raised to believe in God (22.4%), (c) The experience of God in everyday life / a feeling that God is in us (16.2%), (d) Just because / faith / or the need to believe in something. (13.0%), (e) People believe because they fear death and the unknown (9.1%), (f) Arguments based on good design / natural beauty / perfection/complexity of the world or universe (6.0%).

Shermer and Sulloway named this discrepancy *Intellectual Attribution Bias* in which "people consider their own beliefs as being rationally motivated, whereas they see the beliefs of others as being emotionally driven". They further assumed (Shermer 2006: 38) that:

> *by analogy, one's commitment to a political belief is generally attributed to a rational decision ("I am for gun control because statistics show that crime decreases when gun ownership decreases"), whereas another person's opinion on the same subject is attributed to need or emotional reasons ("he is for gun control because he is a bleeding-heart liberal who needs to identify with the victim").*

3.5.1 Our hypothesis

Certain cognitive biases, and therefore attribution biases as well, that lead to errors in judgment, seem to be a common part of human psychology (Heider 1958; Ross 1977; Shermer 2006). We believe that the *Intellectual Attribution Bias* (IAB) can demonstrate how individuals can be biased towards the rationality of others. Since IAB shows that we tend to attribute rational reasons to our own religious faith and emotional or irrational reasons to the faith of others, we expect that the same attitudes will be displayed in other domains as well. We also assume that individuals will tend, in addition, to attribute immoral motives to others, especially when it comes to issues that concern social interactions and relationships in general. In order to test these hypotheses in other domains of behavior and decision making, we conducted two experiments in the form of surveys, one concerning commercial advertising and one concerning voting decision (Foka-Kavalieraki & Hatzis 2015c).

3.5.2 First Experiment: Method and Procedure

In our first experiment we divided in half a group of 101 undergraduate and graduate students of an inter-disciplinary course on the philosophy of social sciences. Students that enrolled in the course came from various social sciences, like economics, philosophy, psychology, law school and sociology. To the one half of participants we gave a questionnaire with the following question:

"How often do you think you get influenced by commercial advertising and why?"

The other half of participants were asked:

"How often do you think the average person gets influenced by commercial advertising and why?"

All the participants had to check a scale from 1 to 7, corresponding to "not at all", "very rarely", "rarely", "sometimes", "many times", "very often" and "always" in order to indicate the degree of influence and then they were allowed to write their answers in brief on the same sheet. Both groups were given 10 minutes to complete the questionnaire.

Results

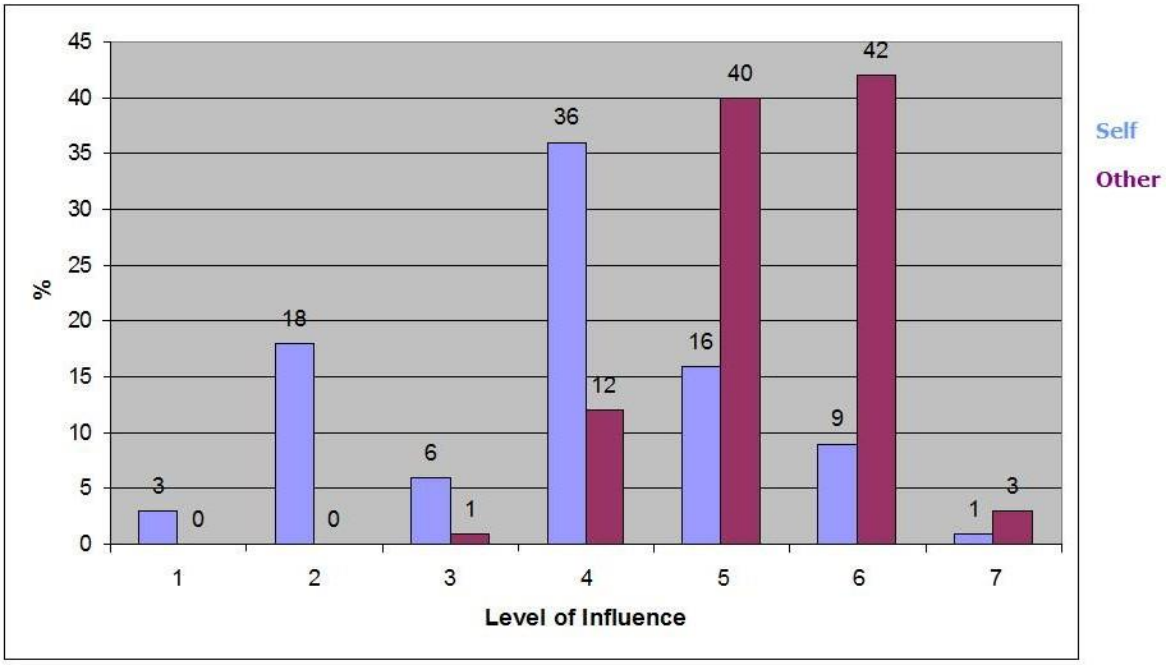
We classified the answers in broad categories. Several participants gave more than one cause for the behavior of self or others. The five most common answers given to the question: “How often do you think you get influenced by commercial advertising and why?” were the following:

1. It’s a source of information (38%)
2. I can filter the information and I’m not easily convinced (19%)
3. I know which goods cover my real needs (13%)
4. Only if it’s about a good that I was already interested in (8%)
5. I prefer not to watch too much TV (6%)

The eight most common answers given to the question “How often do you think the average person gets influenced by commercial advertising and why?” were the following:

1. Lack of judgment and weakness of will (28%)
2. Not aware of their true needs / false needs (22%)
3. Impressive ads influence their subconscious (19%)
4. Lack of information, knowledge, education (17%)
5. Brain-wash (10%)
6. Too much TV (6%)
7. Greediness and overconsumption (5%)
8. Need to believe in something (1%)

Additonaly, as it is clearly seen from Graph 3.1 below, participants considered themselves to be less influenced than others from advertising.



Graph 3.1 Intellectual-and-Moral-Attribution Bias

3.5.3 Second Experiment: Method and Procedure

Similarly, with the first experiment, in our second experiment we divided in half a group of undergraduate law students and a group of undergraduate economics students, so we had two mixed groups consisted of 55 students each. To the one half of participants we gave a questionnaire with the single following question:

"*How do you decide who to vote for in national elections?"*

The other half of participants were asked:

"How do you think the average person decides who to vote for in national elections?"

All the participants were allowed to write their answers in brief on the same sheet. Both groups were given 10 minutes to complete the questionnaire.

Results

Again, we classified the answers in broad categories and several participants gave more than one cause for the behavior of self or others. The seven most common answers given to the question: "How do you decide who to vote for in national elections" were the following:

1. According to my political ideology (57.6%)
2. I follow the candidate's or the party's political program and I am informed about the current affairs of my country (48.5%)
3. I vote whoever is better for my country and me (48.5%)
4. I vote new politicians/political parties with a good record (42.4%)
5. I vote whoever is more sincere/capable/moral (33.3%)
6. I discuss with my family but I decide for myself (15.2%)
7. I don't trust the TV or the media (6.1%)

The ten most common answers given to the question "How do you think the average person decides who to vote for in national elections?" were the following:

1. According to his personal/financial self-interest / political favors (*rousfeti*) (87.9%)
2. According to what his family votes (36.4%)

3. According to his emotional state – e.g. need for indignation, vindictiveness, safety (33.3%)
4. According to his political ideology (33.3%)
5. He is influenced by his economic and social class (24.2%)
6. He is influenced by fads / what others or his environment vote / he is brain-washed (21.2%)
7. According to the political record of the candidate/party (15.2%)
8. According to his educational level and I.Q (12.1%)
9. He votes whoever seems more capable (12.1%)
10. According to what is best for his country (12.1%)

3.4.4 Conclusions and Discussion

As predicted by our initial hypothesis, the IAB was manifested in both experiments. In both cases subjects attributed their own attitude to rational reasons and motivations. For example, advertisements are only a source of information for them and they can filter the messages they receive since they know their true needs. On the contrary, they attributed the behavior of others to emotional and especially irrational causes and motivations. For example, the others fall prey to advertisers because of their faulty judgment, their weakness of character, their ignorance or their greediness. Note that there is mention of "brain-wash" as well. These results are in accordance with the previous literature.

In the second experiment, which concerned voting, a fundamental social and political choice, again as we predicted, participants attributed to others irrational or emotional thinking (and especially negative emotions, such as indignation and vindictiveness), plus a kind of immoral motivation (political favors, self-interest), whereas they attributed rational and moral reasons to themselves. For example, they vote according

to their ideology but they do their own research about candidates and they are informed about what is going on in the world. Political ideology is the most popular factor for personal voting behavior but only about half of the answers attributed the same reason to the average person's voting behavior. Interestingly, if anyone reported that she votes according to her own perceived future benefit, she always added that she voted for the benefit of the country as well. On the contrary, the attribution of strict self-interest, personal or financial, even by the use of questionably legal means, to others, came out as the strongest factor in both experiments and all four conditions. Additionally, some participants reported that they discuss it with their families or friends, but they declared that the final decision is theirs, whereas, they believe that the second most important factor of the average person's voting behavior is to blindly vote what their families vote, whereas, the environment's influence works as "brain-washing". Also, others are believed to be significantly influenced by their socio-economic situation, something that is not considered a factor for the self at all.

We call this overall effect *Intellectual-and-Moral Attribution Bias* (Foka-Kavalieraki & Hatzis 2015c) These results imply that there is a natural tendency in humans to consider themselves smarter, more rational and even more moral than the average person. The average disposition of people towards the rationality of others can have a great impact in cases where individual consent is or should be required. The political, economic and social implications are obvious if most people, and in a larger extent, organizations, corporations, governments, legal representatives and choice

architects, are prejudiced towards the belief that other people are not capable of rational thinking and therefore of giving their consent.

For example, the study and implementation of nudges and choice architecture, as proposed by behavioral economists (Sunstein & Thaler 2009), should be reviewed under the light of such biases like the *Intellectual-and-Moral Attribution Bias*. Further research on the *Intellectual-and-Moral Attribution Bias* should focus on other domains of decision making and choice environments of the public and private sphere, such as personal relationships, self-ownership, specific policy and legislation suggestions, etc., perhaps in combination with other biases, like the overconfidence bias. We strongly feel that the *Intellectual-and-Moral Attribution Bias* will prove salient in most cases.

CHAPTER FOUR

DEFENSES FOR RATIONALITY

4.1. FROM ECONOMICS AND SOCIAL SCIENCES

Behavioral economics' rich experimental evidence suggests that people often face several cognitive limitations that lead them to make bad decisions in a systematic and predictable way (Tversky & Kahneman 1974, 1979; Thaler 1988; Ariely 2008). These findings and insights have enriched the descriptive aspect of economic models and have created a worldwide interest for the relative research and applications. Nevertheless, behavioral economics has received substantial criticism both from the fields of economics and psychology as well as from other fields, such as philosophy, epistemology, legal and political science etc., who either focus on the various limitations and weaknesses of behavioral economics in particular (McKenzie 2010; White 2013) or they attempt to defend the premise of rationality in decision making. In this section we will examine some of these defenses originating from economics and other social sciences.

Perhaps the main criticism against behavioral economics is that it attacks a caricature of rational choice theory and not the integrated model of rationality as it was presented in section 2.4. Posner (2002: 2) stresses out exactly this point that economics,

> *without abandoning its commitment to the rational model of human behavior, has abandoned the model of hyperrational, emotionless, unsocial, supremely egoistic, omniscient, utterly selfish, nonstrategic man (or woman), operating in conditions of costless information acquisition and processing, that cognitive psychologists rightly deride as unrealistic, and, more important, that is deficient in explanatory and predictive power with regard to a number of the phenomena in which economists and economically minded lawyers are interested.*

So, the part of the theory that behavioral economics discredits with its evidence is a kind of a "straw man theory" as we have demonstrated in sections 2.3 and 2.4. To attack particular economic models (or science models in general) as unrealistic is a *non sequitur,* especially if there is confusion about the real target of the critique and a strong indication of cross-purposes. It is also a very simplistic generalization, according to Harrison (2008: 50),

> *because it is often presented as if it is the economic theory rather than the predictions of a particular, parameterized instance of economic theory. Of course it is an extremely popular instance of economic theory, and one contribution of the behavioral revolution has been to remind us of those restrictive assumptions. But the recognition that a certain parameterization is restrictive hardly constitutes a fundamental revolution in thinking. It is as if somebody claimed that the whole of production theory was wrong because the observed behavior of factor shares did not follow the predictions of a Cobb–Douglas production function.*

The concept of *ecological rationality* (Smith 2003; 2008) as an evolving system with survival value that emerges from biological and cultural pressures and accounts for many seemingly "irrational", intuitive or otherwise no deliberated and unconscious attitudes inspires the work of many experimental economists. More specifically, according to this conception, rationality is an evolving procedure that individuals adopt through trial-and-error processes. Any pre-existing biases and cognitive quirks swoop away sooner or later under the massive pressing forces of the market which will crowd out people who do not adapt swiftly. Individuals will eventually learn by their experience to act rationally even when they do not do exactly so in the first place or they do not realize it, moving efficiently toward the market equilibria that mainstream economics predict (see also Plott 1996b and the Discovered Preference Hypothesis). In the following pages we will see how learning plays a major role in rational decision making and how it has been ignored in cases of alleged irrationality.

Behavioral economics has been criticized for parts of its methodology and for its indifference towards the learning abilities of individuals that can result in the correction of possible errors. According to many economists and other social scientists, the conditions of the laboratory experiments have a number of well-known, crucial limitations (Gigerenzer 1991; Plott & Zeiler 2005; List 2006; Smith 2008; McKenzie 2010). As experimental economist Glenn Harrison (2008) points out: "The predictions of economic theory that are often tested in laboratory experiments are those that apply to a 'one-shot' game. Those games are assumed to be played by strangers that

have no history and have no future, so that interactions in the game have no repercussions for future play and past behavior is no guide to current play." (Harrison 2008: 51).

Behavioral economics experiments also have important framing effects themselves, sometimes unintentionally and sometimes deliberately but always unavoidably. If the mainstream assumptions of rationality are accused of having compromised fundamental epistemological principles, so have the behavioral methods as well (Berg & Gigerenzer 2010). Indeed, there is a lot of growing criticism against the experimental framing of behavioral economics since it is argued that the way the subjects' choices are elicited has very little to do with real life or actual market settings (Posner 2003; Friedman 2005; Wright 2007; McKenzie 2010). But most importantly it has been shown that when the framing of an experiment is altered, the seemingly irrational responses of subjects tend to disappear completely (Gigerenzer 1991; Cosmides & Tooby 1992; Ert & Erev 2008). The importance of framing in experimental procedures is a major issue which we will explore in many instances in this chapter.

To illustrate the significance of framing effects in experiments and how they may produce misleading conclusions, we will describe the typical example of mixed gambles and loss aversion. Behavioral economics experiments have shown that people usually prefer the status quo over a gamble with a higher expected value because the expected losses, even when they are lower, loom larger than gains (Kahneman & Tversky 1979; Redelmeier & Tversky 1992; Tversky & Kahneman 1991; Tom, Fox,

Trepel & Poldrack 2007; Wedell & Bockenholt 1994). In a famous experiment, Redelmeier & Tversky (1992) asked their subjects to play the following hypothetical gamble:

"*Imagine that you have the opportunity to play a gamble that offers a 50% chance to win $2,000 and a 50% chance to lose $500. Would you play the gamble?*"

Only 43% of the participants answered that they were willing to play, despite the fact that the expected value ($750) was much higher than the status quo of not playing at all.

Nevertheless, in a series of experiments by economist Eyal Ert and his colleagues, when the framing of the gamble was altered, the results changed and participants chose rather rationally. Ert & Erev (2008) asked their participants whether they would like to play the same hypothetical gamble as the above, but instead of presenting it in a "Accept/Reject" format, they asked them to choose between two different prospects:

"*Please choose between: (a) $0 with certainty, (b) $2,000 with probability of 0.5 - $500 with probability of 0.5*".

The results astonishingly revealed that 78% of the participants chose to play the gamble, even though the status quo and the expected value were identical with those of

Redelmeier & Tversky (1992). Ert & Erev (2008) also showed that loss aversion is situational-dependent when, in another set of experiments, they found that approaching participants casually in the hallway increased the tendency to reject the gamble, than when the problem was presented in a structured environment designated for experiments. Furthermore, in previous experiments, Ert & Erev (2007) had also shown that when they changed a hypothetical gamble in the "choice" setting, subjects proved to be indifferent between games with equal expected outcomes. The hypothetical gamble was framed as following:

"*Please choose between: (a) 0 with certainty (b) 1,000 with probability of 0.5, -1,000 with probability of 0.5*"

50% of participants chose to play it even though it was associated with a loss.

The usual processes of the behavioral tasks have been further criticized not only for the artificiality of their environments but also for their incompatibility with the actual cognitive basis and background of humans. In particular, the main criticism that comes mostly from psychologists who research economic rationality, like Gigerenzer and his colleagues, is that behavioral economists have been testing human performance, i.e. the human mind, against rules of formal logic. They totally ignore the environment that surrounds (or even constitutes) the mind, i.e. how real people actually make choices and decisions. Each time a deviation from the model occurs, they attribute the problem to the human mind rather than to the formal model they use.

This has very often been an unfortunate tactic in sciences, but in the case of economics in search for more empirical realism, this method may be ineffective and not far from any as-if assumptions. Economist Edward Glaeser (2004: 409) argues that, since Adam Smith, the core of economics, which cannot be denied by psychologists, is the simple principle that people respond to incentives (and not only to prices) and the central tool that economists have to study and understand various phenomena is the concept of equilibrium in which "returns are equalized across activities".

Moreover, behavioral economics have been criticized for not having been subjected to empirical investigation, outside the scope of their theoretical framework, and despite their diverse theoretical applications, such as behavioral game theory, behavioral finance, behavioral law and economics, etc. For instance, Berg and Gigerenzer (2010) observe: "Notably missing is the investigation of whether people who deviate from axiomatic rationality face economically significant losses. Despite producing prolific documentation of deviations from neoclassical norms, behavioral economics has produced almost no evidence that deviations are correlated with lower earnings, lower happiness, impaired health, inaccurate beliefs, or shorter lives."

As Vernon Smith has emphasized, behavioral economists, including Kahneman, have only been concerned with attacking the neoclassical model of rationality rather than trying to develop an alternative positive theory of rationality. As a result, they failed to answer the most critical question: "to what kind of 'optimal' decision-making process, if any, have human beings adopted?" (Smith 2008: 151). Behavioral

economists seem to set aside the issues of evolution and natural selection. How does homo sapiens survived nature's strenuous challenges if a basic characteristic of his behavior was the failure to accomplish his goals because of the "numerous" (according to behavioral economists) cognitive limitations and errors in judgments? Moreover, according to Rubin (2002: 156) "humans are deeply competitive with each other […] In this competition, those who made better decisions would have done better". Could irrationality be an evolutionary successful survival trait in a competitive world full of constraints where the choice among alternatives comes down often to life or death? We discuss this issue in depth below.

Many of the "irrational behaviors" that behavioral economists discovered and demonstrated can be explained in terms of rationality and rational choice theory in particular (Posner 2003). For example, in his latest book *The Crisis of Capitalist Democracy* (2010, ch. 9) Richard Posner emphasizes how Keynesian economics, including the key concept of noncalculable risk, can be explained in rational choice theory terms better than by psychology. Every time, during the experimental procedures, there is an inconsistency of choices which the subjects make, behavioral economists rush to the conclusion that these signify inconsistencies of their preferences as well – something that would make the individuals irrational. But a change in choices could pretty much mean a change in a number of other factors relevant to the choice and often invisible to us, such as constraints, transaction costs, opportunity

costs, a deliberate or non-deliberate alteration of the external incentives and in general a twist in the whole subjective cost-benefit calculus of the individual (Hayek 1945; Posner 2003; Weiss 2008).

People's preferences and actions will even tend to be more or less benevolent to others depending on the expected costs (Hindmoor 2006). Posner (2002: 5) asserts that we must always distinguish impediments in instrumental reasoning with subjective preferences that we can hardly discern, as, for example in the case of voting which has been treated as "irrational" behavior by friends and critics of rational choice theory:

> *It is indeed true that when viewed as an instrumental act voting in a political election is irrational, because it costs something (chiefly time) to vote yet there is no offsetting benefit to the individual voter because no such elections are ever decided by one vote. But, treating the desire to vote as a given, in much the same way that other expressive behavior (for example, applauding at a concert or other public performance) is normally treated in economics as a given rather than something the economist is obliged to explain, the economist can answer important questions about voting behavior. These questions include why the old vote more than the young, why retired people vote more than unemployed people (even though both groups might seem to have low costs of time), and why turnout is greater in a close election. Turnout is greater in a close election not because one's vote is more likely to make a difference – even close elections are not decided by one vote – but because the costs of information are lower the more publicity an electoral contest generates, and close elections generate more publicity than one-sided ones, not only because a close race is more exciting but also because candidates will tend to spend more the closer the race; the marginal benefit of campaign expenditures is greater.*

So, while the external factors and variables of the choice environment change, the preferences remain stable over time as it is assumed by the traditional model and the

rationality of the decision makers still stands (Stigler & Becker 1977). According to Pesendorfer (2006), some variables that are observable and shown to matter in behavioral experiments, since they affect decisions in experimental settings, are not useful or relevant in economic applications. Such examples are the reference points of prospect theory, which can easily be manipulated in the laboratory but can hardly be even observable in real economic contexts.

The "hyperrational caricature" of rational choice theory has proved until now a useful tool for economic analysis and modeling, but of course it does not describe reality accurately (Posner 2002: 2). The fact that people sometimes make mistakes, have systematically false beliefs about economics (Rubin 2003; Caplan 2002, 2007), misinterpret the available information, do not have the time and the resources to acquire and process infinite information and sometimes fail to attain their goals by using the optimal means, does not necessarily jeopardize their overall rationality. All these constraints of human cognition and the environment that surrounds it are given facts, well-known to economists since Adam Smith (Ashraf, Camerer & Loewenstein 2005) and their observation certainly does not constitute some sort of a breakthrough for the sciences of behavior.

A major problem with Behavioral Economics is the limited view of economic behavior, their tendency to focus on the pathogeny instead of normality. Law Professor Grant Hayden, and philosopher Stephen Ellis (2007: 632) detect these core drawbacks of behavioral economics thus:

> *Behavioral economists resolutely focus on the trees with very little attention to the forest, and, as a result, they have failed to develop a single, consistent account of economic behavior, one that allows them to fit the various behavioral heuristics and biases together and to integrate them with successful standard economic models.* […] *A primary reason for the failure of behavioral economics to confront important questions is its continued unreflective reliance on the basic economic paradigm. Indeed, the usual behavioral methods for accommodating the empirical evidence take the basic economic account as canonical. Accept, reject or tinker with the functional forms, most standard and behavioral economists confine themselves to thinking about the particular elements of common sense that originally inspired economic models.*

So, behavioral economists have been accused of failing to describe a particular universal pattern of decision making or of providing an alternative, integrated and comprehensive theory of choice, whereas they only seem to point to numerous cognitive biases - which, as we have described in the previous chapter, can be actually scaled down to a few basic categories (see also Gal 2006). Furthermore, the inductive methods of behavioral economics remain as much a troubling issue as the abstract deductions of RCT, especially the axiomatic version (Mitchell 2002a; see also Popper 1959). Glaeser (2004: 408) aptly observes that "[e]conomics is neither so weak nor psychology so strong that economists should content themselves with applying psychology to economic problems" (see also Glaeser 2006).

Instead, behavioral economists, following the work of Kahneman and Tversky, have proposed the Heuristic-and-Biases Program to show that "people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations" (Kahneman &

Tversky 1982: 3). This program illustrates, as we have seen, a series of biases, i.e. systematic deviations from rationality, the latter seen only as a plain set of rules of formal logic and probability theory. This is true for axiomatic RCT but not for the empirical RCT of the Chicago school. In most papers published by behavioral economists this distinction is absent or, worse, there is considerable confusion, evident from the identification of scholars from one tradition with the ideas of the other and vice versa.

Most importantly, behavioral economists haven't managed to provide any testable theory, apart from the simplistic System 1 and System 2 model (Kahneman 2011), for these cognitive processes and as a result there is no predictive ability and no accounting for any shown deviation from the standard model. As they claim: "In general, these heuristics are quite useful, but *sometimes* they lead to severe and systematic errors" (Kahneman & Tversky1982: 3, emphasis is ours). Therefore, the Heuristic-and-Biases Program is a mere demonstration of biases with no attempt of constructing a corresponding explanatory cognitive theory.[48]

That is why, for example, "bounded rationality", despite its more accurate description of human decision making, added little of essence to the explanation of human behavior and very little to the modeling of it (Rubinstein 1998; Glimcher, Dorris & Bayer 2005), apart perhaps of the notion of *approximate optimization* which has

[48] Gigerenzer (2006) offered a very thorough and convincing similar critique; for an equally convincing criticism on Kahneman's work see Plott (1996a).

served to incorporate some aspects of bounded rationality into mainstream economics (Levine 2012). Furthermore, the concept of "satisficing" falls short to offer any real solution to the problems of measuring utility, satisfaction or happiness, since it cannot indicate the particular point of "good enough" (Elster 1986: 526; Elster 1990). It adds an independent variable which is not only extremely subjective but also indeterminate, a moving target. Maximizing can be an unrealistic concept but satisficing can be even worse: it's elusive and trivial.

Nevertheless, experiments did not remain for long a methodological advantage for behavioral economics. Many economists have been designing and conducting revised or different experiments not only in the laboratory but also in the field. Similarly, successful are the large statistical analyses of already existing and published data that some economists have been using and studying in order to correlate different phenomena. The aggregate findings of these approaches lead to the confirmation of rationality as an existing and strong property of human decision making (Mitchell 2002b; 2003). For example, David Levine (2012) argues that some of the behavioral economics experiments cannot be replicated. When he and his colleagues conducted similar experiments to those of Ariely, Loewenstein & Prelec (2003) about the proposed "coherent arbitrariness theory", which we described in the previous chapter, they found very weak or not at all anchoring effects (Fudenberg, Levine & Maniadis 2012).

Experimental economists, prominently represented by Vernon Smith and Charles Plott, have refuted the arguments of behavioral economics theoretically as well as by recreating much more realistic market, institutional and strategic situation settings in their laboratories which include reward-motivated choices. These simulations have shown that almost all of the behavioral cognitive or even moral "biases" are eliminated over time under strong market forces. Plott's (Plott & Zeiler 2005) and Smith's (2008) experiments on the "endowment effect" have repeatedly shown that the relevant risk aversion of the subjects who are not willing to sell a good they possess at the lesser price they would be willing to buy it, depends highly on the experimental procedures and the institutional context, as well as on the subjects' understanding of the specific experimental procedures. Veronika Grimm and Friederike Mengel (2010) have recently shown that delaying acceptance decisions in the Ultimatum Game drastically increases acceptance rates of low offers. While in standard treatments without delay, less than 20% of low offers are accepted, these numbers increase to around 65-75% as they delayed the acceptance decisions by only 10 minutes. So, even one of the most famous "failures" of standard economic theory according to behavioral economics, the irrational rejections of small offers in the ultimatum game, seem to disappear when players are given just a few more minutes to reflect. The prominent experimental economist and game theorist, Ken Binmore, also has shown that, contrary to some behavioral economics' claims, standard game theory can perfectly model individual behavior with a large other-regarding component in its personal utility function, as long as various social preferences are seen as

a set of different tastes with different payoffs (Binmore 2009; Binmore & Shaked 2010).

As we have seen in the previous chapter, one of the first findings of new behavioral economics was the "preference reversal" phenomenon where a subject reports that she prefers gamble A to B, but she places a higher price on B than on A (Lichtenstein & Slovic 1971). Experimental economists Chu and Chu (1990) have demonstrated that reversals of preference are much reduced on the second iteration of a process, when the experimenter arbitrages the inconsistency, whereas the reversals disappear on the third iteration. These results show that subjects change their behavior when they experience the implications of their choices. Similarly, Cox and Grether (1996) report that subjects' selling prices in an English Clock auction were in general consistent with their choices after five repetitions, despite the fact that preference reversal was clearly observed in the beginning. These findings indicate that preference reversal can be a product of inexperience and lack of incentives but rational behavior tends to emerge in the context of a repetitive market institution where it is the market setting that corrects the inconsistency of behavior found in behavioral economics experiments.

Charles Plott, with his longstanding research experience in experimental economics, explains these kinds of phenomena with the particularly insightful *discovered preference hypothesis* that he puts forward, where rationality is understood as a process of discovery and where attitudes like expectations, beliefs and the like are discovered

among other elements of the environment through reflection and practice. Plott identifies two classes of examples where deviations from the rational choice model are observed. The first type consists of situations where individuals face "new tasks" for which they have little or no previous experience. This type of phenomena is studied by behavioral economists. The second type is called "other agent" examples and consists of situations where another person's behavior is important to a specific individual. Both types of behaviors can be found in every day economic, political and social life. Plott describes his *discovered preference hypothesis* thus (Plott 1996a: 226-227):

> *The theory is that rational choices evolve through three stages reflecting experience and practice. Stage one occurs when experience is absent. Untutored choices reflect a type of myopia. The individual is purposeful and optimizing, but exhibits limited awareness about the immediate environment or the possible longer-run consequences of any acts that might be taken. Responses are "instantaneous" or "impulsive", reflecting whatever may have been perceived as in self-interest at the instant. To an "outsider", such behavior could appear to have a substantial random component because inconsistencies among choices may be present. Systematic aspects of choices might exist, reflecting attention and perceptions, but they might not make sense when viewed from the perspective of a preference based model. Stage two is approached as repeated choices, practice, incentives (feedback), provide sobering and refocusing experiences. Problems of the type found in the first class of examples are no longer present in the data. Choices begin to reflect and incorporate an awareness of the environment, and can be recognized by an "outsider" as a stable form of "strategy" or "decision". The full constancy of the rational model begins to find support in the data. However, problems of the sort contained in the second class of examples can still be detected. Stage three, the final stage, is one in which choices begin to anticipate the rationality reflected in the choices of others. The fact that others might be acting rationally, and the consequences of that rationality, as it works through the independent fabric of social institutions, become reflected in the choices of each agent.*

The fact that individuals adapt to their environments and respond to incentives is supported by a number of empirical economists who have undertaken in recent years ambitious and original natural field experiments, in an attempt to approximate real life conditions and avoid the well-known problems of laboratory experiments (Levitt & List 2007; 2009). In this type of experimentation, the subjects are not aware that they are taking part in an experiment and thus the economist can receive naturally occurring data (List 2008; McKenzie 2010; Harford 2008). John List has worked extensively with field experiments and much of his work has shown that people are able of making rational decisions (List & Millimet 2008). For example, by studying the endowment effect, he found that while this bias works on inexperienced buyers, it does not apply on the habitual buyers-and-sellers that are used to trades and exchanges (List 2004). Steven Levitt (1996, 2004; Donohue & Levitt 2001, 2003) recently and Sam Peltzman earlier (1973; 1975) are typical examples of economists who collected massive data from public data-bases and analyzed them in order to test their hypotheses about behavior in or beyond economic markets. Their analyses often lead to counter-intuitive conclusions about the causes of various economic, social, political and other phenomena and they are based on the assumption of rationality and the importance of incentives.

Homo Economicus, is the victim of the worst stereotyping in social sciences but also in popular culture (Ribstein 2006). The rational individual of economic theory is supposed to be utterly self-interested in the sense that she only seeks to maximize her profit and profit is by default an evil thing (Cowan & Rizzo 1995). Typically, the

maximization of utility function is erroneously identified with the maximization of monetary profit (Kirchgässner 2008: 14). This is obviously a mistake for two reasons. The maximization of monetary profit per se is not just another preference that can be represented on an individual's utility function as any other good. Money is only a medium useful for maximizing utility derived from other goods. Money cannot satisfy any preference unless it can be exchanged with goods. It is simply the common form of currency that has as its main function to simplify transactions and reduce transactions costs. It has no intrinsic value whatsoever. So any amount of money is translated into prices for particular wants and desires.

However, money (and its maximization), because of its universal and value-free form as a medium of exchange, plays another even more important role for the improvement of the model of rational choice theory, in the sense that it can help it overcome the implied theoretical tautology concerning preferences, choices and maximization (Hatzis 2010). The price an individual is willing to pay or forgo for a good is a proxy for how much more or less or equally she values it compared with other goods. This way we can infer more safely the subjective ranking of a single individual's preferences on an ordinal, at least, scale, i.e. her utility function, and also do an interpersonal comparison of utility in certain cases. By "good" here we mean, as mentioned in the second chapter, any sort of preference she has, such as material goods and services or a preference for life, death, altruism, dignity, morality, sentiments towards other persons and social norms in general. Thus, the maximization of money

essentially equals the maximization of most of her preferences. According to sociologist George Homans (1961: 79-80):

> *The trouble with him [economic man] was not that he was economic, that he used his resources to some advantage, but that he was antisocial and materialistic, interested only in money and material goods and ready to sacrifice even his old mother in order to get them. What was wrong with him were his values: he was only allowed a limited range of values; but the new economic man is not so limited. He may have any values whatever, from altruism to hedonism, but so long as he does not utterly squander his resources in achieving these values, his behavior is still economic.* […] *In fact, the new economic man is plain man.*

It is now apparent why rational choice remains a powerful theory in economics and other social sciences. The basic assumption of rationality has proved eventually very difficult to be refuted either theoretically or empirically. Combined with the relative simplicity and the prodigious predictability of its model, it outgrows scientifically any suggestions of universal irrationality (Osborne 2003; see also Weintraub 1993). Rational choice theory, by advancing the universal assumption of rationality and supporting it with a model of maximizing behavior, still provides us with the best (in terms of efficiency) and more rigorous (in terms of prediction) model of human behavior. As it is most often the case in natural sciences (Rosenberg 2008: 93), the rational choice theory model works so well and does account for statistical regularities because it approximates the truth more than any other rival theory. But even if we accept that individuals are characterized by various cognitive or other imperfections, the model is still good enough to help us with our predictions. The rational choice model is the only model in economics with the necessary element that every

scientific theory needs (as it was famously stated by Friedman in his seminal 1953 paper): parsimony of its assumptions and reliance of its predictions.

It could be argued that the supposed falsifications (Popper 1959) of rational choice theory, in the form of several departures from rational and maximizing behavior that behavioral economists report, could mean that the model is rendered false. However, this line of Popperian argument, although popular amongst critics of rational choice theory (Boland 2003; see generally Mäki 2008: 544), isn't necessarily and always useful. It is widely accepted by contemporary sciences that confirmation of our hypotheses should also play a significant role for the scientific development. In addition, it is now considered as a common scientific practice for scientists to not get disappointed with any problematic observations that happen to occur and to not immediately abandon their initial assumptions, especially if there is not a credible rival theory (see the discussion in Arabatzis 2008: 165-169). A number of other factors can most likely be responsible for this, such as problems with the collection of data, the measurement methods and tools, the interpretation of the results and of course the existence of variabilities presently unknown or unaccounted for (Hájek & Joyce 2008: 114).

Social science in general has long been plagued by the existence of numerous and scattered disciplines and sub disciplines dealing with the same object of study, i.e. the individual action and the aggregate behavior that stems from it. Undoubtedly,

each of these areas of social sciences has much evidence to present concerning human behavior, but they all remain sporadic and they have definitely failed to provide a unified theory offering reliable prediction. Economics is the only social science that scores so high in predictability and this was the reason for the successful borrowing of its methodological tools by other social sciences (see e.g. law and economics, public choice, etc.). Furthermore, social sciences have fared poorly with issues of great importance since the antiquity, such as the mind-body problem and the accounting of the reasons for actions or intentionality in general (Hausman & McPherson 2006; Rosenberg 2008). Another crucial failure of social sciences was their inability to construct a unifying theory of causes and explanations. Within the field of social philosophy and social science, the dilemma of prediction versus explanation has sometimes become a matter of which side to choose rather than an effort to reconcile both (see also Weber 1880 and Zouboulakis 2001: 34-37). Scientists of any field of study should be interested in the predictive power of their hypotheses as much as with the degree of the truth that these hypotheses offer, since the ultimate goal of science is knowledge.

However, we should always keep in mind that knowledge is not limited to a quest for the causes and explanations of an observable phenomenon. The conclusions that can be drawn from successful scientific predictions can be variably insightful and constructive for the study of the phenomena as well. The emerging fields of experi-

mental economics, field economics and their other branches, keep supplying economic science with more and stronger evidence of human rationality in decision making as this has already been described earlier here.

The leading behavioral economist George Loewenstein and Peter Ubel have emphatically admitted the limitations of behavioral economics in comparison with standard RCT methods in achieving public goals, in a much-discussed and controversial article they wrote for the *New York Times* (Loewenstein & Ubel 2010):

> *But the field has its limits. As policymakers use it to devise programs, it's becoming clear that behavioral economics is being asked to solve problems it wasn't meant to address. Indeed, it seems in some cases that behavioral economics is being used as a political expedient, allowing policymakers to avoid painful but more effective solutions rooted in traditional economics* […] *Behavioral economics should complement, not substitute for, more substantive economic interventions. If traditional economics suggests that we should have a larger price difference between sugar-free and sugared drinks, behavioral economics could suggest whether consumers would respond better to a subsidy on unsweetened drinks or a tax on sugary drinks. But that's the most it can do.*

4.2 From Evolutionary and Cognitive Sciences

4.2.1 Evolution, Brains and Rationality

It is apparent that the concept of rationality should be appropriately extended so as to include and explain the presence of cognitive limitations. In other words, economics, as well as any scientific field interested in decision making and problem solving, needs an integrated theory that will unify its assumptions and empirical evidence into a coherent and more universal theory of explanation and prediction. It seems that humans, with their unusually large and sophisticated brains, have evolved with very common traits, but also with marvelous variability and uniqueness of individual identity (Tooby & Cosmides 1990). This universal human nature offers economists the statistical regularities they are able to observe in various situations of choice environments in or beyond the economic markets (see for example Becker 1976; 1991; and Posner 1992). We believe that a more unifying theory can be better accomplished with the help of the modern theory of human evolution and the contributions of cognitive and brain sciences.

On the one hand, the application of the powerful laws and ideas of evolution can help explain behavior in the broad context of the historical physical and social environment. On the other hand, the study of the brain and mind can inform us on how humans actually make decisions and learn on physiological and mental grounds. These historical and present causes - or *ultimate* and *proximate* - of human behavior, which can be provided by the evolutionary sciences and cognitive sciences relatively, can offer economics a more unifying explanatory theory that is necessary when it comes to the behavior of economic agents, i.e. how humans choose. Or, if we were

to paraphrase the prominent biologist Theodosius Dobzhansky, we could say that nothing about *behavior* makes sense except in the light of evolution.

Economics and biology have encountered each other before (Marciano 2007; Buss 2009; McKenzie 2010). Darwin himself was inspired from Malthus' ideas about the growth of population and the "struggle of existence" when he grasped his own ideas of evolution and natural selection that he later presented in *The Origin of Species* (1859). Malthus asserted in his *Essay on the Principle of Population* (1798: ch. 7) that,

> *the power of population is so superior to the power in the earth to produce subsistence for man that premature death must in some shape or other visit the human race. The vices of mankind are active and able ministers of depopulation. They are the precursors in the great army of destruction; and often finish the dreadful work themselves. But should they fail in this war of extermination, sickly seasons, epidemics, pestilence, and plague, advance in terrific array, and sweep off their thousands and ten thousands. Should success be still incomplete, gigantic inevitable famine stalks in the rear and with one mighty blow levels the population with the food of the world.*

Appreciating Malthus' ideas, Darwin admitted in his autobiography that he was directly influenced by them (Darwin 1887):

> *In October 1838, that is fifteen months after I had begun my systematic enquiry, I happened to read for amusement Malthus on Population, and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favourable variations would tend to be preserved, and unfavourable ones to be destroyed. The result of this would be the formation of a new species. Here, then, I had at last got a theory by which to work.*

It has also long been established that the idea of natural selection was under the influence of the "invisible hand" explanation in economics (Aydinonat 2008). Today, biologists routinely apply the economic assumptions of choice consistency and optimization strategies to model the behavior of organisms (Real 1991; Alcock 1993; Gintis 2007).

Since then, it worked mostly the other way around: many economists have been inspired by the theory of evolution and the application of its principles in economics (Friedman 2005; Rubin 2002, 2003; Smith 2008; McKenzie 2010). In 1898, the economist Thorstein Veblen in his essay *"*Why Is Economics Not an Evolutionary Science?*"*, endorsed an evolutionary framework for economics, one that, according to the Darwinian principles, would apply multiple levels of explanation to the studying of economic behavior, without embracing biological determinism (Hodgson 1998). It can easily be seen why the spontaneous order of nature as well as that of economic markets has stimulated the conjoint interest of biologists and economists alike for search of potential similarities (see also Hayek 1937, 1945; and Nozick 1974, 1994). It has been strongly suggested by Darwin (1859) himself and more recently shown by contemporary philosophers and scientists that the theory of evolution can contribute decisively to these questions that bedevil social sciences for so many centuries, as it is able to finally account for the causes of individual behavior by providing rigorous explanations (Buss 2009). As the prominent evolutionary psychologists Leda Cosmides & John Tooby have pointed out: "In other words, natural

selection's invisible hand created the structure of the human mind, and the interaction of these minds is what generates the invisible hand of economics: one invisible hand created the other" (Cosmides & Tooby 1994a: 328).

The leading game theorist and behavioral scientist Herbert Gintis has also suggested a rigorous framework for the unification of behavioral sciences based on a gene-culture co-evolution perspective and game theory (Gintis 2007; 2009; 2012). Gintis directly opposes behavioral economics' assumptions of irrationality, believes that biological principles should inform all behavioral sciences, from psychology and economics to legal studies and philosophy, and is a strong proponent of the rational actor model. Gintis claims that experiments of behavioral economics that show humans to violate the principles of expected utility in a systematic way are rather performance errors, due to ignorance, misinformation and incorrect beliefs about how to maximize payoffs according to the laws of probability, than proof of irrationality, i.e. preference inconsistency, while, using the rationality model under his framework, he has consistently explained away many claims of prospect theory and the heuristics-and-biases of behavioral economics. Gintis, like many scientists who work in the fields of cognition and behavior, does not accept the general assertion of behavioral economists that humans are systematically irrational or illogical (Gintis 2012: 229):

> *This conclusion is badly at odds with what we know about the evolution of cognitive capacity. The fitness of an organism depends on the effectiveness of its decision making in a stochastic environment. Effective choice is a function*

> *of the organism's state of knowledge, which consists of the information supplied by the sensory inputs that monitor the organism's internal states and its external environment.* […] *The brain thus evolved because larger and more complex brains, despite their costs, enhanced the fitness of their carriers. Brains therefore are ineluctably structured to make on balance fitness-enhancing decisions in the face of the various constellations of sensory inputs their bearers commonly experience. The idea that human choice is on balance illogical or irrational, according to this reasoning, is highly implausible.*

Here, we have to stress out a very important point in order to clarify some aspects concerning the study of behavior through the lenses of evolutionary theory. Philosopher David Buller (2005: 8) properly makes the distinction between the *broad* and the *narrow* field of the application of evolutionary theory to the study of behavior and the mind, i.e. evolutionary psychology: on the one hand, there is a wide field of inquiry which covers all the different work by various scientists who study psychology and behavior under the sole commitment to pose their questions and articulate their answers using theoretical tools and concepts from evolutionary theory in general. However, these scientists, who belong in the broad field of evolutionary psychology and whose study ranges "from studies of foraging and birth spacing in traditional hunter-gatherer societies to studies of encephalization and the evolution of altruism and language", use a wide range of methodological and theoretical approaches. On the other hand, there is a specific group of very influential and significant researchers, like Pinker, Cosmides, Tooby, Buss and many others, who have formed a narrower school of inquiry, within the broader field of evolutionary psychology, which adopts a number of very specific theoretical and methodological doctrines. We are mainly interested in what the theory of evolution has to offer to economics and the understanding of choice behavior in the broader sense. But we are

also very interested to explore some particular and very significant insights and findings concerning decision making and human rationality that the narrower school of evolutionary psychology has contributed to the discussion of rationality.

The evolutionary study of mind and behavior, just like evolutionary biology, can do better than produce "just so" stories since there can be a convergence of multiple data and evidence and various methods and tools that can verify an evolutionary hypothesis. Evolutionary psychology is a behavioral science that uses a variety of methods and sources of data, in addition to all the methods that psychologists use, such as laboratory experiments, interviews, etc. (Simpson & Campbell 2005; Workman & Reader 2008). So, evolutionary psychologists use comparative methods between species, cultures, individuals and sexes, methods from behavioral genetics, mathematical and computational modelling, archeological records, data from public records and hunter-gatherer societies, observation of behavior and human products, etc. The fact that we cannot observe past events is hardly an argument against evolutionary psychology in general, because this would mean that the theory of evolution and natural selection is also a non-testable theory as well as a number of other sciences, such as geology, paleontology, archeology and history. Past events leave their impacts on present states, be it the physical and social environment or the brain and mind of living beings (Barett 2012).

A famous illustration of how evolutionary thinking can help answer important questions, for which other scientific fields fail to provide satisfactory answers, is the case

of morning sickness in the early months of pregnancy. Margie Profet (1992) suggested that sickness in pregnant women is an evolutionary adaptation which prevents mothers from harming their fetuses from potentially toxic foods. Pinker (1997) describes how other psychological or biological theories had offered unsatisfactory explanations, such as the widespread view that pregnancy sickness is a hormonal side-effect, a practically untested and trivial suggestion or the Freudian explanation of the woman's innate aversion to man and her subconscious desire to expel the fetus through the mouth. Profet (1992), on the contrary, collected a convergence of independent evidence in a rigorous and thorough way that fully supported her hypothesis: She found that there are specific plant and meat toxins, the so called "teratogens", that are harmful to developing babies but not to adults and she confirmed that women are averted to those kinds of food that are most likely to contain high percentage of these toxins, she verified that sickness starts when the fetus' organs are just beginning to develop and are most vulnerable to epigenetic abnormalities caused by these toxins and stops when the fetus' organic systems are almost fully developed and need all the nutritional elements they can get. She observed that women's olfaction system is much more sensitive during the months of sickness and not afterwards. Most importantly, she discovered that women that exhibited morning sickness during their first semester where three times less likely to miscarry than those that did not and had less chances of giving birth to babies with perinatal abnormalities. Finally, she found that morning sickness is a cross-cultural phenomenon. This research highlights the significance and rigor of the methodology of evolutionary sciences.

The evolutionary study of behavior can be better achieved from an individualistic point of view rather than a holistic one. In particular, random variation, natural selection and the genes (as natural replicators of organisms), cannot easily find their realistic counterparts in the learned, purposeful and aggregate behaviors and cultural characteristics of societies. A concept of "group mind" or "collective consciousness" is yet more defective. In sum, any notion of "selection", "reproduction", "replicator" or "fitness" on the level of organized groups and societies remains just another argument from analogy (Rosenberg 2008) in which we are not interested here. Also, here, we will not refer to the sociobiological approach (see Wilson 1975) and we will not discuss in depth the concept of Hayekian evolution of institutions and societies. We are going to examine what the theory of evolution has to offer to the disciplines of psychology and brain sciences. We believe that the idea that evolutionary theory can function as a "meta-theory" for all the sciences that deal with human behavior, conjoining them under the umbrella of a single scientific theory, is very promising (Buss 1995a, 1995b, 2009; Tooby & Cosmides 2007; Workman & Reader 2008; Gintis 2009).

Economics is first in line to claim such a unifying and explanatory theory from evolution as it is concerned with human judgment, decision-making, reasoning and acting within environments of choice, namely, it is concerned with high level human cognition. High level cognition consists of a number of very complicated and sophisticated mental and of course neural processes that consume much of the brain's over-

all energy. The brain alone consumes a significant amount of the entire body's energy. We now know from contemporary biology and the brain sciences that something so apparently costly must have been strongly selected for (Rubin 2002: 156; Blackmore 2005; Buss 2005, 2009), i.e. it has had a surviving value in the evolutionary past and its adaptation came down to us by a very long process of trial and error that has been proven successful and so exists for a reason. If we can infer these reasons, then not only will we have shown causality but we'll also be able to better understand and explain how and why human cognition works the way it does. Eventually we will be able to account for rationality as well, as long as we view the latter as a kind of an evolutionary adaptation (for an alternative view, see Hodgson 1993; 2013).

We should then approach rationality - the ability of achieving one's ends at the least cost as well as the tendency to respond to incentives (Posner 1997; Glaeser 2004) - as a dynamic process of an evolutionary adaptation within the limits of equally changing present biological and socio-cultural surroundings, something like the "ecological rationality" according to Gigerenzer (2005; 2006), Tooby & Cosmides (2007) and Smith (2008), which concept we will examine in the following section, or "rational rationality" as proposed by McKenzie (2010). Moreover, rationality should better be seen as an underlying mechanism, that may involve conscious as well as unconscious processes, which underline all actions that involve choice, rather than as a trait that can either characterize a specific choice or not (see also Khalil & Marciano 2010).

Nobody can deny that the human brain is a product of evolution. It acquired its present neural capacities – its "hardware" material – through an evolutionary period of millions of years, as our ancestors strived to survive in a very different environment than the ones they currently inhabit (Cosmides & Tooby 1992; 1994b). But the fact that humans did make it successfully until today proves that the brain really has surviving properties such as the ability of simple reasoning and the power of conceiving ways to reach its goals most efficiently. Efficient in this context means that the brain adapted in such a way as to be able to assess the gains and losses of every choice with the minimal energy costs (Gigerenzer 2007b; see also Mirowski 1989). Sometimes this can be achieved consciously but most of the time it takes place unconsciously to the person herself, depending firstly on the time and then on the energy sources there are to spare. Thus many heuristics have evolved as "rules of thumbs" that serve as cost-saving devices (see e.g. Dudey & Todd 2001; see also Gigerenzer 2007a: 66 for a useful list of studies; and Mantzavinos 2001) and have been surviving tools that once literally saved lives instantly but now some of them may seem wrong on the surface and with no purpose at all. But their origin lies rather on efficient decision making and problem solving than on systematic and harmful irrationality.

A few of the most significant observations of behavioral economics, such as the phenomena of "endowment effect", "time-inconsistent preferences" or "shortsightedness" and "loss aversion" can be successfully explained away with the help of evolutionary psychology (Heyne 2000; Friedman 2005; McKenzie 2010; Posner 2003).

The fact that sometimes we value something that belongs to us more than something that doesn't is considered a successful adaptation in terms of the survival of our distant ancestors. Objects, and mainly food, were very difficult to earn and, once acquired, one would have to cling to them strongly and show to everyone else around that she wouldn't give them up easily. This attitude was apparently more successful than other strategies and so through the eons of evolution it was powerfully selected, ending up as an innate tendency or preference. Of course innateness does not mean inescapable behavior and we have already mentioned above, as we will demonstrate again later, how the revised experiments of experimental economists and other behavioral scientists have shown that people tend to improve their judgment and choice performance in settings with more information and less constraints.

Similarly, the tendency to prefer present gains to slightly increased future gains can be seen as an adaptation selected to enhance fitness. Future, even in terms of a few hours, must have been very doubtful and uncertain in a hostile natural environment, so it comes as no surprise that our ancestors would grab the opportunity to obtain something straightaway than wait and possibly lose it. This uncertainty for the future doesn't seem irrational even in today's free market competitive environments where nobody can really guarantee the stability of future income.

Finally, loss aversion – the tendency to strongly prefer avoiding losses to acquiring gains – makes better sense when viewed from a natural selection's point of view.

Extra gain, in the form of more food or commodities, could usually mean more convenience for the individual, but loss of one or more of those things could easily mean depravation, starvation, even death. As we have already seen in the previous section, according to laboratory experiments, losses appear to loom larger than gains in some environments, but not in others, where some results reveal no evidence for loss aversion in choice among symmetric two-outcome mixed gambles. This pattern was documented in choices among asymmetric multi-outcome gambles, and in the initial choices among asymmetric two-outcome gambles (Ert & Erev 2007, 2008, 2010; see also Harinck et al. 2007; Erev, Ert & Yechiam 2008). In addition, Kermer et al. (2006) has shown that when people actually gamble, losses do not have as much of an emotional impact as they predict. People overestimate the hedonic impact of losses because they overestimate their tendency to dwell on losses.

The phenomenon of overconfidence can also be examined through the lens of natural selection and prove quite advantageous in many cases. For example, economist and game theorist Eyal Winter (2014) believes that overconfidence offers three main advantages. First, it raises the "market value" of the individual in various social interactions but most importantly in sexual selection, as it functions similarly to the male peacock's tail.[49] Second, it serves as an intimidating device towards other people

[49] Darwin (1860) was particularly intrigued by the male peacock's tail as initially he could not understand its survival function. Peacocks' tails are heavy to carry and their big size and brilliant colors make it especially detectable to predators. Indeed, male peacocks do fall prey to predators quite often because of their visible tails. Darwin then conceived the idea of sexual selection as a parallel driving force of natural selection, since species need to survive *and* reproduce. So the peacock's extravagant, but attractive to females, tail poses the risk of detection from predators but at the same time compensates with more successful reproduction.

who compete for the same resources. If someone does not really believe in her own abilities and seems pessimistic about her self-esteem, she will never convince others that she is someone to be reckoned with. Finally, overconfidence can encourage optimism which in turn can inspire action. When someone acts, instead of being pessimistic and inactive, he might raise his chances of problem-solving, innovation and progress.

Rationality does not involve only deliberate and formally logical thinking but every cognitive process, including emotions, which can be employed by the brain and can help the individual to achieve her goals with the best means available at hand (and given all the constraints of time, space, resources and information). Today, the emergence and success of the sciences of the brain are so impressive and have so many repercussions for the study of human behavior that it seems at least a major oversight for a social science to not take seriously into account the study of the brain and the mind while trying to deal with a massive mental state such as rationality (Shermer 2008). So, in sum, we see rationality being "activated" in an inextricable interaction between the individual and the environment, where the environment is of two kinds – internal and external.

The internal environment consists of the actual cognitive procedures that operate during the decision making processes and the constraints the individual may have of memory, computational capabilities, as well as the time and energy that her brain

affords to consume. The external environment has two dimensions; the distant evolutionary environment in which the human brain evolved and the solutions to the problems it had to adapt to, since much of this millennia-long processed adaptations still accompany our behaviors today; but also the present external environment, the actual conditions in which an individual is required to make a choice, including any cultural, social and most importantly institutional context. So, it must be pointed out once again that theories and evidence proposed by evolutionary sciences do not suggest any kind of behavioral determinism. Evolution does not determine our behavior in the sense that genes are the causes of actions, but rather we have also evolved to learn and adapt to the environment – physical or social - albeit genetic predispositions.

Evolution is not the only level of explanation, since complex and high level phenomena, such as human behavior and cognition, always require multiple levels of explanation and causation (Psillos 2002), from social and psychological explanations to neural and chemical ones, that are equally important and intertwined (Thagard 2010). For example, a very important factor in decision making is the brain's *plasticity* – a property that allows neurons to increase their synapses and change their functions with each new information input – which gives humans and other animals the amazing ability to change their behavior by learning.[50] Consequently rationality involves

[50] For a comprehensive understanding of learning and memory, and the involved neural and molecular mechanisms, see the extensive work of biologist and Nobel laureate, Eric Kandel (for example, Kandel 2009).

learning how to do better and become even more rational over time and experience, for example through processes of trial and error. Mistakes occur at times but they are neither daunting nor insurmountable.

Finally, it is worthwhile to mention the theoretical framework and research program of Rational Analysis, and its adjunct cognitive architecture ACT-R (**A**daptive **C**ontrol of **T**hought—**R**ational), which was initially proposed and described by cognitive psychologist John Anderson (1990, 1991) as a specific approach in cognitive sciences with a framework that aims to explain the relationship between principles of formal rationality and the empirical data of rational behavior. Rational Analysis assumes that the impressive success of everyday rationality is based on formal rationality and Bayesian probabilistic standards, challenges the view that humans are irrational and instead offers a theory of cognition and goal-optimizing behavior with a methodology that is successfully used in psychology, computer, social and biological sciences (Oaksford & Chater 2001, Chater & Oaksford 2002). Because Rational Analysis is a cognitive approach to how the mind works, it can account for a number of behavioral and high-level cognitive phenomena, besides decision making and problem solving, such as, reasoning, memory and language. The methodology of Rational Analysis consists of six steps that aim to approximate the cognitive algorithms of rational thinking by specifying the optimal way that a cognitive system, with its computational limitation of information processing, can achieve its goals, given the particular environment to which it is adapted (Chater & Oaksford 1999):

(1) *Goals*: specify precisely the goals of the cognitive system.

(2) *Environment*: develop a formal model of the environment to which the system is adapted.

(3) *Computational limitations*: make minimal assumptions about computational limitations.

(4) *Optimization*: derive the optimal behavior function, given 1–3 above.

(5) *Data*: examine the empirical evidence to see whether the predictions of the behavior function are confirmed.

(6) *Iteration*: repeat, iteratively refining the theory.

Rational Analysis, despite its wealth of psychological applications, is of particular interest to biology, where living organisms are assumed to maximize their inclusive fitness and, likewise, can be of particular interest to economics, where economic agents are assumed to maximize their expected utility, i.e. achieve their goals in an optimal way, given the environment they are adapted to and all internal and external constraints. This model of optimal behavior, like the model of rational choice theory, is instrumental and attempts to explain how actual rationality approximates it. A sim-

ilar, rule-based optimization model is SOAR (**S**tate, **O**perator **A**nd **R**esult), a research program with abundant technological and psychological applications, developed by cognitive scientists Allan Newell, John Laird and Paul Rosenbloom (Newell 1990; Rosenbloom, Laird & Newell 1993). SOAR is a cognitive architecture also designed to approximate rational behavior and it can successfully exhibit intelligent behavior through a range of human cognitive capacities, like reactive decision making, situational awareness, deliberate reasoning and comprehension, planning and all forms of learning.

4.2.2 Ecological Rationality

The concept of ecological rationality, in its broad sense, is varying and has been developed somewhat independently by several researchers of decision making and problem solving, such as experimental economists, behavioral scientists, game theorists, psychologists, cognitive scientists and artificial intelligence theorists. The approaches of ecological rationality that we will examine here adopt various hypotheses, use powerful experimental methodologies and have contributed decisively to the discussion of rationality in economics and social sciences. The common characteristic that they all share stems more or less from the basic principles of evolutionary theory and the notion that behavior is always relevant to the environment and, thus, decision making is adapted to the particular environment's constraints, either as a mechanism built in by evolution or as a skill acquired by learning or both. The second

common characteristic that they share is that they directly challenge the assumptions and findings of behavioral economics.

First, Vernon Smith, established a new and rigorous discipline within mainstream economics through his pioneering work on experimental economics which earned him the Nobel Prize. Contrary to behavioral economists, who assume that economics should incorporate psychological principles, Smith and other prominent experimental economists, like Charles Plott, assume that economics should incorporate psychological methods, in the sense of controlled experiments (Glimcher, Camerer, Fehr & Poldrack 2009). Smith challenges behavioral economics' assumptions of systematic biases and irrationalities and has developed the notion of ecological rationality in order to explain individual behavior in competitive markets, where subjects achieve market equilibria even with little or no information or experience and even where there is a limited number of participants. Ecological rationality, according to Smith, describes how people achieve rational outcomes on an aggregate level, completely equivalent to the rational theoretical model, by unconsciously making use of social, institutional and biological devices.

Smith has very usefully distinguished between two kinds of rationality that further help to clarify how individuals behave in choice environments:

- The *Constructivist Rationality*, which is "applied to individuals or organizations, involves the deliberate use of reason to analyze and prescribe actions

judged to be better than alternative feasible actions that might be chosen. When applied to institutions, constructivism involves the deliberate design of rule systems to achieve desirable performance. The latter include the 'optimal design' of institutions, where the intention is to provide incentives for agents to choose better actions than those which would result from alternative arrangements." (Smith 2008: 2).

- The *Ecological Rationality*, which "refers to emergent order in the form of the practices, norms, and evolving institutional rules governing action by individuals that are part of our cultural and biological heritage and are created by human interactions, but not by conscious human design" (Smith 2008: 2).

Smith's experimental work tests both kinds of rationality and proves that they are not in opposition but they supplement each other and in lot of cases coincide rather than diverge, since the rules of exchange in markets are both constructivist and ecological.

Drawing on his own long experience of experimental work and the ideas of Hayek, Smith has detected a parallelism between the evolution and function of our brains and the socioeconomic world (Smith 2008: 9):

Both the world and our brains have evolved brain solutions, essentially via forms of selection that are not a significant part of our formal reasoning efforts. Whereas in the world our social brains have evolved institutions to solve

> *problems, the brain has evolved internal off-line parallel processing capacities that enable us to function in daily life without continuous monitoring and conscious control, an important adaptation to the emergent mind as a scarce resource.*

Other economists and social scientists have also theorized on models of decision making as both evolved and learned problem-solving behaviors. For example, Mantzavinos (2001) proposes a model where individual motivation stems from the desire to increase one's own utility and so behavior is concentrated in trying to solve this problem, the satisfaction of utility. This motivational aspect, along with one's learning mechanisms, can account for a rational model of individual decision making seen as a problem solving adapted mechanism. Since we examined some findings of experimental economics in the previous section, as part of the defenses of rationality from the field of economics, we will not further elaborate on it here. Instead, we will focus on the work of the other proponents of ecological rationality, the theories they have proposed and the rich body of empirical findings they have produced.

The other two schools of ecological rationality come from cognitive and evolutionary psychology and they have in common that, although they both oppose optimization models, they devote their main criticism against behavioral economics, the latter's findings and methodology. The prominent psychologist Gerd Gigerenzer and his colleagues have developed a concept of ecological rationality using the theoretical approach of the "adaptive toolbox", a set of heuristics or rules of thumb that are adapted to the structure of the environment and are seen as effective strategies that help rather

than impede decision making. Gigerenzer mainly carries on the work of Herbert Simon and has been debating with Daniel Kahneman about the latter's empirical and normative approach to cognitive biases and errors and debunking his heuristics-and-biases program for decades.[51]

Finally, the "narrow" school of evolutionary psychologists that we mentioned before, such as Leda Cosmides, John Tooby, David Buss and Steven Pinker, have developed a concept of ecological rationality using a particular approach of adaptationism and the massive modularity of mind, which we will examine directly below and which assumes that specific mental mechanisms were adapted for various survival problems in environments quite different than the ones that behavioral economists use to test their subjects in their laboratories and thus the framing of problems and structure of choices are of vital importance to problem solving and making rational decisions.[52] Ecological rationality, therefore, is about the rationality of outcomes and not mechanisms, since bounded cognitive mechanisms can produce optimal outcomes when the appropriate evolved cognitive mechanisms utilize the structure of the environment to solve adaptive problems.

[51] See selectively, Gigerenzer 1991, 1993, 1996, 1998, 2005, 2007a, 2007b, 2008, 2015; Gigerenzer, Hell & Blank 1988; Gigerenzer & Hoffrage 1995; Gigerenzer, Hoffrage & KleinboÈlting 1991; Gigerenzer & Murray 1987; Gigerenzer, Swijtink, Porter, Daston, Beatty & KruÈger 1989; Gigerenzer & Golstein 1996; Gigerenzer, Todd & ABC Research Group 1999; Hertwig & Gigerenzer 1999; Gigerenzer & Selten 2001; Gigerenzer & Brighton 2009; Gigerenzer & Gaissmaier 2011.

[52] See selectively, Cosmides & Tooby 1992, 1994a, 1994b, 1996, 2005; Tooby & Cosmides 1990, 2007, Pinker 1997, 2002.

According to contemporary cognitive and brain sciences, the mind is not considered a general problem solver mechanism or a kind of general-purpose processor, but it consists of distinct neural and therefore cognitive structures that serve different functions, a fact that is quite observable in the case of brain lesions and the consequent cognitive impairments (Chomsky 1980; Fodor 1983; Damasio 1994; Pinker 1997; Bechara 2004). For example, brain lesions in the left hemisphere, and particularly in Broca's area, result in a specific form of language and speech impairment known as "non-fluent" or "expressive aphasia", where patients have difficulty in the oral or written production of speech whereas all the other cognitive and intellectual faculties, which are not related to language, are preserved (Foka-Kavalieraki et al. 2008, 2014). Similarly, specific brain lesions in the fusiform area of the occipital and temporal cortex can cause the neurological syndrome of "prosopagnosia" where patients cannot recognize familiar faces or report that they are familiar, including sometimes their own face, although other visual and intellectual capacities remain intact (Duchaine, Parker & Nakayama 2003).

Some evolutionary psychologists have further suggested that the human mind has massive modularity and is composed of autonomous computational modules, or specialized cognitive mechanisms, that are selected by evolution to solve specific adaptive problems that our ancestors faced through their evolutionary history, like problems of survival and reproduction, problems of parenting and kinship or problems that arise from group living. Each of these modules does not necessarily correspond to a specific brain area but the neural network that supports it can be distributed in

various areas that can allow the independent modules to connect and interact with one another (Pinker 1997; Cosmides & Tooby 2005; Carruthers 2006; Tooby & Cosmides 2007; Buss 2009).

One of the most prevalent conclusions derived from the experimental results of behavioral economists, as we have seen in the previous chapter, concerns the inferior performance of subjects when it comes to solving problems of formal logic and Bayesian reasoning, such as their incapability to manage probabilistic inductions (Kahneman & Tversky 1979; Simon 1955, 1956, 1987). One of the major contributions of both evolutionary psychology and contemporary cognitive sciences to the study of rationality is that they have shown that the human mind is not selected to function easily with a general probabilistic reasoning, i.e. to infer probabilities from a single event (Cosmides & Tooby 1994a, 1994b, 1996; Gigerenzer 1991, 1998; Buss 2009). Furthermore, evolutionary psychologists emphasize that theories of formal logic that are content independent are not the appropriate way to test human rationality since problem solving depends always on the specific goal, the available means and the context in which the problem is presented. So, whenever the experiments are designed to present problems of formal logic or single probability events, subjects fail to perform and appear to be riddled with cognitive biases.

Instead, when exactly the same problems are presented as frequencies of events that require specialized logic, or when they are altered to have a content-specific form,

people offer easily the correct answers. The evolutionary explanation is that our ancestors were much more likely to encounter, observe and remember the frequency of occurrence of a certain event rather than imagine its probabilities and similarly they had to solve concrete adaptive problems that occurred in their environment, rather than abstract problems of formal logic. These hypotheses can be also supported by the fact that, as we mentioned above, the human mind is most likely selected to function with several specialized modules for each category of problem-solving, rather than with a general processing mechanism for all kinds of problems. We will further illustrate these evolutionary hypotheses directly below.

The importance of this kind of ecological rationality has been highlighted with several experiments that demonstrate how models of formal logic problems and Bayesian reasoning, although they are the very sophisticated basis of scientific reasoning, very often fail to represent everyday human problem solving and judgment under uncertainty.

One of the most extensively used tasks in the psychology of reasoning is the "*Wason Selection Task*", which was originally devised by Peter Wason (1966; 1968; 1969) in order to investigate whether humans reason according to the rules of formal logic. The "Wason Selection Task" has generally this form: subjects are presented with four cards, one that shows a vowel, one that shows a consonant, one that shows an even number and one that shows an odd number (see Figure 3.1). Subjects are told

that each card has a letter on the one side and a number on the other side and they are given this conditional rule:

"*If a card has a vowel on one side, then it has an even number on the other side*."

Then they are told:

"*Your task is to say which of the cards you need to turn over in order to find out whether the rule is true or false*."

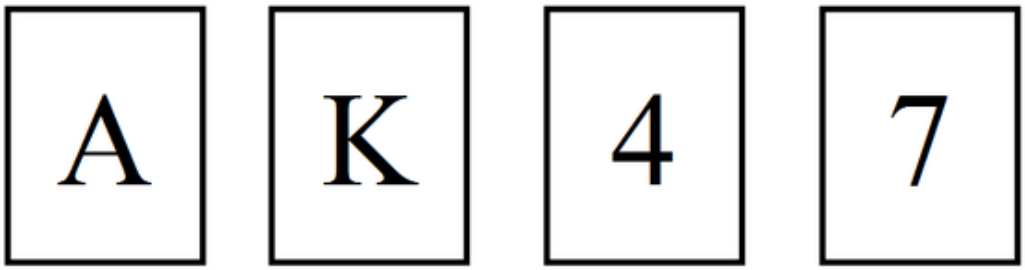


Figure 4.1 Wason Selection Task

The task is of the IF/THEN format ($p \rightarrow q$ or If p then q). The only way to find out if such a rule is falsified is to turn the "A" card and the "7" card. Whenever people are presented with this problem, and although they do not feel that it is a difficult task, they perform pretty poorly and their most frequent answers are "A and 4" (p and q), which only confirms the rule, or "only A" (p), which is also wrong (Johnson-Laird & Wason 1970; Wason & Evans 1975; Griggs & Cox 1982). Typically, less

than 10% of individuals seek the refutation of the rule by correctly selecting the "A and 7" cards (*p* and not-*q*) (Evans & Over 1996).

Evolutionary biology shows that humans, just like other primates, are highly social species and group-living has most likely been a successful adaptation to cope with problems of survival and reproduction through cooperation (Trivers 1971; 1985). Evolutionary psychology suggests that cooperation in social groups had its benefits as well as its costs where the biggest problem that our ancestors had to cope with were the free-riders, i.e. those individuals in the group who enjoyed the benefits of cooperation but did not share any of the costs. The "social brain hypothesis" (Dunbar 1993; Dunbar & Spoors 1995; Hill & Dunbar 2003) further suggests that the enhanced cognitive capacities of humans and other primates, that resulted from their unusually large brains, helped them develop complex social relationships with evolved skills of cooperation and trust through the development of implicit or explicit social contracts, but they also led them to adapt several cognitive mechanisms to detect and avoid free-riders and cheaters.

Leda Cosmides and John Tooby in a series of experiments (Cosmides 1989; Cosmides & Tooby 1992, 1996) and based on this theory, extended their hypothesis to suggest that the human mind contains specialized mechanisms for reasoning about social exchange and has especially developed "Darwinian algorithms", decision making rules in the form of information processing procedures for the detection of cheaters. In order to illustrate how "Darwinian algorithms" work, they altered the

framing of the "Wason Selection Task" and presented it as a social contract problem but kept it logically identical to the original. Subjects were presented with four cards, one that read Beer, one that read Coke, one with the number 25 and one with the number 17 (see Figure 3.2). Subjects were told to imagine that they worked at a bar and their job was to make sure that this rule was not violated by clients:

"*Only people older than 18 years old are allowed to drink beer.*"

Then they were asked:

"Which of the following four people would you need to check to see if the rule is been broken – the person who is over 18, the person who is under 18, the person drinking beer or the person drinking coke?".

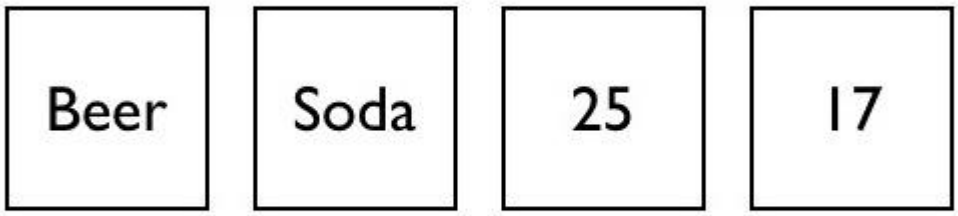


Figure 4.2 Cheater-Detection Task

Typically, when presented with the task framed like this, over 75% of subjects give the correct answer by selecting the "Beer" card and the "17" card. Evolutionary psychologists suggest that this happens because when a problem is content-dependent and presented in a familiar form of social exchange that specifically involves cheating, the specialized modules of cheater-detecting are activated and people easily solve a problem that nevertheless remains a problem of conditional reasoning. They are ecologically rational. Here we see how the framing of a problem can decisively affect the performance of individuals; when a problem is presented in an abstract logical form, people appear to be bad problem-solvers but when an identical problem is presented in a form that responds to how their mind actually works, they prove to be quite rational.[53]

A very important cognitive bias, that behavioral economists have illustrated to derive from the representative heuristic, as we saw in the previous chapter, is the "*base-rate fallacy*". Tversky and Kahneman (1982) presented the following experiment in order to demonstrate the problem of "base-rate fallacy". A group of students and stuff at the Harvard Medical School were asked to answer the following diagnosis problem:

"If a test to detect a disease whose prevalence is 1/1000 has a false positive rate of 5%, what is the chance that a person found to have a positive result actually has the disease, assuming you know nothing about the person's symptoms or signs?"

[53] Or even "better than rational" as Cosmides & Tooby (1994a) characterize their behavior.

Only 18% of the participants gave the correct Bayesian answer, which is "0.02", a fact that, according to behavioral economists, suggests that people, even highly educated and experts, ignore the base-rate information about false positives and are poor at calculating probabilities.

Evolutionary psychologists suggest that the human mind is not adapted to make probability judgments based on a single event but rather to record the frequencies of events (Gigerenzer 1991; Cosmides & Tooby 1996; Brase, Cosmides & Tooby 1998). David Buss states that it is quite reasonable to assume that numerical representations about the probabilities of a single event were nonexistent in our evolutionary past: "I went to the valley eight times; how many times did I find berries? The last three times I put my arm around a potential mate, how many times was I rebuffed? […] A specific woman cannot have a 35% chance of being pregnant; she either is pregnant or not, so probabilities hardly make sense when applied to a single case." (Buss 2009: 391). Similarly, Gigerenzer (1998: 14) argues that human reasoning has two parts:

> *[E]volutionary (and developmental) primacy of frequency formats, and ease of computation. First, mental algorithms, from color constancy to inductive reasoning, have evolved in an environment with fairly stable characteristics. If there are mental algorithms that perform Bayesian-type inferences from data to hypotheses, these are designed for event frequencies acquired by natural sampling, that is, for frequency formats, and not for probabilities or percentages. Second, when numerical information is represented in a frequency format, Bayesian computations reduce themselves to a minimum.*

The evolutionary part of the argument makes it unlikely that such neurons have evolved that compute using an information format that was not present in the environment in which our ancestors evolved.

In order to test the "*frequentist hypothesis*" Cosmides and Tooby (1996) presented the diagnosis problem to a group of Stanford undergraduate students using a frequency version of the same information:

"One out of 1000 Americans has disease X. A test has been developed to detect when a person has disease X. Every time the test is given to a person who has the disease, the test comes out positive. But sometimes the test also comes out positive when it is given to a person who is completely healthy. Specifically, out of every 1000 people who are perfectly healthy, 50 of them test positive for the disease. Imagine that we have assembled a random sample of 1000 Americans. They were selected by a lottery. Those who conducted the lottery had no information about the health status of any of these people. How many people who test positive for the disease will actually have the disease? ___ out of ___."

76% of the participants gave the correct answer, which is "1 out of 50 (or 51)" as opposed to 12% of the participants who answered correctly when presented with the original form of the problem. Furthermore, when the information was given in frequency and pictorial form, 92% of the participants gave the correct answer. Here we see again how some serious cognitive biases can almost disappear when the external

representation of a problem or a choice does not match the internal representations of the corresponding problem solving mechanisms.

Another famous demonstration by Tversky and Kahneman (1983) of the "*base-rate fallacy*" or "*conjuction fallacy*" that is induced by the representative heuristic, as we saw in the previous chapter, was the *Linda problem,* where participants were shown the following description of Linda and then had to answer which of the two alternatives that followed were probable:

"Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations.

- *Linda is a bank teller (T)*
- *Linda is a bank teller and is active in the feminist movement (T&F)"*

85% of the subjects gave the wrong answer (T&F), ignoring the fact that the probability of a conjunction of two events can never be greater than that of one of its constituents.

Gerd Gigerenzer (1991; Hertwig & Gigerenzer (1999) reports that when the form of the problem was changed from a single event version to a frequentist mode, like the following, only 22% or less of the participants violated the conjunction principle:

"There are 100 persons who fit the description above (i.e., Linda's). How many of them are:

(a) bank tellers

(b) bank tellers and active in the feminist movement."

Gintis (2012) suggests that there are many plausible explanations of the conjunction violations in the *Linda problem*, such as that in normal conversation people assume that all information should be taken into account when it is relevant to the speaker's message (Gintis 2012: 230):

> *The widespread claims by experimental psychologists that humans are illogical and irrational when dealing with routine choice is simply incorrect, because there are almost always more plausible explanations of the observed behavior than failure of logic or reason. In some cases, the alternative explanation suggests that humans are highly effective decision makers. More often, however, the alternative is compatible with the axioms of rational choice over an appropriate (often nonobvious) choice space, but involve imperfect decision making.*

Similarly, with the examples that we demonstrated above, there is a very rich experimental literature that shows how certain phenomena that have been interpreted as "cognitive illusions" or "cognitive biases" (overconfidence bias, availability bias, overestimation of low risks and underestimation of high risks, violations of logical

reasoning, etc.) tend to disappear when the structure of the experimental environment is taken into consideration.[54]

Gigerenzer (2008) and other researchers of ecological rationality or critics of behavioral economics, have long argued that the latter's' heuristics-and-biases project and their argument of mental limitations are mere ad hoc labels to a number of phenomena that they cannot predict the conditions under which these heuristics will succeed or fail neither they provide a cognitive theory of problem solving. On the contrary, researchers of ecological rationality focus on building an evolutionary and functional framework of cognitive mechanisms that explains the actual processes of problem solving and decision making and they construct testable models of heuristics. In addition to the "Darwinian algorithms", for example, Gigerenzer and his colleagues (Gigerenzer & Selten 2001; Gigerenzer 2008; Brighton & Gigerenzer 2012) have also proposed over the years an "adaptive toolbox" of effective heuristics that can predictably exploit the structure of the environment to solve problems and can be used to derive hypotheses about cognition. Instead of regarding heuristics as mental limitations that lead to errors and biases and emphasize irrationality, in ecological rationality, heuristics are seen as evolved mechanisms that unconsciously but smartly exploit the structure of the environment and more often than not produce optimal outcomes given the constraints of time and information.

[54] The studies are numerous. See selectively, Gallistel 1990; Erev, Wallsten & Budescu 1994; Dawes & Mulford 1996; Juslin, Winman & Olsson 2000; Fiedler, Walther & Nickel 1999; Lopes 1992; Sedlmeier, Hertwig & Gigerenzer 1998; Oaksford & Chater 1994; McKenzie & Amin 2002.

Most of the tasks that humans effortlessly perform every day, like finding their way through various obstacles, recognizing familiar faces among hundreds, understanding speech in the midst of other noises, calculating distances between objects, etc. can be very complicated when one attempts to analyze them and, e.g., write down specific algorithms for artificial intelligence systems to follow. In fact, many of these human tasks cannot be effectively performed by artificial intelligence systems yet. The most advanced humanoid robot today is Honda's ASIMO, who has an impressive number of 57 degrees of freedom, can navigate itself relatively smoothly in the real world, stand, walk and run in slow speeds, grasp objects, recognize a few gestures, distinguish voices among other sounds and recognize approximately 10 different faces. But ASIMO, although astonishing for a robot, is still very far from exhibiting the whole of human behavior, either in its elegance or complexity, and is still far from energy efficient (Clark 2011). Richard Dawkins has famously stated how difficult a simple task, like catching a ball that is flying, must be in terms of computation (Dawkins 1989: 96):

> *When a man throws a ball high in the air and catches it again, he behaves as if he had solved a set of differential equations in predicting the trajectory of the ball. He may neither know nor care what a differential equation is, but this does not affect his skill with the ball. At some subconscious level, something functionally equivalent to the mathematical equations is going on. Similarly, when a man takes a difficult decision, after weighing up all the pros and cons, and all the consequences of the decision that he can imagine, he is doing the functional equivalent of a large "weighed sum" calculation, such as a computer might perform.*

Gigerenzer and his colleagues have introduced the concept of "fast-and-frugal" heuristics in order to describe "a strategy, conscious or unconscious, that searches for minimal information and consists of building blocks to exploit evolved capacities and environmental structures." (Gigerenzer 2008: 22). An example of such a heuristic is the "gaze heuristic". When a man tries to catch the ball he does not perform all those difficult differential equations in his mind of course, but simply follows this rule: *Fixate your gaze on the ball, start running, and adjust the speed so that the angle of gaze remains constant.* Gigerenzer and his colleagues (Gigerenzer & Goldstein 1996, 2002; Gigerenzer, Todd & ABC Research Group 1999) have also described a number of other ecologically rational heuristics that people use to make accurate inferences, such as the *take-the-best* heuristic and the *recognition* heuristic, which are also successfully used in other fields of decision under uncertainty, such as in artificial intelligence. Fast and frugal heuristics act on the limitations of time and information. So, a fast heuristic, which can solve a problem in little time, and frugal heuristic, which can solve it with little information, is *ecologically rational*, in the sense that it is always relative to the environment and not to some kind of abstract and content-blind norm, as are those described in the heuristics-and-biases program proposed by behavioral economists.

In their original experiment, Gigerenzer and Goldstein (2002) asked American and German students the following question:

"Which city has more inhabitants: San Diego or San Antonio?"

62% of the American students correctly answered “San Diego”, whereas 100% of German students, many of whom had never heard of San Antonio and knew little of San Diego, gave the correct answer. Researchers believed that the ability of the German students to choose better lied precisely on their partial ignorance and a phenomenon they named “less-is-more” effect, which activates the *recognition heuristic*:

If one of two objects (San Diego) is recognized and the other is not (San Antonio), then infer that the recognized object has the higher value with respect with the criterion.

Researchers further found in a series of experiments regarding other cases of inference that the recognition heuristic will be more successful when recognition is strongly correlated with the criterion. More precisely, when the recognition validity a is larger than chance: $a > 0.5$. The recognition heuristic is not like the availability heuristic, which refers generally to the ease of recollection, but it is rather an evolutionary, and thus ecologically, successful mechanism where we can predict in which cases it will be activated and when it will be inhibited, like when there is a low recognition validity or when the reason that someone recognizes the object has nothing to do with the criterion. Gigerenzer (2006: 124) states that

> *the Americans could not use this heuristic. They knew too much. The Americans had heard of both cities, and had to rely on their recall knowledge. Ex-*

> *ploiting the wisdom in partial ignorance, the recognition heuristic is an example of ignorance-based decision making. It guides behavior in a large variety of situations: rats choose food they recognize on the breath of a fellow rat and tend to avoid novel food; children tend to approach people they recognize and avoid those they don't; teenagers tend to buy CDs of bands whose name they have heard of; adults tend to buy products whose brand name they recognize; participants in large conferences tend to watch out for faces they recognize; university departments sometimes hire professors by name recognition; and institutions, colleges, and companies compete for a place in the public's recognition memory through advertisement.*

As we have seen, evolutionary psychology offers us a theory for the historical or ultimate causes of the brain's states and functions and in this way it can lead our research of decision making and rationality toward the correct direction. The evolutionary way of thinking has also helped researchers to conduct experiments and produce findings that further elucidate our understanding of decision making procedures. At the same time, cognitive and brain sciences can provide us with the present or proximate causes of brain functioning and mental states. For example, we are able now to literally look into the substrate of mental states, i.e. neurons and neural activities and infer certain mental states. In the following section we will explore some of the most important contributions of cognitive and brain sciences to decision making and problem solving.

4.2.3 Neuroeconomics, Emotions and Rationality

The brain evolved just like every other part of the human body, and, through a very long period of environmental pressures, specific conscious, but mostly unconscious, cognitive mechanisms were selected which constantly led to successful choices that

enhanced fitness in an uncertain and varying environment. Brains have always had to cope with the scarcity of their two most important resources - time and energy - just like the organisms that carry them have to deal with scarcity of resources in the external physical and social world. So, the reason that the mind uses fast and frugal heuristics to effectively make decisions and solve problems is because it needs to economize its energy within a specified time-frame. Other means of economizing are the exclusion or filtering of the large available sensory input, the large employment of unconscious systems, the function of short-term and long-term memories and the mechanisms of learning, as well as the favoring and development of group-living which results in the sharing of the benefits of dividing work, decisions and accomplishments within communities (Zak & Park 2002; McKenzie, Turner & Zak 2010).

This energy and time, that the mind has to economize, has its direct physical equivalent in the function of neurons. Of course, decision making in the brain has not a form of a mathematical calculation or a sequential following of rules, but it is performed by multiple brain areas that coordinate their distributed parallel processes which are involved in the brain's choice mechanisms (Thagard 2010). The very new but rapidly growing field of neuroeconomics – which emerged in the late 1990's / early 2000's – combines behavioral and neuronal data and is mostly devoted to studying how the brains of humans and other animals solve the problems of maximizing inclusive fitness. Neuroeconomics, which is practiced with the collaboration of psychologists, economists and neuroscientists, achieves this by using the models of economics and the approaches of cognitive neuroscience, either through the study of

brain lesions or through the direct measurement of physiological brain states with the use of neuroimaging techniques and single-neuron recordings.

However, from the beginning, two distinct trends have been visible in neuroeconomics. According to Glimcher, Camerer, Fehr & Poldrack (2009), the main point of difference between them is whether economics can derive a better theory with the help of neuroscientific data or whether the many and scattered evidence of decision making in neuroscience can be unified with the help of economic theory. So, on the one hand, there are behavioral economists and cognitive psychologists that are interested in using neuroscientific data in order to establish alternative theories to the neoclassical economic model of decision making, as those we've examined in chapter 3 (see for example, Breiter et al. 2001). These researchers use functional brain-imaging techniques, like *functional Magnetic Resonance Imaging* (fMRI) procedures and electroencephalography (EEG). And, on the other hand, there are physiologists and cognitive neuroscientists that use the neoclassical model of economics and game theory as a framework for developing neuroscientific models of decision making (see for example, Sanfey & Dorris 2009). These researchers, in addition to brain-imaging, are in a position to use more precision tools of cognitive neuroscience, such as invasive techniques to non-human primates with microelectrodes or studies of brain lesions. Finally, there are economists, like Gul and Pesendorfer (2008) who, in the tradition of Friedman's methodological prescription, insist that neurobiological data are redundant to economics, and likewise, there are neurobiologists who believe that

economics cannot bring substantial predictive or explanatory power to neural behavior (see also Mäki 2010).

Although research in neuroeconomics and publication of papers is increasing exponentially, we will refer to the most important findings of the field that link economic, psychological and neurobiological findings and theories of decision making. Furthermore, we will examine some research in neuroscience and cognitive sciences that has provided us with very interesting evidence concerning emotions and subjective valuations, which are key factors to the studying and understanding of choice mechanisms.

Plato believed that passions are irrational and harmful and always contrary to reason. With his famous "chariot" allegory he described how reason and passions are like two horses that pull the chariot of the human soul to different directions - an idea that dominated philosophical and psychological thought for centuries. Traditionally, emotions have been viewed through this folk-psychological perspective, where they are considered to be distinct and independent functions of "lower quality" states, opposite to rationality and an impediment to decision making.

Charles Darwin, in his book devoted exclusively to the study of emotions, *The Expression of Emotion to Man and Animal* (1872), suggested that emotion expressions (of the face, the body or the voice) are evolved and adaptive mechanisms that serve both as social communicative functions and as surviving devices. More specifically,

through emotional expressions that are visible to others, individuals are able to infer the mental states and intentions of other people and to communicate messages important to survival and social co-existing, such as recognizing threatening or friendly situations from the reaction of others. Furthermore, emotional reactions to stimuli can help prepare and/or protect oneself for various situations by expanding the perceptual experience in order to receive more information. William James, founder of functional psychology and influenced by Darwin, formed his theory of "instincts" and he asserted that, besides having functional value, emotions are perceptions of physiological states - nothing more than the brain's response to physiological changes in the body (James 1884: 190):

> *The more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble, because we are sorry, angry, or fearful, as the case may be. Without the bodily states following on the perception, the latter would be purely cognitive in form, pale, colourless, destitute of emotional warmth. We might then see the bear, and judge it best to run, receive the insult and deem it right to strike, but we could not actually feel afraid or angry.*

Contemporary research of emotions in decision making, and thus very influential to neuroeconomics, was initiated with the groundbreaking work of Antonio Damasio and his colleagues[55] through the study of the performance in gambling tasks of patients who suffered from specific brain lesions. Damasio's *Somatic Marker Hypothesis* (1994) proposes that emotional signals play a fundamental role in decision making. In particular, Damasio and his colleagues (Bechara et al. 1997) devised the *Iowa*

[55] See selectively, Damasio 1994; Damasio 1996; Bechara et al. 1997; Bechara & Damasio 2005.

Gambling Task where participants had to learn, through a series of trials, to select the cards from different decks that yielded higher (real) monetary profit. Healthy participants eventually learned to select the right cards more often than the bad cards. The researchers also tested participants with lesion to areas of the orbitofrontal cortex – the brain region associated with emotional sensitivity to reward and punishment – but with unimpaired intellectual and cognitive functions. These patients never learned to select the advantageous cards. All through the task, the experimenters measured the participants' relative physiological arousals by recording skin conductance levels (sweaty palms), which indicate experience of anxiety or stress. Normal participants exhibited physiological arousals in anticipation of risky choices, but brain-injured participants did not show any emotional responses.

Damasio and his colleagues (Bechara & Damasio 2005) came to some conclusions and proposed a framework to guide neuroeconomics: (a) knowledge and reasoning alone are usually not sufficient for making advantageous decisions, (b) emotion is beneficial to decision-making when it is integral to the task, but can be disruptive when it is unrelated to the task, and (c) the implementation of decisions under certainty or uncertainty engage different neural circuity. Although the *Somatic Marker Hypothesis* has been challenged by other neuroeconomists (see e.g., Fellows & Farah 2005 and Dunn, Dalgleish & Lawrence 2006), these findings were very important because they linked, for the first time, behavior in economic decision making with brain functions and emotions.

Today we know, from systematic studies in psychology and neuroscience, that emotions are complex psychological and physiological states that arise from internal or external environmental stimuli and involve subjective valuation, bodily changes, facial expressions and cognitive appraisals of the relevant events (Vosniadou 2001). Although emotions involve distinct brain processes, they are inseparably connected to reasoning and rational thinking. Elizabeth Phelps (2009) asserts that "the primary function of emotions is to highlight the significance or importance of events so that these events receive priority in further processing". In other words, emotions consciously or unconsciously, attach values to our internal beliefs, concepts or perceptions, as well as to the external set of available choices, so that we can form our preferences and judgments. Of course there are emotions that can lead to bad decisions, like depression or weakness of will, but in general, emotions are far more often advantageous than harmful. The evolutionary personal and social advantages of emotions contribute to the effective behavior of individuals and groups, since they briefly inform us of potential risks and benefits, provide us with a subjective evaluation of events and give us a more direct access to the internal states of others.

From neurobiological studies in humans and other primates, we know that there are several brain regions that are very relevant to emotions, like parts of the limbic system, such as the *hypothalamus* and the *amygdala*, which connects with many other brain areas and is mainly responsible for the emotion of fear. The extended area of the *nucleus accumbens* is associated with feelings of pleasure and anticipation of

pleasure and is mainly responsible for the cognitive processes of reward, reinforcement learning and motivation. On the molecular level, specialized neurons that produce the neurotransmitter dopamine form a neural pathway, known as the *reward system* which initiates from the midbrain and specifically from the *ventral tegmental area* (VTA), passes through the *nucleus accumbens*, and concludes to the *prefrontal cortex*, where higher mental processes take place, such as decision making (Schultz et al. 1993). The *orbitofrontal cortex* is usually associated with the role of combining cognitive information from the frontal cortex with emotional information from the limbic system.

Accumulating evidence in neuroeconomics research, based on all the above evidence, shows that there exists a two-stage neural mechanism of choice in the brain. First, there is a neural mechanism of *valuation* of all available goods and actions, and then, there is a neural mechanism of *selection* among these available alternatives (Glimcher 2009). In other words, a kind of physiological utility (and expected utility) function actually exists in the brain as particular neural circuits are devoted to utility calculations for various sets of choices. In particular, specific neurons increase their firing as the anticipation of and the actual monetary reward of a choice increases (Platt & Glimcher 1999; McClure et al. 2004; Knutson & Peterson 2005; Glimcher et al. 2005; Park & Zak 2007; Knutson & Bossaerts 2007).

These findings suggest that the concept of utility function is not an unrealistic and arbitrary assumption of economics, but that such a function really materializes in the

form of a neural net of calculating devices that perform combining cost-benefit and risk analyses through the reward and fear associated mechanisms of the brain each time the person has to make a choice. In the future it may be possible that these findings can eventually help economists and psychologists to attribute subjective values ("utils") to external material and "non-material" goods, to allow interpersonal and intrapersonal utility comparisons and even predict behavior under certain circumstances (Park & Zak 2007).

Neuroeconomics is a very young interdisciplinary field of study and generalized conclusions are few. However, we have attempted to present some of the most important assumptions and findings from the research of leading neuroeconomists. In the following section we will try to produce some general conclusions about rationality and decision making, based on everything that we have discussed until now, in an attempt to argue that individual consent, as any other type of choice, can be naturally regarded as a rational decision by default.

CONCLUSIONS

So far we have tried to present a concise description of the rationality model and to rebut the main criticism against it which comes from behavioral economics. The basic tenet of this criticism is that the rationality model holds some very unrealistic assumptions for decision making that have little or nothing to do with actual human behavior. However, we have showed that this is not the case. An abundance of experimental findings and insights from within economics and other social sciences, and, more importantly, theories and evidence from evolutionary and cognitive sciences, show that humans are potentially and actually far more rational than behavioral economists describe them and varying models of rationality are considered as best approximations of actual behavior. Although these approaches can be different, they all challenge the assumptions and findings of behavioral economics and adhere to models and theories of rationality, either of an optimizing/maximizing form or of a form of bounded rationality. More importantly, behavioral economics, apart from any empirical data it has to offer, severely lacks a theoretical framework that can generally explain decision making and cognition in its complexity and broadness. Simplistic descriptions of arbitrary automatic and deliberate mechanisms of thought, that are put forward merely to identify equally arbitrary limitations in reasoning, hardly comprise a theory of cognition.

It should be noted here again that, although cognitive science has a core representational-computational assumption of how the mind works, it nevertheless consists of several different theoretical approaches of what kind of mental representations and computational procedures exist (e.g. rules, concepts, analogies, connections, etc.). A rationality model requires a very basic and simple condition, that of the consistency of preferences, but demands no specific requirements about how this or other requirements should correspond on the algorithmic level, i.e. how they will be cognitively implemented for a particular task. So, a variety of different cognitive models could account for rational thinking, like symbolic or connectionist, or even models of cognition that come from research programs outside the boundaries of mainstream cognitive sciences, like those of dynamical systems theory (see for example Chemero 2009; Kelso 1995; Thelen & Smith 1994). Each of these models has a higher or lower degree of explanatory and predictive power or of neural and psychological plausibility concerning the basic aspects of cognition, such as decision making, problem-solving, memory and learning (Thagard 2005; Bermudez 2010).

In order to illustrate this point, let us consider the following: behavioral economists, like Daniel Kahneman, are cognitive psychologists that work with the rule-based approach of cognitive sciences, where they suggest that rule-following mechanisms, i.e. heuristics, are rules of thumb that usually lead to cognitive biases, errors and irrationalities. Similarly, evolutionary psychologists, like Leda Cosmides and Steven Pinker, also ground their theory on the rule-based approach, but they suggest that

heuristics are adapted mechanisms that can lead to ecologically rational decisions. Finally, other decision making theorists, like Herbert Gintis, or cognitive scientists, like John Anderson (and his Rational Analysis program) and Allan Newell and his colleagues (and their SOAR program), use the rule-based approach to show that models of optimization can successfully simulate human cognition and can be completely compatible with experimental data from behavioral sciences and/or evolutionary biology.

So, it is also helpful here to make an insightful distinction between two broad categories of heuristics, as we have examined them throughout this book: There are those scientists that see heuristics as the "bad" side of thinking and intuition, where human reasoning is tested against principles of formal logic and heuristics work as error-prone or "fast and dirty" mechanisms, trading off accuracy for less information that always leads to wrong or even harmful behaviors. And there are those scientists that see heuristics as the "good" side of thinking and intuition, where human reasoning is tested against the given environment and heuristics are seen either as effective strategies in the form of "fast and frugal" cost-saving devices, or as optimal strategies that maximize goal achievement.

Furthermore, we have seen that neuroscience can account for the mechanism of a utility function and evolutionary behavioral sciences can be used to inform the rationality model about some of the content of this utility function, i.e. human preferences. All humans share the same evolutionary past and thus the same physiological

and consequently psychological adaptations. This means that up to a significant degree humans share a certain pattern of preferences when it comes to a number of choices they have to face, such as mate selection, parenting care, deception detection, socializing with others, even food appetites, and so forth (Cosmides & Tooby 1992, 1994b; Buss 2005, 2009; cf. Stigler & Becker 1977). The evolutionary way of thinking can be very useful for economists, as it can offer a reliable representation of human behavior and can help the construction of behavioral models in social sciences (Buss 1995b). Actually it has been suggested that economic theory often makes the same predictions as evolutionary psychology (Harris & Pashler 1995: 45).

Methodology in neuroeconomics that is based on a dual-system approach has received significant criticism (for detailed critical reviews see Dunn et al. 2006; Phelps 2009; Ross 2011). This is because it is founded on the erroneous assumption that there is a strict (theoretical as well as physical) distinction between emotions and reason. However, most neuroscientists and cognitive scientists can't stress strongly enough that such a clear-cut distinction does not have any neural foundation in the brain; what we tend to describe as emotions do not seem to be isolated in specific or separated brain areas but are rather distributed all over the brain, and so the functions that are supposedly contrasted in the brain they are actually highly interrelated and far more complex to distinguish. Indeed, even brain areas that have always been associated with emotional activity - such as the amygdala, the basal ganglia or the medial prefrontal cortex – have also demonstrated reasoning activity (Glimcher 2009).

Studies of brain lesions and/or recovery from them, also strongly advocate this position as they often show that a particular brain area is not exclusively or always correlated with some specific and distinguished emotional activity (Dunn et al. 2006). On the contrary, a large number of preeminent neuroeconomists – including the pioneers – work with a combination of standard microeconomic methodology and cognitive theories, such as the reward mechanisms and the learning processes of the brain and cognition, that result in operational models which are in accordance with the neoclassical economic assumptions (Politser 2008; Glimcher et al. 2009; Ross 2011).

If economists and other social scientists are really interested in what psychology and behavioral sciences have to offer to the study of decision making, and if they really want to inform their models with more accurately descriptive variables, then they should look into all this research besides behavioral economics. Because once they do, it becomes clear that, although people can indeed deviate from normative rationality models in some instances, many cases of the "biases" and "fallacies" in judgment reported by behavioral economists are due more to their experimental procedures, unrealistic expectations and lack of a theoretical framework, and much less to the subjects' actual cognitive limitations.

The long and complicated relationship of psychology and economics, from its seminal form in the early works of economists and philosophers of the 17th and 18th centuries to the interdisciplinary field of present-day behavioral economics, has shown

that economists (or behavioral economists for that matter) are usually wrong in 3, at least, occasions: (i) When they ignore psychology, (ii) when they replace psychology for economics, and (iii) when they choose from psychology only those insights that are more convenient rather than more useful for their work. Nevertheless, it is certain that this relationship can be mutually beneficial: Psychologists can help economists understand the processes involved in decision-making and the formation of preferences. And economists can help psychologists understand how certain mental processes materialize into effective individual choices and coordinated social and economic relations and interactions.

However, the debate over rationality involves serious social and political implications that should not be dismissed lightly. Social scientists are due to make broader normative evaluations as much as positive ones because the role of the sciences – social or natural – includes also the responsibility to try to improve humans' lives and conditions. Natural sciences do so through the technological progress and social sciences through their "reflexive" character since their theories influence people's behaviors once they become widely known (Rosenberg 2008: 128). Furthermore, rational people seem to respond to incentives in an adaptive way, which is usually unpredictable a priori. So the interfusion of descriptive/positive and mainly prescriptive statements in social sciences and particularly economics seems almost inevitable (see also Putnam 2002).

But if we accept that individuals are systematically irrational, as behavioral economists presume, and so incapable of making the right decisions for themselves for the most part of their personal or public life, then paternalistic and authoritarian policies seem to be justified in superseding people's choices (Foka-Kavalieraki & Hatzis 2011). Indeed, as we saw in chapter 3, many behavioral economists have already been suggesting such kinds of policies that they deem as "soft paternalism" or "libertarian paternalism". The most representative work in this direction by Thaler and Sunstein (2009) proposes a number of "nudges" to help individuals make the "right choices".

As we have seen, the evidence to support this kind of paternalism is very weak. Furthermore, the applicability and efficiency of nudges is still highly controversial since there is a substantial lack of evidence concerning how well nudges really work in practice. There are, however, serious concerns about whether nudges actually produce any large scale effects or stable over time, whether they cause any other unwanted consequences alongside the intended results and whether the cost of implementation is sustainable or prone to induce extravagant costs to governments and other agents (Mullane & Sheffrin 2012; Voyer 2015; Kosters & Van der Heijden 2015). Perhaps most importantly, a report published by the Science and Technology Select Committee of the House of Lords in Great Britain in 2011 (where the largest and most active "Nudge Unit" exists to date and which was originally set up within

the Cabinet Office) concluded that nudges alone, as proposed by behavioral economists Sunstein and Thaler, were found unlikely to be successful in changing the population's behavior (House of Lords 2011).

We believe instead that the institutional and social context should be a set of "rules" that helps rational individuals make the best decisions for themselves by continually reducing any transaction costs as much as possible (see e.g. Foka-Kavalieraki and Hatzis 2009 for rationality- and consent-based institutional solutions to market failures) and by providing efficient information. We definitely don't oppose some efficient measures that have such noble aims as long as they don't justify their implementation based on the "irrationality" and "innate incapabilities" of people, but are based on rational persuasion (Hausman & Welch 2010). The "right" direction that a "nudge" could push someone should be the right direction according to her and not according to the benevolent paternalist (Mitchell 2005).

In the two experiments that we presented in the previous chapter, about the *Intellectual-and-Moral Attribution Bias*, we demonstrated that most people tend to think that they are better, cleverer, more rational and more moral, than the "average" person. This natural tendency of humans indicates that people who vote, policy makers themselves included, have paternalistic instincts on the ready and that they are already biased against the validity of individual consent. Therefore, we put forward the question whether theories of decision making, which are studied and posed by humans, can be thoroughly descriptive or whether they don't include some kind of bias. This

is a usual drawback in social sciences where the object of observation is the observant herself. Psychologists should prove the systematic irrationality of homo sapiens beyond a reasonable doubt before they can advocate paternalism of any kind. As we saw in this thesis they are very far from it.

BIBLIOGRAPHY

Abella, Alex. 2008. *Soldiers of Reason: The Rand Corporation and the Rise of the American Empire*. Boston: Mariner Books.

Akerlof, George A. & Rachel E. Kranton. 2010. *Identity Economics: How Our Identities Shape Our Work, Wages, and Well-Being*. Princeton: Princeton University Press.

Akerlof, George A. & Robert J. Shiller. 2015. *Phishing for Phools: The Economics of Manipulation and Deception*. Princeton: Princeton University Press.

Alcock, John. 2013. *Animal Behavior: An Evolutionary Approach*. Sunderland, MA: Sinauer. 10th ed.

Allais, Maurice. 1953. "Le Comportement de l'Homme Rationnel Devant le Risque: Critique des Postulats et Axiomes de l'Ecole Américaine." *Econometrica* 21: 503-546.

Allais, Maurice. 1997. "An Outline of My Main Contributions to Economic Science." *American Economic Review* 87: 1-12.

Amadae, S.M. 2003. *Rationalizing Capitalist Democracy: The Cold War Origins of Rational Choice Liberalism*. Chicago: University of Chicago Press.

Amadae, S.M. 2016. *Prisoners of Reason: Game Theory and Neoliberal Political Economy*. New York: Cambridge University Press.

Anand, Paul, Prasanta K. Pattanaik & Clemens Puppe, eds. 2009. *The Handbook of Rational & Social Choice*. Oxford: Oxford University Press.

Anapolitanos, Dionysios A. 1991. "Rationality in Philosophy and in Sciences: Variations, Comparisons, Positions." *Theory & Society* 5: 111-121. *[in Greek]*

Anderson, John R. 1990. *The Adaptive Character of Thought*. Hillsdale, NJ: Psychology Press.

Anderson, John R. 1991. "Is Human Cognition Adaptive?" *Behavioral and Brain Sciences* 14: 471-517.

Angner, Erik. 2012. *A Course in Behavioral Economics*. New York: Palgrave Macmillan.

Arabatzis, Theodore. 2008. "Experiment." In *The Routledge Companion to Philosophy of Science*. Stathis Psillos & Martin Curd, eds. London: Routledge. Pp. 159-170.

Ariely, Dan, George Loewenstein & Drazen Prelec. 2003. "Coherent Arbitrariness: Stable Demand Curves Without Stable Preferences." *Quarterly Journal of Economics* 118: 73–105.

Ariely, Dan, George Loewenstein & Drazen Prelec. 2006. "Tom Sawyer and the Construction of Value." *Journal of Economic Behavior & Organization* 60: 1-10.

Ariely, Dan. 2008. *Predictably Irrational: The Hidden Forces that Shape Our Decisions.* New York: Harper Collins.

Ariely, Dan. 2010. *The Upside of Irrationality: The Unexpected Benefits of Defying Logic at Work and at Home*. New York: Harper.

Arkes, Hal R., Catherine Blumer. 1985. "The Psychology of Sunk Cost." *Organizational Behavior and Human Decision Processes* 35: 124-140.

Arrow, Kenneth J. 1987. "Economic Theory and the Hypothesis of Rationality." In *Utility and Probability*. John Eatwell, Murray Milgate & Peter Newman, eds. New York: Norton, 1990.

Ashraf, Nava, Colin F. Camerer & George Loewenstein. 2005. "Adam Smith, Behavioral Economist." *Journal of Economic Perspectives* 19(3): 131-145.

Astington, Janet Wilde & Margaret J. Edward. 2010. "The Development of Theory of Mind in Early Childhood." In *Encyclopedia on Early Childhood Development.* Richard E. Tremblay, Michael Boivin & Ray DeV. Peters, eds. Montreal: Centre of Excellence for Early Childhood Development. Pp. 1-5.

Aydinonat, N. Emrah. 2008. *The Invisible Hand in Economics: How Economists Explain Unintended Social Consequences*. London: Routledge.

Bacon, Francis. 1620. *The New Organon (Novum Organum).*" Lisa Jardine & Michael Silverthorne, eds. Cambridge: Cambridge University Press, 2000.

Banerjee, Abhijit. 1992. "A Simple Model of Herd Behavior." *Quarterly Journal of Economics* 107: 797-817.

Barone, Michel J. & Roy Tirthankar. 2010. "Does Exclusivity Always Pay Off? Exclusive Price Promotions and Consumer Response" *Journal of Marketing* 74: 121-132.

Barrett, H. Clark. 2012. "Evolutionary Psychology." In *The Cambridge Handbook of Cognitive Science*. Keith Frankish & William M. Ramsey, eds. New York: Cambridge University Press. Pp. 257-274.

Barry, Brian. 1986. "Lady Chatterley's Lover and Doctor Fischer's Bomb Party: Liberalism, Pareto Optimality, and the Problem of Objectionable Preferences." In *Foundations of Social Choice Theory*. Jon Elster & Aanund Hylland, eds. New York: Cambridge University Press. Pp. 11-43.

Barry, Norman P. 1987. *On Classical Liberalism and Libertarianism*. New York: St. Martin's Press.

Bechara, Antoine. 2004. "The role of emotion in decision-making: Evidence from neurological patients with orbitofrontal damage" *Brain and Cognition* 55: 30–40.

Bechara, Antoine & Antonio R. Damasio. 2005. "The Somatic Marker Hypothesis: A Neural Theory of Economic Decision." *Games and Economic Behavior* 52: 336-372.

Bechara, Antoine, H. Damasio, D. Tranel, A.R Damasio. 1997. "Deciding Advantageously Before Knowing the Advantageous Strategy." *Science* 275: 1293–1295.

Bechtel, W., A. Abrahamsen, & G. Graham. 2001. "Cognitive Science: History". In *International Encyclopedia of the Social & Behavioral Sciences*. Neil J. Smelser & Paul B. Baltes, eds. Amsterdam: Elsevier. Pp. 2154-2158.

Becker, Gary S. 1962. “Irrational Behavior and Economic Theory.” *Journal of Political Economy* 70: 1-13.

Becker, Gary S. 1976. “The Economic Approach to Human Behavior.” In *The Economic Approach to Human Behavior*. Chicago: University of Chicago Press. Pp. 3-14.

Becker, Gary S. 1991. *A Treatise on the Family*. Cambridge, MA: Harvard University Press, 2nd ed.

Becker, Gary S. 1993. “The Economic Way of Looking at Behavior.” *Journal of Political Economy* 101: 385-409.

Becker, Gary & Kevin M. Murphy. 1988. “A Theory of Rational Addiction.” *Journal of Political Economy 96*: 675-700.

Benartzi, Shlomo. 2001. “Excessive Extrapolation and the Allocation of 401(k) Accounts to Company Stock” *Journal of Finance* 56: 1747-1764.

Bentham, Jeremy. 1789. *An Introduction to the Principals of Morals and Legislation,* J.H. Burns & H.L.A. Hart, eds. Oxford: Oxford University Press, 1996.

Berg, Nathan & Gerd Gigerenzer. 2010. “As-If Behavioral Economics: Neoclassical Economics in Disguise?” *History of Economic Ideas* 18: 133-165.

Bermudez, Jose Luis. 2010. *Cognitive Science: An Introduction to the Science of Mind*. New York: Cambridge University Press.

Bikhchandani, Shushil & Sunil Sharma. 2001. “Herd Behavior in Financial Markets” *IMF Staff Papers* 47: 279-310.

Binmore, Ken & Anver Shaked. 2010. “Experimental Economics: Where Next?” *Journal of Economic Behavior and Organization* 73: 87-100.

Binmore, Ken. 2009. *Rational Decisions*. Princeton: Princeton University Press.

Blackmore, Susan, ed. 2005. *Conversations on Consciousness*. Oxford: Oxford University Press.

Boettke, Peter. 2000. *Socialism and the Market: The Socialist Calculation Debate Revisited*. London: Routledge.

Boland, Lawrence A. 2003. *The Foundations of Economic Method: A Popperian Perspective*. London: Routledge.

Boucher, David & Paul Kelly, eds. 1994. *The Social Contract from Hobbes to Rawls*. London: Routledge.

Brase, Gary L., Leda Cosmides & John Tooby. 1998. “Individuation, Counting, and Statistical Inference: The Role of Frequency and Whole-Object Representations in Judgment Under Uncertainty” *Journal of Experimental Psychology: General* 127: 3-21.

Breiter, Hans C., Itzhak Aharon, Daniel Kahneman, Anders Dale & Peter Shizgal. 2001. “Functional Imaging of Neural Responses to Expectancy and Experience of Monetary Gains and Losses.” *Neuron* 30: 619–639.

Brighton, Henry & Gerd Gigerenzer. 2012. “Homo Heuristicus: Less-Is-More Effects in Adaptive Cognition.” *Malaysian Journal of Medical Sciences* 19: 6-17.

Buchanan, James M. 1964. “What Should Economists Do?” *Southern Economic Journal* 30: 213-222.

Buchanan, James M. 1975. *The Limits of Liberty: Between Anarchy and Leviathan*. Chicago: University of Chicago Press.

Buchanan, James M. 1996. “An Ambiguity in Sen’s Alleged Proof of the Impossibility of a Pareto Libertarian.” *Analyse & Kritik* 18: 118-125.

Buller, David. 2005. *Adapting Minds. Evolutionary Psychology and the Persistent Quest for Human Nature.* MIT Press.

Burgin, Angus. 2012. *The Great Persuasion: Reinventing Free Markets Since the Depression*. Cambridge, MA: Harvard University Press.

Buss, David M. 1995a. “Evolutionary Psychology: A New Paradigm for Psychological Science.” *Psychological Inquiry* 6: 1-30.

Buss, David M. 1995b. “The Future of Evolutionary Psychology.” *Psychological Inquiry* 6: 81-87.

Buss, David M. 2009. *Evolutionary Psychology: The New Science of the Mind*. Boston: Pearson.

Buss, David M., ed. 2005. *The Handbook of Evolutionary Psychology*. Hoboken, NJ: Wiley.

Calabresi, Guido. 1961. “Some Thoughts on Risk Distribution and the Law of Torts” *Yale Law Journal* 70: 499–553.

Call, Josep & Michael Tomasello. 2008. “Does the Chimpanzee Have a Theory of Mind? 30 Years Later.” *Trends in Cognitive Sciences* 12(5): 187-192.

Camerer, Colin F. 2003. “Behavioural Studies of Strategic Thinking in Games.” *Trends in Cognitive Science* 7(5): 225-231.

Camerer, Colin F. & George Loewenstein. 2004. “Behavioral Economics: Past, Present, Future.” In *Advances in Behavioral Economics*. Colin F. Camerer, George Loewenstein & Matthew Rabin, eds. Princeton: Princeton University Press. Pp: 3-51.

Camerer, Colin F. & Richard Thaler. 1995. “Anomalies: Ultimatums, Dictators and Manners.” *Journal of Economic Perspectives* 9: 209-219.

Campbell, Keith W. & Constantine Sedikides. 1999. “Self-Threat Magnifies The Self-Serving Bias: A Meta-Analytic Integration.” *Review of General Psychology* 3: 23-43.

Caplan, Bryan. 2002. “Systematically Biased Beliefs about Economics: Robust Evidence of Judgmental Anomalies from the Survey of Americans and Economists on the Economy.” *Economic Journal* 112: 433-458.

Caplan, Bryan. 2007. *The Myth of the Rational Voter: Why Democracies Choose Bad Policies*. Princeton: Princeton University Press.

Carruthers, Peter. 2006. *The Architecture of the Mind: Massive Modularity and the Flexibility of Thought.* Oxford: Clarendon Press.

Chater, Nick & Mike Oaksford. 1999. “Ten Years of the Rational Analysis of Cognition.” *Trends in Cognitive Science* 3(2): 57-65.

Chater, Nick & Mike Oaksford. 2002. “The Rational Analysis of Human Cognition.” In *Reason and Nature: Essays in the Theory of Rationality*. José Luis Bermúdez & Alan Millar, eds. New York: Oxford University Press. Pp. 135-174.

Chemero, Anthony. 2009. *Radical Embodied Cognitive Science*. Cambridge, MA: MIT Press.

Chomsky, Noam. 1980. *Rules and Representations*. New York: Columbia University Press.

Christ, Carl F. 1994. “The Cowles Commission’s Contributions to Econometrics at Chicago, 1939-1955.” *Journal of Economic Literature* 32: 30-59.

Chu Yun-Peng & Ruey-Ling Chu. 1990. “The Subsidence of Preference Reversals in Simplified and Marketlike Experimental Settings: A Note.” *American Economic Review* 80: 902–911.

Clark, Andy. 2011. *Supersizing the Mind. Embodiment, Action and Cognitive Extension*. New York: Oxford University Press.

Coase, R.H. 1959. “The Federal Communications Commission.” *Journal of Law & Economics* 2: 1-40.

Coase, R.H. 1960. “The Problem of Social Cost.” *Journal of Law and Economics* 3: 1-44.

Coase, R.H. 1988. *The Firm, the Market, and the Law*. Chicago: University of Chicago Press.

Cohen, Jeremy, Diana Mutz, Vincent Price & Albert Gunther. 1988. “Perceived Impact of Defamation: An Experiment on Third-Person Effects.” *Public Opinion Quarterly* 52: 161-173.

Cohen-Cole, Jamie. 2008. “Cybernetics and the Machinery of Rationality.” *British Journal for the History of Science* 41: 109-114.

Coleman, James S. 1990. *Foundations of Social Theory*. Cambridge, MA: Harvard University Press.

Cosmides, Leda. 1989. “The Logic of Social Exchange: Has Natural Selection Shaped How Humans Reason? Studies with the Wason Selection Task.” *Cognition* 31: 187-276.

Cosmides, Leda & John Tooby. 1992. “Cognitive Adaptations for Social Exchange.” In *The Adaptive Mind: Evolutionary Psychology and the Generation of Culture*. Jerome H. Barkow, Leda Cosmides & John Tooby, eds. New York: Oxford University Press. Pp. 163-228.

Cosmides, Leda & John Tooby. 1994a. “Better than Rational: Evolutionary Psychology and the Invisible Hand.” *American Economic Review* 50 (2): 327-332.

Cosmides, Leda & John Tooby. 1994b. “Beyond Intuition and Instinct Blindness: Toward an Evolutionarily Rigorous Cognitive Science.” *Cognition* 50: 41-77.

Cosmides, Leda & John Tooby. 1996. “Are Humans Good Intuitive Statisticians After All? Rethinking Some Conclusions from the Literature on Judgment and Uncertainty.” *Cognition* 58: 1-73.

Cosmides, Leda & John Tooby. 2005. “Neurocognitive Adaptations Designed for Social Exchange.” In *The Handbook of Evolutionary Psychology*. David M. Buss, eds. Hoboken, NJ: Wiley. Pp. 584-627.

Cowan, Robin & Mario J. Rizzo, eds. 1995. *Profits and Morality*. Chicago: University of Chicago Press.

Cowen, Tyler. 1989. “Are All Tastes Constant and Identical? A Critique of Stigler and Becker.” *Journal of Economic Behavior & Organization* 11: 127-135.

Cox, James & David Grether. 1996. “The Preference Reversal Phenomenon: Response Mode, Markets and Incentives.” *Economic Theory* 7: 381-405.

Crider, Andrew B., George R. Goethals, Robert R. Kavanaugh & Paul R. Solomon. 1989. *Psychology*. New York: Harper Collins. 3rd ed.

Damasio, Antonio R. 1994. *Descartes’ Error: Emotion, Reason and the Human Brain*. New York: Grosset/Putnam.

Damasio, Antonio R. 1996. “The Somatic Marker Hypothesis and the Possible Functions of the Prefrontal Cortex.” *Transactions of the Royal Society* 351: 1413–1420.

Darwin, Charles. 1859. *On the Origin of Species by Means of Natural Selection or the Preservation of Favoured Races in the Struggle for Life.* London: John Murray.

Darwin, Charles. 1860. *Letter 2743 – Darwin, C. R. to Gray, Asa, 3 April (1860), Darwin Correspondence Project*. https://www.darwinproject.ac.uk/letter/entry-2743

Darwin, Charles. 1872. *The Expression of Emotion in Man and Animal*. London: John Murray.

Darwin, Charles. 1887. “The Autobiography of Charles Darwin.” In *The Life and Letters of Charles Darwin, Including an Autobiographical Chapter*. Francis Darwin, ed. London: John Murray.

Davidson, Donald. 1970. “How Is Weakness of the Will Possible?” In *Moral Concepts*. Joel Feinberg, ed. Oxford: Oxford University Press. Pp. 93-113.

Dawes, Robyn M. & Matthew Mulford. 1996. “The False Consensus Effect and Overconfidence: Flaws in Judgment or Flaws in How We Study Judgment*?” Organizational Behavior and Human Decision Processes* 65: 201-211.

Dawkins, Richard. 1989. *The Selfish Gene*. New York: Oxford University Press.

Dennett, Daniel. 1987. *The Intentional Stance*. Cambridge MA: MIT Press.

Diamond, Peter & Hannu Vartiainen, eds. 2007. *Behavioral Economics and Its Applications*. Princeton: Princeton University Press.

Doherty, Brian. 2007. *Radicals for Capitalism: A Freewheeling History of the Modern American Libertarian Movement*. New York: Public Affairs.

Donohue, John J. III & Steve D. Levitt. 2001. “The Impact of Legalized Abortion on Crime.” *Quarterly Journal of Economics* 116: 379-420.

Donohue, John J. III & Steve D. Levitt. 2003. “Further Evidence that Legalized Abortion Lowered Crime: A Reply to Joyce.” *Journal of Human Resources* 39: 29-49.

Drakopoulos, Stavros A. 1991. *Values and Economic Theory: The Case of Hedonism*. Aldershot: Avebury.

Drakopoulos, Stavros A. 1994. "Hierarchical Choice in Economics." *Journal of Economic Surveys* 8: 133-153.

Drakopoulos, Stavros A. 2011. "Wicksteed, Robbins and the Emergence of Mainstream Economic Methodology." *Review of Political Economy* 23: 461-470.

Drakopoulos, Stavros A. & Karayiannis, Anastassios D. 2004. "The Historical Development of Hierarchical Behavior in Economic Thought." *Journal of the History of Economic Thought* 26: 363-378.

Duchaine, Bradley, Holly Parker & Ken Nakayama. 2003. "Normal Recognition of Emotion in a Prosopagnosic." *Perception* 32: 827-838.

Duchaine, Bradley, Leda Cosmides & John Tooby. 2001. "Evolutionary Psychology and the Brain." *Cognitive Neuroscience* 11:225–230.

Duchon, D., K. Dunegan, & S. Barton. 1989. "Framing the problem and making decisions: the facts are not enough." *IEEE Transactions on Engineering Management* 36: 25–27.

Dudey, Thomas & Peter M. Todd. 2001. "Making Good Decisions with Minimal Information: Simultaneous and Sequential Choice." *Journal of Bioeconomics* 3: 195-215.

Dunbar, R.I.M. 1993. The Co-evolution of Neocortical Size, Group Size and Language in Humans." *Behavioral and Brain Sciences* 16: 681-735.

Dunbar, R.I.M. & M. Spoors 1995. "Social Networks, Support Cliques, and Kinship." *Human Nature* 6: 273-290.

Dunn, Barnaby D., Tim Dalgleish & Andrew D. Lawrence. 2006. "The Somatic Marker Hypothesis: A Critical Evaluation." *Neuroscience and Biobehavior Review* 30: 239-271.

Düppe, Till & E. Roy Weintraub. 2014. "Siting the New Economic Science: The Cowles Commission's Activity Analysis Conference of June 1949." *Science in Context* 27: 453-483.

Ebenstein, Lanny. 2015. *Chicagonomics: The Evolution of Chicago Free Market Economics*. New York: St. Martin's Press.

Ellsberg, Daniel. 1961. "Risk, Ambiguity, and the Savage Axioms." *Quarterly Journal of Economics.* 75: 643-669.

Elster, Jon. 1982. "Sour Grapes – Utilitarianism and the Genesis of Wants." In *Utilitarianism and Beyond.* Amartya Sen & Bernard Williams, eds. New York: Cambridge University Press. Pp: 219-238.

Elster, Jon. 1985. *Making Sense of Marx*. New York: Cambridge University Press.

Elster, Jon. 1986. "Introduction." In *Rational Choice*. Jon Elster, ed., New York: New York University Press. Pp. 1-33.

Elster, Jon. 1989. *Nuts and Bolts for the Social Sciences*. New York: Cambridge University Press.

Elster, Jon. 1990. “When Rationality Fails.” In *The Limits of Rationality*. Karen Schweers Cook & Margaret Levi, eds. Chicago: University of Chicago Press. Pp. 19-51.

Elster, Jon. 2007. *Explaining Social Behavior: More Nuts and Bolts for the Social Sciences*. New York: Cambridge University Press.

Elster, Jon. 2009. *Reason and Rationality*. Princeton: Princeton University Press.

Emmett, Ross B. ed. 2010. *The Elgar Companion to the Chicago School of Economics*. Cheltenham: Edward Elgar.

Erev, Ido, Eyal Ert & Eldad Yechiam. 2008. “Loss Aversion, Diminishing Sensitivity, and the Effect of Experience on Repeated Decisions.” *Journal of Behavioral Decision Making* 21: 575-597.

Erev, Ido, Thomas S. Wallsten & David V. Budescu. 1994. “Simultaneous Over- and Underconfidence: The Role of Error in Judgment Processes.” *Psychological Review* 101: 519-527.

Erickson, Paul, Judy L. Klein, Lorraine Daston, Rebecca Lemov, Thomas Sturm & Michael D. Gordin. 2013. *How Reason Almost Lost Its Mind: The Strange Career of Cold War Rationality*. Chicago: University of Chicago Press.

Erickson, Paul. 2010. “Mathematical Models, Rational Choice, and the Search for Cold War Culture.” *Isis* 101: 386-392.

Erickson, Paul. 2015. *The World the Game Theorists Make*. Chicago: University of Chicago Press.

Ert, Eyal and Ido Erev. 2007. “Loss Aversion in Decisions under Risk and the Value of Symmetric Simplification of Prospect Theory.” University of Texas (working paper).

Ert, Eyal and Ido Erev. 2008. “The Rejection of Attractive Gambles, Loss Aversion, and the Lemon Avoidance Heuristic.” *Journal of Economic Psychology* 29: 715-723.

Ert, Eyal and Ido Erev. 2010. “On the Descriptive Value of Loss Aversion in Decisions under Risk.” Harvard Business School, Working Paper #10-056.

Evans, Jonathan St.B. T. & David E. Over. 1996. *Rationality and Reasoning*. Hove, UK: Psychology Press.

Fehr, Ernst & Klaus M. Schmidt. 1999. “A Theory of Fairness, Competition and Cooperation.” *Quarterly Journal of Economics* 114: 817-868.

Fehr, Ernst & Simon Gächter. 2005. “Altruistic Punishment in Humans.” *Nature* 415: 137-140.

Fellows, Lesley K. & Martha J. Farah. 2005. “Different Underlying Impairments in Decision Making Following Ventromedial and Dorsolateral Frontal Lobe Damage in Humans.” *Cerebral Cortex* 15: 58-63.

Festinger, Leon. 1957. *A Theory of Cognitive Dissonance*. Stanford: Stanford University Press.

Fiedler, Klaus, Eva Walther & Stefanie Nickel. 1999. "Covariation-Based Attribution: On the Ability to Assess Multiple Covariates of an Effect." *Personality and Social Psychology Bulletin* 25: 609-624.

Fodor, Jerry A. *The Modularity of the Mind*. Cambridge, MA: MIT Press.

Foka-Kavalieraki, Yulie, M. Kakavoulia, A. Economou, S. Varlokosta, C. Routsis, D. Kasselimis, C. Potagas, I. Evdokimidis & A. Protopapas. 2008. "A Comprehensive Approach to the Analysis of Narrative Discourse Production by Greek Speakers with Aphasia." Paper presented at the conference *The Science of Aphasia IX*, September 20-25, 2008.

Foka-Kavalieraki, Yulie, Maria Kakavoulia, Spyridoula Stamouli, Alexandra Economou, Athanassios Protopapas & Spyridoula Varlokosta. 2014. "A Comprehensive Battery for the Elicitation and Evaluation of Narrative Discourse in Greek Speakers with Aphasia: Principles, Methodological Issues and Preliminary Results." *Glossologia* 22: 41-60. *[in Greek] [in the Greek original the first name is Kakavoulia]*

Foka-Kavalieraki, Yulie & Aristides N. Hatzis. 2009. "The Foundations of a Market Economy: Contract, Consent, Coercion." *European View* 9: 29-37.

Foka-Kavalieraki, Yulie & Aristides N. Hatzis. 2011. "Rational After All: Toward an Improved Theory of Rationality in Economics" *Revue de Philosophie Economique* 12: 3-51.

Foka-Kavalieraki, Yulie & Aristides N. Hatzis. 2015a. *Rational Choice Theory: An Introduction (University Lectures)*. Athens: University of Athens, 4th ed. *[in Greek]*

Foka-Kavalieraki, Yulie & Aristides N. Hatzis. 2015b. "The Dual Development of Rational Choice Theory from World War III to the End of the Cold War: The Decision Theory in Princeton and the New Political Economy in Chicago" (working paper)

Foka-Kavalieraki, Yulie & Aristides N. Hatzis. 2015c. "Are We Biased Against Rationality? An Experiment on Intellectual-and-Moral Attribution Bias." (working paper)

Frey, Bruno S. & Alois Stutzer. 2007. "Economics and Psychology: Development and Issues." In *Economics and Psychology: A Promising New Cross-Disciplinary Field*. Bruno S. Frey and Alois Stutzer, eds. Cambridge, MA: MIT Press. Pp. 3-15.

Friedman, David. 2005. "Economics and Evolutionary Psychology." *Advances in Austrian Economics* 7: 17-33.

Friedman, Milton. 1946. "Lange on Price Flexibility and Employment: A Methodological Criticism." *American Economic Review* 36: 613-631.

Friedman, Milton. 1949. "The Marshallian Demand Curve." *Journal of Political Economy* 57: 463-495.

Friedman, Milton. 1953. "The Methodology of Positive Economics." In *Essays in Positive Economics*. Chicago: University of Chicago Press. Pp. 3-43.

Friedman, Milton. 1962. *Capitalism and Freedom*. Chicago: University of Chicago Press.

Friedman, Milton. 2007. *Milton Friedman on Economics: Selected Papers*. Chicago: University of Chicago Press.

Friedman, Milton & Rose D. Friedman. 1998. *Two Lucky People*. Chicago: University of Chicago Press.

Friedman, Milton & L.J. Savage. 1952. "The Expected-Utility Hypothesis and the Measurability of Utility." *Journal of Political Economy* 60: 463-474.

Fu, Tiffany, Wilma Koutstaal, Cynthia H.Y. Fu, Lucia Poon & Anthony J. Cleare. 2005. "Depression, Confidence, and Decision: Evidence Against Depressive Realism." *Journal of Psychopathology and Behavioral Assessment* 27: 243-252.

Fudenberg, Drew, David K. Levine, Zacharias Maniadis. 2012. "On the Robustness of Anchoring Effects in WTP and WTA Experiments." *American Economic Journal: Microeconomics* 4(2):131-145.

Gächter, Simon, Henrik Orzen, Elke Renner & Chris Starmer. 2009. "Are Experimental Economists Prone to Framing Effects? A Natural Field Experiment." *Journal of Economic Behavior & Organization* 70: 443-446.

Gal, David. 2006. "A Psychological Law of Inertia and the Illusion of Loss Aversion." *Judgment and Decision Making* 1: 23-32.

Gallistel, Charles R. 1990. *The Organization of Learning*. Cambridge, MA: MIT Press.

Gauthier, David. 1986. *Morals by Agreement*. Oxford: Oxford University Press.

Gemtos, Petros. 1995. *Social Sciences: An Introduction*. Athens: Typotheto/Giorgos Dardanos. *[in Greek]*

Gerd Gigerenzer & Wolfgang Gaissmaier. 2011. "Heuristic Decision Making." *Annual Review of Psychology* 62: 451–82.

Gibbard, Alan. 1974. "A Pareto-Consistent Libertarian Claim." *Journal of Economic Theory* 7: 388-410.

Gigerenzer, Gerd. 1991. "How to Make Cognitive Illusions Disappear: Beyond 'Heuristics and Biases'." *European Review of Social Psychology* 2: 83-115.

Gigerenzer, Gerd. 1993. "The Bounded Rationality of Probabilistic Mental Models." In *Rationality: Psychological and Philosophical Perspectives*. K.I. Manktelow & D.E. Over, eds. London: Routledge. Pp: 284-313.

Gigerenzer, Gerd. 1996. "On Narrow Norms and Vague Heuristics: A Reply to Kahneman and Tversky (1996)." *Psychological Review* 103: 592-596.

Gigerenzer, Gerd. 1998. "Ecological Intelligence: An Adaptation for Frequencies." In *The Evolution of Mind*. Denise Dellarosa Cummins & Colin Allen, eds. New York: Oxford University Press. Pp. 9-29.

Gigerenzer, Gerd. 2000. *Adaptive Thinking: Rationality in the Real World*. New York: Oxford University Press.

Gigerenzer, Gerd. 2005. "Is the Mind Irrational or Ecologically Rational?" In *The Law and Economics of Irrational Behavior*. Francesco Parisi & Vernon L. Smith, eds. Stanford: Stanford University Press. Pp. 38-67.

Gigerenzer Gerd. 2006. "Bounded and Rational." In *Contemporary Debates in Cognitive Science*. Robert J. Stainton, ed. Malden, MA: Blackwell. Pp. 115-133.

Gigerenzer, Gerd. 2007a. “Fast and Frugal Heuristics: The Tools of Bounded Rationality.” In *Blackwell Handbook of Judgment and Decision Making*. Derek J. Koehler & Nigel Harvey, eds. Malden, MA: Blackwell. Pp. 62-88.

Gigerenzer, Gerd. 2007b. *Gut Feelings: The Intelligence of the Unconscious*. London: Penguin.

Gigerenzer, Gerd. 2008. *Rationality for Mortals: How People Cope with Uncertainty*. New York: Oxford University Press.

Gigerenzer, Gerd. 2015. *Simply Rational: Decision Making in the Real World.* New York: Oxford University Press.

Gigerenzer, Gerd & Henry Brighton. 2009. “Homo Heuristicus: Why Biased Minds Make Better Inferences.” *Topics in Cognitive Science* 1:107-143.

Gigerenzer, Gerd & Daniel Goldstein. 1996. “Reasoning the Fast and Frugal Way: Models of Bounded Rationality.” *Psychological Review* 103: 650-669.

Gigerenzer, Gerd, Wolfgang Hell & Hartmut Blank. 1988. “Presentation and Content: The Use of Base Rates as a Continuous Variable” *Journal of Experimental Psychology: Human Perception and Performance* 14: 513-525.

Gigerenzer, Gerd & Ulrich Hoffrage. 1995. “How to Improve Bayesian Reasoning Without Instruction: Frequency Formats” *Psychological Review* 102: 684–704.

Gigerenzer, Gerd & Ulrich Hoffrage. 1995. “How to Improve Bayesian Reasoning Without Instruction: Frequency Formats” *Psychological Review* 102: 684–704.

Gigerenzer, Gerd, Ulrich Hoffrage & Heinz Kleinbölting. 1991. “Probabilistic Mental Models: A Brunswikian Theory of Confidence.” *Psychological Review* 98: 506–528.

Gigerenzer, Gerd & David J. Murray. 1987. *Cognition as Intuitive Statistics*. Hillsdale, NJ: Erlbaum.

Gigerenzer, Gerd & Reinhard Selten, eds. 2001. *Bounded Rationality: The Adaptive Toolbox*. Cambridge, MA: MIT Press.

Gigerenzer, Gerd, Zeno Swijtink, Theodore Porter, Lorraine Daston, John Beatty & Lorenz Krüger. 1989. *The Empire of Chance: How Probability Changed Science and Everyday Life*. Cambridge: Cambridge University Press.

Gigerenzer, Gerd, Peter M. Todd & ABC Reserach Group. 1999. *Simple Heuristics That Make Us Smart.* New York: Oxford University Press.

Gilboa, Itzhak. 2009. *Theory of Decision under Uncertainty*. New York: Cambridge University Press.

Gilboa, Itzhak. 2010a. *Rational Choice*. Cambridge, MA: MIT Press.

Gilboa, Itzhak. 2010b. “Questions in Decision Theory.” *Annual Review of Economics* 2: 1-19.

Gilovich, Thomas, Robert Vallone & Amos Tversky. 1985. “The Hot Hand in Basketball: On the Misperception of Random Sequences.” *Cognitive Psychology* 17: 295-314.

Gintis, Herbert. 2007. “A Framework for the Unification of the Behavioral Sciences.” *Behavioral and Brain Sciences* 30: 1-61.

Gintis, Herbert. 2009. *The Bounds of Reason. Game Theory and the Unification of the Behavioral Sciences.* Princeton: Princeton University Press.

Gintis, Herbert. 2012. "An Evolutionary Perspective on the Unification of the Behavioral Sciences." In *Evolution and Rationality. Decisions, Co-operation and Strategic Behaviour*. Samir Okasha & Ken Binmore, eds. New York: Cambridge University Press. Pp. 213-245.

Giocoli, Nicola. 2003. *Modeling Rational Agents: From Interwar Economics to Early Modern Game Theory*. Cheltenham: Edward Elgar.

Glaeser, Edward L. 2004. "Psychology and the Market." *American Economic Review* 94(2): 408-413.

Glaeser, Edward L. 2006. "Paternalism and Psychology." *University of Chicago Law Review* 73: 133-156.

Glimcher, Paul W. 2009. "Choice: Towards a Standard Back-Pocket Model." In *Neuroeconomics: Decision Making and the Brain*. Paul W. Glimcher, Colin F. Camerer, Ernst Fehr & Russell A. Poldrack, eds. San Diego: Academic Press. Pp. 503-521.

Glimcher, Paul W., Colin F. Camerer, Ernst Fehr & Russell A. Poldrack, eds. 2009. *Neuroeconomics: Decision Making and the Brain*. San Diego: Academic Press.

Glimcher, Paul W., Michael C. Dorris, & Hannah M. Bayer. 2005. "Physiological Utility Theory and the Neuroeconomics of Choice." *Games and Economic Behavior* 52: 213-256.

Goldstein, Daniel G. & Gerd Gigerenzer. 2002. "Models of Ecological Rationality: The Recognition Heuristic." *Psychological Review* 109: 75-90.

Gordon, Roger & Gordon B. Dahl. 2013. "Views Among Economists: Professional Consensus or Point-Counterpoint?" *America Economic Review Papers & Proceedings* 103(3): 629-635.

Gorham, Geoffrey. 2009. *Philosophy of Science: A Beginner's Guide*. Oxford: Oneworld Press.

Gourville, John T. & Dilip Soman. 1998. "Payment Depreciation: the Behavioral Effects of Temporally Separating Payments From Consumption" *Journal of Consumer Research* 25: 160-174.

Griggs, Richard A. & James R. Cox. 1982. "The Elusive Thematic-Materials Effect in Wason's Selection Task." *British Journal of Psychology* 73: 407–420.

Grimm, Veronika & Friederike Mengel. 2010. "Let Me Sleep On It: Delay Reduces Rejection Rates in Ultimatum Games." METEOR, Working Paper RM/10/017.

Gul, Faruk & Wolfgang Pesendorfer. 2008. "The Case for Mindless Economics." In *The Foundations of Positive and Normative Economics*. Andrew Caplin & Andrew Shotter, eds. New York: Oxford University Press.

Hájek, Alan & James M. Joyce. 2008. "Confirmation." In *The Routledge Companion to Philosophy of Science*. Stathis Psillos & Martin Curd, eds. London: Routledge. Pp. 115-128.

Hammond, J. Daniel & Claire H. Hammond, eds. 2006. *Making Chicago Price Theory (Friedman-Stigler Correspondence 1945-1957)*. London: Routledge.

Hammond, J. Daniel. 2006. "The Development of Post-War Chicago Price Theory." In *The Elgar Companion of Post-War Chicago Price Theory*. Ross B. Emmett, ed. Cheltenham: Edward Elgar. Pp. 7-24.

Hands, D. Wade. 2009. "Did Milton Friedman's Positive Methodology License the Formalist Revolution?" In *The Methodology of Positive Economics: Reflections on the Milton Friedman Legacy*. Uskali Mäki, ed. New York: Cambridge University Press. Pp. 143-164.

Hanna, Jason. 2011. "Consent and the Problem of Framing Effects." *Ethical Theory & Moral Practice*. 14: 517-531.

Hardie, Bruce G.S., Eric J. Johnson & Peter S. Fader. 1993. "Modelling Loss Aversion and Reference Dependence Effects on Brand Choice." *Marketing Science* 12: 378-394.

Harford, Tim. 2008. *The Logic of Life: The Rational Economics of an Irrational World*. New York: Random House.

Harinck, Fieke, Eric Van Dijk, Ilja Van Beest & Paul Mersmann. 2007. "When Gains Loom Larger than Losses: Reversed Loss Aversion for Small Amounts of Money." *Psychological Science* 18: 1099-1105.

Harley, Erin M. 2007. "Hindsight Bias In Legal Decision Making." Social Cognition 25: 48-63.

Harris, Christine R. & Harold E. Pashler. 1995. "Evolution and Human Emotions." *Psychological Inquiry* 6: 44-46.

Harrison, Glenn W. 2008. "The Behavioral Counter-Revolution." *Journal of Economic Behavior and Organization* 73: 49-57.

Harsanyi, John C. 1953. "Cardinal Utility in Welfare Economics and in the Theory of Risk-taking." *Journal of Political Economy* 61: 434–435.

Harsanyi, John C. 1955. "Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparisons of Utility." *Journal of Political Economy* 63: 309–321.

Harsanyi, John C. 1977. "Advances in Understanding Rational Behavior." In *Rational Choice*. Jon Elster, ed. New York: New York University Press, 1986. Pp. 82-107.

Hatzis, Aristides N. 1999. *An Economic Theory of Greek Contract Law*. Doctoral Thesis. Chicago: University of Chicago Law School.

Hatzis, Aristides N. 2003. "'Just the Oven': A Law and Economics Approach to Gestational Surrogacy Contracts." In *Perspectives for the Unification or Harmonisation of Family Law in Europe*. Katharina Boele-Woelki, ed. Antwerp: Intersentia. Pp. 412-433.

Hatzis, Aristides N. 2009. "From Soft to Hard Paternalism and Back: The Regulation of Surrogate Motherhood in Greece." *Portuguese Economic Journal* 49: 205-220.

Hatzis, Aristides N. 2010. "Everything for Sale (With One Exception): An Argument Against the Commodification Argument" (working paper).

Hatzis, Aristides N. 2011. "The Ignorance Doctrine." *Books' Journal* 12: 50-53. *[in Greek]*

Hatzis, Aristides N. 2015a. “Moral Externalities: An Economic Approach to the Legal Enforcement of Morality.” In *Law and Economics: Philosophical Issues and Fundamental Questions*. Aristides N. Hatzis & Nicholas Mercuro, eds. London: Routledge. Pp. 226-244.

Hatzis, Aristides N. 2015b. *Law & Economics: University Lectures*. Athens: Athens University of Economics & Business, 5th ed.

Hausman, Daniel M. & Bryan Welch. 2010. “Debate: To Nudge or Not to Nudge.” *Journal of Political Philosophy* 18: 123-136.

Hausman, Daniel M. & Michael S. McPherson. 2006. *Economic Analysis, Moral Philosophy, and Public Policy*. New York: Cambridge University Press, 2nd ed.

Hawking, Stephen. 2001. *The Universe in a Nutshell*. New York: Bantam.

Hayden, Grant M. & Stephen E. Ellis. 2007. “Law and Economics after Behavioral Economics.” *Kansas Law Review* 55: 629-675.

Hayek, F.A. 1937. “Economics and Knowledge.” *Economica* 4(n.s.): 33-54.

Hayek, F.A. 1945. “The Use of Knowledge in Society.” *American Economic Review* 35: 519-530.

Hayek, F.A. 1952. *The Counter-Revolution of Science: Studies on the Abuse of Reason*. Indianapolis: Liberty Fund, 1980.

Hayek, F.A. 1988. *The Fatal Conceit: The Errors of Socialism*. W.W. Bartley III, ed. Chicago: University of Chicago Press.

Heap, S.P. Hargreaves. 2004. “Economic Rationality.” In *The Elgar Companion to Economics and Philosophy*. John B. Davis, Alain Marciano & Jochen Runde, eds. Cheltenham: Elgar. Pp. 42-60.

Heider, Fritz. 1958. *The Psychology of Interpersonal Relations*. New York: Wiley.

Herman, Barbara. 2016. *Morality as Rationality: A Study of Kant’s Ethics*. London: Routledge.

Hertwig, Ralph & Gerd Gigerenzer. 1999. “The `Conjunction Fallacy' Revisited: How Intelligent Inferences Look Like Reasoning Errors.” *Journal of Behavioral Decision Making* 12: 275-305

Heukelon, Floris. 2014. *Behavioral Economics: A History*. New York: Cambridge University Press.

Heyne, Paul. 2000. *The Economic Way of Thinking*. Upper Saddle River, NJ: Prentice Hall, 9th ed.

Higgins, E. Tory. 1997. “Beyond Pleasure and Pain.” *American Psychologist* 52: 1280-1300.

Higgins, E. Tory. 2001. “Promotion and Prevention Experiences: Relating Emotions to Nonemotional Motivational States.” In *Handbook of Affect andSocial cognition*. Joseph P. Forgas, ed. Hillsdale, NJ: Lawrence Erlbaum. Pp. 188-211.

Hill, R.A. and R.I.M. Dunbar. 2003. “Social Network Size in Humans.” *Human Nature* 14: 53-72.

Hindmoor, Andrew. 2006. *Rational Choice*. Hampshire: Palgrave Macmillan.

Hirsch, Abraham & Neil de Marchi. 1990. *Milton Friedman: Economics in Theory and Practice*. Ann Arbor: University of Michigan Press.

Hirshleifer, Jack. 1985. "The Expanding Domain of Economics." *American Economic Review* 75: 53-68.

Hodgson, Geoffrey M. 1993. *Economics and Evolution: Bringing Life Back into Economics*. Ann Arbor, MI: University of Michigan Press.

Hodgson, Geoffrey M. 1998. "On The Evolution of Thorstein Veblen's Evolutionary Economics." *Cambridge Journal of Economics* 22: 415-431.

Hodgson, Geoffrey M. 2013. *From Pleasure Machines to Moral Communities: An Evolutionary Economics without Homo Economicus*. Chicago: University of Chicago Press.

Hogarth, Robin M. & Melvin W. Reder. 1987. "Introduction: Perspectives from Economics and Psychology." In *Rational Choice. The Contrast between Economics and Psychology*. R.M. Hogarth and M.W. Reder, eds. Chicago: University of Chicago Press, Pp. 1-23.

Homans, George Caspar. 1961. *Social Behaviour (Its Elementary Forms*). London: Routledge & Kegan Paul.

Hosseini, Hamid. 2011. "George Katona: A Founding Father of Old Behavioral Economics" *Journal of Socio-Economics* 40: 977–984.

House of Lords. 2011. "Behaviour Change: Report". London: House of Lords, Science and Technology Select Committee.

Hume, David. 1739. *A Treatise of Human Nature.* David Fate Norton & Mary J. Norton, eds. New York: Oxford University Press, 2007.

James, William. 1884. "What is an Emotion?" *Mind* 9: 188-205.

Jefferson, Therese. 2014. "Revisiting the Question of Behavioural Macroeconomics: The Importance of Adding Katona's Work to the Discussion" Working paper.

Jevons, William Stanley. 1888. *The Theory of Political Economy*. London: Macmillan. 3rd ed.

Johnson-Laird, P.N. & P.C. Wason. 1970. "A Theoretical Analysis of Insight Into a Reasoning Task" *Cognitive Psychology* 1: 134-148.

Jolls, Christine, Cass R. Sunstein & Richard Thaler. 1998. 'A Behavioral Approach to Law and Economics.' *Stanford Law Review* 50: 1471-1550.

Jones, Daniel Stedman. 2012. *Masters of the Universe: Hayek, Friedman, and the Birth of Neoliberal Politics*. Princeton: Princeton University Press.

Jones, Edward E. & Keith E. Davis, K. E. 1965. "From Acts to Dispositions: The Attribution Process in Person Perception." In *Advances in Experimental Social Psychology.* Vol. 2. Leonard Berkowitz, ed. New York: Academic Press. Pp. 219-266**.**

Jones, Edward E. & Victor A. Harris. 1967. "The Attribution of Attitudes." *Journal of Experimental Social Psychology* 3: 1-21.

Jones, Edward E. and Richard E. Nisbett. 1972. “The Actor and The Observer: Divergent Perceptions of the Causes of Behavior.” In *Attribution: Perceiving the Causes of Behavior*. In E.E. Jones, D.E. Kanouse, H.H. Kelley, R.E. Nisbett, S. Valins & B. Weiner, eds. Morristown, NJ: General Learning Press. Pp. 79-94.

Juslin, Peter, Anders Winman & Henrik Olsson. 2000. “Naive Empiricism and Dogmatism in Confidence Research: A Critical Examination of the Hard-Easy Effect.” *Psychological Review* 107: 384-396.

Kahneman, Daniel. 2011. *Thinking Fast and Slow*. New York: Farrar, Straus and Giroux.

Kahneman, Daniel & Amos Tvesrky. 1979. “Prospect Theory: An Analysis of Decision under Risk.” *Econometrica* 47: 263-291.

Kahneman, Daniel & Amos Tvesrky. 1986. “Choice, Values and Frames.” *American Psychologist* 39: 341-350.

Kahneman, Daniel & Amos Tvesrky, eds. 2000. *Choices, Values, and Frames*. New York: Cambridge University Press.

Kahneman, Daniel, Jack L. Knetsch & Richard Thaler. 1986. “Fairness and the Assumptions of Economics.” *Journal of Business* 59: 285-300.

Kahneman, Daniel, Jack L. Knetsch & Richard Thaler. 1991. “The Endowment Effect, Loss Aversion, and Status Quo Bias.” *Journal of Economic Perspectives* 5(1): 193-206.

Kahneman, Daniel, Paul Slovic & Amos Tversky. 1982. *Judgment Under Uncertainty: Heuristics and Biases*. New York: Cambridge University Press.

Kandel, Eric. 2009. “The Biology of Memory: A Forty-Year Perspective.” *Journal of Neuroscience* 29: 12748-12756.

Kardes, Frank R., Steven S. Prosavac & Maria L. Cronley. 2004. “Consumer Inference: A Review of Processes, Bases, and Judgment Contexts” *Journal of Consumer Psychology* 14: 23-256.

Kelley, Harold H. 1967. “Attribution Theory in Social Psychology.” In *Nebraska Symposium on Motivation*. Vol. 15. David Levine, ed. Lincoln: University of Nebraska Press. Pp. 192-238.

Kelso, Scott J.A. *Dynamic Patterns*. Cambridge MA: MIT Press.

Kermer, Deborah A., Erin Driver-Linn, Timothy D. Wilson & Daniel T. Gilbert. 2006. “Loss Aversion Is an Affective Forecasting Error.” *Psychological Science* 17: 649-653.

Keysers, Christian & Valeria Gazzola. 2009. “Expanding the Mirror: Vicarious Activity for Actions, Emotions, and Sensations.” *Current Opinion in Neurobiology* 19: 666–671.

Khalil, Elias L. & Alain Marciano. 2010. “The Equivalence of Neo-Darwinism and Walrasian Equilibrium: In Defense of *Organismus Economicus*.” *Biology and Philosophy* 25: 229-248.

Kirchgässner, Gebhard. 2008. *Homo Oeconomicus: The Economic Model of Behaviour and Its Applications in Economics and Other Social Sciences*. New York: Springer.

Klein, Benjamin & Keith B. Leffler. 1981. “The Role of Market Forces in Assuring Contractual Performance.” *Journal of Political Economy* 89: 615-641.

Klein, Naomi. 2008. *The Shock Doctrine: The Rise of Disaster Capitalism.* New York: Picador.

Knetsch, Jack L. 1989. “The Endowment Effect and Evidence of Nonreversible Indifference Curves.” *American Economic Review* 79: 1277-1284.

Knutson, Brian & Peter Bossaerts. 2007. “Neural Antecedents of Financial Decisions.” *Journal of Neuroscience* 27: 8174-8177.

Knutson, Brian & Richard Peterson. 2005. “Neurally Reconstructing Expected Utility.” *Games and Economic Behavior*. 52: 305-315.

Korobkin, Russell B. & Thomas S. Ulen. 2000. “Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics.” *California Law Review* 88: 1051-1144.

Kosters, Mark & Van der Heijden. 2015. “From Mechanism to Virtue: Evaluating Nudge Theory.” *Evaluation* 21(3): 276-291.

Laibson, David. 1997. “Golden Eggs and Hyperbolic Discounting.” *Quarterly Journal of Economics* 112: 443-477.

Laibson, David. 1998. “Life-Cycle Consumption and Hyperbolic Discount Functions.” *European Economic Review* 42: 861-871.

Langer, Ellen. 1975. “The Illusion of Control”. In *Judgment Under Uncertainty: Heuristics and Biases*. Kahneman, Daniel, Paul Slovic & Amos Tversky, eds. New York: Cambridge University Press, 1982.

Larrick, Richard P., Katherine A. Burson & Jack B. Soll. 2007. “Social Comparison and Confidence: When Thinking You’re Better than Average Predicts Overconfidence (And When It Does Not).” *Organizational Behavior & Human Decision Processes* 102: 76-94.

Lazear, Edward P. 2000. “Economic Imperialism.” *Quarterly Journal of Economics* 115: 99-146.

Leonard, Robert. 2010. *Von Neumann, Morgenstern, and the Creation of Game Theory: From Chess to Social Science, 1900-1960*. New York: Cambridge University Press.

Levin, Irwin P. & Gary J. Gaeth. 1988. “Framing of Attribute Information Before and After Consuming the Product.” *Journal of Consumer Research* 15: 374–378.

Levin, Irwin P., Sandra L. Schneider & Gary J. Gaeth. 1998. “All Frames Are Not Created Equal: A Typology and Critical Analysis of Framing Effects” *Organizational Behavior and Human Decision Processes* 76: 149-188.

Levine, David K. 2012. *Is Behavioral Economics Doomed? The Ordinary Versus The Extraordinary*. Cambridge: Open Book Publishers.

Levitt, Steven D. 1996. “The Effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation.” *Quarterly Journal of Economics* 111: 319-325.

Levitt, Steven D. 2004. "Understanding Why Crime Fell in the 1990s: Four Factors that Explain the Decline and Six that Do Not." *Journal of Economic Perspectives* 18(1): 163-190.

Levitt, Steven D. & Stephen J. Dubner. 2014. *Think Like a Freak*. USA: William Morrow and Company.

Levitt, Steven D. & John A. List. 2007. "What Do Laboratory Experiments Measuring Social Preferences Reveal About the Real World?" *Journal of Economic Perspectives* 21: 153-174.

Levitt, Steven D. & John A. List. 2009. "Field Experiments in Economics: The Past, the Present, and the Future." *European Economic Review* 53: 1-18.

Lewin, Kurt, Dembo, T., Festinger, L. and Sears, P. 1944. "Levels of Aspiration" In *Personality and the Behavior Disorders.* Vol. 1. J. McV. Hunt, ed. New York: Ronald Press. Pp: 333-378.

Lichtenstein, Sarah & Paul Slovic. 1971. "Reversals of Preference Between Bids and Choices in Gambling Decisions." *Journal of Experimental Psychology* 89: 46-55.

Lichtenstein, Sarah & Paul Slovic. 1973. "Response-Induced Reversals of Preference in Gambling: An Extended Replication in Las Vegas." *Journal of Experimental Psychology* 101: 16-20.

List, John A. 2004. "Neoclassical Theory Versus Prospect Theory: Evidence from the Marketplace." *Econometrica* 72: 615-625.

List, John A. 2006. "The Behavioralist Meets the Market: Measuring Social Preferences and Reputation Effects in Actual Transactins." *Journal of Political Economy* 114: 1-37.

List, John A. 2008. "Homo Experimentalis Evolves." *Science* 321: 207-208.

List, John A. & Daniel L. Millimet. 2008. "The Market: Catalyst for Rationality and Filter of Irrationality." *B.E. Journal of Economic Analysis and Policy: Frontiers* 8/1/47.

Loewenstein, George and Peter Ubel. 2010. "Economics Behaving Badly." *New York Times* (July 14, 2010).

Lopes, Lola L. 1992. "Risk Perception and the Perceived Public." In *The Social Response to Environmental Risk: Policy Formulation in an Age of Uncertainty.* Daniel W. Bromley & Kathleen Segerson, eds. Boston: Kluwer Academic. Pp: 57-74.

Lord, Charles G., Lee Ross, & Mark R. Lepper. 1979. "Biased Assimilation and Attitude Polarization: The Effects of Prior Theories on Subsequently Considered Evidence" *Journal of Personality and Social Psychology* 37: 2098-2109.

Mäki, Uskali. 2008. "Economics." In *The Routledge Companion to Philosophy of Science*. Stathis Psillos & Martin Curd, eds. London: Routledge. Pp. 543-554.

Mäki, Uskali. 2010. "When Economics Meets Neuroscience: Hype *and* Hope." *Journal of Economic Methodology* 17: 107-117.

Mäki, Uskali, ed. 2009. *The Methodology of Positive Economics: Reflections on the Milton Friedman Legacy*. New York: Cambridge University Press.

Malthus, Thomas R. 1798. *An Essay On The Principle of Population*. London: J. Johnson.

Mantzavinos, Chrysostomos. 2001. *Individuals, Institutions, and Markets*. Cambridge: Cambridge University Press.

Marciano, Alain. 2007. "Economists on Darwin's Theory of Social Evolution and Human Behaviour." *European Journal of the History of Economic Thought* 14: 681-700.

Marshall, Alfred. 1890. *Principles of Economics*. London: Macmillan.

Mazzoni, Giuliana & Manila Vannucci. 2007. "Hindsight Bias, the Misinformation Effect, and False Autobiographical Memories" *Social Cognition* 25: 203-220.

McCloskey, Deirdre. 2011. "Ethics, Friedman, Buchanan, and the Good Old Chicago School: Getting (Back) to Humanomics." Paper presented at the meeting of the annual Summer Institute for the Preservation of the History of Economic Thought, University of Richmond (June 24, 2011).

McClure, Samuel M., David I. Laibson, George Loewenstein & Jonathan D. Cohen. 2004. "Separate Neural Systems Value Immediate and Delayed Monetary Rewards." *Science* 306: 503-507.

McKenzie, Craig R.M. & Marsha B. Amin. 2002. "When Wrong Predictions Provide More Support Than Right Ones." *Psychonomic Bulletin & Review* 9: 821-828.

McKenzie, Richard B. 2010. *Predictably Rational? In Search of Defenses for Rational Behavior in Economics*. Berlin: Springer.

McKenzie, Richard B., Paul Zak & Jessica Turner. 2010. "The Neuroeconomics of Rational Decision Making." In McKenzie (2010), *Predictably Rational?* Pp. 175-201.

Merz, Jon F. & Baruch Fischhoff. 1990. "Informed Consent Does Not Mean Rational Consent: Cognitive Limitations on Decision-Making." *Journal of Legal Medicine* 11: 320-350.

Meyerowitz Beth & Shelly Chaiken. 1987. "The Effect of Message Framing on Breast Self-Examination Attitudes, Intentions, and Behavior." *Journal of Personality and Social Psychology* 52: 500-510.

Mill, John Stuart. 1843. *A System of Logic, Ratiocinative & Inductive*. London: Parker & Son.

Mill, John Stuart. 1848. *Principles of Political Economy with Some of Their Applications to Social Philosophy*. London: Parker & Son.

Mill, John Stuart. 1859. *On Liberty*. London: Parker & Son.

Mill, John Stuart. 1863. *Utilitarianism*. London: Parker & Son.

Miller, Alan D. & Ronen Perry. 2012. "The Reasonable Person." *New York University Law Review* 87: 323-392.

Miller, Franklin G. & Alan Wertheimer, eds. 2010. *The Ethics of Consent: Theory and Practice*. Oxford: Oxford University Press.

Miller, George A. 2003. "The Cognitive Revolution: A Cognitive Perspective". *Trends in Cognitive Sciences* 7(3): 141-144.

Mirowski, Philip. 1989. *More Heat than Light: Economics as Social Physics, Physics as Nature's Economics*. New York: Cambridge University Press.

Mirowski, Philip. 2001. *Machine Dreams: Economics Becomes a Cyborg Science*. New York: Cambridge University Press.

Mitchell, Gregory. 2002a. "Why Law and Economics' Perfect Rationality Should Not Be Traded for Behavioral Law and Economics' Equal Incompetence." *Georgetown Law Journal* 91: 67-167.

Mitchell, Gregory. 2002b. "Taking Behavioralism Too Seriously? The Unwarranted Pessimism of the New Behavioral Analysis of Law." *William and Mary Law Review* 43: 1907-2021.

Mitchell, Gregory. 2003. "Tendencies Versus Boundaries: Levels of Generality in Behavioral Law and Economics." *Vanderbilt Law Review* 56: 1781-1812.

Mitchell, Gregory. 2005. "Libertarian Paternalism in an Oxymoron." *Northwestern University Law Review* 99: 1245-1277.

Moore Don A. & Paul J. Healy. 2008. "The Trouble with Overconfidence." *Psychological Review* 115: 502-517.

Morris, Christopher W., ed. 1999. *The Social Contract Theorists: Critical Essays on Hobbes, Locke, and Rousseau*. Lanham, MD: Rowman & Littlefield.

Moscati, Ivan. 2007. "Early Experiments in Consumer Demand Theory: 1930-1970." *History of Political Economy* 39: 359-401.

Mueller, Dennis. C. 2003. *Public Choice III*. New York: Cambridge University Press.

Mullane, Maggie & Steven Sheffrin. 2012. "Regulatory Nudges in Practice." Working Paper.

Newell, Allen. 1990. *Unified Theories of Cognition*. Cambridge, MA: Harvard University Press.

Newell, Allen, J.C. Shaw & Herbert A. Simon. 1958. "Elements of a Theory of Human Problem Solving." *Psychological Review* 65: 151-166.

Newell, Allen, J.C. Shaw & Herbert A. Simon. 1959. "The Processes of Creative Thinking." Santa Monica, CA: Rand Corporation, P-1320.

Newell, Allen & Herbert A. Simon. 1956. "The Logic Theory Machine: A Complex Information Processing System." Santa Monica, CA: Rand Corporation, P-868.

Newell, Allen & Herbert A. Simon. 1972. *Human Problem Solving*. Englewood Cliffs, N.J.: Prentice-Hall.

Newell, Allen & Herbert A. Simon. 1976. "Computer Science as Empirical Inquiry: Symbols and Search." *Communications of the ACM* 19(3): 113-126.

Nguyen, Leanh & Douglas Frye. 1999. "Children's Theory of Mind: Understanding of Desire, Belief and Emotion with Social Referents." *Social Development* 8: 70-92.

Norberg, Johan. 2008. "The Klein Doctrine: The Rise of Disaster Polemics." Washington, DC: Cato Institute Briefing Paper #102.

North, Adrian C., Amber Shilcock & David J. Hargreaves. 2003. "The Effect of Musical Style on Restaurant Customers' Spending." *Environment and Behavior* 35: 712-718.

Nozick, Robert. 1969. “Coercion.” In *Philosophy, Science, and Method: Essays in Honor of Ernest Nagel*, Sidney Morgenbesser, Patrick Suppes, and Morton White, eds. New York: St. Martin’s Press. Pp. 440–472.

Nozick, Robert. 1974. *Anarchy, State, and Utopia*. New York: Basic Books.

Nozick, Robert. 1977. “On Austrian Methodology.” *Synthese* 36: 353-392.

Nozick, Robert. 1981. *Philosophical Explanations*. Cambridge, MA: Harvard University Press.

Nozick, Robert. 1993. *The Nature of Rationality*. Princeton: Princeton University Press.

Nozick, Robert. 1994. “Invisible-Hand Explanations.” *American Economic Review* 84(2): 314-318.

Nussbaum, Martha C. 1997. “Flawed Foundations: The Philosophical Critique of (a Particular Type) of Economics.” *University of Chicago Law Review* 64: 1197-1214.

Oaksford, Mike & Nick Chater. 1994. “A Rational Analysis of the Selection Task as Optimal Data Selection.” *Psychological Review* 101: 608-631.

Oaksford, Mike & Nick Chater. 2001. “The Probabilistic Approach to Human Reasoning.” *Trends in Cognitive Sciences* 5(8): 349-357.

O’Connor, Timothy (2009). “Degrees of Freedom.” *Philosophical Explorations* 12(2): 119-125.

Osborne, Martin J. 2003. *An Introduction to Game Theory*. Oxford: Oxford University Press.

Over, David. 2004. “Rationality and the Normative/Descriptive Distinction.” In *Blackwell Handbook of Judgment and Decision Making*. Derek J. Koehler & Nigel Harvey, eds. Malden, MA: Blackwell. Pp. 3-18.

Park, Janng Woo & Paul J. Zak. 2007. “Neuroeconomics Studies.” *Analyse & Kritik* 29: 47-59.

Peltzman, Sam. 1973. “An Evaluation of Consumer Product Legislation: The 1962 Drug Amendments.” *Journal of Political Economy* 81: 1049-1991.

Peltzman, Sam. 1975. “The Effects of Automobile Safety Regulation.” *Journal of Political Economy* 83: 677-725.

Perloff, Richard M. 1999. “The Third-Person Effect: A Critical Review and Synthesis.” *Media Psychology* 1: 353-378.

Perloff, Richard M. 2002. “The Third-Person Effect.” In *Media Effects: Advances in Theory and Research*, Jennings Bryant & Dolf Zillmann, eds. Mahwah, NJ: Erlbaum. 2nd ed. Pp. 489–506.

Pesendorfer, Wolfgang. 2006. “Behavioral Economics Comes of Age: A Review Essay on Advances in Behavioral Economics.” *Journal of Economic Literature* 44: 712-721.

Peterson, Martin. 2009. *An Introduction to Decision Theory*. New York: Cambridge University Press.

Phelps, Elizabeth A. 2009. “The Study of Emotion in Neuroeconomics.” In *Neuroeconomics: Decision Making and the Brain*. Glimcher, Paul W., Colin F. Camerer, Ernst Fehr & Russell A. Poldrack, eds. San Diego: Academic Press. Pp. 233-250.

Philips-Davison, W. 1983. “The Third-Person Effect in Communication.” *Public Opinion Quarterly* 47: 1-15.

Pinker, Steven. 2002. *The Blank Slate: The Modern Denial of Human Nature*. New York: Viking.

Pinker, Steven. 1997. *How the Mind Works*. New York: Norton.

Platt, Michael L. & Paul W. Glimcher. 1999. “Neural Correlates of Decision Variables in Parietal Cortex.” *Nature* 400: 233-238.

Plott, Charles. 1996a. “Rational Individual Behaviour in Markets and Social Choice Processes: The Discovered Preference Hypothesis.” In *The Rational Foundations of Economic Behaviour*. Kenneth J. Arrow, Enrico Colombatto, Mark Perlman & Christian Schmidt, eds. New York: St. Martin’s Press. Pp. 225-250.

Plott, Charles. 1996b. “Comments on: Daniel Kahneman, ‘New Challenges to the Rationality Assumption’.” In *The Rational Foundations of Economic Behaviour*. Kenneth J. Arrow, Enrico Colombatto, Mark Perlman & Christian Schmidt, eds. New York: St. Martin’s Press. Pp. 220-224.

Plott, Charles R. & Kathryn Zeiler. 2005. “The Willingness to Pay - Willingness to Accept Gap, the ‘Endowment Effect,’ Subject Misconceptions, and Experimental Procedures for Eliciting Valuations.” *American Economic Review* 95: 530-545.

Politser, Peter. 2008. *Neuroeconomics: A Guide to the New Science of Making Choices*. New York: Oxford University Press.

Popper, Karl. 1959. *The Logic of Scientific Discovery*. London: Routledge.

Posner, Richard A. 1973. *Economic Analysis of Law*, Boston: Little Brown.

Posner, Richard A. 1992a. *Economic Analysis of Law*. Boston: Little, Brown & Co., 4th ed.

Posner, Richard A. 1992b. *Sex and Reason*. Cambridge, MA: Harvard University Press.

Posner, Richard A. 1998. “Rational Choice, Behavioral Economics, and the Law.” *Stanford Law Review* 50: 1551-1575.

Posner, Richard A. 2002. “Behavioral Law and Economics: A Critique.” *Economic Education Bulle*tin 42: 1-40.

Posner, Richard A. 2003. “Behavioral Law and Economics: A Critique” In *Behavioral Economics: Preference, Context and Action*. Elias Khalil, ed. Great Barrington, MA: Behavioral Research Council (AIER).

Posner, Richard A. 2010. *The Crisis of Capitalist Democracy*. Cambridge MA: Harvard University Press.

Posner, Richard A. & Andrew M. Rosenfield. 1977. “Impossibility and Related Doctrines in Contract Law: An Economic Analysis.” *Journal of Legal Studies* 6: 83-118.

Profet, Margie. 1992. “Pregnancy Sickness as Adaptation: A Deterrent to Maternal Ingestion of Teratogens.” In *The Adaptive Mind: Evolutionary Psychology and the Generation of Culture*. Jerome H. Barkow, Leda Cosmides & John Tooby, eds. New York: Oxford University Press. Pp. 327-365.

Psillos, Stathis. 2002. *Causation & Explanation*. London: Routledge, 2014.

Putnam, Hilary. 2002. *The Collapse of the Fact/Value Dichotomy and Other Essays*. Cambridge, MA: Harvard University Press.

Rabin, Matthew. 1993. “Incorporating Fairness into Game Theory and Economics.” *American Economic Review* 83: 1281-1302.

Rabin, Matthew. 1998. “Psychology and Economics.” *Journal of Economic Literature* 36: 11-46.

Rabin, Matthew. 2002. “A Perspective on Psychology and Economics.” *European Economic Review* 46: 657-685.

Rachels, James. 2003. *The Elements of Moral Philosophy*. Boston: McGraw Hill, 4th ed.

Rajan, Raghuram G. & Luigi Zingales. 2003. *Saving Capitalism from the Capitalists*. New York: Crown Business.

Ramsey, Frank P. 1928. “Truth and Probability.” In *The Foundations of Mathematics and other Logical Essays*. R. B. Braithwaite, ed. London: Routledge & Kegan Paul, 1950.

Rand, Ayn. 1964. *The Virtue of Selfishness: A New Concept of Egoism*. New York: Signet.

Rawls, John. 1999. *A Theory of Justice*. Cambridge, MA: Harvard University Press, 2nd ed.

Real, Leslie A. 1991. “Animal Choice Behavior and the Evolution of Cognitive Architecture.” *Science* 253: 980-986.

Redelmeier, Donald A. & Amos Tversky. 1992. “On the Framing of Multiple Prospects.” *Psychological Science* 3(3): 191-193.

Reder, Melvin W. 1982. “Chicago Economics: Permanence and Change.” *Journal of Economic Literature* 20: 1-38.

Ribstein, Larry E. 2006. “Imagining Wall Street.” *Virginia Law & Business Review* 1: 165-200.

Rizvi, S. Abu Turab. 2001. “Preference Formation and the Axioms of Choice.” *Review of Political Economy* 13: 141-159.

Rizzolatti, Giacomo & Laila Craighero. 2004. “The Mirror-Neuron System”. *Annual Review, Neuroscience*. 27:169–92.

Rizzolatti, Giacomo, Leonardo Fogassi & Vittorio Gallese. 2001. “Neurophysiological Mechanisms Underlying the Understanding and Imitation of Action”. *Nature Reviews: Neuroscience* 2: 661–70.

Robbins, Lionel. 1932. *An Essay on the Nature and Significance of Economic Science*. London: Macmillan.

Robbins, Lionel. 1935. *An Essay on the Nature and Significance of Economic Science*. London: Macmillan, 2nd ed.

Rosenberg, Alexander. 2008. *Philosophy of Social Science*. Boulder, CO: Westview, 3rd ed.

Rosenbloom, Paul S., John E. Laird & Allen Newell. 1993. *The Soar Papers: Research on Integrated Intelligence*. Cambridge, MA: MIT Press.

Ross, Don. 2005. *Economic Theory and Cognitive Science: Microexplanations*. Cambridge, MA: MIT Press.

Ross, Don. 2011. "Neuroeconomics and Economic Methodology." In *The Elgar Handbook of Economic Methodology*. John B. Davis & D. Wade Hands, eds. Cheltenham: Edward Elgar (forthcoming).

Ross, Lee. 1977. "The Intuitive Psychologist and his Shortcomings: Distortions in the Attribution Process." In *Advances in Experimental Social Psychology*. Vol. 10. Leonard Berkowitz, ed. New York: Academic Press. Pp. 173-220.

Roth, Alvin E. 2007. "Repugnance as a Constraint on Markets." *Journal of Economic Perspectives* 21(3): 37-58.

Rubin, Paul H. 2002. *Darwinian Politics: The Evolutionary Origin of Freedom*. New Brunswick, NJ: Rutgers University Press.

Rubin, Paul H. 2003. "Folk Economics." *Southern Economic Journal* 70: 157-171.

Rubinstein, Ariel. 1998. *Modeling Bounded Rationality*." Cambridge, MA: Harvard University Press.

Samuels, Warren J. ed. 1993. *The Chicago School of Political Economy*. New Brunswick, NJ: Transaction Publishers.

Samuelson, Paul. 1938. "A Note on the Pure Theory of Consumers' Behaviour." *Economica* 5: 61-71.

Samuelson, Paul. 1947. *Foundations of Economic Analysis*. Cambridge, MA: Harvard University Press.

Samuelson, William & Richard Zeckhauser. 1988. "Status Quo Bias in Decision Making." *Journal of Risk and Uncertainty* 1: 7-59.

Sanfey, Alan & Michael Dorris. 2009. "Games in Humans and Non-human Primates: Scanners to Single Units." In *Neuroeconomics: Decision Making and the Brain*. Paul W. Glimcher, Colin F. Camerer, Ernst Fehr & Russell A. Poldrack, eds. San Diego: Academic Press. Pp: 63-78.

Sargent, Thomas. 1993. *Bounded Rationality in Macroeconomics*. New York: Oxford University Press.

Savage, Leonard J. 1972. *The Foundations of Statistics*. New York: Wiley. 2nd ed.

Schooler, L. 2001. "Rational Theory of Cognition in Psychology." In *International Encyclopedia of the Social & Behavioral Sciences*. Neil J. Smelser & Paul B. Baltes, eds. Amsterdam: Elsevier. Pp. 12771-12775.

Schultz, Wolfram, Paul Apicella & Tomas Ljungberg. 1993. “Responses of Monkey Dopamine Neurons to Reward and Conditioned Stimuli during Successive Steps of Learning a Delayed Response Task.” *Journal of Neuroscience* 13: 900-913.

Schwartz, Hugh. 2008. *A Guide to Behavioral Economics*. Falls Church, VA: Higher Education Publications.

Screpanti, Ernesto & Stefano Zamagni. 2005. *An Outline on the History of Economic Thought*. New York: Oxford University Press.

Searle, John R. 2001. *Rationality in Action*. Cambridge, MA: MIT Press.

Sedlmeier, Peter, Ralph Hertwig & Gerd Gigerenzer. 1998. “Are Judgments of the Positional Frequencies of Letters Systematical Biased Due to Availability?” *Journal of Experimental Psychology: Learning, Memory and Cognition* 24: 754-770.

Selten, Reinhard. 1991. “Evolution, Learning, and Economic Behavior.” *Games and Economic Behavior* 3: 3-24.

Sen, Amartya. 1970. “The Impossibility of a Paretian Liberal.” *Journal of Political Economy* 78: 152-157.

Sen, Amartya. 1971. “The Impossibility of a Paretian Liberal: Reply.” *Journal of Political Economy* 79: 1406-1407.

Sen, Amartya. 1977. “Rational Fools: A Critique of the Behavioral Foundations of Economic Theory.” *Philosophy & Public Affairs* 6: 317-344.

Sen, Amartya. 1982. *Choice, Welfare and Measurement*. Cambridge, MA: Harvard University Press.

Sen, Amartya. 1987. “Rational Behaviour.” In *Utility and Probability*. John Eatwell, Murray Milgate & Peter Newman, eds. New York: Norton, 1990. Pp. 198-216.

Sen, Amartya. 2002. *Rationality and Freedom*. Cambridge, MA: Harvard University Press.

Sent, Esther-Mirjam. 2004. “Behavioral Economics: How Psychology Made Its (Limited) Way Back Into Economics.” *History of Political Economy* 36: 736-760.

Shavell, Steven 1998. “Contracts.” In *The New Palgrave Dictionary of Economics and the Law*. Peter Newman, ed. Houndmills, Basingstoke: Palgrave Macmillan. 1: 436-445.

Shermer, Michael. 2006. *Why Darwin Matters. The Case Against Intelligent Design.* New York: Henry Holt.

Shermer, Michael. 2008. *The Mind of the Market: Compassionate Apes, Competitive Humans and other Tales from Evolutionary Economics*. New York: Times Books.

Simon Herbert A. 1987. “Bounded Rationality.” In *Utility and Probability*. John Eatwell, Murray Milgate and Peter Newman, eds. New York: Norton, 1990. Pp. 15-18.

Simon, Herbert A. 1955. “A Behavioral Model of Rational Choice.” *Quarterly Journal of Economics* 69: 99-118.

Simon, Herbert A. 1956. “Rational Choice and the Structure of the Environment.” *Psychological Review* 63: 129-138.

Simon, Herbert A. 1976. “From Substantive to Procedural Rationality.” In *Method and Appraisal in Economics.* Spiro Latsis, ed. Cambridge University Press.

Simon, Herbert A. 1978. “Rationality as Process and as Product of Thought.” *American Economic Review* 68(2): 1-16.

Simon, Herbert A. 1979. “Rational Decision Making in Business Organizations.” *American Economic Review* 69: 493-513.

Simon, Herbert A. 1990. “Invariants of Human Behavior”. *Annual Review of Psychology* 41: 1-20.

Simon, Herbert. 1991. *Models of My Life*. New York: Basic Books.

Simpson, Jeffry A. & Lorne Campbell. 2005. “Methods of Evolutionary Sciences.” In *The Handbook of Evolutionary Psychology*. David M. Buss, ed. New York: Wiley. Pp. 119-144.

Skinner, B.F. 1969. *Contingencies of Reinforcement: A Theoretical Analysis*. New York: Appleton-Century-Crofts.

Slovic, Paul. 1991. “The Construction of Preference.” *American Psychologist* 50: 364-271.

Smith, Adam 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*, R.H. Campbell, A.S. Skinner & W.B. Todd., eds. Oxford: Oxford University Press, 1979.

Smith, Adam. 1759. *The Theory of Moral Sentiments*. London: Millar.

Smith, Adam. 1776. *An Inquiry Into the Nature and Causes of the Wealth of Nations*. R.H. Campbell, A.S. Skinner and W.B. Todd. Oxford: Oxford University Press, 1976.

Smith, Vernon L. 2003. “Constructivist and Ecological Rationality in Economics.” *American Economic Review* 93: 465-508.

Smith, Vernon L. 2008. *Rationality in Economics: Constructivist and Ecological Forms*. New York: Cambridge University Press.

Stigler, George J. 1961. “The Economics of Information”. *Journal of Political Economy* 69: 213-225.

Stigler, George J. 1984. “The Imperial Science?” *Scandinavian Journal of Economics* 86: 301-313.

Stigler, George J. 1988a. *Memoirs of an Unregulated Economist*. New York: Basic Books.

Stigler, George J. ed. 1988b. *Chicago Studies in Political Economy*. Chicago: University of Chicago Press.

Stigler, George J. & Gary S. Becker. 1977. “De Gustibus Non Est Disputandum.” *American Economic Review* 67: 76-90.

Sugden, Robert 1991. “Rational Choice: A Survey of Contributions from Economics and Philosophy.” *Economic Journal* 101: 751-785.

Sun, Ye, Zhongdang Pan & Lijiang Shen 2008. “Understanding the Third-Person Perception: Evidence From a Meta-Analysis” *Journal of Communication* 58: 280-300.

Thagard, Paul. 2005. *Mind: Introduction to Cognitive Science*. Cambridge, MA: MIT Press.

Thagard, Paul. 2010. *The Brain and the Meaning of Life*. Princeton: Princeton University Press.

Thaler, Richard H. 1980. “Toward a Positive Theory of Consumer Choice.” *Journal of Economic Behavior and Organization* 1: 39-60.

Thaler, Richard H. 1988. "Anomalies: The Winner's Curse." *Journal of Economic Perspectives,* 2(1): 191-202.

Thaler, Richard H. 1999. “Mental Accounting Matters.” *Journal of Behavioral Decision Making* 12: 183-206.

Thaler, Richard H. & Cass R. Sunstein. 2009. *Nudge: Improving Decisions About Health, Wealth and Happiness*. London: Penguin, 2nd ed.

Thelen, Esther & Linda B. Smith. 1994. *A Dynamic Systems Approach to the Development of Cognition and Action*. Cambridge, MA: MIT Press.

Tom, Sabrina M., Craig R. Fox, Christopher Trepel & Russell A. Poldrack. 2007. “The Neural Basis of Loss Aversion in Decision Making Under Risk.” *Science* 315: 515–518.

Tooby, John & Leda Cosmides. 1990. “On the Universality of Human Nature and the Uniqueness of the Individual: The Role of Genetics and Adaptation.” *Journal of Personality* 58: 17-67.

Tooby, John & Leda Cosmides. 2007. “Evolutionary Psychology, Ecological Rationality, and the Unification of the Behavioral Sciences.” *Behavioral and Brain Sciences* 30: 42-43.

Trebilcock, Michael J. 1993. *The Limits of Freedom of Contract*. Cambridge, MA: Harvard University Press.

Trivers, Robert L. 1971. “The Evolution of Reciprocal Altruism.” *Quarterly Review of Biology* 46: 35-57.

Trivers, Robert L. 1985. *Social Evolution*. Menlo Park, CA: Benjamin/Cummings.

Tversky, Amos & Craig R. Fox. 1995. “Weighing Risk and Uncertainty.” *Psychological Review* 102: 269-283.

Tversky, Amos & Daniel Kahneman. 1971. “Belief in the Law of Small Numbers.” *Psychological Bulletin* 76(2): 105-110.

Tversky, Amos & Daniel Kahneman. 1972. “Subjective Probability: A Judgment of Representativeness.” *Cognitive Psychology* 3: 430-454.

Tversky, Amos & Daniel Kahneman. 1974. “Judgment under Uncertainty: Heuristics and Biases.” *Science* 185: 1124-1131.

Tversky, Amos & Daniel Kahneman. 1979. “Prospect Theory: An Analysis of Decision under Risk”. *Econometrica* 47: 263-291.

Tversky, Amos & Daniel Kahneman. 1981. “The Framing of Decisions and the Psychology of Choice.” *Science* 211: 453-458.

Tversky, Amos & Daniel Kahneman. 1982. “Judgment under Uncertainty: Heuristics and Biases.” In *Judgment Under Uncertainty: Heuristics and Biases*. Daniel Kahneman,

Paul Slovic & Amos Tversky, eds. New York: Cambridge University Press. Pp. 3-20.

Tversky, Amos & Daniel Kahneman. 1983. "Extensional Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment." *Psychological Review* 90: 293-315.

Tversky, Amos & Daniel Kahneman. 1986. "Rational Choice and the Framing of Decisions." *Journal of Business* 59: 5251-5278.

Tversky, Amos & Daniel Kahneman. 1991. "Loss Aversion in Riskless Choice." *Quarterly Journal of Economics* 106: 1039-1961.

Tversky, Amos, Paul Slovic & Daniel Kahneman. 1990. "The Causes of Preference Reversal." *American Economic Review* 80: 204-217.

Vallentyne, Peter, ed. 1991. *Contractarianism and Rational Choice: Essays on David Gauthier's* Morals by Agreement. New York: Cambridge University Press.

Van Horn, Robert & Matthias Klaes. 2011 "Chicago Neoliberalism versus Cowles Planning: Perspectives on Patents and Public Goods in Cold War Economic Thought." *Journal of the History of Behavioral Sciences* 47: 302-321.

Van Horn, Robert & Philip Mirowski. 2006. "Neoliberalism and Chicago." In *The Elgar Companion of Post-War Chicago Price Theory*. Ross B. Emmett, ed. Cheltenham: Edward Elgar. Pp. 196-206.

Van Horn, Robert, Philip Mirowski & Thomas A. Stapleford, eds. 2011. *Building Chicago Economics: New Perspectives on the History of America's Most Powerful Economics Program*. New York: Cambridge University Press.

Van Overtveldt, Johan. 2007. *The Chicago School: How the University of Chicago Assembled the Thinkers Who Revolutionized Economics & Business*. Chicago: Agate.

Veblen, Thorstein. 1898. "Why Is Economics Not an Evolutionary Science?" *Quarterly Journal of Economics* 12: 373-397.

Venugopal, Rajesh. 2015. "Neoliberalism as Concept." *Economy and Society* 44: 165-187.

von Mises, Ludwig. 1949. *Human Action. A Treatise in Economics (The Scholar's Edition)*. Auburn, AL: The Ludwig von Mises Institute, 1998.

von Neumann, John & Oskar Morgenstern. 1947. *Theory of Games and Economic Behavior*. Princeton: Princeton University Press, 2nd ed.

Vosgerau, Joachim. 2010. "How Prevalent Is Wishful Thinking? Misattribution of Arousal Causes Optimism and Pessimism in Subjective Probabilities" *Journal of Experimental Psychology* 139: 32-48.

Vosniadou, Stella. 2001. *Introduction to Psychology. Vol. A: Biological, Developmental and Behaviorist Approaches. Cognitive Psychology*. Athens: Gutenberg. *[in Greek]*

Voyer, Benjamin G. 2015. "'Nudging' Behaviours in Healthcare: Insights from Behavioural Economics." *British Journal of Healthcare Management* 21(3): 130-135.

Wallis, W. Allen. 1980. "The Statistical Research Group, 1942-1945." *Journal of the American Statistical Association* 75: 320-330.

Wason, Peter C. 1966. “Reasoning.” In *New Horizons in Psychology*. Brian M. Foss, ed. Harmondsworth: Penguin. Pp. 135–151.

Wason, Peter C. 1968. “Reasoning About a Rule.” *Quarterly Journal of Experimental Psychology* 20: 273–281.

Wason, Peter C. 1969. “Structural Simplicity and Psychological Complexity: Some Thoughts on a Novel Problem.” *Bulletin of the British Psychological Society* 22: 281–284.

Wason, Peter C. & Jonathan St. B.T. Evans. 1975. “Dual Processes in Reasoning?” *Cognition* 3: 141-154.

Watson, David, David Wiese, Jatin Vaidya & Auke Tellegen. 1999. “The Two General Activation Systems of Affect: Structural Findings, Evolutionary Considerations, and Psychobiological Evidence.” *Journal of Personality and Social Psychology* 76: 820-838.

Weber, Max. 1880. *The Methodology of the Social Sciences*. Edward A. Shils & Henry A. Finch, tr. New York: Free Press, 1949.

Wedell, Douglas H. & Ulf Böckenholt. 1994. “Contemplating Single versus Multiple Encounters of a Risky Prospect.” *American Journal of Psychology* 107: 499–518.

Weintraub, E. Roy. 1993. “Neoclassical Economics.” In *The Concise Encyclopedia of Economics*. Library of Economics and Liberty. http://www.econlib.org/library/Enc1/NeoclassicalEconomics.html

Weintraub, E. Roy. 2002. *How Economics Became a Mathematical Science*. Durham: Duke University Press.

Weintraub, E. Roy. 2007. “Economic Science Wars.” *Journal of the History of Economic Thought* 29: 267-282.

Weiss Uri. 2008. “The Rationality of Irrationality.” (working paper)

White, Mark D. 2009. “Pareto, Consent, and Respect for Dignity: A Kantian Perspective.” *Review of Social Economy* 67: 49-70.

White, Mark. D. 2013. *The Manipulation of Choice: Ethics and Libertarian Paternalism*. New York: Palgrave Macmillan.

Wicksteed, Philip H. 1910. *The Common Sense of Political Economy.* London: Macmillan.

Wicksteed, Philip H. 1933. *The Common Sense of Political Economy*. Lionel Robbins, ed., Clifton NJ: Kelley, 2nd ed.

Wilkinson, Nick & Matthias Klaes. 2012. *An Introduction to Behavioral Economics*. Hampshire: Palgrave Macmillan, 2nd edition.

Wilkinson, Nick. 2008. *An Introduction to Behavioral Economics*. Hampshire: Palgrave Macmillan.

Wilson, Edward O. 1975. *Sociobiology: The New Synthesis.* Cambridge, MA: Harvard University Press.

Wilson, Timothy. 2002. *Strangers to Ourselves*: *Discovering the Adaptive Unconscious*. Cambidge, MA: Harvard University Press.

Winter, Eyal. 2014. *Feeling Smart: Why Our Emotions Are More Rational Than We Think.* Philadelphia: Public Affairs.

Workman, Lance & Will Reader. 2008. *Evolutionary Psychology: An Introduction*. Cambridge: Cambridge University Press, 2nd ed.

Wright, Joshua D. 2007. "Behavioral Law and Economics, Paternalism, and Consumer Contracts: An Empirical Perspective." *NYU Journal of Law & Liberty* 2: 470-511.

Zak, Paul J & Kwang Woo Park. 2002. "Population Genetics and Economic Growth." *Journal of Bioeconomics* 4: 1-37.

Zak, Paul J. 2007. "The Neuroeconomics of Trust". In *Renaissance in Behavioral Economics: Essays in Honor of Harvey Leibenstein*, Roger Frantz, ed. New York: Routledge. Pp 17-33.

Zingales, Luigi. 2012. *A Capitalism for the People: Recapturing the Lost Genius of American Prosperity*. New York: Basic Books.

Zouboulakis, Michel S. 2001. "From Mill to Weber: The Meaning of the Concept of Economic Rationality." *European Journal of the History of Economic Thought* 8: 30-41.

Zouboulakis, Michel S. 2014. *The Varieties of Economic Rationality*. *From Adam Smith to Contemporary Behavioural and Evolutionary Economics*. London: Routledge.