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Libertarian Paternalism in Policy Making

Empirical, Methodological and Philosophical Problems

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Nudge theory, according to its founders Richard Thaler and Cass Sunstein, is a kind of libertarian paternalism that helps people towards making choices that can improve their health, wealth and lives. The theory relies on the insights of the Heuristics & Biases research program, and the assumption that people are systematically irrational. Nudge theory has been used in several cases by both government and private administrations, in an attempt to guide individuals towards making preferable decisions, always on the basis that these decisions would be better for them. The aim of this paper is to review the relative literature of the theory's applications in both the private and the public sector, and also examine the effectiveness of its applications. Specifically, we examine examples where nudge theory has been broadly used as a policy making tool, such as in the UK, as well as in other countries around the globe. In addition to that, we present the implementations of the theory in the private sector and in particular, we discuss the concept of nudge management, that is now applied by many big organizations. Moreover, we also present applications related to the controversial field of using nudges for commercial purposes. Finally, since nudging is considered by many a controversial practice, we also investigate the ethical concerns that often arise from the interventions related to the behavioral insights and we attempt to present a critique of the theory's basic assumptions.

1. Introduction

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

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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 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, and 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, Knetsch & 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 (Meyerowitz & 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."

Later, 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” (Thaler & Sunstein 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.” (Thaler & Sunstein 2009: 10). So, a nudge “is any aspect of the choice architecture that alters people’s behavior in a predictable 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.” (Thaler & Sunstein 2009: 6). In a similar way, recently, Sunstein introduced the term “navigability” (Sunstein 2019) and declared that the inherent obstacles to it are a major source for the lack of freedom of choice.

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

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 "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. The government of New South Wales in Australia recently established a similar team.

In this paper, we will attempt to examine nudging as a policy making tool both in the public and the private sector and we will try to review their effectiveness as well as its ethical and philosophical concerns.

2. Nudging As a Policy Making Tool

The Behavioural Insights Team (BIT) or Nudge Unit of the United Kingdom was founded in 2010, by the new coalition government led by David Cameron of the United Kingdom, in an

attempt to improve government policy and services, while helping the UK's government save money. The newly formed coalition contacted Richard Thaler and proposed to him to lead the program with the help of David Halpern, who was then selected to create the Behavioral Insights Team (BIT) or Nudge Unit. It is the first organization created by a government, with the aim to gather contributions from various disciplines in the behavioral field, in order to design interventions and programs that could help individuals make better choices to their own advantage, while "using the findings of behavioral science to improve the workings of government" (Thaler, 2015).

One of BIT's first programs was related to tackling fraud, error and debt. In particular, the BIT team in collaboration with the British tax collection authority (HMRC) implemented some experiments in order to test how effectively social norms can encourage individuals to pay their tax debts on time. The methodology used was that of randomized control trials (RCTs), where at different groups of people, different interventions were applied (for example a modified letter, a changed process, a text message), while continuing to treat the one group as business per usual, in order to determine the difference in effectiveness of each of the interventions. The basic ideas underlying these trials are seven insights from the behavioral studies: make it easy, highlight key messages, use personal language, prompt honesty at key moments, tell people what others are doing, reward desired behavior, highlight the risk and impact of dishonesty. The approach that was adopted by the team showed that the effectiveness of different interventions and insights depends heavily on the context and setting and even relatively insignificant changes to processes, forms and language can have a significant, positive impact on people's compliance and can also help save public time and money. To be more specific, the simple and relatively cheap use of letters alone, resulted in "a high debt clearance rate of more than 70% of new self-assessment cases". Later, in order to further increase this metric, HMRC implemented social norms as nudging factors, so that they make the letters more effective. In particular, the BIT redesigned the letters with the goal to make them easier to understand and added sentences that highlighted the fact that most of the people pay their taxes on time, in order to see how these social norms will affect the behavior of citizens. Most of these letters contained sentences like "9 out of 10 people in Britain pay their taxes on time" (instead of "only 1 out of 10 do not pay in time") and other variations that could inform people about the fact that most of their fellow citizens actually pay their taxes on time. These

interventions resulted in a 15% point increase in payments from the group that received these modified letters, in comparison to the control one (Behavioral Insights Team, 2012).

Public health was also considered to be a high priority for the BIT, so many experiments were carried out in order to develop new policy practices that would lead to the reformation of the health sector. Statistics in the UK have shown that many bad lifestyle habits like smoking, drinking alcohol, lack of physical activity and consumption of unhealthy food contribute to an increased number of deaths (Behavioral Insights Team, 2011). The BIT in collaboration with the Health Department of the UK implemented a number of campaigns and interventions, in order to nudge people to a healthier lifestyle, with the ultimate goal to save both lives and money. For example, checklists were introduced in order to reduce errors in clinical teams. In addition to that, interventions managed to reduce DNAs (Did Not Attends), meaning missed doctor appointments by 30%, using a combination of simple behavioral approaches, like letting the patients to complete the appointment card instead of the nurse doing it for them (active commitment) and letting them know, by simple messages, that most of the people turned up promptly to their appointments .

Regarding alcohol consumption, various interventions were implemented in order to reduce harms associated with it. These interventions included price signals (larger alcohol taxation for high strength beers) and social norms, in order to increase awareness about the actual levels of alcohol consumption by others, an approach that was tested through a specific 'Drinkaware' campaign with students in Welsh universities. Among other interventions related to healthier food consumption, the BIT in collaboration with food industry partners, agreed to reduce the levels of salts in food in an effort to decrease the annual number of deaths related to strokes caused by hypertension. As stated by the BIT, this intervention could potentially save up to 4,500 lives per year (Behavioral Insights Team, 2011).

With regards to smoking, the BIT invested on campaigns promoting smoking substitutes like e-cigarettes, that remain until today the most successful alternative for people who wish to quit smoking (The Behavioural Insights Team, 2015). In addition to that, in order to help women quit smoking during pregnancy, the BIT designed stickers that were placed on pregnancy tests, containing messages that let women know about where they can seek for help.

This intervention was based on studies showing that only 45 percent of women who smoke quit spontaneously, when finding out they are pregnant and the rest of them might intend to quit, but do not have the resources or information to do so. This experiment was tested in areas with high rates of women smoking during pregnancy, but the results were not remarkable.

With regards to organ donation, the UK government had to face the fact that, while most of the people (polls suggest 9 out of 10) support organ donation, only a small percentage of them end up registering to join the NHS Organ Donor Register. In order to close the gap between intention and action, new effective interventions were implemented, and the trial testing results were impressive. In particular, the Behavioural Insights Team conducted a big Randomised Controlled Trial (RCT) in partnership with NHS Blood and Transplant (NHSBT), the Government Digital Service (GDS, who run GOV.UK), the Department for Health (DH), and the Driving & Vehicle Licensing Agency (DVLA) (The Behavioural Insights Team, 2013). The purpose of the research was to investigate how interventions could affect the cognitive bias of the status quo. To be more specific, the trial tested the effect of different messages on high traffic websites that encourages people to join the NHS Organ Donor Register. Trial testing showed that the best-performing message “If you needed an organ transplant, would you have one? If so please help others” could lead to an annual increase of 96,000 registration (The Behavioural Insights Team, 2015).

BIT achieved to also reduce the number of errors in prescribed medication in UK hospitals, by modifying the prescription charts (King et al., 2014) an intervention that aimed to protect patients from taking antibiotics that they might be allergic to. In addition to that, in order to reduce pressure on hospitals with limited capacities, they redesigned the referral websites and added features that could inform people about long waiting times at specific hospitals. These interventions led to 38% reduction of referrals to overbooked hospitals (The Behavioural Insights Team, 2017). Furthermore, the number of unnecessary prescriptions of antibiotics was decreased, due to interventions based on social norms, that informed doctors that the number of their antibiotics prescriptions was above average (Hallsworth et al., 2016).

In September 2014, the Behavioral Research Centre for Adults and Skills was founded. Its purpose was to conduct research on the education field and to come up with intervention that would help adults with low educational level to stick to new educational programs, in order to improve problems that they were facing (social exclusion, less productivity and lower income). The main issue was that in many colleges, there was a high number of attritions at key moments. After sending encouraging text messages to students, the results showed a 7 percentage point increase in attendance, in comparison to the control group. In addition to that, the team noticed that the number of students who did not continue their studies after the mid-term break, decreased by 36% in the treatment group in comparison to the control one. In addition to that, encouraging text messages were also effective in increasing the number of students applying to competitive universities by 17% (The Behavioural Insights Team, 2015).

The BIT also implemented behavioural insights, in order to support policy makers on important social issues like crime, immigration and national security (The Behavioural Insights Team, 2015). The underlying idea was that policy body cameras might be able to restore public faith in law enforcement and at the same time support policemen on their everyday duties. Experiments took place in order to evaluate the impact of body worn cameras on policemen. As the results indicated, when policemen were wearing these cameras they felt safer. In addition, it was noticed that when policemen were wearing body worn video cameras, they tend to have an average of 3.3 fewer days of absence, in comparison to those who did not (Linos et al., 2017).

The BIT also collaborated with Avon and Somerset police, in order to establish a new strategy that would result in more diversity in the police forces, in an attempt to create a multicultural law enforcement agency. Results indicated that applicants from black or minority ethnic (BME) backgrounds tend to have lower success rates at their first test, due to the “stereotype effect”. The BIT contacted a Randomised Controlled Trial (RCT) where the control group received the business as usual email, informing the candidates about the upcoming test, while the treatment group received an adjusted encouraging email. These interventions increased the success rate of the treatment group at 20% (Ruda, 2015).

In addition to the above, the Behavioral Insight Team has conducted many trials, in order to find ways to improve other important policy areas, like consumer and finance, energy, environment, sustainability and gender equality. In particular, consumers' protection has always been considered as a top priority for the BIT team and that is why numerous trials took place, in order to design policies that can offer meaningful choices and quality for consumers, particularly as they evolve in the digital age, while helping them save money (The Behavioural Insights Team, 2015).

In April 2015, the Behavioral insights Team in collaboration with the Treasury worked together for the launch of a new pension system. The new system allowed individuals to decide how they wish to spend their pension, in comparison with the old system, that obligated most pensioners to purchase an annuity with their pension pots. In order to support the new system, the BIT provided information to help citizens deal with the complexity of pension information and guidance through the decision process. The team collaborated with the UK government's Pension Wise service and through different interventions they investigated different ways of encouraging people to access the Pension Wise guidance services. The results were impressive: a tenfold increase in the proportion of savers visiting the Pension Wise website for guidance was noticed (The Behavioural Insights Team, 2016).

Moreover, the BIT applied behavioral insights in order to reduce household energy consumption. Studies showed that behavioural factors often result in overconsumption of energy, leading to suboptimal use of heating systems. The team conducted experiments in order evaluate the potential energy-saving in houses that did not have proper heating controls systems and the results indicated that smart heating controls technologies can reduce the annual household gas consumption, contributing in increasing the annual savings up to 6% (The Behavioural Insights Team, 2016).

Furthermore, in 2016 the Behavioral Insights team expanded their work on issues related to gender equality, applying behavioural insights for the prevention of gender discrimination in the workplace. Their main goal was to increase women's representation on executive boards, protect their rights for equal treatment (with schemes like the Shared Parental Leave) and minimize the gender pay gap. Although a number of interesting trials have been performed,

the results showed no significant impact on the prevention of gender inequality in the workplace (The Behavioural Insights Team, 2017-18).

To sum up, the above applications indicate the significant impact that the work of the Behavioral Insights Team has in a broad range of policy fields, including consumer and finance, energy and sustainability, health and wellbeing, education, home affairs and gender equality. The organization often highlights the fact, that it is always following its initial principle, that is using liberty-preserving approaches that can provide solutions, when an individual's behavior can lead to negative results. Over the years, the BIT has applied various interventions in many fields, conducted numerous trials and designed many programs, with the aim to gather further behavioral insights that could help individuals make better choices to their own advantage, while protecting social welfare. As a result, a great amount of literature has been produced. Nowadays, almost every government department in the UK is using behavioral insights, in order to provide efficient policies to the citizens. Just in the period 2016-2017, the BIT expanded its operations in 25 countries (including North America and Australia), conducted 163 trials in various policy areas and opened new offices in Singapore and New Zealand. In addition to that, the team has collaborated with many international organizations (like OECD, the World Bank, UNDP) in projects related to the behavioral sciences (Afif et al., 2019)

The pioneering work of the Behavioral Insights Team in the UK set the example and several countries around the world started to express an interest in behavioral economics and in particular in using nudging as a policy making tool. Many countries including Australia, Canada, Denmark, France, Germany, Netherlands, Singapore, and the United States soon followed the UK's example and established their own units. As we shall briefly see below, these units have conducted numerous trials and designed many programs similar to that of the BIT, in various policy fields.

In Australia, many government departments are now using behavioral insights in order to provide efficient policies in the public sector. In 2012, the first unit named The New South Wales Behavioral Insights Unit was established, supported by the Behavioral Insights Team in the UK. Following this, many other units were created like the Australian Securities and

Investments Commission (ASIC) Behavioral Economics Unit in the Department of the Environment and Energy (2014), the Behavioral Economics and Research Team in the Department of Health (2015), the Behavioral Economics Team of the Australian Government (2016) and the Victorian Behavioral Insights Unit (2016) (Afif et al., 2019). Until today, the Australian Tax Office, the Department of Social Services, the Australian Consumer and Competition Commission, the Department of Human Services and the Department of Jobs and Small Businesses, all have their own behavioral insights teams (Afif et al., 2019). After its establishment in 2016, the Behavioural Economics Team of the Australian Government (BETA), which is the Australian Government's central unit for applying behavioural insights (BI) to public policy, has completed almost 30 projects with over 30 partners, claiming to have delivered up to twenty-five million dollars per year in direct benefits to government (BETA, 2019).

The Danish Government, although it doesn't have a dedicated behavioral team, has also been interested in the applications of behavioral insights in many policy areas. The Danish Business Authority, the Danish Taxation Authorities, the Danish Environmental Protection Agency, the Ministry of Industry, Finance and Industrial Affairs, and the Ministry of Health are some of the government bodies that have ran projects related to the application of behavioral insights, with the support of organizations like the Danish Nudging Network, that was established in 2010 and the nudging consultancy iNudgeyou, established in 2011 (Afif et al., 2019). For example in 2015, the Danish Ministry of Taxation, with the support of iNudgeyou achieved to increase tax compliance for businesses up to 10%, while applying simple interventions (email reminders) focused on loss aversion. Many interventions have also been tested in other fields: the Ministry of Environment and food of Denmark, in collaboration with the Danish Nudging Network, have worked together in many projects that aim to reduce food waste, increase food recycling and also promote healthy options in different food categories (Hansen, 2017).

The Netherlands is another country that has applied behavioral insights in many policy areas. The Behavioral Insights Network Netherlands was established in 2014, but an interest in nudge theory and its potential impact on policy making was first noticed in 2009, when the Netherlands Scientific Council for Government Policy (WRR) published the report "The Human Decider" (Tiemeijer et al., 2009), with the aim to promote the application of behavioural insights in public policy. Until today, many trials and interventions have taken place in

different policy areas including home affair, environment, health, education and finance (Behavioral Insights Network Netherlands, 2017).

Other European countries where applications of behavioral insights took place are France and Germany. In 2013, the Secretariat-General for Government Modernization (SGMAP) in France, one of the Prime Minister's services, started to apply behavioral insights in public policy making. Until today, the SGMAP in partnership with other organizations like NudgeFrance and the consulting firm BVA, has implemented interventions related to behavioral insights in many different policy areas, including environment, health, and road safety. In 2015, Germany established its first behavioral unit within the Federal Chancellery's Directorate General for Political Planning, Innovation and Digital Policy. Since then, the team has worked on many behavioral projects related to healthcare, finance, consumer welfare and public service.

In the United States of America, the first application of behavioral insights is related to the Pension Protection Act in 2006, a legislation that resulted in the reformation of the private pension law system in USA (Urban Institute, 2015). Through this legislation, all employers were automatically enrolled in a pension plan, in an attempt to protect those who were not familiar with their retirement options. In addition to that, the law encouraged employers to offer training to their employees for their retirement preparation. The idea of the automatic enrollment was based on insights of behavioral economy, claiming that defaults rules in choices architecture can protect individuals through the decision-making process.

In the period 2009-2012, the office of Information and Regulatory Affairs (OIRA) collaborated with other government departments on projects involving the implementation of behavioral insights in effective policy making. In 2013, the first behavioral insights team was formed in the White House, in an attempt to support federal government in conducting trials and interventions in different national policy fields. In 2015, President Barack Obama issued an executive order, urging the government departments to use behavioral insights for the reformation of policy making in various fields and also established the Social and Behavioral Sciences Team (SBST), but the team is no longer active since January 2017. The SBST was a subcommittee of the National Science and Technology Council, consisting of behavioral scientists, policymakers

and civil servants across twenty-two different government departments and councils, including the Departments of Defense, Agriculture, Veterans Affairs, Health and Human Services, Education, Housing and Urban Development, Justice and Energy (Social and Behavioral Sciences Team, 2016). In 2015, a team consisting of scientists formed the Office of Evaluation Sciences (OES) within the General Services Administration (GSA). This team has collaborated extensively with SBST in many projects, offering the scientific support in applying behavioral insights across the US government. Until today, the OES continues to support many agencies while implementing interventions and trials related to behavioral insights across different sectors. Nowadays, many other states including New York, Philadelphia, and Washington, D.C. have their own behavioral insights teams, while other such as Boston and New Orleans collaborate with behavioral scientists in different national projects.

Other countries that have applied behavioral insights in the police making process are Canada and Singapore. Singapore's government has collaborated extensively with the Behavioral Insights Team of the UK since 2012 and in 2016 a new office started operations in the country. Since then, the BIT has collaborated with fifteen national agencies, including the Ministry of Manpower, the Public Services Division of the Prime Minister's Office and the Ministry of Home Affairs, in attempt to reform the policy making process into one that has a more beneficial social impact in various fields, including retirement plans, health and wellbeing, education and home affairs. The Ontario Behavioral Insights Unit, is the first behavioral insights team in Canada and was established in 2013. Since then, many others have followed: the Employment and Social Development Canada has its own team since 2014 and the Privy Council Office has established the Impact and Innovation Unit (IIU) in 2015, supporting the Canadian government in the implementation of behavioral insights across the federal level. Moreover, the Canada Revenue Agency created the Accelerated Business Solutions Lab in the same year, the Province of British Columbia Behavioral Insights Group was established in 2016 and, finally, in 2017 the Personnel Research in Action team was established by the Department of National Defence, applying behavioral insights related to the Canadian Armed Force procedures. Many projects related to the applications of behavioral economics have also been conducted in many areas across the country. All the above organizations, although they mostly work independently, often collaborate in projects across departments at the federal level and the IIU is usually leading the efforts and coordinating the processes.

In addition to the nudge units across the globe, other organizations were also established with the goal to apply behavioral insights in policy making. For example, in 2016 in Peru, the Ministry of Education created MineduLab, an innovation lab which operates in the field of education policy and supports teachers and students in everyday challenges. Moreover, the Abdul Latif Jameel Poverty Action Lab (J-PAL) is now an established research center in India, applying behavioral insights in policy making for poverty eradication. Other countries such as Mexico, Indonesia, Kuwait, Kenya, Qatar, and the U.A.E. have also explored the applications of behavioral insights in public policy, through collaborations with various organizations such as the BIT, ideas 42, the World Bank, and J-PAL.

3. Applications in the Private Sector

3.1 Nudge Management

Alongside applications of behavioural insights in the public policy making, applications of behavioral insights have also been noticed in the private sector and the concept of “nudge management” has started to attract the interest of many international private organizations. The term “nudge management” refers to a scientific managerial approach, that uses insights of behavioral economics and in particular the nudge theory in designing interventions that can help increase the knowledge worker productivity (Ebert et al. 2017). The term “knowledge worker” refers to employees, whose effectiveness and productivity relies heavily on their capability of complex decision making and judgment (Drucker 2019). In other words, the productivity of the knowledge worker of the 21st century, depends primarily on his interactions with other employees, shareholders and customers.

Increasing knowledge worker productivity has been studied by many management scholars and there are many scientific reports that indicate that in order to strengthen the potential for innovation and achieve the objectives of the organization, managers should rely on managerial approaches that focus on the optimization of fast thinking and unconscious behavior among employees (Brynjolfsson 2011). The principal idea underlying the concept of nudge management is that of the dual process theory of mind. As Elbert et al. (2017) report, most

traditional managerial approaches are focusing on an attempt to strengthen the abilities of the rational system, while most of the human's mistakes should be attributed to fails of the automated system (Ebert et al. 2017). The authors claim that the knowledge of how the human brain actually works could benefit private organizations, by providing the tools needed in order to implement the right choice architecture, with the ultimate goal to make people more efficient, productive and happier at their workplace. For example, nudge management can be a useful tool in preventing planning fallacy, which is correlated to the optimism bias and is described as the tendency to failure while managing project timelines and also to often overlook project risks. In order to prevent this, the authors suggest that employees can share their key objectives and their timelines in front of their co-workers, since this can affect the optimism bias due to the fear of failure and can also increase their commitment. In addition that, in order to reduce distracting factors in productivity, they also suggest some other interesting nudges: "no meeting days" or "work from home" days can reduce employees' distraction and result in more efficiency, and default rules like "turn off the sound effects" related to unconscious actions like checking constantly emails or social media, can also have a positive impact on task engagement.

Google is a highly representative example of a company that has applied nudge management with great results. The company's ongoing successful story relies not only on its dedication to continuous technological innovation, but also on applying innovative approaches to human management. In particular, Google is applying nudge theory in various forms to increase productivity and happiness of its employees. In contrast to a strict managerial approach, its management system focuses on the optimization of the choice architecture, in an attempt to help employees make better decisions in their workplace, to be happier and increase their productivity and their potential for innovation. As described in many popular books published by the company, different types of interventions have taken place in order to contribute to its employee's welfare (Brock 2015). For example, office architecture has been redesigned and the so called "micro kitchens" have been created, in order to help employees share their knowledge, increase brainstorming and social contact. In addition to that, food choices in the cafeteria have been architected in a way that promotes a healthy lifestyle.

Boston Consulting Group (BCG), is another example of a company that has applied interventions related to behavioral insights in order to increase its employees' work-life balance, which is now considered to be a top priority. As the firm reported, a reformation of its email system took place, in an attempt to reduce the emails sent by managers after office hours (Fetherston et al., 2017). In particular, they included a pop-up window, that reminds the sender that the email is about to be sent after working hours. As reported by the firm, these digital nudges have a great impact and can help organizational goals towards improving employee's behavioral consistency (Fetherston et al. 2017).

Default rules can also have beneficial impact on environmental protection. One example is that of Rutgers University in New Jersey (Sunstein 2008). In 2008, the university changed its default printer setting from "print on a single page" to "print on front and back." This simple default rule resulted in a decrease of paper consumption, by over fifty-five million sheets in just three years, which corresponds to a 44 percent reduction and is equivalent to saving 4,650 trees. These results indicate once again, that small and cost-effective nudges can help people in organizations make better decisions that will lead to beneficial results not only for the organization but also for the environment.

Another example is that of the British airline company Virgin Atlantic that used nudges in an attempt to make pilots reduce fuel consumption. The airline tested a series of interventions that could affect pilots' behavior. In particular, three hundred and thirty-five pilots were randomly assigned to groups, including a group that was informed through a letter that they were taking part in a study of fuel consumption. The results were quite impressive: the group of pilots that got informed about their participation in the emission study, resulted in saving up to 3 million pounds in fuel consumption and also led to a significant decrease of carbon dioxide emissions (approximately 20,000 tons) (Greer et al. 2016). This is one of the most successful implementation of behavior insights in the private sector and indicates that simple and low-cost nudges can have a great impact on both the organization and the environment.

Nowadays, the interest of incorporating insights of behavioral economics by private organizations has increased. Many reports from consulting firms can be found in literature, including Boston Consulting Group, Deloitte and McKinsey Quarterly, that take over projects related to

the transformation of business structure of big companies, based on the insights of behavioral theories (Güntner et al. 2019). As the above examples strongly indicate, the implementation of scientific proved managerial approaches, such as nudge theory, can have a major impact on employees' efficiency, productivity, behavioral consistency and can also contribute to individuals' wellbeing in their workplace, while at the same time satisfying the company's objectives.

3.2 Nudging Customers

In the context of public policy making and when facing challenges related to fields like healthcare and environmental protection, nudge theory and behavioral insights are almost generally accepted as beneficial tools, that can help increase optimum behaviors, through the implementation of the right choice architecture. In addition to that, as mentioned above, using nudge theory in people's management, can also lead to great results related to people's productivity and wellbeing in their workplace. In this part, we will shortly discuss the applications of the theory in a controversial area, that is using nudges for commercial and marketing goals. The approaches used in the private sector are quite similar as in the public sector, but the objectives can be quite different.

Since the rise of behavioral economics and the spread of nudge theory, many enterprises around the world have adopted new marketing policies, that use behavior insights with the goal to nudge people towards making certain choices. Nudge marketing takes advantage of individuals' mental shortcuts and biases, by changing the choice architecture in a way that can influence an individual's behavior. One example is that of default rules that are widely used in the controversy marketing approach named "negative option marketing" (NOM). The idea underlying this marketing approach is that consumers need to take action in order not to buy or stop using a product or service (Licata et al. 2007). In case the consumer does nothing, that is equivalent to a silent agreement. This method takes advantage of cognitive bias like status quo and inaction, in order to somehow "manipulate" individuals to desired actions (Sunstein 2013). Examples include cases such as magazine annual subscriptions, where the customer is automatically re-subscribed to another year of membership, unless he takes action (request to unsubscribe) , or free trial memberships to online websites, where

customers get charged after the trial period, without being asked if they wish to do so (VonBergen et al. 2016). The above approaches highlight the fact that nudges that are profitable for firms can have a negative impact on consumers' welfare.

Despite the ethical concerns that arise from the above applications of behavioral insights in the private sector, there are numerous studies that present some "beneficial nudges", in the sense that there are cases where the desire of profit maximization in an enterprise, can also be aligned with consumer's benefit. One example is described by Kroese and others, who conducted an experiment in Dutch train station stores (Kroese et al. 2016). In this experiment, researchers tried to investigate whether the way the food options are displayed to customers can actually affect their choices. In particular, there were two experimental groups: in the first group, healthier food choices were displayed close to the cash desk, while on the other experimental group, the layout of the healthy food choices was the same, but there were also signs, containing messages that informed people about the importance of adopting a healthier lifestyle. Researchers wanted to find out, if the fact that people knew that they were being nudged, affected their choices. The results showed that customers' purchasing patterns were significantly healthier, when healthy food options were more visible in both groups. In addition to that, letting people know about the fact that they were being nudged, showed no negative results and, in fact, people stated that they appreciated the effort.

In another example, hotels used behavioral insights in order to nudge customers towards reusing towels in hotel bathrooms, in an effort to reduce both expenses related to laundry and environmental waste. In an experiment that took place in the 4-star hotel TUI Magic Life, two different groups of customers were encouraged by small cards to reuse their towels (Rapp 2017). In the first group, the message was informing customers about the positive environmental impact of reusing towels. In the second group, the message was adjusted with the hope to nudge customers towards the preferable behavior by using the force of habit. In particular, the message was "Reuse me again tomorrow. Just like at home." The results were very promising: the rate of reused bath towels increased in both scenarios, and even more impressive is the fact that, in the second group, the percentage was even more: 49.4% in comparison to 38.6% in the threat scenario. On an annual basis, these results correspond to a reduction of 129,000 litres of water consumption and 1,676 decrease in carbon dioxide emissions.

4. A Critique of Nudge Theory

4.1 The Relationship Between Psychology and Economics

Economics and the study of mind and behavior (which in more recent centuries has been called “Psychology”), have been interacting for a long time. 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 them both and the relationship between them. Through time, the economic model of behavior has been influenced by specific ideas from psychology that culminated in the emergence of the interdisciplinary branch of Behavioral Economics and its criticism of the orthodox neoclassical economic model.

However, 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 does². 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, the Heuristics-and-Biases program (henceforth H&B), is about a particular research agenda (the study of logical errors 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

² 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).

several fundamental theoretical approaches (such as the computational model, the connectionist model, etc.). This is one of the reasons that there is a substantial amount of criticism against H&B which comes directly from other branches of behavioral sciences and which is little or not at all known to economists (Jones 2019). Here, we will attempt to illuminate some aspects of these other contributions of psychology to economics, which are many and sometimes especially critical to the narrow field of H&B, and to suggest that the field of Behavioral Economics should adopt a broader perspective.

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: 6), “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, 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 psychological issues 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, this ability has been found to exist in small children and even some animals (Nguyen & Frye 1999; Astington & Edward 2010; Call & Tomasello 2008).

Not surprisingly, economic theory employs this simple “common sense” theory to its basic psychological assumptions concerning the economic agent. An agent’s actions and choices are caused by her preferences and the goals she tries to achieve, based on her beliefs about the world and other people. In fact, rational choice theory (RCT) 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: 80). However, according to the instrumentalist view, RCT 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 indispensable 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 Menoecus: “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.”. Hedonism influenced many scholars of economics in the 18th and 19th centuries and especially the marginalists in the formation of the maximization utility model (Drakopoulos 1991; 1994). Bentham (1789) articulates this view in the beginning of his book *The Principles of Morals and Legislation* by declaring that pain and pleasure “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, 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): "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.' [...] 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 (Wilson 2002; Hastie & Dawes 2010). But his major contribution to behavioral sciences, that applies even today, was the discovery of the subconscious. 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.

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 consumers’ 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 condition that these choices are consistent in order to be rational (Rosenberg 2008: 87).

Although “Revealed Preference Theory” received sufficient criticism, it is still incorporated, in various degrees, in today’s economic 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, 2006; Hindmoor 2006). But economists argue 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. The economic model is primarily concerned with how ends are achieved and not how these ends have been 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 asserted 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 “Revealed Preference Theory” is based on firm 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 most 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. 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 is 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” and the H&B research program that it launched: the documentation of a number of cognitive errors that occur when decision-making is tested against formal models of rationality. We will not describe this in any more detail, as it is a well-known and established branch of Behavioral Economics. But the relationship of psychology and economics does not end with the H&B program. There is more to it than most economists acknowledge or are aware of.

4.2 Evolution, Brain and Decision Making

It is apparent that any theory of decision making should include and explain the presence of cognitive limitations as much as the learning capacities and the power to correct mistakes. This can never be accomplished without 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 integrated 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.

Most people interested in this discussion believe that economics is at odds with the insights of evolution because they think that the former fails to incorporate evolutionary tendencies like cooperation, sympathy or fairness. They usually describe the abusive or aggressive behavior of big corporations or their CEO's as illustrative examples of what economic theory dictates. But this only constitutes another big misconception about economics. First, because economic science is not responsible for and does not identify with the strategies of big corporations and businesses, no more than biology identifies with the unhealthy choices of individuals or genetic mutations that bring about negative outcomes to their carriers. Economics can explain and predict, though, how certain strategies may work out. Second, because economic theory never actually modeled "selfish" individuals with the single preference to maximize money. Instead, mainstream economic models are able to incorporate many behavioral traits, like other-regarding preferences, altruism and so on, by simply adding them in the utility function of the individual and attributing the appropriate values for each ranked preference. We will attempt to show here how the insights of evolutionary theory can be more at odds with the behavioral models suggested by the H&B program.

But economics and biology have encountered each other long before these contemporary discussions (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). Appreciating Malthus' ideas, Darwin admitted in his autobiography that he

was directly influenced by them.³ 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).

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 the H&B’s assumptions of global 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 H&B 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 standard model under his framework, he has consistently explained away many claims of Prospect Theory. Gintis, like many scientists who work in the fields of cognition and behavior, does not accept the general assertion of H&B that humans are systematically irrational or illogical because “this conclusion is badly at odds with what we know about evolution and cognitive capacity” (Gintis 2012: 229).

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

³ Darwin writes in his memoirs: “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.” (Darwin 1887)

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. 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.

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).

Decision making is a complex process and it should always be investigated within the complexity of its environment. This 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 – despite any genetic predispositions.

This is an important insight that was particularly and consistently emphasized by the pioneer of Behavioral Economics, Herbert Simon. 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). 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). Unfortunately, proponents of the H&B program, more often than not, forget about the second blade of Simon's scissors, the determining role of the environment. Particularly learning processes are systematically being ignored or trivialized by H&B behavioral economists (Kahneman 2011: 417).

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 decision theory and the empirical data of behavior. Rational Analysis assumes that the impressive success of everyday decision making is based on formal models and Bayesian probabilistic standards, challenges the view that humans are systematically 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 (Chater & Oaksford 1999; 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.

A similar, 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 actual 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.

4.3 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 H&B.

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 H&B 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. 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 socio-economic world (Smith 2008: 9). A substantial amount of research from other experimental economists as well show that many of the systematic biases that are demonstrated by H&B experiments, like preference reversal, the endowment effect, loss aversion, inequity aversion in ultimatum games, etc., tend to disappear when the framing of tasks is altered or when a little more time, real motivation, proper training, more information or experience through repeated games and transactions are offered (Chu & Chu 1990; Cox & Grether 1996; Plott 1996; Plott & Zeiler 2005; Smith 2008; Ert & Erev 2007, 2008; Grimm & Mengel 2010).

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 H&B, 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 H&B program for decades.⁴

⁴ See selectively, Gigerenzer 1991, 1993, 1996, 1998, 2005, 2007a, 2007b, 2008, 2015b; Gigerenzer, Hell & Blank 1988; Gigerenzer & Hoffrage 1995; Gigerenzer, Hoffrage & Kleinböling 1991; Gigerenzer & Murray 1987; Gigerenzer, Swijtink, Porter, Daston, Beatty & Krüger 1989; Gigerenzer & Golstein 1996; Gigerenzer, Todd & ABC Research Group 1999; Hertwig & Gigerenzer 1999; Gigerenzer & Selten 2001; Gigerenzer & Brighton 2009; Gigerenzer & Gaissmaier 2011.

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 decision making.⁵ Ecological rationality, therefore, is about the rationality of outcomes and not mechanisms, since bounded cognitive mechanisms can produce optimal outcomes when the appropriately evolved cognitive mechanisms utilize the structure of the environment to solve adaptive problems.

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. 2014).

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

⁵ See selectively, Cosmides & Tooby 1992, 1994a, 1994b, 1996, 2005; Tooby & Cosmides 1990, 2007, Pinker 1997, 2002.

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 H&B experimental results 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 decision making 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 decision making 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 easily provide 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 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.”

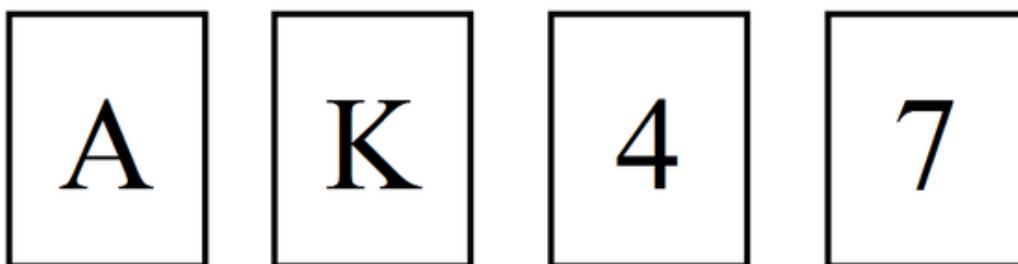


Figure 1. Wason Selection Task

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 because one of the biggest problems 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 & Spoons 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 heuristics 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 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 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.⁶

A very important cognitive bias, that H&B proponents have illustrated 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 staff at the Harvard Medical School were asked to answer the following diagnosis problem:

⁶ Or even “better than rational” as Cosmides & Tooby (1994a) characterize their behavior.

“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?”

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). The evolutionary part of the argument makes it unlikely that such blocks of 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 "conjunction fallacy" is 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).

Similar 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.⁷

Gigerenzer (2008) and other researchers of ecological rationality or critics of H&B, have long argued that the latter’s argument of mental limitations are mere ad hoc labels to a number of phenomena for which they cannot predict the conditions under which the relative 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 global 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.

⁷ 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 as, for example, in the case of AI, when one needs to 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).

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 a flying 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; 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 H&B program.

In their original experiment, Goldstein and Gigerenzer (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.

The purpose of this kind of research is not of course to rationalize every behavior or deny the existence of cognitive limitations and errors. Instead, evolution helps us understand the true function of things that otherwise seem incomprehensible or even irrational and can reveal new ways to improve our behavior and enhance our decision making abilities.

4.4. Neuroeconomics, Learning and Emotions

The brain is a product of evolution and natural selection. Through a very long period of genetic mutations and environmental adaptations, specific conscious and unconscious cognitive mechanisms were selected because they very often resulted in 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 division of labor, 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. Decision making in the brain 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 (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 usually 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.

The psychology of learning is a very broad field in behavioral sciences and neuroscience has contributed a lot to our understanding of the brain and cognitive learning mechanisms. For the specific purposes of this paper we will only mention that a substantial amount of research suggests that many of our cognitive biases can be sufficiently mitigated with the appropriate training in children and adults alike (Fong et al. 1986; Nisbett 2009; Gigerenzer 2014b). Furthermore, a lot of this research, inspired by the evidence that we presented in the previous section, focuses particularly on the statistical education of doctors and patients (Gigerenzer & Hoffrage 1995, Gigerenzer 2010; 2014a; 2015a) or the enhancement of economic education at schools (McKenzie 2010: 265). So, people can be assisted in their decision making, either by having the choice environment changed toward a more "mind-friendly" structure (e.g. changing a single-probability problem into a frequency format) or by receiving the proper training.

As far as emotions are concerned, Plato's belief that passions are irrational and harmful and always contrary to reason has influenced our conception of feelings through the centuries. 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).

Contemporary research of emotions in decision making, and thus very influential to neuroeconomics, was initiated with the groundbreaking work of Antonio Damasio and his colleagues⁸ 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 rational decision making. His findings were very important because they linked, for the first time, behavior in economic decision making with brain functions and emotions.

⁸ See selectively, Damasio 1994; Damasio 1996; Bechara et al. 1997; Bechara & Damasio 2005.

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. When seen under this light, it is obvious that emotions are absolutely necessary for deliberation (Mameli 2004).

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, performing a sort of cost-benefit and risk analysis through the reward and fear associated mechanisms (Platt & Glimcher 1999; McClure et al. 2004; Knutson & Peterson 2005; Glimcher et al. 2005; Park & Zak 2007; Knutson & Bossaerts 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.

5. Ethical Discussion and Conclusions

As expected, this approach to behavioral change (nudging) is something that has faced harsh criticism, as it is based on the highly controversial premise that people systematically may make poor economic decisions due to inherently cognitive restrictions. In any case, arguments against the theory's basic scientific assumptions can easily be supported or refuted by the empirical data and sooner or later, behavioral scientists will be able to reach precise conclusions and enrich their practices with the accurate scientific insights. However, the main reason why most academics and public commentators argue against this practice is due to the political, practical and most of all ethical implication of nudging. Critics support that nudging manipulates people's choices, restricts freedom and thus the term "Libertarian Paternalism" is an oxymoron.

The main argument that libertarian paternalists use in order to reinforce their position, is that nudging is used in an effort to improve people's behaviors, leading them to make better decisions for themselves and/or their society. The main question that arises at this point, is how is it possible to judge what would be in the people's best interests? In many cases, people have not even thought too much about their preferences, much less express them. Moreover,

even when people are asked about their preferences or opinions, their answers could be biased based on the choice architecture and the way their choices are presented. As a result, even if we accept that the theory is correct and that people are not inherently rational, there is no empirical data to support that the choice architects (being irrational human beings themselves) are able to nudge people towards making the right decisions.

Nevertheless, even if we assume that libertarian paternalists are more rational and capable than individuals, this does not mean that they know people's real preferences and subjective goals, the realization of which can contribute to their general welfare. Some goals may seem objectively good and legitimate, but that does not mean that these are the goals that everyone pursues for their happiness and wellbeing, nor that they are the only goals that each person sets for himself at any given time. As Mark White (2013) states, the issue of health for example, is a multidimensional one. One may be interested in improving his muscle strength but not his cardiovascular condition, or someone else may smoke but at the same time he might struggle to maintain an ideal body weight. If an intervention is designed with the aim to help this individual quit on smoking, it is likely to result in overeating and eventually in weight gain, so another intervention should be designed in order to deal with that.

Another strong argument against this practice is that libertarian paternalism cannot be differentiated from other forms of paternalism, since it also encroaches the individual's autonomy, when the libertarian paternalist tries to replace the individual's idea of what is good with his own one (White 2013). On the other hand, libertarian paternalists claim that nudging is not another form of mandates and bans and thus their method does not limit people's freedom. As a result, they claim that since individuals are always free to dismiss anything, their approach to behavioral change is a liberty preserving one. However, as the critics argue, the underlying idea of this approach is based on the fact that people are not hyper-rational beings and that they can be easily manipulated. This means that we can not state that people have the ability to reject an intervention easily or even at all (Hansen et al. 2013).

Even Thaler and Sunstein do not ignore the possible "bad" applications of their theory. That is why, they are strong advocates of transparency. As Sunstein states, it is very important for choice architecture to be governed by transparency, so that people can be aware of any kind

of interventions that might take place, so that they can review them and decide whether there are beneficial or no. The problem is that, unfortunately, nudges vary in kinds and levels of transparency, and for someone to detect, observe and analyze them is an extremely difficult task (Yeung 2012). Hansen and Jespersen (2013) argue that transparency and monitoring is not always feasible in some nudges, that the authors claim to be ethical. They claim, that if transparency is relying on the principle of visibility, then many nudges that are described as ethical by the authors, could not be considered as so. One example would be that of using stripes at the beginning of dangerous curves on the road, in order to create “a sensation that driving speed is increasing”, or the default rules related to organ donation. The critics argue that these kinds of interventions are neither visible nor easy to monitor and should thus not be acceptable by Thaler and Sunstein as ethical.

In addition, Hausman and Welch (2010) wonder what kind of intervention can be considered as the greatest threat to an individual’s freedom and autonomy. Is it the case of subconsciously leading an individual’s behaviour to preferable choices without him even realizing or wanting it (nudging), or is it the case of being punished for a behaviour he consciously decided to choose? In the case of the state, these kind of interventions that are based on subconscious manipulation, combined with lack of transparency and an unclear agenda of interventions (even if the citizens have given their hypothetical consent to their government), can easily lead to practices of hard paternalism. After all, no one can guarantee that every government that comes to power will maintain the same notion of "good" and use these practices wisely.

Libertarian paternalists argue that nudging is an inevitable fact in people’s lives since the choice architecture of a decision-making context is something that can greatly influence our behavior and ultimately our decision. They argue that it is something that happens, even if the choice architecture is completely random. Considering that, they conclude that since nudging is an unavoidable fact of our everyday decisions, it is unreasonable to try and take measures to avoid it (Thaler & Sunstein 2009). On the other hand, as Hansen and Jespersen (2013) claim, it would be wrong to ignore the issue of intentionality. While it may be true that we are being unintentionally nudged by the condition and choice architecture, ethically speaking, is it the same thing as being intentionally manipulated to make a certain decision?

For example, in cases where there is the opt-in / opt-out option (I choose to participate or I choose not to participate in something), the default choices made by the architects determine people's behaviors. And that is because the citizen may not pay much attention to the fact that there is a default choice that binds him to something, or maybe he does not understand all the dimensions of this option, and while there will always be the option to change it, due to the status quo bias, most individuals will probably not try to.

Let's take for example organ donation. In several European countries, in an attempt to increase the rates of organ donation which are still significantly low, citizens are automatically registered as organ donors. If citizens wish not to be considered as organ donors, they have to opt-out. Psychologists Johnson and Goldstein (2004) analyzed data from these countries and found out something really interesting: when consent is taken for granted, the rates of organ donors are very high, and in countries such as Austria, Hungary, France and Poland, the rates reach over 99%. However, actual organ donation in these countries has increased only by 16.3% over a ten-year period, a difference that researchers attribute to various causes, such as the fact that many citizens theoretically agree on organ donation (they stay stick to the initial default option), but when the time comes to donate, they refuse to so do, or because of the complicated procedures required to sign the final agreement papers by other family members.

The effectiveness of this measure, however, is not the only issue that arises. There are other important ones that are involved and may be even more serious, such as the idea that a person's body belongs by birth to the state and that each one of us should act and ask to be exempted from such rules, in order to acquire the right of self-determination. Critics worry that in a society where citizens' self-determination is not respected and the state does not seek for citizens' explicit consent to such serious issues, abuse of power can easily thrive, and further restriction of people's freedom can take place.

Something worth mentioning here, is that people can learn from their mistakes and self-correct similar behaviors in the future. As Klick and Mitchell (2006) argue, such paternalistic approaches have a moral and "cognitive" risk, since individuals may lose their motivation to act consciously and carefully (high level of motivation contributes to cognitive errors mitigation).

In addition to that, these interventions prevent individuals from searching and processing complex information and investing in their personal education, which are all very important processes for the development of strategic thinking.

Education, in particular, is a very powerful tool when it comes to beating cognitive limitations. Numerous studies have showed that many of our cognitive deficits can be mitigated with proper education and practice in both young people and adults (Fong et al. 1986; Nisbett 2009; Gigerenzer 2014b). For example, many researchers argue that while Bayesian probabilities are considered difficult to be understood by both experts and non-experts, if the same problems are presented as statistical ones (which are closer to human perception according to the ecological rationality), the rates of understanding and problem-solving can be significantly increased. Similarly, other researchers argue that investing in economic education in schools can help people overcome financial illiteracy and consolidate economic terms that are often used in daily basis, such as the opportunity cost, supply and demand, etc. (McKenzie, 2010).

It is clear by now that Behavioral Economics, i.e. the contribution of psychology and behavioral sciences to economics, is a much broader field than the H&B program. 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 better decision makers than H&B economists describe them. Although these approaches can be different, they all challenge the assumptions and findings of H&B program and adhere to models and theories either of an optimizing/maximizing form of decision making or of a form of bounded rationality. More importantly, H&B, 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 decision making 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 effective decision making, 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). However, we can't help but recognize how heuristic mechanisms are seen by different researchers. 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 behavior. 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.

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 the H&B program. Because once they do, it becomes clear that, although people can indeed deviate from normative decision making models in some instances, many cases of the "biases" and "fallacies" are due more to this program's experimental framing, 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 three, 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 to their agenda 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.

To conclude, even though the proposed model of human decision-making is not perfect, the fact that there is a vast literature of applications of the nudge theory in both the public and private sector is quite promising, since this indicates that both public and private organizations are becoming more interested in incorporating scientific insights into their operations. In addition to that, through the vast literature of applications, there were many cases where the idea that nudges can potentially have a positive impact in people's lives came to our minds, as for example in the private sector where we analyzed the concept of "nudge management", which can be considered as a more human-centered design approach in people's management. Nevertheless, we should always take into consideration two very valid points: First of all, until today, it is widely accepted that there is not such a theory that can sufficiently explain human behavior. That means that the H&B program is one of the many theories that try to explain the decision-making process, and as a result, further examination needs to take place in order to reach more accurate conclusions. Secondly and most importantly, there are many ethical concerns that arise when dealing with any form of manipulation of choice, even in the case of nudge theory, where the motives are always presented as pure ones by the libertarian paternalists.

The fact that humans make mistakes cannot be disputed by any behavioral scientist. The point is, that these mistakes have their usefulness since people can learn from them, correct their behavior, improve their skills and achieve their goals. As a result, we should take into consideration that libertarian paternalism cannot be considered neither the only available policy-making tool in the private or the public sector, nor the most effective one. Other practices

such as providing objective information to the people, investing in appropriate education, using rational persuasion and, of course, adopting a policy of transparency, could definitely assist policymakers in trying to improve people's lives and help them make the best decisions for themselves, while maintaining their freedom and autonomy, which are the most valuable human rights.

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