

IMAGES OF DIFFICULTY

Ana Narciso Costa*

ISCTE-IUL/DINÂMIA'CET, PORTUGAL

ABSTRACT

The difficulty of choice refers to the effort involved in the process of deliberation whenever the agent is confronted with a set of alternatives whose consequences are evaluated in a multidimensional space of incommensurable and conflictive values. Tension stemming from the conflict between values (or ends) and reluctance to trade off those values against each other is the source of difficulty. The distinction between a computational and a moral aspect of difficulty is drawn with the support of empirical evidence from psychology and neuroscience research. This research shows not only that individuals spontaneously operate a distinction between non-moral and moral dilemmas, but also that the neural patterns observed during actual decision-making processes are different and dependent on the non-moral or moral coloring of the choice situation. Moreover, this research shows that neural patterns vary across different sorts of moral dilemma. The paper further argues that those advances are putting the neoclassical economics rational choice model under pressure.

Received on: 25th-Apr -2012

Revised on: 12th-June -2012

Accepted on: 11th-Aug -2012

Published on: 2nd-Apr-2013

KEY WORDS

Difficulty of choice; Moral difficulty; Values conflict; Moral dilemmas; Taboo tradeoffs; Tragic tradeoffs

*Corresponding author: Email: ana.costa@iscte.pt; Tel: +351-217903000; Fax: +351-217940042

[1] INTRODUCTION

The difficulty of choice refers to the effort involved in the process of deliberation whenever the agent is confronted with a set of alternatives whose consequences are evaluated in a multidimensional space of incommensurable and conflictive values (see Costa [1]). Tension stemming from the conflict between values (or ends) and reluctance to trade off those values against each other is the source of difficulty.

Behavioral sciences, especially cognitive and social psychology, neurosciences and behavioral economics (see for example Tetlock *et al.* or Greene *et al.* in [2-13]), and philosophy (see for example Dewey or Nussbaum in [14-24]) have recognized the difficulty of choice as a pervasive feature of human decision making.

In contrast, for the neoclassical economics rational choice model, commensuration is assumed as a precondition for choice, and choice as evidence of the overcoming of the conflict between values (or ends) through commensuration. In fact, rationality is conceived in neoclassical economics as consistency of choice: a choice is rational to the extent that the agent facing a set of alternatives and another set of consequences of those alternatives is able to articulate preference relations between all pairs of alternatives (completeness) and the resulting preference ordering is transitive. It may be inferred from completeness and transitivity, that there is a preference index (utility function). Utility is thus a unique and abstract measure to which the multiple dimensions of evaluation of alternatives may be reduced and choice involves only a value maximization problem. A crucial implicit assumption of the neoclassical

economics rational choice model is the reducibility of all value dimensions to a single common measure, that is, commensurability of value. Accordingly, in the case of conflicts between values, rationality would always demand that concessions in one dimension might be compensated by gains in other(s) along the surface of an indifference curve.

Alternatively, it could be argued that individuals do choose, but they frequently choose with difficulty, and that choice may also be interpreted as evidence of the possibility of overcoming conflict without relying on commensuration (see Costa and Costa and Castro Caldas [1, 25]). Faced with difficulty, individuals may simply refuse to make a choice which requires the establishment of tradeoffs infringing normative concerns; they may experience moral outrage by the mere contemplation of those tradeoffs (see for example Lichtenstein, Gregory and Irwin or McGraw and Tetlock in [26, 7, 2, 5]). Moreover, individuals make choices that deviate from the predictions of the neoclassical economics model of human action. In face of difficulty, individuals often resort to heuristics evoked to cope with value conflicts and value compositions (see Gigerenzer and Gigerenzer and Selten [12, 27]).

Difficulty has both computational and moral aspects. Computational difficulty was described by Simon [28] as a situation in which the individual "may be trying to implement a number of values that do not have a common denominator – e.g., he compares two jobs in terms of salary, climate, pleasantness of work, prestige, etc.". Computational difficulty is part of what led Simon to the concept of bounded rationality. Given difficulty, the individual is compelled to resort to

heuristic choice procedures, such as choosing the first alternative satisfying aspiration levels, one for each value dimension.

Moral difficulty, which Simon did not consider in his 1955 paper, has the same absence of a “common denominator” to all values in common with its computational counterpart. However, while the second type of difficulty stems from the incapacity to establish the numerical tradeoffs allowing the one-dimensional reduction of the multiple values, moral difficulty is instead a consequence of the dissonance or tension resulting from any attempts at determining these same tradeoffs.

Evidence of a more precise distinction between computational and moral difficulty has been gathered by psychology, mainly cognitive and social psychology, and neuroscience research. On one hand, this research suggests that individuals tend to spontaneously identify the distinction between these two types of difficulty – computational and moral difficulty – and, on the other, that the neural correlates observed during actual decision-making processes are different and dependent on the non-moral or moral coloring of the choice situation. Moreover, the neuroscience research shows that neural patterns vary across different sorts of moral dilemma.

The paper addresses these developments in psychology and neuroscience research with the aim of showing that they are putting the neoclassical economics rational choice model under pressure. It further argues that these advances may indeed cause shifts in the ontology of the individual underlying the neoclassical economics rational choice model. This is not to suggest that economics, or any other social science for that matter, must have a biological foundation. Nevertheless, economists must at least come to terms with the implications of these advances in psychology and neuroscience research; dissonant ontologies across fields of knowledge might be a source of intellectual discomfort.

[II] THE DIFFICULTY OF CHOICE: INSIGHTS FROM PSYCHOLOGY AND NEUROSCIENCE RESEARCH

2.1. Psychology research on the difficulty of choice

In the realm of psychology, Tetlock’s and colleagues work has been exploring the reactions in experimental studies of individual participants to different types of transaction: “routine tradeoffs”, in which a money counterpart is given for goods and services typically exchanged in the market (for instance, paying someone to clean my home, buying a house, buying food, paying a doctor to provide medical care for me or my family, and paying a lawyer to defend me against criminal charges in court), “taboo tradeoffs”, in which a money counterpart is given for goods and services not usually

exchanged in the market (for instance, buying and selling of human body parts for medical transplant operations, of surrogate motherhood contracts, of adoption rights for orphans, of votes in elections for political offices, of the right to become a U. S. citizen, of the right to a jury trial, of sexual favors (prostitution), of someone else to serve jail time to which the buyer had been sentenced by a court of law, and paying someone to perform military service which the buyer had a draft obligation to perform), and “tragic tradeoffs”, in which equally important values conflict with each other (see Tetlock *et al.* [2]).

In one of the experimental studies, participants have to assess “routine” and “taboo tradeoffs” by allowing or disallowing each one, by morally approving or disapproving these transactions and by describing the emotional reactions that these transactions have triggered in them (see Tetlock *et al.* [2]). This experimental study aims to show that while “routine tradeoffs” are deemed acceptable by individuals as they do not trigger any kind of emotional reaction and moral outrage, “taboo tradeoffs” give rise to expressions of indignation and to emotional stress in the participants.

The other experimental situation implemented by Tetlock *et al.* [2] aims to compare the reactions of spectators to the decisions of a hypothetical health care decision-maker who is faced with a tragic choice between the lives of two patients, or with a transaction that presupposes a monetary valuation to a patient’s life. The participants in the experimental study have to assess the decision of the health care decision-maker and describe their own feelings about this decision. Participants also have to consider whether or not if the health care decision-maker should be removed from his job and, if the health care decision-maker was a friend of theirs, whether or not the friendship would end if they knew the decision he made.

In the tragic choice situation, the health care decision-maker is faced with two children who need a liver transplant. Due to the shortage of organs, one of the patients must be chosen. The participants (spectators) in the experimental study are informed of the duration of the hypothetical deliberation process. In this tragic choice situation, the longer deliberation was interpreted as revealing awkwardness stemming from the fact that the consequences of the choice are always detrimental whatever the option taken by the hypothetical health care decision-maker.

In the other situation (“taboo tradeoff”), the health care decision-maker has to decide whether to allow a liver transplant (for a child), or if the monetary resources needed should be allocated to other needs in the hospital (for instance, the acquisition of better equipment, or raising salaries to recruit talented doctors). It is now shown that the longer the deliberation, the worse the evaluation of the health care decision-maker, even if at the end he authorizes the liver transplant. In this situation, a longer deliberation process is

seen as revealing the admissibility of this type of tradeoff. The mere consideration of the sacrifice of a life in exchange of greater efficiency is perceived as being corrosive of the importance and the meaning of a sacred value (life), even if in the end the alternative chosen still upholds that value.

2.2. Neuroscience research on the difficulty of choice

The neurosciences provide several studies which try to identify the neural correlates of moral judgment and the interaction between the brain regions most directly involved in processing emotions and cognition. Some of these experimental studies contrast different dilemmatic situations – moral and non moral –, as well as different types of moral dilemmas. The studies converge in the identification of the neural correlates of moral emotions and cognition: the frontal lobe (more specifically the Brodmann area (BA) 9/10), the orbitofrontal cortex ((BA 10/11/25), the superior temporal sulcus (BA 39), insula, the posterior and anterior cingulate cortex (BA 24/31/32), the parietal lobe (BA 7/40), the dorsolateral prefrontal cortex and the ventromedial sectors of the prefrontal cortex (see for example Damásio or Adolphs in [29-33], or Greene *et al.* or Koenigs *et al.* in [3, 6, 11, 4, 8]). Additionally, the limbic regions which include the amygdala, the hypothalamus and the thalamus are important in processing certain disagreeable basic emotions, such as fear and disgust, and also in moral emotions processing.

In the case of experimental studies developed by Greene *et al.* [3, 6], the participants are confronted with the description of various moral dilemmas. In each moral dilemma situation, the participants have to decide on which is the correct alternative. While the participants respond to the various dilemmas, magnetic resonance images of their brains are registered.

Greene *et al.* [3] consider non-moral and moral dilemmas which may also be either personal or impersonal (see note 1). The non-moral dilemmas are about choices between conflicting value dimensions, but where these values dimensions are deprived of a moral significance. By contrast, the moral dilemmas involve situations where the moral salience of the conflicts between values is highlighted. In some experimental situations, the conflicts are even between sacred values (a human life versus n human lives). Impersonal versus personal moral dilemmas draw on some puzzling situations. For instance, in the case of impersonal moral dilemmas, a runaway trolley that mortally threatens five people may be diverted onto a side track, where it will kill only one person. In the case of personal moral dilemmas, experimental subjects are faced with the alternative of pushing someone in front of a runaway trolley, killing the person pushed but saving five others (see note 2).

This experimental study shows that dilemmatic situations differ in the extent to which emotions are engaged in reaction. Not only is emotional stress stronger in moral dilemmas than

in non-moral dilemmas, but it is also stronger in personal moral dilemmas than in impersonal moral dilemmas. This is revealed by increased brain activity in regions related to social and/or moral emotion processing (see note 3). Moreover, in the personal moral dilemma condition, the experimental subjects who approve an alternative which triggers a negative emotional reaction tend to have a longer reaction time. For instance, in the footbridge dilemma situation, subjects who approve of pushing someone in front of a runaway trolley, killing the person pushed but saving five others, have to override a negative emotional response which requires an additional cognitive control. This is revealed by increased brain activity in the anterior dorsolateral prefrontal cortex (DLPFC) and also by a longer reaction time. In other conditions - impersonal moral dilemma and non-moral dilemma –no difference is found in reaction time.

Greene *et al.* [6] explore the reasons underlying this difference in reaction time between the personal moral dilemma condition and the remaining conditions. The experiment tests the difference between difficult and easy personal moral dilemmas and tests the conjecture that the longer reaction time, which is a feature of the first type of dilemma, results from the conflict experienced when the surveillance of a utilitarian moral reasoning depends on a disgusting personal intervention (see note 4). The conjecture is corroborated by the observation of more intense brain activity in regions associated with the control of cognitive conflicts and processes of abstract reasoning (more precisely, the anterior and posterior cingulate cortex (BA 32/23/31), parietal lobe (BA 7/40) and the dorsolateral prefrontal region (BA 10/46)), together with significant brain activity in neural structures more closely related with the processing of moral and/or social emotions. This pattern of brain activity is not found in the case of easy personal moral dilemmas, in which there is no conflict between an emotional reaction and a utilitarian moral judgment. In these situations, the reaction time is comparatively short, and the activity of the neural structures more directly related with cognitive conflict and processes of abstract reasoning is lower.

These results (Greene *et al.*, Greene and Haidt, and Greene *et al.* [3, 34, 6]) suggest that the longer reaction time in situations of difficult personal moral dilemmas is not related to higher computational complexity, which is also present in the case of easy personal moral dilemmas, but to the conflict arising from the moral judgment of competing choice alternatives and the corresponding emotional reaction. The authors proposed a dual process theory of moral judgment, in which emphasis is given to a function of control and inhibition of cognitive processes over emotional responses (see note 5).

Koenigs *et al.* [11] tested these moral experimental conditions in patients with emotion-related damage in the ventromedial prefrontal cortex. Their aim is to identify a causal relationship between the neural structures more closely related with the

processing of moral and/or social emotions and the moral judgment. This experimental study shows that, in the personal moral dilemma situation, the patients with emotion-related damage in the ventromedial prefrontal cortex are more willing to agree to endorse harmful actions in accordance with a utilitarian reasoning than the other experimental subjects (healthy individuals and individuals with neural lesions in other brain regions).

[III] DISCUSSION

This psychology and neuroscience research is inspiring in terms of the distinction between a moral and a computational dimension of the difficulty of choice. This investigation suggests that: (a) individuals spontaneously operate a distinction between moral and non-moral dilemmas and between different types of moral dilemma; (b) this distinction is grounded on a difference in the specific neurophysiologic processes involved; (c) not only are the chooser and the doer aware of this difference, but also the observers. In fact, observers tend to interpret the same signal (for instance, the reaction time in a deliberation process) differently depending on the type of dilemma evoked; (d) when there is an alternative which is deemed both morally appropriate and triggers a positive emotional reaction, the reaction time is comparatively short; (e) when the consequences of the choice's are all morally and emotionally detrimental or (f) when there is a conflict stemming from the fact that the surveillance of a utilitarian moral reasoning depends on a disgusting personal intervention, the reaction time is longer.

It could be argued that the distinction between a moral and a computational difficulty not only makes sense but is supported by evidence. However, it may be insufficient in that there may be different types of moral and computational difficulty. Moreover, the evidence also suggests that moral difficulty is not different from computational difficulty because the former type belongs to the realm of emotions. Not only do emotions relate to both but cognitive elements may also be present with emotions in the case of moral difficulty. It can even be claimed that this cognitive element may sometimes play a regulative function over emotions (Greene *et al.*, Greene and Haidt, and Greene *et al.* [3, 34, 6]). On the other hand, emotional elements may be present even when assessing morally neutral consequences of action, as suggested by the somatic marker hypothesis (see Damásio [29]).

The results also suggest that the different brain regions which are identified as associated to moral judgment also participate in other processes that are not specifically moral, e.g. physiological regulation functions that generate avoidance and approach behavior and social behavior in general. Many of these brain structures sustain the capacity to represent the mental states of other individuals by inferring their beliefs and intentions ("theory of mind", mirror neurons) (see note 6).

However, the neuroscience research so far is not suitable to address moral difficulty in ordinary situations as since it only

draws on extreme dilemmatic situations. As stated by Moll *et al.* [8]: "[t]he making of moral judgments on extreme and unfamiliar situations, such as those posed by classic moral dilemmas, offers interesting ways to probe philosophical points of view, but can hardly be taken as a proxy for everyday moral reasoning". The same authors argue in favor of extending neuroscience research to these more familiar and current moral dilemmas. Moreover, an extension of experimental conditions to actual situations of interaction and choice, instead of hypothetical situations, could also offer more insights into how individuals cope with value conflicts that arise in practice.

Nevertheless, the experiments in psychology and neuroscience research suggest that the attribution of a money price to goods and services that are not usually object of market transactions may be a source of moral difficulty. These results are puzzling from the perspective of the neoclassical economics rational choice model. In fact, descriptive validity of its assumptions that rationality always requires the establishment of tradeoffs between all values and that valuing something means ascribing a monetary counterpart to seem to be disproved. The view of individuals as mere "wantons" whose only purpose would be the satisfaction of their first order desires, as is highlighted by the neoclassical economics rational choice model, is also put under pressure. However, the question of how and why certain transactions and not others are seen as problematic remains; why the assignment of a money price to certain goods and not others may corrupt their value and significance. It might be conjectured that this could happen when the attribution of a money price or any other type of tradeoff blocks the possibility for individuals to express certain judgments about themselves, about others and about the nature of the economic and social relations involved in such transactions. This suggests that moral difficulty may not only be relevant in extreme dilemmatic situations, but may in fact be a relatively common feature of choice situations in social contexts.

[IV] CONCLUSION

The paper is grounded on the concept of the difficulty of choice, which has been recognized as a pervasive feature of human decision making by behavioral sciences, especially cognitive and social psychology, neurosciences and behavioral economics. The distinction between a computational and a moral aspect of difficulty is drawn with the support of empirical evidence from psychology and neuroscience research. The limits of this research to address moral difficulty in ordinary situations are also acknowledged. The paper further argues in favor of the idea that the developments from psychology and neuroscience research may put the neoclassical economics rational choice model under pressure by revealing its explanatory fragilities.

FINANCIAL DISCLOSURE

The research was partially funded by FCT under two projects: "Choice beyond (in)commensurability (BeCom)" (PTDC/CS-ECS/099630/2008) and "A behavioral approach to consumer credit decision making (BEHAVE)" (PTDC/PSI-PSO/114257/2009).

ACKNOWLEDGEMENT

The author benefited from extensive discussions with José Castro Caldas and also from suggestions he made during the period of PhD supervision and in the realm of BeCom project "Choice Beyond (In

NOTES

- (1) www.sciencemag.org/cgi/content/full/293/5537/2105/DC1 contains a complete description of the sixty dilemma situations that participants have to deal with.
- (2) "Me hurt you" is the label that appears in the literature in connection to the moral personal violations (Greene *et al.* [3, 6]). This type of moral violation pertains to bodily offences, inflicted on a particular individual or group of individuals, and is the result of a direct and deliberate action from the agent.
- (3) The brain regions where an increase brain activity is registered, by fMR image, are: frontal lobe (more precisely the BA 9/10), superior temporal sulcus (BA 39) and posterior cingulate cortex (BA 31) (Greene *et al.* and Greene and Haidt [3, 34]). On the other hand, the brain regions correlated with work memory, like the frontal lobe (BA 46) and the parietal lobe (BA 7/40), show an increase in activity in impersonal moral dilemmas and in non moral dilemmas. Finally, there is not a significant difference of brain activity between impersonal moral dilemma and non moral dilemma in the superior temporal sulcus (BA 39), in the frontal lobe (BA 46) and in the parietal lobe (BA 7/40).
- (4) One of the tragic examples evoked is of a group trying to hide from a Nazi persecution in which a child may at any moment cry calling the enemies' attention.
- (5) Greene *et al.* [35] aim to outline more evidence for a difference between utilitarian and non utilitarian moral reasoning. While the former is more closely related with controlled cognitive processes, the latter tends to be driven by more automatic processes. This experimental study shows that the cognitive load increases the average reaction time only for utilitarian judgments. In the case of non utilitarian judgments, the cognitive load has no significant impact on the average reaction time.
- (6) These regions are the frontal lobe (more specifically BA 9/10), the superior temporal sulcus (BA 21/39), the region most anterior of the anterior cingulate cortex (BA 32), and the parietal lobe (BA 40) (see for example Frith and Frith or Decety and Chaminade in [36-39]).

REFERENCES

- [1] Costa, Ana. [2008] A Dificuldade da Escolha. Ação e Mudança Institucional, Phd Dissertation, ISCTE-IUL, Lisbon.
- [2] Tetlock P, O Kristel, S Beth, M Green, J Lerner. [2000] The Psychology of the Unthinkable: Taboo trade-offs, forbidden base rates, and heretical counterfactuals, *Journal of Personality and Social Psychology* 78: 853-870.
- [3] Greene Joshua D, R Brian Sommerville, Leigh E Nystrom, John M. Darley and Jonathan Cohen. [2001] An FMRI Investigation of Emotional Engagement in Moral Judgment, *Science* 293: 2105-2109.
- [4] Moll Jorge, Ricardo de Oliveira Souza, Paul J Eslinger, *et al.*, [2002] The Neural Correlates of Moral Sensitivity: A Functional Magnetic Resonance Imaging Investigation of Basic and Moral Emotions, *The Journal of Neuroscience* 22(7): 2730-2736.

commensurability: controversies and public decision-making on territorial sustainable development". The usual disclaimers apply.

CONFLICT OF INTERESTS

The author declares no competing interests in relation to the work.

- [5] Tetlock Philip E. [2003] Thinking the unthinkable: sacred values and taboo cognitions, *TRENDS in Cognitive Sciences* 7(7): 320-324.
- [6] Greene Joshua D, Leigh E Nystrom, Andrew D Engell, John M. Darley, Jonathan Cohen. [2004] The Neural Bases of Cognitive Conflict and Control in Moral Judgment, *Neuron* 44: 389-400.
- [7] McGraw, A. P. and Tetlock, P. E. [2005] Taboo Trade-Offs, Relational Framing, and the Acceptability of Exchanges, *Journal of Consumer psychology* 15(1): 2-15
- [8] Moll, Jorge, Roland Zahn, Ricardo de Oliveira Souza, Frank Krueger, Jordan Grafman. [2005] The Neural Basis of Human Moral Cognition, *Nature Reviews* 6: 799-809.
- [9] Lichtenstein, S. and Slovic, P. [2006] The Construction of Preference, Cambridge University Press, New York
- [10] Shafir E, Simonson I and Tversky A. [2006] Reason-Based Choice. In: The Construction of Preference, S. Lichtenstein and P. Slovic (eds.), Cambridge University Press, New York, p. 411-433.
- [11] Koenigs Michael, Liane Young, Ralph Adolphs, *et al.* [2007] Damage to the prefrontal cortex increases utilitarian moral judgements, *Nature*, March: 1-4.
- [12] Gigerenzer G. [2010] Moral Satisficing: Rethinking Moral Behavior as Bounded Rationality, *Topics in Cognitive Science* 2: 528-554.
- [13] Berns, Gregory S., Emily Bell, C. Monica Capra, Michael J. Prietula, Sara Moore, Brittany Anderson, Jeremy Ginges e Scott Atran [2012] The price of your soul: neural evidence for the non-utilitarian representation of sacred values, *Philosophical Transactions of The Royal Society* 367: 754-762.
- [14] Dewey John. (1930) [1922] Human Nature and Conduct. An Introduction to Social Psychology, The Modern Library, New York.
- [15] Wiggins David. [1975-1976] Deliberation and Practical Reason, *Proceedings of the Aristotelian Society*, New Series 76: 29-51.
- [16] Levi Isaac. [1986] Hard Choices. Decision Making under Unresolved Conflict, Cambridge University Press, Cambridge.
- [17] Nussbaum M. [1986] The Fragility of Goodness. Luck and Ethics in Greek Tragedy and Philosophy, Cambridge University Press, New York.
- [18] Raz Joseph. [1986] The Morality of Freedom, Clarendon Press, Oxford.
- [19] Nussbaum M. [1997] Flawed Foundations: The Philosophical Critique of (A Particular Type of) Economics, *The University of Chicago Law Review* 64: 1197-1214.
- [20] Radin Margaret J. [1997] Contested Commodities, Harvard University Press, Cambridge.
- [21] Richardson Henry S. [1997] Practical Reasoning about Final Ends, Cambridge University Press, Cambridge.
- [22] O'Neill J. [1998] The Market: Ethics, Knowledge and Politics, Routledge, London
- [23] O'Neill John [2007] Markets, Deliberation and Environment, Routledge, London.

- [24] Putnam H. and Walsh V. [2012] *The End of Value-Free Economics*, Routledge, NY
- [25] Costa A. and Castro Caldas J. [2011] Claiming Choice for Institutional Economics, *Journal of Economic Issues*, XLV(3): 665-684
- [26] Lichtenstein S, Gregory R, Irwin J. [2007] What's Bad Is Easy: Taboo Values, Affect, and Cognition, *Judgment and Decision Making*, 2(3): 169-188
- [27] Gigerenzer, G. and R. Selten (eds.) [2001] *Bounded Rationality the Adaptive Toolbox*, The MIT Press, Cambridge MA.
- [28] Simon, Herbert. [1955] A Behavioural Model of Rational Choice, *Quarterly Journal of Economics* 69: 99-118.
- [29] Damásio António R. [1994] *O Erro de Descartes. Emoção, Razão e Cérebro Humano*, Publicações Europa América: Mem Martins.
- [30] Adolphs Ralph. [2003] Cognitive Neuroscience of Human Social Behaviour, *Nature* 4: 165-178.
- [31] Casebeer William D. [2003] Moral cognition and its neural constituents, *Nature Reviews*, 4: 841- 846.
- [32] Casebeer William D. and Patricia S. Churchland [2003] *The Neural Mechanisms of Moral Cognition: A Multiple Aspect Approach to Moral Judgment and Decision Making*, *Biology and Philosophy* 18: 169- 194.
- [33] Damásio António. [2003] *Ao Encontro de Espinosa. As Emoções Sociais e a Neurologia do Sentir*, Publicações Europa América: Mem Martins.
- [34] Greene Joshua and Jonathan Haidt. [2002] How (and where) does moral judgment work?, *TRENDS in Cognitive Sciences* 6(12): 517-523.
- [35] Greene JD *et al.* [2008] Cognitive load selectively interferes with utilitarian moral judgement, *Cognition* 107(3): 1144-1154.
- [36] Frith, Uta and Chris Frith [2001] The Biological Basis of Social Interaction, *Current Directions in Psychological Science* 10(3): 151-155.
- [37] Decety, J. and T. Chaminade [2003] Neural correlates of feeling sympathy, *Neuropsychologia* 41: 127-138.
- [38] Gallagher, Helen L. and Christopher D. Frith [2003] Functional imaging of 'theory of mind', *TRENDS in Cognitive Sciences* 7(2): 77-83.
- [39] Rilling, James K., Alan G. Sanfey, Jessica A. Aronson, Leigh E. Nystrom and Jonathan D. Cohen [2004] The neural correlates of theory of mind within interpersonal interactions, *NeuroImage* 22: 1694-1703.

ABOUT AUTHORS



Dr. Ana Costa is an Assistant Professor at ISCTE – Lisbon University Institute (Political Economy Department of the School of Social Sciences) and she is a researcher at DINAMIA'CET (Research Centre for Socioeconomic Change and the Territory). She graduated in Economics and concluded a Master in Development and International Cooperation at ISEG and a PhD in Economics at ISCTE. Her present main research interests include: individual and collective deliberation, value conflicts and moral dilemmas, behavioral economics, institutional economics and the history of economic ideas. She also collaborates on Observatory on Crises and Alternatives (Centre for Social Studies, CES-Coimbra University/International Labour Organization, ILO).