Adapting to economics:
Simon's modular bounded rationality

Enrico Petracca

(*University of Bologna*)[1]

FIRST DRAFT – PLEASE DO NOT QUOTE WITHOUT PERMISSION

1. Introduction

"An economist must have peculiar theories indeed who cannot quote from the *Wealth of Nations* to support his special purposes", Jacob Viner (1927, p. 207) provocatively said. Something very similar can be said today in behavioral economics with respect to the work of Herbert A. Simon. In fact, a behavioral economist must have particular theories indeed who cannot quote from *Models of Bounded Rationality* (Simon, 1982) to support his special purposes. At least as a matter of terminological continuity, it is well established that the notions of *behavioral economics* and *bounded rationality* are original Simonian jargon; but also the subjects, such as *heuristics* and *framing* are originally Simonians too. Regarding this terminological persistence, Heukelom (2014, pp. 117-118; 154-155; 182-183) suggests that post-Simonian's theorists have instrumentally exploited Simon's protective umbrella, even while in fact establishing alternative points of view with respect to Simon's (see also Sent, 2004a). What was, however, Simon's attitude toward these later theories of bounded rationality is a rather understudied matter.

This essay maintains that the reconstruction of Simon's attitude towards later theories of bounded rationality cannot be in any way detached from Simon's own definition(s) of bounded rationality. A thorny point in the reconstruction of Simon's intellectual path has often concerned whether Simon's definition of bounded rationality was always unitary and consistent (see, e.g., Mongin, 1986; see Augier, 2001 for a very strong defense of the consistency view). As it is our aim to show, the perceived different shades in Simon's definitions of bounded rationality have crucially depended on the different situations in which they have been conceived and on the different audience they were addressed to. In particular, when interacting with economists, Simon's definition of bounded rationality took, as we shall see, a particular configuration, which made it easier to break into and be accepted by economics' scientific worldview. In other disciplines, as for instance cognitive psychology and AI, but also in social sciences such as organization and administrative science[2], the

[1] E-mail address: enrico.petracca2@unibo.it.

[2] Although Simon tended to picture his approach to social science as a unitary one, under the fortunate label 'sciences of artificial' (Simon, 1996), Crowther-Heyck (2005) rightly distinguishes two Simonian research programmes, which

definition of bounded rationality took instead a sensibly different configuration. These two configurations of the definition of bounded rationality – which might even be labeled for convenience $Simon_1$ and $Simon_2$ – will be here inquired into their historical and situated roots. In particular, the very idea of bounded rationality as a modular and adaptive notion will be shown to be a response to specific disciplinary pressures exerted in the variegated panorama of mid1950s US academia, and in particular by the configuration of the 1950s US social sciences.

Simon's modular, and in the end plural, definition of bounded rationality has to be read in the light of the wider Simon's project, which consisted in establishing a radical critique to the social sciences, under the broad label of 'bounded rationality'. In the light of this reading of Simon's ambitious project, it will be here questioned that Simon's critique was – as it is usually claimed – "uncompromising" (Heukelom, 2014, p. 117). Far-reaching and non-disciplinary-specific as it was, Simon's bounded rationality had to adapt to the specificities of the many disciplines it interacted with[3]. In economics, the sort of adaptation we are going to discuss has generated two main consequences, which are still visible in current research on bounded rationality. Firstly, conceptual modularity has rendered Simon's bounded rationality vulnerable to the economic mainstream's counterattack and assimilation try. Secondly, it brought Simon to be sympathetic with notions of bounded rationality that were apparently quite distant from his own, such as Kahneman and Tversky's. The entanglement between the theoretical definition(s) of bounded rationality and Simon's aim to be the leader of a trans-disciplinary critique of the social science has so far generated significant interpretative troubles, which this paper aims to contribute to decipher.

Interestingly, the path of conceptual adaptation to different disciplinary environments, accomplished through a modular specification of the basic components of bounded rationality, is in line with Simon's own view of modular adaptation as devised for instance in Simon (1962). One might thus argue that bounded rationality itself has undergone a path of boundedly-rational adaptation. This particular point would provide a 'rationale' to the otherwise rather disparaging judgments over the consistency of Simonian bounded rationality, which typically concern the "recurrent gaps between what Simon does and what Simon says" (Mirowski, 2002, p. 470). On the opposite side of the spectrum, our point of view will also back the positive judgements over the "consistent vision" held by Simon (Augier, 2001). Our explanation consists in saying, if the expression is allowed, that bounded rationality's adaptation was 'Simonian, all too Simonian'.

The paper is structured as follows. Section 2 identifies the origins of Simon's modular notion of bounded rationality in the 1950s, emphasizing the selected emphasis that Simon provided on the cognitive rather than the environmental limits of cognition when interacting with professional economists. Section 3 reconstructs the consequences that this intellectual strategy generated on the reduction of the revolutionary nucleus of bounded rationality to an emendation of the rational choice paradigm. Then, the complicated relationship between Simon and the 'heuristics and biases' approach is reconstructed in Section 4. Section 5 considers Simon's later point of view on the mainstream

entail disciplinary demarcations: on the one hand the 'sciences of choice', as economics, and on the other hand the 'sciences of control', as organization science.

[3] Not by chance Simon is described as a true 'Renaissance man' for the interdisciplinary scope and extent of his research (Dasgupta, 2003).

approaches to bounded rationality. It then inquires into the connection between Simon and the allegedly most 'Simonian' research program in bounded rationality known as 'ecological rationality'. The reconstruction of the theoretical and historical connections as sketched above will greatly benefit from unpublished material from Simon's archive.

2. Where all began: publishing bounded rationality modularly

It has been argued that "if ever a topic cried out for intellectual history – not a timeless, placeless history of ideas, but a situated history of intellectuals and their *most obsessive projects* – it is surely rationality" (Erickson et al., 2013, p. 10, emphasis added). If this might be true in general, there are reasons to argue that it is particularly true for Simonian bounded rationality[4]. As we aim to show in this section, the alleged unstable and shifting meaning of the notion of bounded rationality Simon has always been accused for, was in fact strictly dependent from an adaptation process to different disciplinary and research environments in the 1950s. Since the early 1950s, while holding fast his case base at the then-called Carnegie Tech[5] and continuing his insightful summer forays at RAND Corporation, Simon was in fact involved in two major research institutions with quite different research agendas. On the one hand was the Cowles Commission, whose research was in the field of advanced mathematical economics, and on the other hand was Ford Foundation, whose research was mainly in the field of organization science. The specific research carried in these two institutions will mark the future fate of bounded rationality, the most evident manifestation of this divide being the publication place, the conceptual complementarity, and the rhetorical structure assumed by the two foundational articles on bounded rationality of the 1950s.

The first appearance of the notion of 'bounded rationality'[6] was in 1947, when Simon published his Ph.D. dissertation in Political Science at the University of Chicago, which would become the well-known *Administrative Behavior* (Simon, 1947). To our purposes, it is particularly telling that one early critique to *Administrative Behavior* arose in Simon's private correspondence with the business executive Chester I. Barnard[7], where Barnard raised the issue that the book presented somehow alternative definitions and uses of the notion of rationality at the same time[8]. This early critique seems to envisage the underlying difficulties that Simon would encounter in attacking perfect rationality from different standpoints. In particular, a true issue consisted in calibrating his critique to different

[4] The reference to 'obsessive' projects in the previous quote reminds of Simon's self-characterization as a "monomaniac of decision making" (Simon, 2001).

[5] After various experiences, such as the job at the Illinois Institute of Technology (1942-1949), Simon never permanently left Pittsburgh and the soon-to-be -called Carnegie-Mellon University. Pittsburgh played a strategic role in Simon's career, allowing him to always claim his own research independence (Simon, 1991a, pp. 109-113).

[6] Klaes and Sent (2005) thoroughly reconstruct the conceptual history of bounded rationality, emphasizing the unstable terminology of the origins.

[7] Barnard is credited by Simon as a precursor of the notion of bounded rationality (see, e,g, Simon, 1979, p. 499), so that he asked him to write the preface to *Administrative Behavior*. One of the seven pictures in Simon's office was Chester Barnard's (Simon, 1991a, p. 72).

[8] Chester I. Barnard, Memorandum of detailed observations on 'Administrative Behavior' by Professor Simon, June 24 1945. See also Crowther-Heyck (2005, p. 132). Klaes and Sent (2005, pp. 40-41) track Simon's changes to the notion of bounded rationality through the different editions of *Administrative Behavior*.

disciplinary environments, or also to changing disciplinary environments. Undoubtedly, the environment of economics was particularly tough. Simon arrived at the Cowles Commission in the early 1950s, where he interacted with people of the caliber of Marshack, Koopmans, Lange, Arrow, Klein, Hurwicz, Patinkin, Modigliani, and Debreu. The Cowles Commission were at that time the "sun" – as Simon called it – in his erratic journeys as young scholar coming from the "recesses of the outer space" (Simon, 1991a, pp. 115). As a bold young intellectual, he came there with the spirit of the one "prepared to preach the heresies of bounded rationality to economists, from the gospel of *Administrative Behavior*, chapter 5, in season and out." (ibid., p. 144). But bounded rationality was not a consistent corpus of theories to be simply 'preached'. Really, it was not even yet a 'theory'. This might be the main reason why Simon was at that time specifically concerned in thinking of a specific strategy for effectively introducing a critique to perfect rationality. It is of the early 1950s in fact the memorandum "Some strategic considerations in the construction of social science models" (Simon 1954) in which Simon insisted on the strategic importance of building a plurality of models of bounded rationality[9]. In that memorandum, Simon pointed out that "[o]ur general procedure […] has been to start with theories of the most 'rational' behavior – theories that incorporate the fewest possible limits on rationality. We have then progressively diluted the requirements of rationality or stated otherwise, have imposed successive limitations" (ibid. p. 35-36). That is to say, Simon's intellectual strategy simply consisted in pursuing a *modular* and *incremental* relaxation procedure to perfect rationality's assumption. In 1952, while at RAND – in the summer of the famous 'Santa Monica Colloquium' – Simon elaborated one foundational model of bounded rationality, "A Behavioral Model of Rational Choice"[10], which will be published in 1955 in *The Quarterly Journal of Economics*, and would rest, as Simon said, as the paper for which he will be mostly known among economists (Simon, 1991a, p. 156). In the same period at RAND, and as an outcome of his parallel research at Ford Foundation[11], Simon conceived another famous model of bounded rationality, "Rational Choice and the Structure of the Environment"[12], which will then be published in a major journal of psychology, the *Psychological Review*, in 1956[13]. These papers are so foundational to Simon's theory of bounded rationality that he claimed in retrospective: "If I were asked to select just two of my publications *in economics* for transmission to another galaxy where intelligent life had just been discovered, these are the two I would choose" (Simon as quoted in Rubinstein, 1998, p. 23, emphasis added). Why if they were so foundational to Simon's definition of bounded rationality had they so different fate *in economics*? They had not only been conceived, as Simon said, as "companion piece[s]" (Simon, 1991a, p. 166), the one the "sequel" of the other (1955, p. 100); they were, as

[9] The memorandum is presented, after solicitation by Marshack, at the Cowles Commission seminars in two sessions on November 15-16 1951. The talk devoted to the inner circle of economists had the eloquent title: "The Strategy of Model Construction: Relaxing the Rationality Principle" (Letter from Marshack, October 25, 1951).

[10] Originally published as RAND P-365, January 20 1953.

[11] The original title of the research project at the Ford Foundation was 'Research into Behavior in Organizations' (see Ford Foundation Working Paper #1, written with Harold Guetzkow, February 28 1952). The project then will develop in partnership with the Graduate School of Industrial Administration (GSIA) in Pittsburgh. The most noticeable output of research at Ford will be the well-known text *Organizations* (March and Simon, 1958).

[12] There is a sequel to this paper that has never been published as such, with the title: RATIONAL CHOICE AND THE STRUCTURE OF THE ENVIRONMENT: II. THE DIFFICULTY OF THE ENVIRONMENT (22 April 1954). Here Simon attempts to generalize some of the 1956 results, also introducing a measure of environmental "difficulty".

[13] I did not found trace of the 1956 paper in memoranda and correspondences with the main figures at the Cowles Commission. This gives an idea of Simon's 'compartmentalized' interactions on the topic of bounded rationality.

Crowther-Heyck claims, "initially considered as a single project". They could be conceived, as Simon later did, as mathematized version of Chapter 4 and 5 of his *Administrative Behavior* (Simon, 1982, Vol. 2, p. 204). Nonetheless, they had in the end a separate birth, two completely different gestation environments and audiences: and then the one sent to a journal of economics, the other to a journal of psychology[14]. Referring to this split, Mirowski claims that it was due to "some unfortunate historical accidents" (Mirowski, 2002, p. 460). Reading the split as a mere 'historical accident' risks, however, of overcoming something important that might lay behind. The intellectual content of the two papers might be in fact clearly distinguished with respect to its order of 'acceptability' in the scientific community of economics. In particular, the 'economic' 1955 paper emphasized the 'cognitive' limits to human cognition, while the 'psychological' 1956 emphasizes the 'environmental' limits to human cognition. Roughly stated, the former concerned in particular the 'internal' while the latter the 'external' limits to human cognition. In this context, a natural question arises, which have, however, only rarely been posed: why did Simon wanted to 'preach' the gospel' of Chapter 5 of *Administrative Behavior* at the Cowles Commission while substantially neglecting Chapter 6? Were they not both foundational parts of bounded rationality? No doubt, disciplinary pressure was at work. This is evident when the 1955 paper was published amended of three appendixes that were not strictly 'economic' in nature[15]. Disciplinary incentives were set, and they drove adaptation. This adaptive choice to grant a primary status to the 'mentalist' limits of cognition in economics is the first move, as we shall point out in the course of the paper, which triggered then a path-dependent process where bounded rationality in economics was reduced, with the welcoming support by Simon's opponents, to a cognitive and mental phenomenon. Simon had to adapt to be heard, but this was at the cost of not taking all the pieces together.

2.1 The *limbo* of information: internal bounds take over the external bounds of reason

The 1959 article 'Theories of decision making in economics and behavioral science', meant to be a survey article on the theories of decision making addressed to an audience of economists and published in the AER, is another important step in Simon's relationship with economics. In this paper, two remarkable things happen. The first is that Simon provided economists with a wide and complete view on bounded rationality, emphasizing thus also the environmental and adaptive dimensions of human rationality. In a sense, the paper was a vindication of the 1955-1956 paper split, even if it has never gained the same success. The second important thing occurred in the article is the first noticeable influence of Simon's cognitive psychology and AI approach on bounded rationality[16]. It was January 1956 when, in an often-recalled episode, Simon announced to his class at Carnegie Tech that "[o]ver Christmas, Al Newell and I invented a thinking machine", the famous program *Logic Theorist*, often considered the first program of AI ever written[17]. Influenced by this context, the 1959 article can be read as an attempt to unify both the 'internal' and 'external' bounds of cognition by

[14] Mirowski (2002, p. 460) claims that the separation between the 1955-1956 papers is at the root of the economists' neglect of Simon's later work in cognitive psychology and AI.
[15] The original RAND P-365 did not present appendixes. The topic of 'chess' was roughly sketched within the text and then expanded in a version circulated at the Carnegie Institute of Technology (Simon, 1998, p. 67).
[16] Simon's fundamental interest in cognitive psychology is described in Crowther-Heyck (2005).
[17] For an account of Simon's role as father of AI see McCorduck (1972).

bringing the latter back to the 'internal' cognitive processes of decision makers. Decision makers' adaptation to the structure of a decision environment is, in this cognitive psychology framework, mediated through the cognitive process of 'representation' (a crucial notion in Simon's cognitive psychology) of the environment taking place in the agent's mind. The underlying tension between 'cognitive adaptation' and 'mindless adaptation' that pervades the article, and which is basically the tension behind the 1955-1956 paper split, is thus resolved in favor of the former. The knowledge of an agent's goal and the structure of an environment is not enough for predictive purposes: focus must be necessarily placed on the 'internal structure' of the agent (Simon, 1959, pp. 255-256).

The resolution of the tension between internal and external bounds of reason in favor of the former through the notion of 'representation' has been functional, we argue, to the understandability and penetration of bounded rationality in economics. But the notion that mostly played as crossing interface with the framework of economics was surely that of 'information'. Along with the computational limits of the economic agent, which undoubtedly belonged to the domain of 'internal' bounds of reason, the indigested – at least to economics – 'external' bounds found an ingenious place, being reduced to an issue of 'information'. The environment did matter, but not directly, insofar as it was reduced to the 'information space' of the economic agent. In this way, the environment was not ruled out, but it was placed in a *limbo* between internal and external bounds of reason, i.e. the limbo of information. This informational reductionist path chosen by Simon put the program of bounded rationality on the track of the 'information processing' worldview that was already prospering in economics (see, e.g., Lipman, 1995; Petracca, 2017). This surely made Simon's critique more understandable in economics but, at the same time, rendered it less specific, less radical and more prone to any assimilation try. In what follows, we are going to see how the emphasis on the internal bounds of reason rendered easier the neoclassical counterattack over bounded rationality.

3. How the optimizing counterattack had an easier task

The 1955-1956 paper split and the information-processing framework of bounded rationality can be read, as we do, through the lens of an adaptive strategy to the specificities of economics as social science in the 1950s. However, while this strategy might have fostered the intellectual survival, or even the prosperity, of bounded rationality in economics, it might also have rendered its assimilation into the extant mainstream easier. The case of the relationship between Simon's bounded rationality and Stigler's famous article "The Economics of Information" of 1961 is particularly telling of this assimilation process. As Philippe Mongin says:

"Quand Simon expose pour la première fois ses idées, en 1955, la théorie micro-économique ordinaire semble incapable de relever ses objections et de lui oppose son propre concept de rationalité limitée. En un certain sens, il n'en va plus de même dix and après, lorsque la théorie de la 'recherché' inaugurée par Stigler, offre les premier modelés optimisateurs de la décision en information limitée et couteuse. *Ces modelés prennent au pied de la lettre les recommandations faites naguère par Simon*, puisqu'ils élargissent le système des contraints qui sont de nature à influencer la décision individuelle" (Mongin, 1986, pp. 555-556, emphasis added)

In other words, once the limitations were located inside the economic agent's mind, reduced to limitations of the information and computational capability at disposal of the agent, it became easier to conceive models that were in nature not different from the typical optimizing under constraints

ones. Even worse, these optimizing models seemed to follow really "au pied de la lettre" (i.e. word by word) Simon's advices. By strategically lessening the conceptual emphasis on the environment and adaptation in bounded rationality, Simon found in the paradoxical situation of being both a radical opponent of optimizing models[18], and the father/allied to optimizing-inspired models of bounded rationality, as is the case with Stigler's search model[19].

The empire of neoclassical economics, to echo a famous motto (Mirowski, 2002, ch. 6), stroke back, by using the apparently little and innocuous backdoor – the disproportionate rhetorical emphasis on 'informational and computational constraints' – left by Simon in his adaptation process to economics. Simon became the inflexible critique of optimizing models that could be even quoted to support these very optimizing models. The relationship with optimization is a true issue in the history of Simon's bounded rationality, studded with a number of compromising sentences that need to be contextualized case by case[20]. Sometimes Simon found itself in true embarrassment with respect to this. As writer of early optimizing, "reactionary" (Simon, 1991a, p. 166) models himself (e.g. Simon, 1951) he later retracted by claiming "My skepticism did not come through the reader…I found, with dismay, that my analysis was being taken seriously" (see also *A comparison of game theory and learning theory*: p. 203 Vol. 2 Models of Bounded Rationality)[21]. Undoubtedly, the more he confronted neoclassical economists, the more he naturally had to use the notion of 'optimization', at least critically. But sometimes it is hard to unambiguously ascertain where critiques ended and justification started[22].

The optimizing counterattack took advantage from another contingent situation. Starting from the 1960s, a Simon more and more absorbed by cognitive psychology lost interest in economics. Simon, as is commonly held, lost interest in decision making (i.e. sciences of choice), focusing comparatively much more on problem solving (i.e. the science of control). This deep immersion in cognitive psychology and AI culminated in 1972 with the fundamental opera, co-authored with Allen Newell, *Human Problem Solving*. In this opera, the well-known 'scissor' metaphor for bounded rationality was introduced, where Simon, even if still standing firmly within the information-processing framework, openly put on the same ground cognition and environment, acknowledging them both as necessary requirements for a theory of bounded rationality:

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[18] Gigerenzer et al. (1999, p. 12) recalls that Simon, jokingly but tellingly, wanted to sue those economists who would misinterpret bounded rationality as 'optimization under constraints'.

[19] The case with Stigler is paradigmatic of Simon's attempt to fight on multiple rhetorical fronts. In fact, Simon never lost the chance to say that he 'anticipated' Stigler's model already in his 1955 paper (see, e.g., letter to Klaus Fiedler, May 19 1999) while, at the same time, he always openly declared to be against Stigler's 'school of search' (e.g., Simon, 1979). A similar case is Simon's confrontation with 'new institutional economics' (see Section 3.2. below).

[20] Sometimes we can identify at work rhetorical strategies, as that of conceding to utility maximization the full right of representing a choice situation while denying any operational meaning to it (*concessio*): "the notion of seeking a satisfactory return *can be translated into utility maximizing* but not in any operational way" (Simon, 1959, p. 262, emphasis added).

[21] Referring to his 1951 paper, he claims that "most of my theory of the employment contract can be expressed without either equations or maximization. But in that qualitative form it would not have captured the attention of economists, who, in the "new institutional economics," continue to pour the new wine into the old bottle of neoclassical reasoning. At least we have some new wine" (Simon, 1991a, p. 167).

[22] For instance, in a correspondence with Marshack we find sentences like "rules for optimal decision making, if they are to be of any real use, must be 'optimal' in relation to the information possessed by the decision-maker and the size of the computational problems he can handle", which did not imply any rejection – if at all the contrary – of the notion of optimization (Letter to Marshack, 11 April 1953).

"[j]ust as a scissors cannot cut a paper without two blades a theory of thinking and problem solving [i.e., a theory of rationality] cannot predict behavior unless it encompasses both an analysis of the structure of task and an analysis of the limits of rational adaptation to task environment" " (Newell and Simon 1972, p. 55)

But this 1972 masterpiece was little, if ever, read by professional economists. In fact, it was not even addressed to them.

3.1 Approaching to the Nobel Prize

Although all along the 1960s and much of the 1970s Simon was much involved, invested with the role of undisputed authority, in the major institutions devoted to the development of the behavioral sciences in the post-war US (Simon, 1991a; Crowther-Heyck, 2005; Heukelom, 2014), Simon's distracted distance from economics ended only at the mid of the 1970s. It happened in series of climax-like circumstances. In 1974, Simon participated to the famous Nafplion Colloquium in Greece, while in 1976 he was awarded the Distinguished Fellowship of the AEA. In the next year, a conference at Carnegie Mellon celebrated his work in economics (Simon, 1978a). Then in 1978 his Richard T. Ely lecture gained much attention among economists (see Foss, 2001). All this was just a prelude for the fundamental episode of the Nobel Prize in economics of 1978. Although Simon barely dissimulated his interest in the autobiography, his proactive attitude towards the community of economists in view of the prize has become proverbial in the discipline (see McCloskey, 2000, p. 24). At that crucial moment, a certain strategical attitude towards the economists' community was necessary because, as Simon recalled, "economists did not regard me as an economist; and bounded rationality seemed to be dying a quiet death, in the United States at least"[23] (Simon, 1991, p. 320). At that time, in the writings hosted by economic journals and addressed to economists, are in fact clearly perceptible all the symptoms of that adaptation process that led to modulate the rhetoric emphasis on the internal bounds of cognition. In the famous paper "From Substantive to Procedural Rationality" (Simon, 1976), the main justification for the shift from 'substantive' to 'procedural' rationality is almost completely grounded in human's computational limitations. In the Ely Lecture, the focus is not only on the 'cognitive' faculty of attention, but this is also rhetorically modulated by using an (unusual for Simon) economics jargon, in fact considering attention as a "scarce resource" (Simon, 1978b, p. 8) to be allocated. It is, however, the 1978 Nobel Lecture the work that has mostly been called into question for its 'friendliness' to economists. Mongin (1986) considers the Nobel Lecture as a work in which Simon was "ambiguous" (p. 557) on optimization[24]. Further, Gigerenzer at al. (1999) consider the Nobel Lecture as the place in which Simon forgot that bounded rationality was a scissors having two blades, human cognition and the environments, putting more rhetorical emphasis on the issue of computational limitations. Actually, at a close reading, the Nobel Lecture is quite generous in emphasizing the role of the environment in decision making. One might say that it is even particularly generous, by identifying the role of the environment as the main difference between bounded rationality and rational choice theory. In fact, Simon claims that once we postulate that the

[23] Confront this statement with Simon's harsh letter to Rae Goodell (Letter to Goodell, February 19 1979) who in the day after of the Nobel prize depicted Simon as an outsider of the discipline. In the end, as Simon synthetized "If I was an outsider to the economics profession as a whole, I was an insider to its elite." (Simon, 1991a, p. 326).

[24] In this work, Simon stresses that bounded rationality is more frugal in assumptions, and not in the scope of explained phenomena, than rational choice theory.

agent is perfectly rational, the decision outcome is completely determined by the structure of the environment[25]. But this is not a matter of stated sentences. Our point is that the issue is mostly 'rhetorical'. Even in a paper in which Simon fully considers the role of the environment in cognition, the perceived and inherited message is quite the opposite. How is it possible? By perusing Simon's writings addressed to economists in the sprint towards the Nobel Prize, we can quite distinctively perceive that Simon modulated his message, and that the main ground on which the battle could be won or lost was that of cognitive and computational limitations of agents and not that of adaptation.

3.2 Organizations and markets

The Nobel Prize was officially awarded to Simon "for his pioneering research into the decision-making process *within economic organizations*"[26]. The Nobel committee did so specify that the decision making Simon inquired into was programmatically restricted to particular environments, i.e. organizations. In this regard, the prize committee emphasized that decision making for agents in markets had to be considered, in some way, different with respect to decision making for agents within organizations. This is a crucial point to scrutinize for our argument, as it involves Simon's scientific image, either as built by himself or as perceived by his fellow economists. There is no doubt that Simon as leading figure in organization studies emphasized the environmental features of bounded rationality. This was, as we have seen, his Ford-Foundation side. But the emphasis on the 'organizational' side of bounded rationality might have risked once more to lessen the scope and extent of bounded rationality among economists, relegating it to that "relatively new area of economic research" (ibid., Royal Swedish Academy of Science communicate) that was business economics or organizational economics. Something that was perceived, at least according to the Prize committee, as beyond of the identity-making topic of market decision making.

This underlying tension between the wide extent of Simonian bounded rationality's message and the sectorial limits in which the discourse automatically slipped into each time the focus was on 'organizations' was visible in the Nobel Lecture itself. The title of the lecture pays the due acknowledgment to the topic for which he was awarded the Nobel Prize, but it does not go farer than this. A small portion of the paper – and, most notably, a conceptually not pivotal one – is devoted to dealing with decision-making within organization, while the rest of the paper is, as we remarked above, about 'general' decision making.

The debate with Oliver Williamson over 'new institutional economics' is well know (Augier and March, 2001). The risk of debates like this was, as already stated, to make them dismissed as a sectorial and limited debates, while the message of bounded rationality aspired to be a general one. To cope with this risk, Simon shifted between two ways out. On the one hand, Simon envisaged a

[25] "[In omniscent rationality] all the predictive power comes from characterizing the shape of the environment in which the behavior takes place. The environment, combined with the assumptions of perfect rationality, fully determines the behavior. Behavioral theories of rational choice – theories of bounded rationality – do not have this kind of simplicity. But, by way of compensation, their assumptions about human capabilities are far weaker than those of the classical theory [of omniscient rationality]." (p. 347). There would be "recent *revisionist*" (p. 360, emphasis in the origin) rational choice theory forced to add behavioral assumption in the case of changing environments.

[26] The Royal Swedish Academy of Sciences, Press Release, October 16 1978. The emphasis is added.

'pan-organizational' view of the economy, since "the economies of modern industrialized society can more appropriately be labeled organizational economies than market economies" (1991b, p. 42). In Simon's view, a theory of organizations is a theory in which the behavior of individuals "inside the skin of firms" (ibid.) is characterized by additional (even if not *ad hoc*) phenomena with respect to the ones singled out by neoclassical approaches as, for instance, authority, rewards, identification and coordination. The second way out consisted in treating organizations as not ontologically different from individuals (Simon, 1972)[27], in this way eliminating the issue of environmental specificity of decision making. In either case, it is quite evident that environmental specificity represented a conceptual threat for the general scope of bounded rationality's message in economics.

3.3 The two-stage presentation of the argument

After the Nobel Prize, Simon's relationship with "classical"[28] economics reached a sort of adaptation equilibrium. Once more, rhetoric played a great role in reaching this adaptation state, allowing Simon not to abdicate to his own fundamental ideas. In Simon's writings addressed to economics, we find bounded rationality typically defined in a two-stage fashion. The entry "Bounded Rationality" prepared for the first edition of *The New Palgrave Dictionary of Economics* (Simon, 1987) is a case in point. A first stage considers a selective definition of bounded rationality, which arguably embodies the central message Simon wanted to convey to economics. This stage typically reads like this:

"The term 'bounded rationality' is used to designate rational choice that takes into account the cognitive limitations of the decision-maker – limitations of both knowledge and computational capacity" (Simon, 1987, p. 266)

The emphasis is decisively and exclusively placed on the cognitive and informational limitations of the economic agent that represent the major relaxation of the subject expected utility (SEU) assumptions. This definition of bounded rationality, which is conceptually and spatially self-contained in the *locus* of introduction, is typically followed by a second stage, in which this synthetic definition is discussed and complemented. Further relaxations of the SEU assumptions are discussed, as for instance, the one according to which choices are not any more made among fixed sets of alternatives. But the environment is once more obscured when it is the moment to recap the central message Simon wanted to convey, that is fundamentally 'cognitive':

"The particular deviations from the SEU assumptions of global maximization introduced by behaviorally oriented economists [among which of course Simon places himself] are derived from what is known, empirically, about human thought and choice processes, and especially what is known about the limits of human cognitive capacity for discovering alternatives, computing their consequences under certainty or uncertainty, and making comparisons among them" (ibid.)

The role of the environment does not vanish, but acquires a subordinated place, as it can be called into cause and modulated at will. The structure of the concept of bounded rationality in economics can be expressed in the following form, where the order of arguments expresses not only their order of presentation but their rhetorical priority:

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[27] "A theory of organizational behavior macroscopic enough to treat the organization as a monolith will be a theory on an 'individual'" (p. 162, emphasis in the original). See also, Simon (1991a, p. 73).

[28] Simon tended to call the economics of his own time, to which he opposed, as "classical" (see Simon, 1979).

(a) Human cognition is limited in resources, knowledge (i.e. information) and computational capacity;

(b) From these limitations, a series of consequences – among which their adaptation to the environment – arise.

This conceptual modulation had visible effects in the community of optimizers. It is not uncommon to find reactions to Simon's speeches and articles by neoclassical economics in which they agree with Simon "on the first part of his speech" but not "with its implications" [29], i.e., the rejection of the maximizing postulate. This is just an example that whenever Simon emphasized the issue of cognitive and informational limitations, obscuring the adaptation to environmental specificities, it rendered the dissent by traditional economists more reasonable and circumscribed. The structure of Simon (1987), where bounded rationality is presented as a series of relaxation of SEU assumptions, is arguably designed to get this outcome. And it did: it elicited moderate reactions among economists, making them feel part of the same discourse. As we shall see in what follows, Simon's emphasis on limited computational and information capacity will be at the core of the until-today understudied, but central, relationship between Simon's bounded rationality and Kahneman and Tversky's heuristics and biases approach.

4. Simon and the heuristics and biases approach

In the course of the 1980s, just behind the corner of the Nobel Prize, Simon's today-called 'old' behavioral economics suddenly faced the fate of being obscured by 'new', Kahneman and Tversky's (hereafter, KT) behavioral economics (see Sent, 2004a; see also Heukelom, 2014)[30]. Simon experienced the paradox of being "Nobel and neglect" (Leijonhufvud, in Augier and March, 2004, p. 351). Although the theoretical differences between 'old' and 'new' behavioral economics have been pointed out in some detail[31], this shift continues to be still surrounded by a certain haziness, characterized as it was by apparently contrasting phenomena. On the one hand, as already mentioned, the shift was accompanied by a marked terminological persistence that was possibly instrumental to the incumbents. On the other hand, the credits to Simon have been rare or virtually inexistent (see, e.g., Earl, 2012)[32]. This is symptomatic of a delicate situation, in which Simon's heritage was, for KT, at the same time an asset and a danger. On Simon's side, the situation was characterized by two similarly opposite tendencies. On the one hand was the risk of losing his status as absolute authority over bounded rationality, while on the other hand was the opportunity to embark KT as strong alleys against the main enemy, i.e. mainstream economists. In this last regard, Gerd Gigerenzer claims that Simon simply "tolerated" KT (Gigerenzer, in Augier and March, 2004, p. 390). With the risk of overdramatizing, one might depict this situation as an *instrumental-toleration* equilibrium between

[29] Letter by Barbara J. Redman, January 4 1978.

[30] For a slightly different categorization of 'old' and 'modern' behavioral economics see Kao and Velupilliai (2015).

[31] See Petracca (2017) that identifies the theoretical points of continuity between Simon's and KT's approaches to bounded rationality.

[32] Just to give a taste of this judgment, it is telling that in a commemorative article in honor of Herbert Simon by Kahneman and Frederick (2004) the only Simon's work cited by the authors is Simon (1935).

Simon and KT. It might be interesting to account for this instrumental toleration from Simon's point of view, which has been so far the less inquired into.

What has been most striking in this shift in behavioral economics is the relative quietness in which it happened. No public disputes at all. On the contrary, apparent continuity has been the prevailing feeling. In 1986, a conference at the University of Chicago organized under the auspices of the Russell Sage Foundations marked symbolically the shift (see Heukelom, 2014, pp. 158-160)[33]. Simon, in quality of 'Nobel father', wrote the introduction to the proceedings of the conference[34]. In return, KT put in their contribution one of the very rare explicit passage where they claim the compatibility of their approach with Simon's (Kahneman and Tversky, 1986, pp. S272-S273). More than a shifting point, it looked like as they were passing the baton. To the direct question addressed by Mie Augier during an interview – "Do you think [KT's] works are consistent with your view on bounded rationality?" – Simon in fact answered:

"Oh, yes, very much indeed. And I think they had a very big impact. […] Their first publication was in *Econometrica*, I believe. And I'm not sure – but I think I was a referee on that. […] They are certainly important for the future of behavioral economics" (in Augier, 2001, p. 273).

How was this continuity possible if they were proposing such evidently different points of view on bounded rationality? To understand this, and then to understand why the differences between Simon and KT have been remarked only late in time, after a phase in which they were almost confused, the modularity thesis proposed in this essay might be a good *explanans* of the situation. It might not be groundless to consider the ready acceptance of KT's framework in economics just because KT focus on the cognitive determinants of bounded rationality, programmatically neglecting the environmental and adaptive ones. But, from economists' point of view, this cognitive program had already been put in place, even if less distinctively, by Simon. Or, at least, this is what had emerged from the earlier interaction between Simon and economists. Thus, no wonder whether in the 1980s the conceptual divide between Simon and KT was not clearly perceived. The distinction between Simon's "cognitive limitations" and KT's "cognitive distortions" was even pointless if the adaptive dimension did not enter into the picture. And in fact it has not yet fully entered in economics, if not in the latest years (see Section 6).

Simon's writings are plenty with KT-like passages, most of which are related to the psychology of biased perception:

"In actual fact the perceived world is fantastically different from the 'real' world. The difference involves involve both omissions and distortions, and arise in both perception and inference. This sin of omission in perception are more important than the sins of commissions" (1959, p. 272).

[33] In private, the situation might have been a little bit different, as often was the case with Simon. Heukelom (2014, pp. 159-160) reports a letter by Simon in which Simon reproaches the Russel Sage's Foundation perception that bounded rationality needed for a new approach was misleading. This might be telling of Simon's fear of being overcome.

[34] The proceedings of the conference have been published as Hogarth and Reder (1986), while selected article, among which Simon (1986) and Tversky and Kahneman (1986) were also published in a special issue of the *Journal of Business*.

Another common topic with KT concerned Simon's earlier study of the 'framing effect'[35]. Further, the phenomenon of judgment errors, at least in the form of decision biases in organizations, can be traced back to *Administrative Behavior* (Simon, 1947).

Simon, because of his mostly 'cognitive' interaction with economists, found himself in the situation of being perceived 'Kahnemanian enough' (and *vice versa*) to consider KT allies in a common opposition toward rational choice theorists. The differences between his own approach and KT were clear to Simon (see Simon, 1991, pp. 231-233), but the exploitable communalities were more cogent and strategically useful. Thus, practically innumerable are the episodes in which Simon synergistically mentions KT's research as true evidence in favor of the bounded rationality of human agents. Even, KT's research becomes exploitable evidence in favor of Simon's own adaptive approach to bounded rationality[36]:

"In spite of its failure as a description of human choice, the SEU theory provides a useful framework for categorizing and diagnosing the nature of the departures of actual choice from the requirements of rationality. Kahneman and Tversky have been particularly active and successful in recent years in developing a taxonomy of deviations from rationality and proposing mechanisms of human choice to account for the deviations. Thus, there is emerging a theory of bounded rationality or procedural rationaltiv that describes man as an organism of limited computational ability and possessing limited information and limited imagination, seeking to survive in a world rich in complexity." (Simon, 1980, p. 75).

A few anecdotes might give the sense of this partnership in the creation of the 'bounded rationality' brand. In 1976, while discussing the unsuitability of traditional textbooks to teach useful economics, the absence of KT from these textbooks is lamented[37]. In 1986, impeded to attend at a conference, Amos Tversky was the person indicated to preach the gospel of bounded rationality[38]. Further, when corresponding with the editor of the *European Journal of the History of Economic Thought*, who asked him to name the most important works in bounded rationality, he mentioned "some of the papers by Tversky and Kahneman"[39]. Nonetheless, this partnership always took place at a certain distance. There was no coordinated strategy. No daily exchange between Simon and KT took place. A sense of astonishment might in fact take the reader when, in a late 1998 correspondence, Simon suggested Kahneman to read his foundational papers on bounded rationality, as if Kahneman was a casual correspondent[40], to which Kahneman responded that he "will go back to the three papers you mention [and] will write when I have studied them"[41].

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[35] In the original version of the Nobel lecture (Kahneman, 2002, p. 458), Kahneman explicitly acknowledged Simon as the discoverer of the framing effect. Kahneman, however, specified that the discovery happened in the field of 'problem-solving' and not in that of 'decision-making'. This part was then deleted in the AER version of the lecture (Kahneman, 2003b). Further, it is not completely fair Kahneman's allegation (Kahneman, 2003, p. 1470) that "the role of emotion in judgment and decision making received less attention in that [Simon's] work than it had received before the beginning of the cognitive revolution in psychology in the 1950's." (see, e.g., Earl, 2012). Simon as cognitive psychologist spent much of his attention on the role of 'hot cognition' and to its reduction to the information-processing paradigm (see, e.g., Simon, 1967; see also Frantz, 2003).

[36] Simon in particular considers in his writings the article Kahneman and Tversky (1973).

[37] Memorandum on 'Economics at CMU: An Opportunity for Undergraduate Economics Instruction at CMU', April 19 1992, CMU.

[38] Letter to George R. Feiwel, February 13 1984.

[39] Letter to J.L. Cardoso, September 6 2000 [not original date].

[40] E-mail to Kahneman, November 8 1998.

[41] E-mail from Kahneman, November 9 1998.

5. The "lover's quarrel" continues: the issue of empirical support

In any case, the 1980s worked as catalyzers for the legitimization of bounded rationality in economics, changing the mainstream's perception of bounded rationality from something from which to defend to an opportunity to exploit. Leading figures in mainstream economics of the 1980s and 1990s started to develop their own theories of bounded rationality. These neoclassical theories were not any more elicited by some earlier critique, but had now a genuinely 'positive' character, thus inaugurating bounded rationality's independence with respect to Simon's authority. This authority-free approach to bounded rationality signed a new phase of Simon's "lover's quarrel with [mainstreaim] economics" (Samuelson, 2004, p. 155). In this new phase, Simon's objective turned from preaching the gospel of bounded rationality to being acknowledged as the true interpreter of bounded rationality. "After all – Simon said – I did introduce the term, and have at least some modest qualifications as its interpreter"[42].

The economists involved in Simon-free theorizing on bounded rationality included names such as Kenneth Arrow, Robert Aumann, Thomas Sargent, Ariel Rubinstein, and Reinhart Selten. In particular, Simon was not particularly sympathetic with the intellectual attempts by Sargent and Aumann. As he writes in a letter to Spiro J. Latsis[43], "[t]he phrase 'bounded rationality' is practically faddish now in economics. Tom Sargent (!) has written a book of that title, and Robert Aumann has given a major talk on it. Both are still in the business of manufacturing models in which the bounds of rationality are inserted on a priori grounds without troubling to look for facts"[4445]. Simon had already repeatedly argued against neoclassical economics' attitude to make "armchair assumptions""[46], that is, to apriori theorizing without a solid empirical evidence. He also used to call this approach to economic theory as "formalist" economics (see, e.g., Simon 2000). An exchange with Ariel Rubinstein on the manuscript of the book *Modelling Bounded Rationality* is a well-known instance of the attack to that 'formalist' bounded rationality Simon had "much to disagree with" (Rubinstein, 1998, p. 187). Although the formalist exponents of bounded rationality now seemed to agree, at least in words, with the necessity to add behavioral assumptions to theories, Simon always remained concerned with the empirical methods used by economist to introduce these behavioral assumptions. "How do you know it?" is, for instance, the question addressed by Simon to Sargent.

Simon appeared much less harsh with respect to the approaches by Kenneth Arrow and Reinhart Selten to bounded rationality[47]. But they never fully satisfied him, nor did he consider them as part

[42] Letter to Ariel Rubinstein, February 7 1997.
[43] Letter to S.J. Latsis, December 29 1996.
[44] Somewhere else Simon is even more explicit, by emphasizing "the recent embrace that bounded rationality has received from people like Tom Sargent and Aumann", to which he is eager to add "neither of whom has a clue about what is really involved" (Letter to Conlisk, July 25, 1996).
[45] Simon refers to Sargent (1993) and Aumann (1997). For the relationship between Sargent and Simon's notion of bounded rationality see Sent (1997). On the relationship between Simon and game theory see Sent (2004b).
[46] The notion of "armchair method" was common among psychology-trained decision scientists (see, e.g., Edwards 1954, p. 381).
[47] Regarding Arrow see Arrow (1987), and for Selten see Selten (1992). Once he praised "Arrow and Reinhard Selten, who see the need for much more empirical work" (Letter to A.M. Silveira). But Simon's judgments varies significantly depending on the audience. As regards Selten, this time coupled with Harsanyi, "[s]ophisticated formalism, for example,

of the same intellectual fight, as is the case with KT. An economist who entered into Simon's graces was John Conlisk[48]. Simon explicitly wrote to Conlisk to congratulate with him for a paper by Conlisk (1996). As Simon wrote, "[y]ou will probably not be surprised to learn that I was delighted to see your paper […]. Another blow for (genuine) rationality among economists, and one that I hope will have impact. I will not comment in detail on all of the points in your argument to which I said 'amen'"[49]. A Simon now more in search for differentiation with respect to economists demonstrated a more explicit predilection for theorists, like Conlisk, who emphasized the environmental and adaptive dimension of bounded rationality[50]. But he did not touch on this point too explicitly. He continued to manifest his disagreement with economists as if the matter was a generic lack of empirical support of economics, behind which the distinction between cognitive and environmental limits remained nuanced. The case of the cycle of lectures later published as *An Empirically Based Microeconomics* (Simon, 1997) might be considered important in this regard. In these lectures, we find a more precise idea of what Simon considered 'empirical evidence' in economics. Not only the comrades in arms KT were mentioned, but also the works in experimental economics by Vernon Smith and Charles Plott was granted Simon's imprimatur.

6. Finally ecological

Particularly telling of Simon's attitude towards the new brands of bounded rationality is, finally, Simon's approach towards 'ecological rationality'. As is well known, ecological rationality programmatically gets back to the adaptive notion of bounded rationality, after the above mentioned heuristics and biases' complicated relationship with Simon. If KT were tolerated, ecological rationality was considered to be "embraced" by Simon (Gigerenzer, 2004, p. 390). By all means, ecological rationality's getting back to Simon has not been a mere lip service paid to the authority. It is a true return to Simon's scissors, which has been possible only after a true exegetical – and devoted – interpretation of Simon's thought (see, e.g., Gigerenzer & Goldstein, 1996, p. 651). On his part, Simon publically endorsed ecological rationality by greeting the 1999 book *Heuristics that Make Us Smart* – that is, the foundational book of ecological rationality – as "the book [that] strikes a great blow for sanity in the approach to human rationality". Against this idyllic background, an episode lays in which Simon was privately in touch with Gerd Gigerenzer, the father of ecological rationality, which is worth considering for its symbolic value. In 1999, Simon was asked by the *Psychological Review* to act as referee for the paper "On the Robustness of Fast and Frugal Heuristics"[51], submitted by Czerlinski J., Martignon L., Gigerenzer G. and Goldstein D. G, which was one of the early attempts

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of the kind that won a Nobel Prize for John Harsanyi and Reinhard Selten, required unrealistic assumptions about human decision making that were entirely unsupported by empirical evidence on actual decision processes". Also Harsanyi had been pleased before for its sensibility to empirics.[in **Research and Innovation Processes In Memory of Lee Bach, May 21 1999].**

[48] The relation between Simon and Conlisk is discussed by Mirowski (2002, p. 472-473) who, however, holds a different view with respect to the one exposed here.

[49] Letter to Conlisk, 25 July 1996.

[50] "So just as the behavior of an electron will be different, depending on the electrical and magnetic fields in which it finds itself, so the behavior of economic actors will be different depending on the social and historical context in which they find themselves" (Letter to Conlisk, July 25 1996).

[51] Manuscript # 99-035. Simon agreed with the publication of the article conditioned to substantial revisions. The article in the end was partly absorbed in the book Gigerenzer et al. (1999).

to introduce the class of ecological heuristics called 'fast-and-frugal' (FF) heuristics. After sending the referee report to the editor, Simon allowed him to disclose his identity to the authors, so that an e-mail exchange took place then between Simon and Gigerenzer. Simon's referee report[52] was, in fact, quite blunt and striking. Synthetically, Simon claimed that the paper's "effectiveness […] is diminished by excessive claims, inaccurate history, and too great exuberance" (p.2.). In fact, he found that

> [t]he authors describe FF [fast-and-frugal heuristics] as built on simple "search rules", "simple stop rules" and "simple decision rules". True, but this does not distinguish them from anything else in the (vast) psychology and AI literature on heuristic search. We must render the old verdict: "What's true is not new" (p.3).

In other words, Simon was complaining because FF was advocating to itself too much novelty with respect to the already existent literature, which Simon himself had contributed to create. In the referee report, Simon critically emphasized the "inaccurate history" that Czerlinski et al. were depicting in their paper. In fact, as Simon read it, they were explicitly accusing Simon for neglecting that bounded rationality had two blades, in particular the environmental blade of Simon's scissors. As evidence of this neglect they were referring to Simon's Nobel lecture[53]. Czerlinski et al. were, in other words, attacking Simon's selective emphasis on the cognitive module of bounded rationality. By doing so, they aimed to legitimate themselves as the true interpreters – more Simonian than Simon – of bounded rationality. Needless to say, Simon answered quite badly to that allegation[54]. The message of the referee report was, in the end, that "[the authors] need to reconsider their strategies of product differentiation" (p. 5).

This referee report was coeval to an email exchange in which Simon and Gigerenzer corresponded on the draft of *Simple Heuristics that Make Us Smart*. Gigerenzer at first presented the book to Simon as a book that "was based almost entirely on your notions of bounded rationality and satisficing"[55]. A flattered Simon responded to this deferent presentation by claiming: "needless to say, I found myself very pleased with the way you lay out the issues in the first chapter"[56]. The exchange then touched other sensible points in the relationship between Simon's bounded rationality and ecological rationality. In particular, the argument centered on whether fast-and-frugal heuristics were a subclass of satisficing models, as Gigerenzer was first inclined to think or on the same level of satisficing looked as a particular heuristics[57]. Simon's reply to Gigerenzer's question is quite interesting, as Simon claimed

[52] E-mail to Klaus Fiedler, May 19 1999.
[53] In self-defense, Simon replied to this that in the Nobel Lecture his 1956 article on the structure of the environment was however cited in the bibliography.
[54] "These pages are totally unacceptable and need to be rewritten, greatly abridged and with the history corrected" (p. 5).
[55] E-mail from Gigerenzer, April 29 1999.
[56] E-mail to Gigerenzer, May 4 1999. Curiously enough, in the published version even in that first chapter there is a note, i.e. note 24 at p. 24 in which Gigerenzer et al. re-propose the allegation that Simon sometimes forgot the dual nature of bounded rationality.
[57] The latter seems to be Gigerenzer's latest stance.

I do agree that I have used bounded rationality as a generic term, to refer to all of the limits th[at] make a *human being's problem spaces something quite different from the corresponding task environments*: knowledge limits, computational limits, incomparability of component goals. [58]

Simon's answer might even look paradoxical, as he somehow proposes to Gigerenzer a sort of biased-perception, KT-like interpretation of bounded rationality. This is just an instance of the very tricky conceptual subtleties that were involved when Simon dialogued with other proponents of bounded rationality, in dialogues that were supposed to be elucidative. The benchmark poles always remained cognition and environment, biased perception or cognitive adaptation. Depending on the audience, these notions played a different rhetoric role.

7. Concluding remarks

This has not been a counter-history of Simonian bounded rationality. This means, above all, that this has not been a history of Simon's inconsistencies. Quite the contrary in fact is true. The undeniably tortuous path of Simon's bounded rationality in post-war social sciences shows itself to be quite consistent if the purely theoretical ground is read in the light of the strategic considerations necessary for the establishment of bounded rationality as the new standard notion of rationality. If talking about 'strategic considerations' might call into cause too much premeditation on Simon, the word 'adaptation' might be more to the point. To survive and establish a new rationality standard, bounded rationality adapted to different disciplinary environments, and even to different audiences within the same discipline. It is this adaptation that is at the root of the modular structure assumed by bounded rationality in the two publications of 1955-1956. From then on, Simon emphasized either or both of the two modules in order to ease the dialogue with different disciplinary mainstreams.

This means that bounded rationality never assumed in Simon's thought a specific and immutable configuration. Rather, it assumed a space of possible configurations, coagulating around the *loci* of the two major boundaries of human cognition, the internal ones and the external ones. Simon always honestly acknowledged the plurality of bounded rationality[59]. He explicitly did so when exposing the incremental strategy of assumption relaxations in Simon (1954); and he did so then in multiple occasions, when Simon acknowledged that the notion 'bounded rationality' did not mean anything too specific for him. For instance, as Simon wrote to Gigerenzer:

I have never thought of either bounded rationality or satisficing as precisely defined technical terms, but rather as signals to economists that they needed to pay attention to reality, and *a suggestion of some ways* in which they might (in Gigerenzer, 2004, p. 406, emphasis added).[60]

In commenting on Simon's work, Mirowski has rightful claimed that bounded rationality is a notion subject to "family resemblance" (Mirowski, 2002, p. 476). The metaphor of the family looks particularly appropriated in the case of bounded rationality, where Simon always played the role of

[58] E-mail to Gigerenzer September 2 1999, later published in Gigerenzer (2004, p. 406). See also Simon's claim when he says: "At an abstract level, bounded rationality is a very weak theory (almost as weak as SEU maximization with an unspecified utility function)" (Letter to Conlisk, 25 July 1996, p.2).

[59] For further dimensions along which reconstructing the plurality of bounded rationality beyond the cognitive/environmental divide see see Katsikopoulos (2014).

[60] On the intentional 'vagueness' behind the notion of bounded rationality see also Simon (1997).

head of the family, in the attempt to build the family in the first place, and then wishing to lead it, confronting with more or less devoted descendants.

In the light of this remarks, the history of bounded rationality might be properly understood as an instance of Simon's boundedly rational, adaptive behavior in the field of economics.

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