DOI: http://dx.doi.org/10.1590/0103-6351/6044

Strategy: notes for an economic and historical approach

Estratégia: notas para uma abordagem econômica e histórica

Enéas Gonçalves de Carvalho [1]
Sebastião Neto Ribeiro Guedes [1]
Rogério Gomes [1]
[1] São Paulo State University (UNESP)

Abstract

The objective of this article is to elaborate an economic and historical approach to the notion/concept of strategy. More specifically, it aims to propose a definition of strategy that helps to unravel this important topic from a paralysing tangle of schools, approaches and definitions. It was also sought to delimit more clearly its nature and what can (and what should not) be considered as strategy. For that, the research work adopts a historical perspective and, as starting point, the approach proposed by Simon (1993). Besides that, it was made an additional effort to specify better and enrich the Simon's driveway with the contributions from some other pertinent authors – mainly from the Keynesian and Schumpeterian schools.

Keywords

Strategy, Decision-making, Uncertainty, Dynamic capability.

JEL Codes B5, L2, L1.

Resumo

O objetivo deste artigo é elaborar uma abordagem econômica e histórica da noção/ conceito de estratégia. Mais especificamente, a intenção é propor uma definição de estratégia que ajude a desvencilhar este importante tópico de um emaranhado paralisante de escolas, abordagens e definições. Procurou-se, também, delimitar mais claramente a sua natureza e o quê pode (e o quê não deve) ser considerado como estratégia. Para tanto, adotou-se basicamente uma perspectiva histórica e, como ponto de partida, o enfoque proposto por Simon (1993). Adicionalmente, procurou-se ampliar e enriquecer o referido enfoque a partir das contribuições de alguns outros autores pertinentes, principalmente, das escolas keynesiana e schumpeteriana.

Palavras-chave

Estratégia, Tomada de decisão, Incerteza, Capacidades dinâmicas.

Códigos JEL *B5, L2, L1.*

1 **Introduction**

> *"Strategy, one might say, is decision making that deals with the 'Big Questions'" (Simon, 1993, p. 131)*[1]

Unlike what Marshall apparently imagined, the economists who succeeded him – especially those in the mainstream – never paid more attention to the notion (or concept) of *strategy*[2]. A partial, but nevertheless noteworthy, exception was that of the game theory that adopted, however, a very restrictive interpretation of the notion of *strategy*[3] – that has become more a particular extension of the well-known theory of the subjective expected utility *(SEU)* than a true introduction to the notion of *strategy* in the economic theory (Simon, 1986,1993; Ancona, 1989a) (see below).

Notwithstanding, a relatively small number of economists, over the years, have more or less explicitly used the notion/concept of *strategy*. Besides Marshall, the best-known examples may be those of Veblen, Schumpeter, Morgenstern, Myrdal, J. Robinson, Kaldor, Bain, Penrose, Hirschman, Boulding, Caves, Porter, Perroux, Nelson, Freeman, Rosenberg4 (Langlois, 2003; Rumelt *et al*.,1991; Pavitt and Steinmueller, 2002; Freeman and Soete, 1997; Loasby, 2010; Foss and Stieglitz, 2012).

On the contrary, the study of the *strategy* has a very long tradition in the field of 'military art' (Ancona, 1989a; Mintzberg *et al*., 2003; Clausewitz, 1989). And, since the middle of last century, the conception of *strategy* has also been the subject of research and discussions in the social sciences. In this area, business scholars, mainly, and political scientists have excelled in incorporating the notion into their theoretical approaches and research methodologies (Rumelt *et al*., 1991; Mintzberg *et al*., 1998; Simon, 1993; Lindblom, 1980).

1 This definition of strategy, proposed by Simon (1993: 131), is the starting point of the discussion on this important topic – unfortunately not very usual in economics – that we will develop in this article, especially in item III below.

2 At the Appendix C of the Principles of Economics (PE), Marshall dealt with the notion of strategy with special attention. "It is recently, and to a great extent through the wholesome influence of the criticisms of the historical school, that prominence has been given to that *distinction in economics which corresponds to the distinction between strategy and tactics in warfare*" (Marshall, 1920: 453; emphasis added [hereafter *ea*]).

3 Which, in addition to being incompatible with its more usual conception, is also conflicting with the classical interpretation of strategy proposed by Clausewitz, 1989.

4 More recently, economists such as Williamson, Winter, Teece, Dunning, Langlois, Loasby, Foss, Krugman, Kreps, Milgrom, Stieglitz, Tirole, Mowery, Cantwell, Dosi, Metcalf, and Malerba, among others, have expanded the list of scholars interested in the notion of strategy.

It has also been observed the use of the notion of *strategy* by relevant scholars of sociology (Aron, Block, Dore, Mann, Tilly, Wallerstein), international political economy (Arrighi, Berger, Cox, Gilpin, Ostry, Strange), and international relations (Johnson, Kennedy, Kissinger, Morgenthau, Nye Jr., Waltz). In addition, we can as well mention some prominent historians (Anderson, Braudel, Carr, and Hobsbawm) and several economic and technological historians too (Chandler, David, Hounshell, Lazonick, and Rosenberg).

The general aim of this paper is to develop an economic and historical approach to the notion/concept of strategy. In a more specific way, its goal is to propone a definition of strategy that helps to unravel this relevant subject from a paralysing tangle of approaches, schools, and definitions. Also, it was sought to delimit more clearly its nature and what can (and what should not) be properly considered as strategy.

This article is structured as follows. Four other items follow this introduction. In the second topic, decision-making, game theory, choices, and *strategies* were focused from a critical perspective. In item three, we sought to advance a definition of strategy, which takes Simon as a starting point, but that was tentatively more broadened and enriched with the contributions from some other pertinent authors – mainly from the Keynesian and Schumpeterian schools. In the penultimate topic, we tried to present the probable determinants of the strategies. In the latter, the usual final considerations were made.

2 **Decision-making, choices and strategies**

2.1 **Decision-making theory (DM) and game theory (GT): some brief comments**[5]

In the dominant economic thinking – within what is known as decision-making theory –, what has prevailed is the normative (or prescriptive) ap-

5 As *DM* and *GT* theory have a non-central role in this article, we will approach here only their basic aspects, being exempt from dealing with its most recent developments. For the latter, we refer interested readers, on *DM*, to articles (or books) by Vercelli's, 1999; Morroni, 2006; and Basili and Zapia, 2019 and 2010. On *GT*, we refer readers to articles Devetag and Louçã, 2004; Hargreaves-Heap and Varoufakes, 2004; Mirowsky, 2002; Israel, 2007; and Syll, 2018.

proach, with special emphasis on the influential theory of the subjective expected utility *(SEU)*. *SEU* theory is

> *"a sophisticated mathematical model of choice that lies at the foundation of most contemporary economics, theoretical statistics, and operations research.* SEU *theory defines the conditions of perfect utility-maximizing rationality in a world of certainty or in a world in which the probability distributions of all relevant variables can be provided by the decision makers" (Simon, 1986: 2; Vercelli, 1999; Fishburn, 1987; Arthur, 1992).*

In summary, the subjective expected utility theory assumes that: a) the decision-maker has a well-defined utility function and therefore can establish a *cardinal relationship* as the unit of measure of his or her preference regarding a specific set of future events; b) the decision-maker may stipulate to the totality of future series of events a *joint probability distribution* (objective or subjective); c) the decision-maker is confronted with a *well-defined group of possibilities* from which to make his/her choice; and d) the decision-maker will opt for the alternative or choice that *maximises the expected value of his/her utility function* – for the set of events resulting from his/her choice (Simon, 1986).

The subjective expected utility theory, however, faces serious difficulties whenever, in economics, politics and other social contexts, there is interdependence/conflict of real or potential interest, non-coherent behaviour, and, especially, if they are combined with incomplete information and *radical/strong uncertainty* (Simon, 1986, 1993; Shackle, [1972] 1992; Sen, 1987; Vercelli, 1991, 1999; Carvalho, 2020; Davidson, 1996, 2011; Dequech, 2011).

By the way, we are adopting here the classic distinction between uncertainty and risk proposed by Keynes and Knight. In the literature on the topic, they are also usually referred to, respectively, as radical/strong uncertainty or risk (or, still, weak uncertainty). As Louçã appropriately pointed out,

> *"[t]here are in fact two possible concepts of certainty [or risk] and uncertainty: (…) for the second,* uncertainty is epistemologically autonomous of certainty [or risk]. *The opposition is rather sharp, since the first version implies the reduction of uncertainty concept to that of mathematical risk, as some precise distribution is assumed: that is, for instance, the strategy of the Rational Expectations models.* Keynes argued extensively against this procedure (Keynes, 1937: 212-3), and so did Knight, defining uncertainty as a non-measurable value *(Knight, 1921: 19-20) and* Shackle, arguing that the irreversible quality of time prevented any meaningful knowledge of the probability distribution of economic actions *(Shackle, 1990: xii)" (Louçã, 1997: 148; ea)*[6].

6 As a more detailed discussion on this complex topic would certainly go beyond the ob-

In its turn, the study of the actual processes of decisions, according to Simon

> "reveals massive and unavoidable departures from the framework of *SEU* theory". *(...) Increasingly, research is being directed at decision making that* takes realistic account of the compromises and approximations *that must be made in order to fit* real-world problems to the informational and computational limits of people and computers*, as well as to* inconsistencies in their values and perceptions*" (Simon, 1986: 5; ea).*

It is particularly noteworthy that Keynes had already reached a similar conclusion regarding the characteristics of knowledge – in discussing causality in the realm of 'moral sciences'. In his pioneering work on probability, Keynes (1921 [2004]: 275; *ea*) had already concluded that, "our knowledge is partial, there is constantly, in our use of the term cause, some reference implied or expressed to *a limited body of knowledge*"[7].

Formulated by the famous mathematician Von Neumann and the mathematician economist Morgenstern in 1944, game theory was, probably, the most ambitious attempt to answer the questions posed to subjective expected utility theory (Simon, 1986). The characteristic approach to game theory is to consider that: a) the agents have *full knowledge of the rules*; b) they are *typically rational* – that is, their preferences are compatible with the axioms of rational choice theory, and therefore they can be treated as *maximisers of the subjective expected utilities* –[8]; and c) they have *equal and common knowledge of their rationality and the rules of the game*[9].

However, as we know, the answers provided by the sophisticated mathematical theory of games are not seldom puzzling and ambiguous. "In *many situations*, no single course of action *dominates* all the others; in-

jectives and limits of this article, we refer interested readers to the following authors in our bibliography: Schackle, 1966, 1972; Simon, 1986, 2000; Vercelli, 1991, 1999; Hargraeves, 1989; Carvalho, 1992; Louçã, 1997; Lawson, 1997; Possas, 1997; Morroni, 2006; Prado, 2006; Davidson, 1996, 2011; Dequech, 1999, 2007, 2011).

7 Concepts of Keynes's work, such as *'weight of argument'*, *'non-numerical probabilities'* and *'probabilistic causality'*, have received increasing attention from unorthodox economists in recent decades (Shackle, 1976; Vercelli, 1991, 2001; Basili and Zappia, 2019, 2010). As for the pioneering work of Keynes, see also Hicks, 1980.

8 This topic will be resumed in item III below.

9 Unless stated otherwise, the comments regarding game theory made in this article concern what can be considered the "standard [or conventional] game theory" – in the sense of that which "is explained in advanced textbooks," and which is typically adopted by mainstream economists – as pointed out by Devetag and Louçã (2004: 12) and Hargreaves-Heap and Varoufakes (2004). In this regard see also Simon (1986), Possas (1997), Prado (2006), Israel (2007), Mirowski (2002).

stead, *a whole set of possible solutions are all equally consistent with the postulates of rationality"* (Simon, 1986: 7-8; *ea*).

Despite these and other limitations – as highlighted by Simon (1986 and 1993), Hollis (1994), Devetag and Louçã (2004), Hargreaves-Heap and Varoufakes (1995, 2004), Mirowsky (2002), Bunge (1997,1999), Possas (1997) and Prado (2006), among others –, the dissemination of the standard game theory in several areas of the economy has been very widespread – especially among mainstream economists –, and even other disciplines in the social sciences, such as political science and law, have also started to use it widely.

However, as pointed out by Devetag and Louçã (2004),

> *"[w]hile nowadays theoretical and applied I.O., contract theory, microeconomics, and even individual decision theory as applied to inter-temporal choice are completely pervaded by* subtle game-theoretic nuances and increasingly and obscure concepts*, it is quite interesting to note that, already in the 40s, several military officers at RAND corporation, where game theory had had its initial moments of glory, soon started to be absolutely dissatisfied with its developments, and began to consider its whole analytical apparatus* simply irrelevant as an aid to solve complex international policy problems*" Devetag and Louçã (2004: 12; ea).*

In fact, it is at least quite surprising (and even intriguing) that what was obvious to the military and to some of those responsible for game theory section of RAND some sixty years ago does not yet seem evident to the mainstream economists: "namely, that game theory can be a useful tool to analyze strategic interaction in a novel and rigorous way, but its solution concepts are *largely irrelevant except for simplest game* (and even here there might be disagreement (…)"(Devetag and Louçã, 2004:13;ea; Mirowski, 2002).

Based on a broad critical appraisal effort that resulted in two well-founded books, Hargreaves-Heap and Varoufakes (1995, 2004) presented an assessment of game theory and its recent evolution that, besides being relatively synthetic and judicious, seemed very appropriate for the success of this our very brief approach to game theory.

> *"The ambitions claim that game theory will provide a unified foundation for all social science seemed misplaced to us ten years ago (when we writing this book's first version). It still does. Our book started life, all these years ago, with an attempt to discuss the variety of objections to this grand claim. some were associated with the assumptions of game theory* (for instance, that agents are instrumentally motivated and that they have common knowledge of rationality)*, some came from the questionable inferences draw from these assumptions* (as when it is assumed that common knowledge delivers consistently aligned beliefs)*, and yet others sprang from the failure (even once the contro-*

> *versial assumptions and the inferences are in place) to* generate determinate predictions of what 'rational' agents would, or should, do in important social interactions.
>
> *In the ten years that have come to pass, two things have happened: first, game theory's appeal among social scientists grew in leaps and bounds. Second, many game theorists came to recognize the problematic nature of their subject matter. In this, we feel vindicated. For when our earlier book was published, it was criticised by some 'loyalists' as overly critical. It now seems that most of the criticisms in that book* have become widely accepted as true and fair. *Indeed, many of developments within game theory in the late 1990s and beyond are direct responses to this recognition.*
>
> *The important developments of the last decade happened in three areas evolutionary game theory, the study of psychological games which stretch the limits of* Homo Economicus*, and some clever laboratory experiments. All three have combined nicely to illuminate the* dialectical relationship between action and structure – *the very type of relationship that conventional game theory assumes away, to its detriment we fear (Hargreaves-Heap and Varoufakes (2004: 302; ea)".*

To make the basic viewpoints adopted in this article even more clear, we should also clarify, in this subitem, what we mean by economic mainstream[10]. From our perspective, the dominant economy can be characterised synthetically as follows: a) by methodological individualism (or reductionism) (Schumpeter, 1994; Bunge, 1997 e 1999; Vercelli, 1991; Hargreaves-Heap e Varoufakes, 2004; Hollis, 1994; Louçã, 1997; Prado, 2006); b) by using the hypothetical-deductive method (Hollis e Nell, 1977; Vercelli, 1991; Lawson, 1997; Mirowsky, 2002; Hollis, 1994; Louçã, 1997; Prado, 2006); c) by adopting the maximising rationality axiom (Simon, 1986, 2000; Vercelli, 1991; Shackle, 1972; Possas, 1997; Hargraves, 1980; Louçã, 1997, Prado, 2006)[11]; d) by using the equilibrium norm (Louçã, 1997; Lawson, 1997; Kaldor, 1985; Shackle, 1972, Vercelli, 1991, Possas, 1997; Ingrao e Israel, 2000; Prado, 2006)[12], and e) by assuming the widespread applicability of the so-called ergodic theorem to economic processes (Georgescu-Roegen, 1971; Vercelli,1991; Louçã,1997; Davidson, 2011; Mirowski, 2002; Arthur, 2010; Possas, 1997 e Carvalho, 2020)[13].

10 This is undeniably a controversial issue that will not be discussed here because it is outside the scope of the article and because the space limitation does not allow it. The intention here is to just make our viewpoint explicit and try to shed additional light on the relationship between the mainstream and the standard game theory. In this regard, see (Possas, 1997; Prado, 2006; Dequech, 2003; Hargreaves-Heap and Varoufakes; 2004; Lawson, 1997; Louçã, 1997).

11 This point will be retaken in item III below.

12 Not always properly explained – either as an assumption or as a result (to be demonstrated in the latter case), or as the resting state of a system, or as the evolution between two successive resting states.

13 Although unusual – indeed, prominent mainstream authors who explicitly reiterate er-

Regardless of the merits and potentialities of game theory – or rather, game theories[14] (Davis, 1997; Israel, 2007), especially non-standard (or non-conventional) versions – the point to note is that they are drastically restricted (or even rendered unfeasible), once they are subjected to the unavoidable limitations of the economic mainstream and its axioms and basic assumptions (as seen above).

This is the case, for example, with the cooperative games approach – which apparently has better potential to deal with the interdependence/interaction of the players – but which was neglected, not by chance, due to the non-cooperative approach (with Nash equilibrium), by mainstream economists (Israel, 2007; Hargreaves-Heap and Varoakufes, 2004). Something quite similar also occurs with evolutionary games – which introduced more realism in the treatment of institutions – and with psychological games (which increased the complexity of the approach to human behaviour): they can only preserve their heuristic potentials and introduce a higher dose of realism when not used together with the mainstream paradigm[15] (Devetag and Louçã, 2004; Hargreaves-Heap and Varoakufes, 2004; Possas, 1997).

2.2 **Choices and strategies**

In this context of standard game theory, the term '*strategy*' has been (and is) used in a very specific (and restrictive) sense – from the point of view of these authors – and, besides that, is not compatible with how the notion has been adopted traditionally in the field of 'military art', in the social sciences or even in most of the approaches to innovation strategies.

In fact, in this mathematical theory, '*strategy*' is assimilated to choice – not any choice, a choice with interdependence, in which the agent "does

godicity in the economy are effectively few (Samuelson, 1969; Lucas and Sargent, 1981) (in this regard, see Vercelli, 1991 and Davidson 2011) –, the characterization of the dominant economic thinking, as being strictly linked to the supposed validity of the ergodic theory, finds, on the other hand, strong support in several non-orthodox authors we consider here.

14 "The definition of game theory is very broad. There really isn't a 'theory' of games; there are in fact many theories" (Davis, 1997: xiv).

15 From our point of view, the so-called mainstream is constituted – due to the criteria previously explained – by the neoclassical schools (neo-Walrasian and Marshalian aspects), by the old neo-Keynesian and monetarist schools, and by the recent new-classical and new-Keynesians ones (Possas, 1997, Prado, 2006; Dequech, 2007; Lawson, 1997; Louçã, 1997). By the way, what we calling, in generic terms, mainstream economics would correspond, approximately, to what Prado (2006) calls reductionist microeconomics, at the microeconomic level

not have *complete* knowledge, for he does not know *which* thing his opponent *will* do (...); [but] he knows what things his opponent can do" (Shackle, 1972 [1992]:161; *ea*). It is not, therefore, a situation of *typical rational choice*, since there is no *complete knowledge*.

Indeed, as insightfully observed by Shackle (1972 [1992]:183; *ea*), it is a circumstance of "*quasi-rational* choice of conduct": the agent does not know exactly what the opponent will do, but is supposedly aware of all possibilities of action. Or, to quote a very fortunate and perceptive expression of Georgescu-Roegen (1971:122; *ea*), these are "situations where the exact outcome is not known but *the outcome does not represent a novelty*". On the contrary, the usual sense of strategy does not ignore the existence of surprise – "(...) the most powerful and incisive element in the whole art of war (...)" (Shackle, 1972 [1992]:161) – and novelty (Ancona, 1989a).

De facto, strategy assumes radical/strong uncertainty – in the sense in that it cannot be reducible to a probabilistic risk, as already seen before –[16], bounded rationality[17], incomplete information, significant interdependence and/or inconsistency of the agents' behaviour[18], which characterise, contrary to what mainstream economists think – the main important and frequent circumstances in which human decisions are made –, not just those of an economic nature (Keynes, 1937; Schakle, 1966,1972 ; Simon, 1986, 2000; Hargreaves, 1989; Vercelli, 1991, 1999; Carvalho, 2020; Dequech,1999; Marroni, 2006).

In a hypothetical opposite situation, if the future is known – feasible of a *perfect complete prediction* (see below) – and the expectation of a certain event is certain, the conceivable choices regarding that future would in practice be reduced to a single one – the hypothetical choice *('strategy')* that maximises profits and/or utility (Morroni, 2006; Dosi and Egidi, 1991; Simon 1986).

Therefore, a *perfect complete prediction* is equal to certainty and presupposes, simultaneously, a perfect knowledge of the actual results (theoreti-

16 Schackle, 1966, 1972; Simon, 1986, 2000; Vercelli, 1991, 1999; Hargraeves, 1989; Carvalho, 1992; Louçã, 1997; Lawson, 1997; Possas, 1997; Morroni, 2006; Prado, 2006; Davidson, 1996, 2011; Dequech, 1999, 2007, 2011).

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

18 Conditions which are particularly frequent in oligopolistic market structures (Dosi *et al.*, 1990; Freeman and Soete, 1997; Nelson and Winter, 1982; Tidd *et al.*, 2005).

cal knowledge) and a complete *information processing ability*. In turn, an *imperfect complete prediction* equals risk – objective or subjective estimation of probability distributions of all possible events. *Imperfect complete prediction* also supposes – as in *perfect complete prediction*, a complete *information processing ability* (Morroni, 2006; Dosi and Egidi, 1991; Heiner, 1983). In an *imperfect complete prediction* situation, the sum of the probabilities of all expectations would be equal to one, and there would exist space for various choices *('strategies')*, *all known*, associated with the different risks involved.

The circumstance would change significantly, also from the point of view of the *strategies*, if the future is subject to an *incomplete prediction* – radical/strong uncertainty, this is, the impossibility of knowing the future events and, consequently, the not certainty associated with the expectations related to the occurrences to coming (Keynes, 1937; Shackle, 1972; Davidson, 1996; Dosi and Egidi, 1991; Morroni, 2006).

Incomplete prediction would result in a) *substantive uncertainty* (see next) – because of the combination of an *incomplete* knowledge of the list of possible events, due to a changing future, with a *complete information processing ability* – or in b) *procedural uncertainty* (see next) – resulting, alternatively, from the association of a *complete* knowledge of the list of possible events with an *incomplete information processing ability* (Marroni, 2006; Dosi and Egidi, 1991; Simon, 1986). In these last two cases of *incomplete prediction*, the sum of the expectations – which can be considered as propositions about the probabilities that certain future events will happen – would not be equal to the unit and the conceivable *strategies* would be multiple and would not be restricted only to known and/or perfectly predictable events and behaviours (Morroni, 2006; Keynes, 1937, 1921; Shackle, 1972, 1961; Davidson, 1996).

According to the authors (Dosi and Egidi), the terms *substantive uncertainty* – "the lack of all the information which would be necessary to make decisions with certain outcomes"(Dosi and Egidi, 1991: 145) – and *procedural uncertainty* – "[the] limitations on the computational and cognitive capabilities of the agents to purpose unambiguously their objectives, given the available information" (Dosi and Egidi, 1991: 145) – are clearly used in strict analogy with Herbert Simon's distinction between substantive and procedural rationality[19].

19 Conditions which are particularly frequent in oligopolistic market structures (Dosi *et al.*, 1990; Freeman and Soete, 1997; Nelson and Winter, 1982; Tidd *et al.*, 2005).

In this way, strategies would confront the complexity of the environment, the radical/strong uncertainties, the novelties and changes that an unpredictable future can bring. Strategies would then be formulated, implemented and adapted – under conditions of *radical uncertainty* (*substantive* and/or *procedural*) and usually modified in the light of new information and knowledge (Keynes, 1937; Shackle, 1972; Simon, 1986; Arthur, 1992; Dosi and Egidi, 1991; Tidd *et al*., 2005; Morroni, 2006).

Generally speaking, *strategies* would occur, basically, in *nonergodic* (changeable) *systems/processes* (Georgescu-Roegen, 1971; Davidson, 1982-83, and 2007; Vercelli, 1991) or in *open systems* – according to the concept of critical realism (Lawson, 1997; Bhaskar, 2008). *Choices*, in turn, would be attributes, mainly, of the *ergodic* (immutable) or *closed systems*.[20]

At this point, it seems timely to make a brief digression. The notion of *strategy* proposed in this article only makes sense in conditions of *incomplete prediction*, plus the circumstance that adjustments of forecast errors *is time consuming* (there are *significant lags*) and/or imply *non-negligible costs*. That is, if adjustments were immediate and/or with negligible costs – which, in general, does not prevail in the most relevant economic decisions (Keynes, 1921, 1937; Shackle, 1972; Davidson, 1996; Simon 1996) – there would be no significant practical difference between the *incomplete prediction* of the future on the one hand, and the *perfect complete prediction* and the imperfect complete prediction, on the other. And, in this case, the notion of *strategy* would cease to make sense, for it would not distinguish itself from *choices*.

From this point of view, strategies could be considered in the *strict sense* (and *strong*) of the term – and in a manner compatible with the interpretation usually attributed to this notion outside the mainstream economy –, since they would be *developed, implemented and adapted* under *radical/strong uncertainty and nonergodic conditions* (Morroni 2006; Tidd *et al*., 2005; Shackle 1972; Simon, 1993; Vercelli, 1991).

According to the perspective proposed here, '*strategies*' (or choices) adopted under conditions of certainty or risk should be considered in the *non-strict sense* (or weak) of the term, since, in such circumstances, '*strategies*' (or choices) would not confront surprises, novelties or even unforeseen events (Keynes,1937; Shackle, 1972; Simon,1993; Vercelli, 1991; Morroni, 2006).

20 This conception is, to a certain extent, compatible with the ideas found in Hicks (1980), for instance. See, in relation to this last point, Davidson (2011).

Thus, it would be more appropriate to call them, perhaps, *choices under certainty conditions*, or yet *choices under risky conditions* (or even just *choices*), rather than '*strategies*' – as economists who adopt standard (or conventional) game theory as a theoretical framework do, for instance. According to our standpoint, *strategy* denomination, in the *strong sense* (strict) of the term, would apply only to circumstances in which *radical/strong uncertainty*, incomplete information, significant interdependence/interaction, and conflict of real or potential interest and/or inconsistent behaviour of agents are observed (Shackle, 1972; Simon, 1986, 1993; Tidd *et al*., 2005).

Additionally, it seems useful to highlight the existence of a clear convergence between this proposition adopted here and the argument developed by Shackle (1961), regarding the distinction between the concepts of *decision* and choices. It is worth remembering that the similarity in question becomes even more evident when it is stressed that the definition of *strategies* in development here, considers the latter as a subset of *decision-making*, in line also with Simon's (1993) conception (see item *III* below).

In order to better clarify the nature of *strategies*, an additional distinction must be made between the former and the notion of *crucial decisions*, originally proposed by Shackle (Davidson, 1996). From our viewpoint, not every *crucial decision* – for example, a routine investment decision – would be configured as *strategies*. That is, *strategies* would be only a subset of the *crucial decisions*, since the latter is not just about '*big questions*' (or 'big decisions'), as in the former case (Simon, 1993; Barney, 1995) (see below)

3 **An Attempt to define strategies**

It may not be a total waste of time to seek to organise ideas with a view to obtain some theoretical and explanatory progress on the notion of strategy – notwithstanding, the previous considerations about the lack of agreement on this matter in the several areas in which it has been discussed. Perhaps the actual difficulty can be circumvented from an appropriate theoretical perspective – despite the entanglement of sometimes even conflicting notions of *strategies*.

Such a perspective has as starting point the Simon's (1986, 1993) contributions in the so-called *decision-making theory* in general, and especially in the more specific field of *strategy*. The subject of strategy had already been

treated unsystematically in some others works by this influential American polymath (Simon,1996, 1978). However, it was just in a specific article – written for a special issue of the influential *Strategic Management Journal* – that Simon approached straighforwardly the question of strategy and proposed the following definition: "[s]trategy, one might say, is *decision making* that deals with the *'Big Questions'*" (Simon, 1993:131; *ea*)[21].

More specifically, the definition proposed by Simon (1993) seems to offer a way to remove the notion of *strategy* from the apparent dead-end that the profusion of schools, approaches and definitions has caused (Mintzberg *et al*., 2003; Rumelt *et al*., 1991; Rumelt *et al*., 1995; Whittington, 2002). At the same time, the Simon's (1993) definition is also compatible with most of the main characteristics that are usually attributed to *strategies* (Langlois and Robertson, 1995; Mintzberg *et al*. 1998).

Besides this, the definition of *strategy* suggested by Simon (1993) is still consistent with much of the recent research related to innovation strategies, in general, and technological innovation strategies in particular (Freeman and Soete, 1997; Tidd *et al*., 2008; Pavitt and Steinmueller, 2002). Likewise, the definition of Simon is also congruent with the interpretation that was consolidated in the field of military studies (Ancona, 1989a; Clausewitz, 1989) and with several influential approaches in the social sciences (Lindblom, 1980; Chandler, 1962, 1995).

With respect to the influential definition of *strategies* proposed by Chandler (1962, 1995), the compatibility is not total. Actually, the inclusion of objectives (or targets) as part of the *strategies* suggested in the delimitation of the emeritus US business historian render it not entirely consistent with Simon's definition (1993), although the similarities are, undeniably, significant. De facto, the objectives are part of what, as we know, Simon (1986) addresses as *problem-solving*, and they are thus excluded from his delimitation of *strategies*.

Besides being non-restrictive, the definition adopted by Simon (1993) places *strategies* within the appropriate framework of *decision-making* theory. By situating *strategies* in this field, Simon establishes a critical dialogue with both "[t]he classical formal theory [normative] of decision making" (Simon, 1993:134; Fishburn, 1987) and "[t]he concept of rational behavour"

21 Barney (1995), for instance, considers strategies as equivalents to *big decisions*. For perspectives consistent with this approach proposed by Simon, see Nelson, 1995; Freeman and Soete 1997; Pavitt, 1990; Langlois and Robertson ,1995; Morroni, 2006.

(Sen, 1987: 68)[22].

It should be stressed that the descriptive (or positive) *decision-making* approach proposed by Simon and his collaborators is not confined to the theoretical dimension, but also incorporates a great empirical concern. Regarding the attention paid to the empirical dimension, the influential book by Cyert and March (1992) –Simon's outstanding contributors – must also be detached.

With regard to the experimental results, it should be either highlighted – as it was appropriately appointed by Marroni (2006: 66)[23] – that "[t]he pioneering works concerning experiments on cognitive anomalies in perception and in the process of choice that prevent full rationality and optimisation were carried out jointly by D. Kahneman (...) and A. Tversky".

In the same line, but based on a well detailed and extensive survey of the experimental results[24], McFadden pointed out at least *twenty-five types of cognitive irregularities* that results in the formulation of problems of choice, which are incompatible with perfect [full] rationality. Analogous way, he concluded either "(...) that *perception-rationality fails, and that the failures are systematic, persistent, pervasive, and large in magnitude*" (MacFadden, 1998: 28; *ea*).

Complementary to the previous arguments, Simon (2000) also added the perspective that the

> *"classically defined rationality, according to Albin [1998] simply go far beyond the capabilities of human actors to deal with the word's complexities. These are the* 'barriers and bounds to rationality'.
>
> *However, Albin's critique is somewhat distinct from and complementary to the critique of Tversky and Kahneman [and McFadden], and of Carnegie revisionists of the theory of the firm. Albin's being based primarily* on logical*, the others primarily on empirical considerations. (…) his [Albin] chief argument is a* logical and mathematical one*: that human computation, being at most as powerful as a Turing machine,* falls short*, a priori, of the demands of classical theory. The*

22 It should also be mentioned that Simon's approach establishes an important connection with the so-called *problem-solving theory*, originated from cognitive psychology, but which has received increasing attention in the areas of artificial intelligence, of neuroscience, and from some economists (Simon, 1979 and 1986; Dosi and Egidi, 1991; Tversky and Kahneman, 1974; Kahneman, 2003.

23 "Among the numerous papers by these two authors, see, for instance, Tversky and Kahneman (1974, pp. 3ff., 1992, pp. 44ff.); Kahneman and Tversky (1979, pp. 17ff., 1996, pp. 582ff.); Tversky and Fox (1995, pp. 93ff.); Kahneman (2003, pp. 1449ff.)" (Morroni, 2006: 66).

24 "There are excellent surveys of behavioral decision theory by Camerer (1998), Machina (1989), Rabin (1997), and Thaler (1991); to reduce the overlap, I abbreviate my discussion of the areas of choice under uncertainty and behaviour in games which are emphasised in these surveys" (McFadden, 1998:16).

> *argument has a number of distinct components* deriving from Gödel's theorem in modern logic*, from* computational complexity theory *developed in computer science, and from the* theory of cellular automata*" (Simon, 2000: 245-6; ea)*[25].

Furthermore, it can be postulated that strategies – that is typically a three-step process (development, implementation and adaptation) (Tidd *et al*., 2005)[26] – are usually formalised in plans, that result, in turn, from a more or less detailed planning process. Likewise, these plans jointly articulate, structure and coordinate the companies' chief aims, their strategies, their top-level decisions and the intermediate (or operational) goals (Morroni, 2006; Rumelt *et al*., 1991).

Depending on the complexity and comprehensiveness, *strategies* (and their plans) can be subdivided into partial, relatively specific sub-plans (Whittington, 2001; Mintzberg *et al*. 2003). Often companies adopt, regarding *strategies*, a sequential aiming (or adaptive behaviour), which can be described as a dynamic process of retroactive adjustment of intermediate goals, based on new information/knowledge obtained in the organisation itself and/or economic environment – including competitors (Morroni, 2006; Simon, 1986).

This process consists of the successive examination of the partial objectives, which enables the implementation of the adaptive and sequential decision-making. This procedure is carried out on the basis of performance feedbacks – resulting from the monitoring of the successive attempts of success and failure – which, in turn, result from adjustments previously made (Morroni, 2006; Simon, 1986; Cyert and March, 1992).

Furthermore, the targets of these processes are to refine *strategies* and their implementations, reduce the costs and time involved in retroactive adjustments – that is, increase the *degree of flexibility* of the *strategies* and implementation procedures –, avoid premature commitment with a *strat-*

25 For a broader and more critical discussion of the important issue of rationality in economics – which would certainly go beyond the scope and limits of this article – we refer readers to the following authors in our bibliography: Bunge 1985; Hollis and Nell, 1977;Tversky and Kahneman, 1974; Sen, 1987; Hargreaves, 1989, Hollis, 1994;Simon, 1978, 2000; Vercelli, 1997; Louçã, 1997, Lawson, 1997;MacFadden, 1998;Kahneman, 2003; Hargreaves-Heap e Varoakufes, 2004;Morroni, 2006).

26 *Strategies*, like most *decision-making*, should also be conceived as "the terminal act of a problem-solving activity, preceded by the formulation of the problem itself, the identification of the relevant information, the application of pre-existing competences [capabilities] or the development of new ones to the problem solution and, finally, the identification of alternative courses of action" (Dosi and Egidi, 1991: 150).

egy and its implementation process (Morroni, 2006; Simon, 1986; Cyert and March, 1992; Vercelli, 1991).

4 **Probable determinants of the strategies**

Before starting this new item, it is necessary to give a brief explanation of an epistemological nature. Given that it does not seem an easy task (even when possible) to establish a clear hierarchy among the *causes* (or the necessary conditions) related to *strategies* and that the ranking of the *causes* looks to be, besides that, sectorally variable and along the time, it would be too pretentious and even reckless to postulate the *status of determinants* to the *factors* under examination.

It may be more prudent and appropriate, therefore, to call them alternatively *probable determinants*, given that if something *'usually'* happens – how Keynes (1921; see below) and also evolutionary biology tells us – this does not mean that it *'always'* happens (Mayr, 1982)[27]. Indeed, in addressing the subject of *causality*, Keynes (1921[2004]: 275) had already proposed that "[i]t has also been convenient to speak of causal relations between objects which do not strictly stand in the position of cause and effect, and even to speak of *a probable cause*, where there is no implication of necessity and where *the antecedents will sometimes lead to particular consequents and sometimes will not*" (*ea*).

In this sense and drawing inspiration from Davidson (2011) and Mayr (1982), it's possible to postulate that there are *uncertainties* regarding the *causes of past events* whenever it's not possible to conceive *a full list* of the respective causes and/or no one can assigns *probabilities/weights* to all of them because the *data is incomplete* – there are *epistemological* and/or *ontological uncertainties* concerning the *causes of previous facts* –, so that they are not always perfectly orderable (or even orderable) (Keynes, 1921; Hicks, 1980)[28].

27 Regarding to the complex and relevant question of causality in economics, see, for example, Marshall, 1920; Keynes, 1937, and 1921; Kaldor, 1985; Georgescu-Roegen, 1971; Simon, 1987; Hicks, 1980; Vercelli, 1991; Lawson 1997. For the discussion of causality in general, see Bunge, 1997; Bhaskar, 2008; Ziman, 2000.

28 As for the uncertainty – or indeterminacy, in the biology parlance – of (past) events in biological sphere, the arguments of Mayr (1982), the eminent evolutionary biologist, seems to be broadly consistent with our viewpoint introduced above.

Putting it differently, the *retrodiction* of *historical processes/ongoings* – by frequently involving events subject to (ontological and/or epistemological) *uncertainty* – tends to be incomplete and/or provisional, since 'historical facts' are also subject the changes that new discoveries and knowledge usually bring (Keynes, 1921; Shackle, 1966; Mayr, 1982; Ziman, 2000).

Considering that we adopt here the conception that *strategies* are a subset of *decision-making* it seems reasonable to address the issue of the *probable determinants* of strategies from the analogous problem of the *probable determinants* of decision-making. Although the approaches to decision-making were initially dominated by the individual perspective, currently the conception that *decision-making* is of a collective organisational nature, at least at the corporate and political level, is gaining momentum – since that these agents and/or organisations are complex (or collective) (Simon,1978; Vercelli, 1999; Cyert and March, 1992; Morroni, 2006).

In the scope of organisations, there seems to be a relative consensus that the main conditioning of *decision-making* include hierarchical relationships; ownership structures and, in particular, the attribution of responsibilities – notably for those involved in *decision-making* – and control rights; the objectives of the companies; the rules and norms relating to collective decisions; the degree of rationality of agents' behaviour – and their *dynamic capabilities* – and their respective motivations; and also the incentive structure of the stakeholders. In complex organisations, these components/participants are obviously not isolated: on the contrary, they are strongly and mutually interconnected (Morroni, 2006; Teece *et al*. 1997; Simon, 1996; Cyert and March, 1992).

As a useful first approximation, it might be appropriate to summarise the interaction between the major *probable determinants* of *decision-making* (and, by extension, *strategies*) in organisations, as follows: a) structure conditions/affects control rights; b) the latter and the attribution of responsibilities play a relevant role in the choice of the objectives of the firms, which, in turn, configure, to an extent, the respective structure of incentives; and c) this latter and the type of rationality – which is closely linked to the level of the *dynamic capabilities* (see below) – condition/affect, as well, individual/collective behaviour in the context of the organisational *decision-making* process and, by extension, the *development, implementation and adaptation* of the strategies (Morroni, 2006; Teece, 2007; Tidd *et al*., 2005).

Actually, the interaction process of chief *probable determinants* of *decision-making* – described above in a rather simplified way – is much more complex. De facto, this complexity may result from the innumerable feedbacks which can follow from the relations, in several directions, between the several important *probable determinants* of the *decision-making* process (and the development, implementation and adaptation of the *strategies*), and also from the non-negligible effects of many others less direct factors (Morroni, 2006; Simon, 1978; Tidd *et al*., 2005).

Similar to other social organisations, businesses are characterised by the need for power and control. Few would disagree that structures of ownership condition/affect control rights, which in turn influence significantly the decision-making process and strategies. The conditioning of the ownership structure and the relationships between ownership, control, and organisational configuration are often controversial and complex and are beyond the scope and space restrictions imposed to this article (Marroni, 2006; Cyert and March, 1992).

The aims and decisions – and *strategies* – of the firms are conditioned by the respective incentive structures which, in turn, are strongly related to the respective organisational and ownership configurations. Incentive structures are major conditioning to the evolutionary process of business organisations. Likewise, the behaviours of firm stakeholders are also main *probable determinants* of the *decision-making* process. Yet, the firm stakeholders' conduct is usually shaped by several types of incentives and sanctions – among which the following are highlighted: a) market *stimuli* and penalties, b) incentives related to contracts between independent parties, c) incentives related to the organisations that regulate the functioning of markets, and d) the internal incentives to the business organisations themselves (Morroni, 2006; Cyert and March, 1992).

The type and level of rationality are either conditioning in the configuration of the *decision-making* process – and in the *development, implementation and adaptation* of *strategies* – in the organisations. The type and level of rationality are based on capabilities in the sense that the two depend on "the gap between agent´s abilities [capabilities][29] and the difficult of the

29 The terms skills and capabilities can be considered, in certain contexts, as synonyms. We have opted for the use of capabilities instead of skills because the former seems to be more appropriate to the collective context in which decisions (and *strategies*) are usually made in companies and the latter seems more suited to individual *(decision-making)*. See, in this regard, Dosi and Egidi (1991) and Morroni (2006).

decision problem to be solved" (Heiner, 1983: 562; Morroni, 2006).

The noun *capabilities* were used to highlight the central role of organisational and administrative knowledge/skills to integrate/coordinate, construct, adapt and adequately reconfigure the internal and external competencies of firms – organisational and functional resources and attributes – in response to a changing environment (Teece, 2007; Nelson and Winter, 1982; Tidd *et al*., 2005).

The adjective *dynamic* was used both to emphasise the transformations of the economic context and to detach that companies – through the *learning processes* – become apt to develop new products, processes and even new *capabilities*. This means that companies are *not passive* in the *processes of change* – making the latter should be considered, therefore, as *partially endogenous* to the respective processes (Schumpeter, 1934; Dosi *et al*., 1990; Teece *et al*., 1997; Nelson, 1995; Tidd *et al*., 2005).

The *capabilities* encompass organisational and administrative processes and the current positions of firms in the markets. Processes should be understood as how things are done in companies (or their 'routines'). The positions relate, in turn, to the current endowment of technological assets and intellectual property, to their consumer base, to their relations with suppliers and distributors and to occasional strategic alliances with competitors[30] (Teece, 2007; Nelson, 1995; Tidd *et al*., 2005).

Likewise, the *dynamic capabilities* are the subset of the *capabilities* that enable firms – in response to changing market conditions – to create new processes, products and new *capabilities* through the *learning processes*. On the edge, the *dynamic capabilities* can even provide the conditions for the creation of *new economic and technological trajectories* for the companies (Dosi *et al*., 1990; Freeman and Soete, 1997; Nelson and Winter, 1982; Tidd *et al*., 2005).

To complete this subject, it can be added that the subset of the *dynamic capabilities* – that is directly related to the *learning processes* concerning the *development, implementation and adaptation* of *strategies* – can be understood, in turn, *as strategic dynamic capabilities* or even as *dynamic meta-capabilities*. If the arguments developed herein – based on the notions, mostly, of Teece (2007), Nelson (1995), Simon (1993), Tidd *et al*. (2005), and Morroni (2006)

30 Together, processes and positions delimit the possible trajectories of firms, that is, the available economic and technological alternatives, as well as the attractiveness of future opportunities (Dosi *et al*., 1990).

– are correct, it would be difficult to overestimate the importance of this last subject *(strategic dynamic capabilities)*.

5 **Closing remarks**

It may be appropriate to start these final considerations by explaining what the *strategies* are not. Thus, flexibility, incrementality, adaptability etc. are attributes of *strategies*, but are not equivalent to them. At this point, a biological analogy seems to be useful. The strategies of reproduction and/or feeding of living organisms are characterised, among other attributes, by greater or lesser flexibility/generality and by greater or lesser adaptability to environmental changes. These qualities should not, however, be assimilated to the *strategies* themselves (Mayr, 1982).

Analogously, *strategies* should not be confused with tactics. As the former are concerned with decision-making related to the *'big issues'* (Simon, 1993), it seems more appropriate to consider them as a *long-term* notion and therefore to be distinguished from the second (tactics), which, in turn, can be considered as being of short-term.

Indeed, the distinction between the general/very important and local/less important that is usually made among *strategy* and tactics in 'military art' can be replaced, with advantages, by the distinctiveness between *long-term (strategy)* and short-term (tactics) in economics, even because *long-term* decisions are generally more significant than short-term ones[31].

Likewise, the objectives of the companies should not be muddled with their *strategies*, at least from the point of view adopted in this work (Simon, 1986). From this perspective, the *strategies* closely resemble what Sloan called corporate 'policies' (Whittington, 2001). Also, the strategies relate to *how* (and/or *where* and/or *when*) *to do* and not *what to do*. And *how* (and/or *where* and/or *when*) *to do*, to achieve the *objectives*, involves the use of means and *capabilities* available, but may also imply the creation of new means and/or the development of new *capabilities*.

As explained earlier, *strategies* have been defined herein as the decisions

31 It should be noted that instead of using the criterion suggested by Marshall (1920) to distinguish among *strategy* and tactics, we have chosen to adopt, alternatively, the Marshallian distinction either between long-term and short-term, as the most appropriate method for address this issue in the economic field.

related to the *'big questions'* of the companies. These resolutions are taken under conditions of *radical uncertainty*, subject to *limited rationality*, in the presence of (not-negligible) interdependencies between agents, conflicts of interest and without guarantees of behavioural consistency. Strategies are typical of *nonergodic* (or open) systems/processes. They concern, also, the long-term and are only a subset of so-called *crucial decisions* – which fall, in turn, within the broader scope of *decisions* (Shackle, 1972, and 1961; Simon, 1993; Davidson, 1996; Vercelli, 1991).

Although it is perhaps not as fundamental and ubiquitous in economics as it is in the biological sciences, diversity is certainly very relevant in several dimensions of the former, such as in the case of *decision-making* of economic agents – with their multiple objectives, strategies, capacities, structures, conducts/behaviours, and performance/competitiveness. These latter features are especially frequent and important in the oligopolistic market structures (Schumpeter,1942 and 1934; Shackle,1972; Simon, 1986; Dosi *et al*., 1990; Freeman and Soete, 1997; Nelson and Winter, 1982).

Lastly, the important relationship between the notions of *strategies* and *international competitiveness* should be highlighted. Indeed, there is a growing perception, in many works in specialised literature, that the international competitiveness has one of its chief conditions in the capacity to the development, implementation and adaptation strategies (Teece *et al*., 1997; Freeman and Soete, 1997; Nelson, 1995; Tidd *et al*., 2005; Melo *et al*., 2017). This last connection serves, in addition, to reinforce the observation made previously (see item II above) – since the link between *strategy* and the *international competitiveness*, here highlighted, also involves the Schumpeterian concepts of *competition* and *innovation*.

References

ANCONA, C. *Tática/Estratégia in Romano*. Estado-Guerra. Enciclopédia Einaudi. Lisboa, Imprensa Nacional. vol. 14. 1989a. p. 372-396.

ANCONA, C. *Guerra in Romano*. Estado-Guerra. Enciclopédia Einaudi. Lisboa, Imprensa Nacional. vol. 14. 1989b. p. 348-372.

ARTHUR, B. W. *'On Learning and adaptation in the economy'*. SFI Working Paper. 1992. p. 92-07-038.

ARTHUR, B. W. Complexity, the Sata Fe approach, and non-equnilibrium economics. *History of economics ideas*. Vol. 18, Nº 2. 2010. p. 149-166.

BARNEY, J. B. *Beyond individual metaphyors in understanding how firms behave*. In RUMELT, R. P. at al (Edit.) Fundamental issues in strategy: a research agenda. Boston, HBP, 1995.

BASILI, M.; ZAPPIA, C. Shackle and modern decision theory. *Metroeconomica*. vol. 60, n° 2. 2019. p. 245-282.

BASILI, M.; ZAPPIA, C. Ambiguity and Uncertainty in Ellsberg and Shackle. *Cambridge Journal of Economics*, vol. 34. 2010. p. 449-474.

BHASKAR, R. *A Realist theory of science*. London, Routledge. 2008.

BLAUG, M. *Economic theory in retrospect*. Cambridge, CUP. 1997.

BUNGE, M. *Racionalidad y realismo*. Madrid, Alianza Editorial, 1985.

BUNGE, M. *Buscar la filosofía en las ciencias sociais*. Mexico, Siglo Veitiuno Editores. 1997.

BUNGE, M. *Las Ciencias sociais em discusión*: uma perspectiva filosófica. Buenos Aires, Editorial Sudamericana. 1999.

CARVALHO, F. C. de. *Keynes e os pós-keynesianos: princípios de macroeconomia monetária de produção*. Rio de Janeiro, Alta Books. 2020.

CHANDLER, A. D. Jr. *Strategy and structure: chapters in the history of the American industrial enterprise*. Cambridge, MIT Press. 1962-1991.

CHANDLER, A. D. Jr. *The Functions of the HQ unit in the multibusiness firm*. In RUMELT, R. P. at al (Edit.) Fundamental issues in strategy: a research agenda. Boston, HBP, 1995. p. 323-360

CLAUSEWITZ, C. *On War*. Princeton, PUP. 1989.

CYERT, R. M.; MARCH, J. G. *A Behavioral Theory of the Firm*. Englewood Cliffs, Prentice-Hall. 1992.

DAVIDISON, P. Rational Expectations: a Fallacious for Studing Crucial Decision-Making Process. *Journal of Post Keynesian Economics*. vol. 5, n° 2. 1982-1983. p. 182-198.

DAVIDISON, P. Reality and Economic Theory. *Journal of Post Keynesian Economics*. vol. 18, n° 4. 1996. p. 479-508.

DAVIDSON, P. *John Maynard Keynes*. London, Macmillan. 2011.

DAVIS, M. D. *Game theory: a nontechnical introduction*. New York, Dover.1997

DEQUECH, D. Neoclassical, mainstream, orthodox, and heterodox economics. *Journal of Post Keynesian Economics*. Vol. 30, N° 2. 2007. p. 279-302.

DEQUECH, D. Uncertainty: A Typology and refinements of existing concepts. *Journal of Economics Issues*. Vol. XLV, N° 3. 2011. p. 621-640.

DEQUECH, D. Expectations and confidence under uncertainty. *Journal of Post Keynesian Economics*. Vol. 21, N° 3. 1999. p. 415-430.

DEVETAG, G.; LOUÇÃ, F. *The Influence of experimental and computational economics: economics back to the future of social sciences*. Working Papers Department of Economics – Lisbon school of economics and Management 2004/10.

DOSI, G.; PAVITT, K.; SOETE, L. *The Economics of technological change and international trade*. Hertfordshire, Harvester Wheatsheaf. 1990.

DOSI, G.; EGIDI, M. Substantive and procedural uncertainty: an exploration of economic

behaviours in changing environments. *Journal of Evolutionary Economics*, vol. 1, nº 2. 1991. p. 145-168.

EATWELL, J. *et al*. *The New Palgrave dictionary of economics*. London, Macmillan. 1987.

FAGERBERG, J. *et al*. *The Oxford handbook of Innovation*. Oxford, OUP. 2005.

FISHBURN, P. C. *Utility Theory and Decision Theory*. In Eatwell, J *et al*. The New Palgrave dictionary of economics. London, Macmillan. 1987. p. 779-783.

FOSS, N. J.; STIEGLITZ. *Handbook on the economics and theory of the firm*. Modern resource – based theory(ies). In Dietrrich, M. and KRAFFT, J. Cheltenham, Edward Elgar. 2012. p. 256-274.

FREEMAN, C.; SOETE, L. *The Economics of Industrial Innovation*. Cambridge, MIT Press. 1997.

GEORGESCU-ROEGEN, N. *The Entropy law and the economic process*. Cambridge, HUP. 1971.

HARGREAVES-HEAP, S. *Rationality in economics*. Oxford, Basil Blackwell. 1989.

HARGREAVES-HEAP, S. VAROUFAKIS, Y. *Game theory: a crtical introduction*. London, Routledge. 1995.

HARGREAVES-HEAP, S; VAROUFAKIS, Y. *Game theory: a critical text*. London, Routledge. 2004

HEINER, R. A. The origin of predictable behavior. *American Economic Review*, vol. 73, nº 4. 1983. p. 560-595.

HICKS, J. *Causality in economics*. Oxford, Basil Blackwell. 1980.

HOLLIS, M. *Filosofia de las ciencias sociais*. Barcelona, Ariel. 1998.

HOLLIS, M.; NELL, E. J. *O Homem econômico racional*: uma crítica filosófica da economia neoclássica. Rio de Janeiro, Zahar. 1977

INGRAO, B.; ISRAEL, G. *Invisible hand*: economic equilibrium in the history of science. Cambridge, MIT Press, 2000.

ISRAEL, G. *Does game theory offer 'new' mathematical images of economic reality?* In: Giacomin,A.; Marcuzzo, M. C. (edit.) Money and Markets: a doctrinal approach. London, Routledge. 2007. p. 48-56

KAHNEMAN, D. Maps of bounded rationality: psychology for behavioral economics. *American Economic Review*, nº. 93(5). 2003. p. 1445-1475.

KALDOR, N. *Economic without equilibrium*. Armonk, Sharpe. 1985.

KEYNES, J. M. *A Treatise on Probability*. New York, Dover Publications. 1921-2004.

KEYNES, J. M. *The General theory of employment, interest, and money*. New York, Harvest/HBJ. 1936-1964.

KEYNES, J. M. The General theory of employment. *QJE*. vol. 51, nº 2. 1937. p. 209-223.

LANGLOIS, R. N. *Strategy as economics versus economics as strategy. Managerial and Decision Economics*. vol. 24. 2003. p. 283-290.

LANGLOIS, R. N. and Robertson, P. L. *Firms, markets and economic change*: a dynamic theory of business institutions. London, Routledge. 1995.

LINDBLOM, C. E. *The Policy-making process*. Englewood Cliffs, Prentice-Hal. 1980.

LOASBY, B. J. Capabilities and Strategy: problems and prospects. *Industrial and Corporated Change*, vol. 19, nº 4. 2010. p. 1301-1316.

LAWSON, T. *Economic and reality*. London, Routledge. 1997.

LOUÇÃ, F. *Turbulence in economics*: an evolutionary appraisal of cycles and complexity in historical processes. Cheltenham, E.E. 1997.

MARSHALL, A. *Industry and trade*: a study of industrial and business organisation; and of their influences on condition of various classes and nations. New Delhi,Vani Prakashan. 1919-2015.

MARSHALL, A. *Principles of Economics*. London: Macmillan and Co. 8th ed. (scanned version). 1920.

MAYR, E. *The Grow of biological thought*: diversity, evolution, and evidence. Cambridge, Belknap Press. 1982.

MCFADDEN, D. 'Rationality for Economists?' Santa Fe Working Paper nº 98-09-086, p. 1-38. Reprinted in *Journal of Risk and Uncertainty*, nº 19(1-3). 1999-1998. p. 73-105.

MELLO, T. *et al*. Competitiveness and technological gap: a comparative analysis between Brazil and selected European countries. *Revista Brasileira de Inovação*. vol. 16, nº 1. 2017. p. 129-156.

MINTZBERG, H. *et al*. *The Strategy process*: concepts, contexts, cases. Englewood Cliffs, Prentice-Hall. 2003.

MINTZBERG, H. *et al*. *Strategy safary*: a guided tour through the wilds of strategic management. New York, Free Press. 1998.

MIROWSKI, P. *Machine dreams*: economics becomes a cyborg science. Cambridge, CUP. 2002

MORRONI, M. *Knowledge, Scale and Transactions in the Theory of the Firm*. Cambridge, Cambridge Press. 2006.

NELSON, R. R. *Why do firms differ, and how does it matter?* In Rumelt, R. P. at al (Edit.) Fundamental issues in strategy: a research agenda. Boston, HBP, 1995.

NELSON, R. R.; WINTER, S. G. *An Evolutionary theory of economic change*. Cambridge, HUP. 1982.

PAVITT, K. What we know about the strategic management of technology. *California Management Review*. vol. 32, nº 2. 1990. p. 17-26.

PAVITT, K.; STEINMULLER, W. E. *Technology in corporate strategy*: change, continuity and the information revolution: in Pettigrew, A. *et al*. Handbook of strategy management. London, Sage Publications. 2002. p. 345-372.

PETTIGREW, A. *et al*. *Handbook of strategy management*. London, Sage Publications. 1980.

PORTER, M. *Competitive strategy*: Techniques for Analyzing industries and Firms. New York, Free Press. 1980.

PORTER, M. What is strategy? *Harvard Business review*. 1996. p.61-78.

POSSAS, M. L. A Cheia do *"mainstream"*: comentário sobre os rumos da ciência econômica. *Revista de Economia Contemporânea*. Nº 1. 1997. p. 13-37.

PRADO, E. F. S. Microeconomia reducionista e microeconomia sistêmica. *Revista Nova Economia*. Vol. 16, N° 2. 2006. p. 303-322.

ROSENBERG, N. *On Technological expectations*. In Rosenberg, N. Inside the Black Box: technology and economics. Cambridge, CUP. 1982. p.104-119.

RUMELT, R. P. *et al*. Strategic management and economics. *Strategic Management Journal*. vol. 12. 1991. p.5-29.

RUMELT, R. P. *et al*.(Edit.) *Fundamental issues in strategy*: a research agenda. Boston, HBP, 1995.

SCHUMPETER, J. A. *The Theory of economic development*: an inquiry into profits, capital, credit, interest and the business cycle. London, Transaction Publishers. 1934-2008.

SCHUMPETER, J. A. *Capitalism, socialism & democracy*. London, Routledge. 1942-2003.

SCHUMPETER, J. A. *The creative response in economic history*. In Essays: on entrepreneurs, innovations, business cycles, and the evolution of capitalism. London, Transaction Publisher. 1951-1989. p. 221-231.

SCHUMPETER, J. A. *Business cycles*: a theoretical, historical, and statistical analysis of the capitalist process v. 1 e 2. Mansfield, Martino Publishing. 1939-2005.

SCHUMPETER, J. A. *History of Economic Analysis*. New York, OUP. 1954-1994.

SEN, A. K. *Rational behavior*. In Eatweell, J. *et al*. The New Palgrave dictionary of economics. London, Macmillan. 1987. p. 68-76.

SHACKLE, G. L. S. *Decision, order and time in human affairs*. Cambridge, CUP. 1961-2010.

SHACKLE, G. L. S. *The Nature of Economic Thought*: selected papers 1955-1964. Cambridge, CUP. 1966-2010.

SHACKLE, G. L. S. *Epistemics and Economics*: a critique of economic doctrines. Cambridge, CUP. 1972-1992.

SIMON, H. A. Strategy and organization evolution. *Strategic Management Journal*. vol.14. 1993. p.131-142.

SIMON, H. A. Decision Making and problem solving. Report of the research briefing. *National Academy of Sciences*. 1986.

SIMON, H. A. *The Sciences of artificial*. Cambridge, MIT Press. 1996.

SIMON, H. A. Rationality as Process and as Product of Thought. *American Economic Review*. Papers and Proceedings of the Ninetieth Annual Meeting of the American Economic Association. vol. 68, n° 2. 1978. p. 1-16.

SIMON, H. A. *Bound rationality*. in Eatweell, J. *et al*. The New Palgrave dictionary of economics. London, Macmillan. 1987. p. 266-267.

SIMON, H. A. *Barriers and bounds to rationality*. Structure Change and Economic Dynamics. vol. 11. 2000. p. 243-253.

SYLL, L. P. Why game theory never will be anything but a footnote in the history of social sciences. *Real-World Economics Review*. N° 83. 2018. p. 45-64.

TEECE, D. *et al*. Dynamic capabilities and strategic management. *Strategic Management Journal*. vol. 18. 1997. p. 509-533.

TEECE, D. Explicating dynamic capabilities: the nature and microfoundations of (sustain-

able) enterprise performance. *Strategic Management Journal*, vol. 28. 2007. p.1319-50.

TIDD, J. *et al*. *Managing Innovation*: integrating technological, market and organizational change. Hoboken, Wiley & Sons. 2005.

TVERSKY, A.; KAHNEMAN, D. Judgment under uncertainty: heuristics and biases, *Science*. 1974. p. 1124-31.

VERCILLI, A. *Methodological Foundations of Macroeconomics*: Keynes & Lucas. Cambridge, CUP. 1991.

VERCELLI, A. *The Recent advances in decision theory under uncertainty*: a non-technical introduction, in Luini, L. Uncertainty decisions: bridging theory and experiments. Dordrecht, Kluwer. 1999. p. 237-260.

WHITTINGTON, R. *What is strategy and does it matter?* Hampshire, Cengage. 2001.

ZIMAN, J. M. *Real science:* what it is, and what it means. Cambridge, CUP. 2000.

About the authors

Enéas Gonçalves de Carvalho – egcarvalho58@gmail.com
Department of Economics, São Paulo State University, Araraquara, SP, Brazil.
ORCID: https://orcid.org/0000-0002-5482-8976.

Sebastião Neto Ribeiro Guedes – sebastiao.guedes@unesp.br
Department of Economics, São Paulo State University, Araraquara, SP Brazil.
ORCID: https://orcid.org/0000-0001-5579-4985.

Rogério Gomes – rogerio.gomes@unesp.br
Department of Economics, São Paulo State University, Araraquara, SP Brazil.
ORCID: https://orcid.org/0000-0001-8469-7076.

The authors would like to thank the comments and suggestions made by two anonymous referees who were helpful in drafting the final version of this article. However, the usual caveats should be applied.

About the article

Submission received on March 05, 2020. Approved for publication on January 17, 2021.