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Lauren Larrouy

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Revisiting Methodological Individualism in Game Theory: The Contributions of Schelling and Bacharach

Lauren Larrouy*

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Abstract:

The purpose of this contribution is to illustrate how both Schelling and Bacharach’s methodologies can help scholars bring a new approach to behavioral game theory in which the nature of usual standard methodological individualism is insufficiently questioned. I aim to show that both Schelling and Bacharach question the nature of interactive rationality. They provide original insight concerning (i) the conditions of possibility of the existence of determinate solutions and (ii) the resolution process of games. Furthermore, their questioning of the methodological implications of the well-known trio of standard game theory (common knowledge, the transparency of reasons and the reduction of “strategic uncertainty” to “physical uncertainty”) offers some ideas on how to build an alternative theory of games. As forerunners, they open an ongoing research program which can still be a fruitful source of methodological innovation regarding interactive rationality and its collective determinants. JEL Codes: B21, B41, C72, D03, D79, D81.

Key words: game theory, interactive rationality, framing, focal point, team reasoning, methodological individualism

1. Introduction

This contribution is centered on the respective contributions of T. C. Schelling and M. Bacharach, two authors who developed a very specific epistemological approach to game theory. Their respective methodologies question the usual methodological individualism of standard game theory and open new perspectives within behavioral economics. They stress this form of individualism in such a manner that they question the methodological foundations of game theory in a deeper way than contemporary behavioral game theory. To understand

* University of Nice Sophia Antipolis – GREDEG/CNRS – France, Lauren.Larrouy@gredeg.cnrs.fr
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their originality, let us recall some commonplace statements of standard game theory and their associated problems.

“Game theorists of the strict school believe that their prescriptions for rational play in games can be deduced, in principle, from one-person rationality considerations without the need to invent collective rationality criteria – provided that sufficient information is assumed to be common knowledge” (Binmore, 1994, p. 143; in Colman, 2003, p. 143)

Standard game theory relies on three mainstays: (i) each player is perfectly rational in the sense of the expected utility theory (EUT) as defined by von Neumann and Morgenstern (1944) and tries to maximize her own material payoff – i.e., she is motivated by “self-centered self-interest” (Sen, 2007); (ii) a common knowledge of the structure of the game1 and of players’ rationality is assumed to prevail (e.g. see Sugden, 2001, p. 115); and (iii) a ‘solution concept,’ the Nash equilibrium, is used as a benchmark in static and repeated complete information games (e.g. see Bacharach, 2001a; Aumann, 1987; Myerson, 1999). These assumptions involve in particular that any ‘rational deduction’ concerning games may also be common knowledge (Colman, 2014, p. 36). This is what Bacharach (1987) calls “the transparency of reasons.” Accordingly, each player truly anticipates the equilibrium strategy profile for every other player. This implies that all the relevant information for players to make their decision is included in the structure of game, and above all within its mathematical structure.2 Game theory is therefore “an internally closed procedure which operates according to fixed rules” (von Neumann 1983 [1931], p. 61-62; quoted by Gioccoli, 2003, p. 15).

However, even by imposing strong requirements with respect to players’ knowledge and rationality, this standard conception of game theory raises two kinds of puzzles: common-interest games (e.g. pure coordination games and the Hi-Lo game) and social dilemmas (e.g. the prisoner’s dilemma in which the solution is counterintuitive regarding players’ expected payoffs). The existence of multiple equilibria in usual coordination games leads to an indeterminacy problem, i.e. the incapacity of standard game theorists to provide determinate solutions.3 And the fact is that economic situations in which there are multiple equilibria are numerous (Gold, Sugden, 2006, p. xv). Besides, in experimental contexts individuals are (i) most often perfectly able to coordinate their expectations and their actions about each other in common interest games (e.g. see Schelling, [1960]1980, chap. 3; Metha, Starmer, Sugden, 1994; Colman, 2014, p. 35), and (ii) generally cooperate in a prisoner’s dilemma whereas standard game theory predicts mutual defect (see Sally, 1995). Subsequently, agreeing

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1 The structure of the game in normal form is defined by the set of players (who they are and their number), their available strategies and the outcome associated with each combination of strategies for each player – i.e., each player’s payoff function (e.g. see Hargreaves Heap Varoufakis, [1995]2004; Bacharach, 1976; and Bacharach, in Gold, Sugden, 2006).

2 Following von Neumann and Morgenstern (1944), game theorists generally suppose that every player can do what they are capable of doing as game theorists, i.e. understanding mathematics to draw valid conclusions from games’ mathematical structure. The underlying premise is the fact that mathematics is “the universal language” (Gioccoli, 2003, p. 16).

3 In addition, (i) assuming other regarding preferences do not necessarily provide a solution (e.g. Fehr, Schmidt, 1999; Bolton, Ockenfels, 2000; Charness, Rabin, 2004; Falk, Fischbacher, 2006), and (ii) the multiplicity of equilibria persist in repeated games – this refers to the well known “Folk Theorem” (see Hargreaves Heap, 2002: 47; Hargreaves Heap, Varoufakis, [1995]2004).
with Sugden (2001, p. 115), if we consider that the purpose of game theory is “to propose solutions for games” (original emphasis), both from a normative and a positive point of view, standard game theory faces serious difficulties.

In addition, numerous claims are made with respect to the fact that “the other” is naturalized both in complete and incomplete information games (e.g. see Hargreaves Heap, Varoufakis, [1995] 2004, p. 37; Lesourne et al., 2006, p. 69). All of the eventual dispositions in which “the other” may be are contained within the definition of the game, i.e. within the different states of the world that are described by the game. According to Aumann (1987, p. 1) this specificity is explained by the fact that “probabilities can only be assigned to events not governed by rational decision makers.” This means that probabilities can only be assigned to natural events. That is why, in some way, the other is treated like an event of “Nature.”

“[T]he same rationality applies to the actor for individual decision in a risky environment and in game theory, the “strategic uncertainty” about the opponent being in some sense “naturalized” in a “physical uncertainty”.” (Lesourne et al., 2006, p. 69)

Therefore, some authors goes so far as to declare that game theory stay anchored within individual decision theory (e.g. Mariotti, 1995). For instance, Bacharach and Hurley (1991, p. 3) assume that “a number of questions arise about the relationship between individual rationality and game-theoretic rationality” and about “whether games may be embedded within supposedly individual decision problems.”

The originality of the two authors I focus on in this contribution is precisely to stress the implications of (i) imposing common knowledge, (ii) assuming the ‘transparency of reasons,’ and (iii) reducing “strategic uncertainty” to “physical uncertainty.” The main methodological consequence is that they question the usual type of methodological individualism in standard game theory. Both Schelling and Bacharach think that game theory “is going so far, abstracting too much, [and] confusing the essence of quite disparate things” (Bacharach, 1976, p. 1). Therefore, they offer some ideas about how to build an alternative theory of games. They portray players as “socially embedded” individuals (Davis, 2002) because the rationale of their strategic decisions relies on their (personal and collective) identity, their cultural background (i.e. on their acknowledgement of social conventions which correspond to coordination devices reducing strategic uncertainty), the identity of their co-players, and the environment surrounding the game. In other words, the determinants of player’s decisions are no longer intrinsic to themselves, i.e. to their set of preferences or their utility function.

Two significant methodological consequences follow: both Schelling and Bacharach (i) integrate “collective rationality criteria” in their account of strategic interactions, and (ii) conceive games as “open-systems” and no longer as “self-contained worlds” like in standard game theory. Besides, since in games, players’ identity matters for both Schelling and Bacharach, players are heterogeneous in a strong sense (i.e. not only in terms of preferences,

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4 For a definition of this concept see Lawson (1997, 2003), Hodgson (2000), and Morgan (2002). The “open-system” methodology can be considered as grounds for heterodox economics (e.g. see Hodgson, 1988; Dunn, 2001).
but in terms of perceptions and modes of reasoning). Therefore, methodologically both Schelling and Bacharach resort to intersubjectivity and to players’ capacity of empathy.5

Schelling and Bacharach’s respective purposes are nonetheless different. Schelling’s attempt is mainly to rebuild game theory. He anticipates the above-mentioned stalemates. At the time of the first publication of Schelling’s book, *The Strategy of Conflict* (1960), game theory was conceived only as a branch of mathematics without any “possible applications to concrete socio-economic problems” (Gioccoli, 2003, p. 348). Basically, game theory was considered as a mere “mathematical toolbox” (Gioccoli, 2003). Schelling’s ‘vision’ of game theory is completely different. He vividly denounces the axiomatic method.

“There is … no way that an analyst can reproduce the whole decision process either introspectively or by an axiomatic method. There is no way to build a model for the interaction of two or more decision units, with the behavior and expectations of those decision units being derived by purely formal deduction” (Schelling, 1980[1960], p. 163).

Hence, in his “theory of interdependent decisions” Schelling paves the way to build an alternative theory of games. Bacharach’s work appears during the period of the Refinement Program when “finding coherent foundations for game theory was seen as one of the most important theoretical projects in economics” (Gold, Sugden, 2006, p. xiv). He aims to enrich game theory and for that purpose I will show that he draws on some of the conceptual and methodological innovations offered by Schelling. The methodological advances Bacharach proposes can be summarized through the introduction of two dimensions: (i) the inclusion of players’ frames within games in his “Variable Frame Theory” (VFT) – where players’ subjective representations of the game become different from the game theorists’ objective presentations (Bacharach, 1991, 1993, 1997, 2001a; Bacharach, in Gold and Sugden, 2006; Bacharach, Bernasconi, 1997; Bacharach, Stahl, 2000); and (ii) the conceptualization of a collective mode of reasoning in his “Team Reasoning” theory (TR), (Bacharach, 1995, 1997, 1998, 1999, 2001a, 2001b; Bacharach, in Gold, Sugden, 2006).

In this contribution, I consider how using both Schelling and Bacharach’s methodologies can help scholars to bring a new approach to behavioral game theory in which the nature of usual methodological individualism is insufficiently questioned. I aim to show that both Schelling and Bacharach question the nature of interactive rationality. They provide an original insight on (i) the conditions of possibility of the existence of determinate solutions and (ii) the resolution process of games. The methodological basis of both Schelling and Bacharach’s contribution within game theory is to draw on more empiricism and therefore to take into account that strategic interactions generally occur among heterogeneous players. Furthermore,

5 On the one hand, the concept of intersubjectivity in economics was developed by Lawson (1997), Fullbrook (2001, 2002, 2004), and Latsis (2006). Basically, resorting to intersubjectivity means that individuals and the social world are interdependent and co-constructed. On the other hand, the concept of empathy was defined by Fontaine (1997, 2000), Sugden (2002), and Marciano (2002). It relies to human ability to put herself in the other’s place. The concept of empathy is also related to a rapidly growing literature crossing philosophy of mind and cognitive psychology: the simulation theory. This literature focuses on human capacity of ‘mind reading,’ i.e., the ability to attribute mental states to others (Gordon, 1986; Goldman, 1993, 2006).
their analysis of the above-mentioned trio (common knowledge, transparency of reasons and the reduction of strategic to physical uncertainty) and its methodological consequences is never seriously considered within standard contemporary game theory. Therefore, both Schelling and Bacharach, as forerunners, open a relevant research program which can still be the source of methodological innovation regarding interactive rationality and its collective determinants. From this prospect, I will to emphasize (i) why Schelling and Bacharach challenge the usual methodological individualism adopted by game theory in a comparative way, (ii) why the methodological consequence is a conception of strategic interactions as “open-systems”, and (iii) why this in turn gives such a great role to intersubjectivity and empathy. This will allow me to highlight that following Schelling’s methodological innovations, Bacharach opened up new research agenda in order to build an intersubjective account of game theory.

The remainder of the paper will be structured as follows. The first part will be dedicated to the presentation of Schelling’s criticism of game theory and some of the aspects of his proposition to reorient game theory. I will exhibit the role of intersubjectivity and empathy in players’ decision-making and why his account of games is based on the concept of open system. The second and the third parts of the paper will present Bacharach’s variable frame (VF) and team reasoning (TR) theories. I will show how they progressively incorporate some of the conceptual and methodological aspects of Schelling’s reorientation of game theory that are grounded on the collective determinants of players’ decisions. The use of these determinants in turn releases the standard methodology of games from its stalemates as a closed and well-defined system and opens the door to the roles of intersubjectivity and empathic feelings in strategic interactions. And, finally in the fourth part of the paper I will compare how Schelling and Bacharach respectively escape from the usual individualism of standard game theory and assess the commonly held view that their theories are in opposition to each other (for instance in Sugden, Gold, 2006; and Sugden, Zamarrón, 2006).

2. Schelling’s “reorientation of game theory”: how to build a new theory of “interdependent decisions”?

In this section, I will present Schelling’s arguments concerning the limits of standard game theory and his propositions to bypass them. I will point out the common mechanisms Schelling considers in the resolution process of games (whatever the types of games). This will allow me to exhibit that the methodological foundations of players’ decision-making in Schelling’s “reorientation of game theory” contrast with the usual individualism of standard game theory.

Basically, Schelling defines game theory as the study of interdependent decisions, which means for him that:

“There is no independently “best” choice that one can make; it depends on what the others do … Any “solution” of a problem like this is necessarily a solution for both participants. Each must try to see the problem from the other’s point of view, but when
he does he sees himself trying to reach a decision … Each must base a decision on his expectations … Game theory is the formal study of the rational, consistent expectations that participants can have about each other’s choices” (Schelling, 1984, p. 214-15).

It follows that the purpose of a theory of games, according to Schelling, is to identify and to define the devices ensuring convergent and consistent expectations among players on a singular solution (e.g. see Schelling, 1980[1960], p. 54, 115). Seen from this angle, Schelling’s “reorientation of game theory” is based on two dimensions: identifying (i) the “perceptual and suggestive elements” that induce the convergence of players’ expectations and (ii) the “structural elements” on which players’ behavior depend (Schelling, 1980[1960], p. 83-84). Since perceptions count, the resolution of a game is a matter of framing. Indeed, for Schelling, the solution of games strongly depends on the way players’ perceive and then formulate their decision problem (ibid., 69). He claims that game theory does not show interest in these elements whereas their identification should be the object of inquiry of game theorists. I will emphasize that it is precisely with respect to these elements that his methodology is based on the incorporation of “collective rationality criteria.”

Schelling concentrates his criticism of standard game theory on three premises which preclude the convergence of players’ expectations – i.e. their “meeting of minds”: (i) the general belief that the mathematical structure of games is sufficient or even the only relevant device in order for players to solve a game, (ii) the use of the ‘maximin’ theorem and the supremacy of divergent interest games within game theory – which for Schelling rest on individual decision-making processes because the other in the interaction is naturalized, and (iii) the symmetry between players in the concept of solution and of rationality inherited by the Nash equilibrium (1950, 1951) and Harsanyi (1961, 1967/1968) (Schelling, [1960]1980, p. 267-290).

Schelling insists on the fact that the mathematical structure of games may not be the most appropriate device to ensure players’ convergent expectations: “there is no presumption that mathematical game theory is essential to the process of reaching agreement, hence no basis for presuming that mathematics is a main source of inspiration in the convergence process” (Schelling, [1960]1980, p. 114). He distinguishes players’ perceptions from the ones of the theorists (ibid., 113-14). There is no guarantee that players and theorists both pay attention to the same perceptual elements in games. For him, even players’ objective strategies (as defined by the theorists) have a symbolic content (ibid., 96). Even if there is no other coordination device available except the mathematical structure of games, the way players label their strategies matters (ibidem). It is the symbolic content of these objective strategies that eventually orient players toward a solution. Subsequently, for Schelling, “the principles relevant to successful play … the propositions of a normative theory, cannot be derived by purely mathematical means from a priori considerations” (ibid., 163). In his view, supposing that every player must understand mathematics to solve a game restricts strategic interactions to the universe of mathematicians. However, as Schelling demonstrates it, real strategic interactions occur everyday and individuals are perfectly able to coordinate or to cooperate, regardless of whether they are mathematicians (see Schelling, [1960]1980, chap.3). Therefore, Schelling argues that standard game theory is methodologically ill founded because it
abstracts games from subjective perceptions and from all contextual information, even though they are highly relevant and valuable to solving games. In this manner, standard game theorists are unable to provide normative principles of rational play for non-mathematician players (see Schelling, [1960]1890, p. 114, 289-290).\(^6\)

This implies that for Schelling the rationality of the actor and the spectator differ and this assumption prevails both for the players and the theorists. Each player in a strategic context is a spectator of her co-players’ action (see Schelling, 1984, p. 214-15). Players are therefore heterogeneous.\(^7\) Each individual has subjective perceptions of her decision problem and this encompasses subjective perceptions of her co-players’ perceptions, intentions, and rationality. Accordingly, players must progressively discover what the others’ perceptions are. This is especially true given that these perceptions are potentially unlimited since they are no longer restricted to the mathematical content of the game. In this perspective, Schelling postulates that players’ behavior is a source of information. During mutual interactions, the players’ reactions convey information about their eventual underlying perceptions and intentions – they are both intertwined (ibid., 110). If players ‘know’ their co-players’ “value system,” it can give them an insight into their perceptions. In fact, Schelling declares: “[a]n important characteristic of any game is how much each side knows about the other’s value system” (ibid., 139). Through their interactions players have therefore to discover each other’s value system, they have to progressively understand each other in order “to discover patterns of individual behavior that make each player’s actions predictable to the other” (ibid., 84-85). In this process, players’ social position – i.e. “[t]he concept of role in sociology” (ibid., 92) – matters. Social positions are related to patterns of behaviors, i.e. behavioral routines. These routines imply some way of doing and thinking that may therefore orient players’ expectations with respect to others’ behaviors, value systems and, accordingly, intentional states (ibidem).

Hence, players’ intersubjective capacity becomes the main component of their capacity to finally reach a meeting of minds. In Schelling’s methodology, this meeting of minds is ensured at last by players’ mutual capacity of empathy, i.e. their ability to put themselves in each other’s shoes in order to see the decision problem through each other’s eyes. Subsequently, discovering and progressively knowing each other’s value system is of particular importance. Players have to interact as long as necessary to have sufficient information on their co-players’ value system. This information ultimately gives players the capacity to attribute to their co-players some mental states (e.g. some intentions and expectations). Knowing each other’s value system allows players to understand each other through mutual empathy and therefore to reach the required meeting of minds. This mechanism is true for any type of game.

To solve a game, players must use every available source of information. They have to use all of the structural or the perceptual characteristics that may enable them to induce the prominence of one pattern of behavior over the other. In reality, according to Schelling, every

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\(^6\) For a comparative claim refer to Innocenti (2007, p. 412, 414)

\(^7\) See Innocenti (2007).
context of play provides some “hints” (“clues,” “signals,” “keys,” etc.) to orient players’ expectations toward their meeting of minds (Schelling, [1960]1980, p. 57). Players have to find and to use every “suggestive detail” as “clues” in this discovering process (ibid., 107-108). One pattern of behavior on which players’ expectations can converge on progressively emerges from this process. One outcome, which is the focal point, therefore becomes distinct from all of the others. Focal points “enjoy prominence, uniqueness, simplicity, precedent, or some rationale that makes them qualitatively differentiable from the continuum of possible alternatives” (ibidem). A focal point is specific to a given time, a given place, and a given set of players (ibid., 57-58).

In addition to players’ behavior, the suggestive details rely on the context of games. This context is not only a conceptual tool but has a semantic content in Schelling’s work as well. Schelling distinguishes the physical environment surrounding a game from the social and cultural environment. In the case of the physical environment, “some of the objective details of the situation can exercise a controlling influence” (ibid., 71). We can mention his example of paratroopers. Paratroopers are dropped in an unknown territory in which one characteristic emerges: a bridge crossing a river. In the absence of any other possible – seemingly reliable – meeting point, the paratroopers will converge toward the bridge. Thus, in this specific case, the bridge is the “objective detail” which allows coordination. In the case of the social and cultural environment, players exploit their experience of social interactions or their cultural background. Players’ cultural background lets them define what kind of coordination device should be use to insure convergent expectations. For instance, players can rely on “analogies,” “precedents,” “incidents” (ibid., 90), “clichés,” “conventions” (ibid., 84-85), “institutions,” “traditions” (ibid., 91), etc.; basically, everything that can be perceived and interpreted as successful, and accordingly as a stable coordination device (ibidem). Players must think that these devices are reliable in the sense that everybody believes that everybody else can conform to it, etc. (Schelling, [1960]1980, p. 91). For that purpose, players must share a common background, i.e. players must ultimately know that these coordination devices belong to the value system of the other players.

A very peculiar methodological consequence follows (compared to standard game theory). Schelling does not recognize the usual theoretic dichotomy between divergent-interest games (i.e. zero-sum games10) and pure coordination games. For him, the resolution process (described above) of these two types of games is the same. Both imply the interdependence of players’ decisions, expectations, and subsequently of success (Schelling, [1960]1980, p. 86). This explains why Schelling disclaims the concept of divergent-interest games, and instead adopts that of “mixed-motive games.” Whatever the type of games, players are dependent on each other. For their mutual benefit they must together manage to coordinate (ibid., 57). To succeed, “[t]he players must jointly discover and mutually acquiesce in an outcome or in a

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8 See Innocenti (2007) for a detailed summary of Schelling’s account of strategic interactions as a discovering process. The way in which players form and revise their expectations of each other is endogenous to games (ibid., 410)

9 In this perspective Sugden and Zamarrón (2006) highlight Schelling’s pragmatism. In order to be reproduced, coordination devices must work in practice, i.e. they must recurrently induce players’ success.

10 And as defined by von Neumann and Morgenstern (1944).
mode of play that makes the outcome determinate. During their interactions, they must together find ‘rules of the game’ or together suffer the consequences” (ibid., 107). Players must therefore collaborate in this collective decision process (ibid., 135). This explains why Schelling rejects the rationale of the maximin theorem (even from a normative perspective). The maximin theorem is, for him, fundamentally anti-communicative and is firmly drawn on usual and standard individualism.

“In a zero-sum game the analyst is really dealing with only a single center of consciousness, a single source of decision. True, there are two players, each with his own consciousness; but minimax strategy converts the situation into one involving two essentially unilateral decisions. No spark of recognition needs to jump between the two players; no meeting of minds is required; no hints have to be conveyed; no impressions, images, or understandings have to be compared. No social perception is involved. But in the mixed-motive game, two or more centers of consciousness are dependent on each other in an essential way. Something has to be communicated; at least some spark of recognition must pass between the players. There is generally a necessity for some social activity, however rudimentary or tacit it may be; and both players are dependent to some degree on the success of their social perception and interaction.” (ibid., 163).

In Schelling’s work, this strong complementarity among players suggests that they form a transitory collective entity having a common purpose (which is to find a solution together through their interactions). This statement is indisputable in the following quotation: “a ‘gamelike’ situation can be viewed as a collective decision-process – a process by which two or more individuals jointly decide on an outcome” (Schelling, 1984, p. 236), and is reinforced in coordination games in which Schelling claims that it “is a ‘team’ situation” (ibid., 220).

Schelling gives an example about a couple. The partners are lost in a supermarket and have to find each other. They are able to solve this coordination problem (each of them has to go to the same place, so we face here a pure coordination game) by thinking of a place that is so obvious that each of them knows and is “sure” that this place is obvious for each of them (ibid., 54). The resolution of this coordination problem primarily relies on the mutual knowledge of each member has of the other. There is an intersubjective faculty in each member of the couple’s thoughts which is the result of the knowledge they have about each other. By this knowledge they know how they will be able together to find a solution. Each member is able to imagine herself as being the other to see the situation through her eyes. This is why, in my view, they form a group with a distinct mode of reasoning. Each member of the group uses the fact that put together they become an entity with a common fate. Each player uses her knowledge about the other in a way that gives information to her about the kind of practical reasoning they will use together. Thus, they can be considered (via their mutual knowledge) as a kind of collective entity, even if this doesn’t imply collective agreement and collective action in the strong and restrictive sense of Gilbert (1989, 2000, 2003).11 This example seems trivial because in a couple each person necessarily knows her

11 Sugden and Zamarrón (2006) point out that the example of the couple raises many question about the existence of a collective identity. Nevertheless, they ultimately assert that it is not a collective agency as
partner quite well. However, it is typical of the cognitive and psychological phenomena involved in the game solving for Schelling.

In cases in which there is not such strong knowledge among players, their purpose is to interact as long as their mutual behaviors provide sufficient information for them to understand each other’s value system and to be able through their mutual capacity of empathy to provide a determinate solution. Obviously in games of war, Schelling does not claim that belligerents form a team. Nevertheless, for him, these are “mixed-motive games” which means that the priority of the belligerents is to find a satisfactory solution. Avoiding war – which is in the interest of each belligerent – therefore requires collaboration. In this perspective, for Schelling, the belligerents have to communicate and to accommodate each other. In order to anticipate other’s behavior (and accordingly her intentions), each belligerent must be able to put herself in the other’s place. For that reason each solution is specific to the parties concerned and depends on their respective value system (see Schelling [1960] 1980, chap. 1). Hence, the same resolution process as in coordination games prevails.

3. Bacharach’s Variable Frame Theory: a theory of focal points

“Focal points have done more for the theory of games, than game theory has done for the theory of focal points” (Schelling, 1997; quoted by Carvalho, 2007, p. 4).

In the Variable Frame Theory (VFT) Bacharach’s aim is to “outline a rigorous theory of salience” (Bacharach, Bernasconi, 1997, p. 2). He tries to justify what he calls the “Schelling’s competence” (Bacharach, Bernasconi, 1997) by defining a theory of focal points within the framework of game theory. Nevertheless, in contrast to Schelling’s methodology, in Bacharach’s account the fact that an option is salient should not be “reason-giving.” To the contrary, it should be the result of a rational choice (ibid., 34). That is why the VFT “derives focal-point play from an explicit model of salience and from well-defined rationality postulates” (Bacharach, Bernasconi, 1997, p. 37).

Like Schelling, Bacharach claims that standard game theory confuses players and theorists’ perceptions of games although distinguishing them can provide new insight into the resolution of coordination games (in Gold, Sugden, 2006, p. xvi). In this perspective, Bacharach’s methodology is based on the integration of players’ frames within games. He defines frames as follows: “[a] frame is a set of concepts or predicates an agent uses in thinking about the world” (Bacharach, 2001a, p. 1). More specifically, in a game theoretic framework, “a

Gilbert (1989, 2000, 2003) defines it, i.e. two or more people who decide together, by a common agreement, to accomplish together a collective and interdependent action. It is true that if we retain this restrictive definition of a collective agency, Schelling’s example does not match.

Recall that the context of the first publication of The strategy of Conflict (1960) is the Cold War. Avoiding a devastating conflict for both the United States and Russia was therefore crucial. This explains Schelling’s view.

Bacharach (1993, p. 256-257) asserts that standard non-cooperative game theory miss-specifies the payoffs matrices. The purpose of the VFT is therefore a respecification of standard coordination games.
players’ frame is, most simply, the set of variables she uses to conceptualize the game” (Bacharach, 1997, p. 4). As a consequence, according to the way players perceive their decision problem, they define a game described by a payoff matrix of which the structure depends on the available options they think they have (Bacharach, 1991, p. 3). Subsequently, in the VFT Bacharach “[offers] a rudimentary descriptive model of the process that brings questions to the minds of the players and the consequences of this process” (Bacharach, 1993, p. 258). According to their frames, players build their own game according to their own “rules” (ibidem). Because players’ perceptions may differ widely from the theorists’ ones, their subjective strategies may differ from the strategies that can be considered by the game theorist in the same situation. These statements imply that (i) games are no longer self-contained and (ii) who the players are matter. In other words, both the context of play and the identity of the players matter. Analytically, the formalization of a model in the VFT is based on three premises: the specification of (i) the players’ frames (which encompass the process bringing these frames and their structure), (ii) the set of players’ subjective strategies according to their frames, and (iii) the principles of equilibrium selection.

When players frame a decision problem, they have families of concepts, which come to their mind. Since Bacharach builds the VFT from matching games (i.e., in brief, situations in which players have to choose the same objects to coordinate), concepts are basically characteristics or ‘properties’ of the objects; for example being green, red, round, etc. In these cases, the families to which these properties belong are ‘color,’ ‘shape,’ etc. Players’ frames correspond to a “repertoire” which is the set of families of concepts they handle. The probability of a characteristic – and its associate family – to come to players’ minds is formalized by a probability called the “availability” of the family. Framing is a matter of noticeability: “whether a normal person thinks of a predicate [i.e. a characteristic] in a situation depends on how conspicuous or noticeable is the feature of the situation which the predicate expresses” (Bacharach, 1991: 16). Accordingly, the propensity that conspicuous characteristics of the situation come to players’ mind is higher (ibidem). Nonetheless, availability may not only be a matter of context, but may also depend on players (Bacharach, 1997, p. 4) and more precisely on players’ culture (Bacharach, 1993, p. 267).

Players’ set of strategies are defined from a set of options corresponding to an ‘act-description space’. “[A]n option of a player is a feasible action for her described as she herself describes. It follows that a player’s options must be descriptions of possible actions which only use attributes [i.e. concepts] in her frame” (Bacharach, Bernasconi, 1997, p. 6; original emphasis). From each available concept, an act description follows (Bacharach, 1991, p. 16). In a matching game, this conceptualization allows only two types of actions: (i)

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14 Thereby, Bacharach’s use of framing is totally different from the framing effect literature. As Bacharach (2001a, p. 4) emphasizes: “in the … ‘framing effect’ literature, an experimenter studies the sign of the effect on choice of a manipulation designed to affect subjects’ frames”. When he mentions his conception of frames he always refers to Kahneman and Tversky (Kahneman and Tversky, 1979; Tversky and Kahneman, 1981, 1986); even though he uses framing in a different manner than they have. Bacharach is concerned by the way individuals naturally tend to frame a situation, i.e. without manipulation.

15 In Bacharach’s models of VFT, availability is almost a matter of “visual noticeability” (1991, 1993, 1997). However, this is only one aspect (see Bacharach, 2001a)
“choose/pick” the unique object which possesses a given characteristic (for instance ‘yellow’), or (ii) “choose/pick at random” one of the objects when none possesses a unique characteristic. We see Bacharach’s particularity. In standard game theory there is no need to label a strategy in such a way since the ‘desirability’ of each outcome is sufficient for players to make their decisions.

Then, players have to form beliefs about their available choices – with respect to their frames, others’ frames and accordingly others’ subsequent choices and acts. Players’ frames restrain their belief-space. A player cannot imagine that other options – outside their frames – might eventually be available (Bacharach, 1993, p. 260). It means that she cannot believe that she is able to handle an action which is not based on her repertoire (ibidem). The same is true for her beliefs about the other players’ available actions, as well. Bacharach supposes that each player believes that the others’ repertoires cannot be different from her own; it can be a subset, or eventually the same, but not another one (ibidem). Therefore, each player has a subjective probability for every sub-repertoire of her own repertoire. This subjective probability is interpreted as “the subjective probability that a player having repertoire r assigns to the other player’s having r’” (ibid., 261). A game is solved if each player finally chooses an option.16

Finally, Bacharach advocates for four principles of “rational decision”:17

i. A “principle of rarity”: a player prefers to choose a rare object. By doing so, and against several identical objects, she maximizes her payoff: “Ceteris paribus, players prefer to pick an object which is rarer” (Bacharach, Bernasconi, 1997, p. 10).

ii. A “principle of availability”: in some circumstances, choosing a rare object can be too risky, so a player prefers a more available object; “Ceteris paribus, a player is more inclined to pick an attribute which is more available” (ibid., 11).

iii. A “principle of insufficient reason”: if options are perfectly symmetrical (i.e., if none of the characteristics, concepts or families, allow players to differentiate them), there is no “sufficient reason” – to choose one of them.

iv. A “principle of coordination”, i.e. a principle of “payoff dominance” (Harsanyi, Selten, 1988): if players are rational they play their “part” in the single Pareto optimal equilibrium (Bacharach, 1993, p. 257).18

Contrary to Schelling, this last principle implies that it is the formal and mathematical characteristics of the game which lead to a solution in the VFT. By this way, Bacharach is

16 In the VFT, a solution is formally a pair of subjective best reply, i.e. a pair of “decision functions” (Bacharach, 1993; Bacharach, Bernasconi, 1997).

17 Bacharach (in Bacharach, Bernasconi, 1997, p. 4) claims “strategies are chosen in a way which is rational in a perfectly familiar game theoretical sense. However the game that gets played is determined by non-rational (though not irrational) features of the players. These are players’ “frames.”” Framing is indeed an unconscious process (Bacharach, 1991).

18 Bacharach admits that this principle can be controversial, but he justifies its application by improvements in game theory leading game theorists to recognize the principle of coordination as a rational way to play in games. He refers especially to Aumann and Sorin (1989) and to Anderlini (1990). Besides, we can mention Colman’s attempt (2003: 144-145) to prove the relevance of this concept; objecting to Gilbert (1989), and referring to Crawford, Haller (1990), Farrell (1988), Gauthier (1975), Janssen (2001), Lewis (1969) and Sugden (1995, 2000).
able to explain how in coordination games with potentially multiple equilibria a Pareto dominant equilibrium is the solution (Bacharach, 1993, p. 257). Nevertheless, Pareto optimal solutions express what is generally perceived as “payoff-irrelevant features” of games (Heat et al., 2006, p. 637). These features rely on the context of play.

In fact, in the VFT, salience stems from framing. Except for the latter, the above-mentioned principles are totally outsiders vis-à-vis game theory (and not only standard game theory). However they sound familiar if we have in mind Schelling’s contribution. They are based on the characteristics that define Schelling’s focal points (i.e. ‘prominence,’ ‘uniqueness,’ and ‘simplicity’). To draw a theory of salience, Bacharach starts with Lewis’ (1968) definition (which is itself an extension of Schelling’s one) in which salient options possess two characteristics: (i) ‘conspicuousness’ or ‘noticeability’ and (ii) ‘uniqueness.’ For Bacharach (1993, p. 270), these two dimensions must be distinguished because they are “logically independent.” They involve different mechanisms in individuals’ process of reasoning. Conspicuousness relies on the unconscious phase – i.e. the phase of framing – whereas uniqueness results from the conscious phase – i.e. the reasoning or strategic phase which is the game per se (Bacharach, 1991, p. 35). Conspicuousness is linked to the principles of availability (Bacharach, 1991, p. 34) and of rarity (i.e., in Schelling’s terminology, to prominence and simplicity). This is what Bacharach calls the “salience-1” or “primary salience.” Uniqueness is linked to the last principles and corresponds to the “Salience-2,” or “secondary salience”. It “raises the expected utility of the pair in which both choose the salient option, and so give a game-theoretic reason for choosing it (expressed in the principle of coordination)” (ibid., 35). An option is of secondary salience if each player thinks that this option is of “primary salience” for the other players (ibidem).

Bacharach explains the nature of salience and gives a theoretical content to the notion of focal points within the framing phenomenon. As a consequence, like for Schelling, salience – and by implication focal points – depend on the physical and socio-cultural context of game and on the players (Bacharach, 2001a, p. 5). However, Bacharach explicitly claims that salience may not be shared among players and it does not preclude coordination on a Pareto optimal Nash equilibrium (Bacharach, Bernasconi, 1997, p. 38-39). This implies that in contrast to Schelling, players do not necessarily reach a meeting of minds to coordinate. This goal will be reached through the Team Reasoning (TR).

4. From the variable frame theory to the team reasoning theory: how to ensure convergent expectations on game theoretic focal points

“[B]y reference to team agency TR can explain the stability of behavioral patterns and behavioral expectations” (Lahno, Lahno, 2014, p. 2).
Bacharach’s TR theory exhibits and exploits other aspects of Schelling’s account of interdependent decisions in strategic contexts which were not the cornerstones of his VFT.20 The first aspect relies on the fact that, for Schelling, players can be considered as a collective agency, i.e. as a collective entity. In the team reasoning theory, when players become members of a team, they recognize the team as the unit of agency in the game. With this in mind, team members therefore acknowledge that the resolution process of a game is a collective process, like in Schelling’s account. Second, like in Schelling’s theory, this phenomenon is induced by contexts showing scope for cooperation and coordination, i.e. by contexts exhibiting common interest. According to Bacharach (and again like Schelling) any type of game provides the basis to enhance TR, i.e. cooperative behaviors. In the TR theory, every mixed-motive game shows scope for coordination and cooperation (even if some of them are more risky than others, like the prisoner’s dilemma for instance) (Bacharach in Gold, Sugden, 2006, p. 86-87, 144). Nevertheless, in contrast to Schelling, in the TR theory, this common interest is again expressed by the aim to reach a game theoretic focal point: the Pareto optimal equilibrium. Third, the members of a team have convergent expectations about other members’ expectations and behaviors. In Schelling’s words, the TR theory ensures a meeting of minds among team members. As soon as players recognize themselves and the others as members of a team, they know they have convergent expectations; they all know that everybody in the team adopts the team’s objective as theirs (Sugden, 2000). Everybody expects that everybody expects, etc. cooperative behaviors for that purpose.

To propose a realistic mode of reasoning, Bacharach methodologically combines TR and framing. Therefore, his TR theory aims to show how players’ subjective representations induce various modes of reasoning, i.e. either individualistic reasoning or team reasoning. In the TR theory, players’ frames concern the way they perceive themselves rather than the context striceto sensu (even if they are linked). More specifically, if players team reason they are in “we frame” whereas if they remain standard individualistic reasoners, they are in “I frame.” When players are in “we frame,” they express their “group identity” (Bacharach in Gold, Sugden, 2006, p. 73). From the viewpoint of a player, seeing herself as a member of a group is a process of affiliation which is “a psychological process in which a person who does think about a certain group, defined by some shared property, comes to thinks about it as ‘us’” (Bacharach, 1997, p. 2). Being a member of a group and acting for this group implies in her mind a “cognitive extension … of self-interest” meaning that the objectives of the group define her own objectives (Bacharach, 1997, p. 16; 1999, p. 118). Players no longer recognize the individuals as the decision-unit of the game, but the set of players as an entity. It is this “agency transformation” which leads to the TR.21

In the TR theory, the nature of choices changes. In fact, team reasoners are “profile directed reasoners” instead of “means-end reasoners,” i.e. “best-reply reasoners” as it is supposed in

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20 See Larrouy (2014) for a detailed presentation of the VF and TR theories and how they enhance continuity in Bacharach’s work.
21“Having the group interest at heart does not … suffice to explain … cooperation … something more happens … This something is ‘agency transformation.’ The key to my explanation is that agency transformation involves not only a transformation of payoff but also a transformation of reasoning” (ibid., 90).
standard game theory (Bacharach, 1995, 1997, 1999, 2001, 2006). The mode of reasoning of team reasoners is a three-step process: they first determine a collective profile of action according to a collective utility function, then they identify their available option in this collective profile of actions and finally they perform it (Bacharach, 1995, p. 3).\textsuperscript{22}

Bacharach is interested in spontaneous group identification (in Gold, Sugden, 2006, p. 81). Let us recall that group identification is a framing phenomenon. Therefore, players’ different self-perceptions, i.e. in this case, respectively individual and collective, are a matter of the availability of frames (\textit{ibid.}, 74). In fact, “the personal and social levels of categorization have varying different saliences in different interactions” (1997, p. 23). Hence, Bacharach’s main aim is to justify why players switch between self-perceptions and in turn between modes of reasoning. In other words, in his theory, players possess certain cognitive and psychological \textit{predispositions} to be cooperative and some of the time, i.e. depending on the game, “we frame” takes over “I frame.” Some games’ structure induces the salience of “we frame” and allows for cooperative behaviors. For that reason, Bacharach argues that this phenomenon is \textit{endogeneous} to games (\textit{ibid.}, 6).\textsuperscript{23} The probability with which players are in I or We frames must therefore be determined by the specific characteristics of games. In this perspective, drawing on the literature on social psychology and on experiments within this subfield, Bacharach (in Gold, Sugden, 2006, p. 132) precisely defines the conditions which trigger we frames.\textsuperscript{24} Notably, experiments in the theories of self-identity and self-categorization (in social psychology) point out that two characteristics induce group-identification: common interest and interdependence, which are both particularly relevant for game theoretic contexts (\textit{ibid.}, 82). In fact, for Bacharach, they “may help explain why a group of people locked into a game might tend to group identify. They have a common interest in Pareto-optimal outcome and, usually, they had no hand in choosing the payoff matrix” (\textit{ibid.}, 133). These conditions trigger what Bacharach calls a “common problem mechanism (\textit{ibidem}). He defines the game theoretical characteristics which constitute this “common problem mechanism” as follows:

\begin{itemize}
  \item i. “P\textsubscript{1} [Player 1] and P\textsubscript{2} [Player 2] have a \textit{common interest} in s* over s [s* and s being two different outcomes] if they mutually know that both prefer s* to s” (\textit{ibid.}, 83);
  \item ii. “among all the feasible outcomes there is one – call it s* – both P\textsubscript{1} and P\textsubscript{2} rank highest, and that it can only be brought about by each acting in a particular way” (\textit{ibid.}, 84), i.e. they have a \textit{copower} for reaching s*;
  \item iii. and finally “the \textit{interdependent} hypothesis concerns situations in which s* is not assured by individualistic decision-making, and P\textsubscript{1} and P\textsubscript{2} perceive that it is not” (\textit{ibid.}, 85).
\end{itemize}

\textsuperscript{22} The collective utility function is a Paretoian ranking of the sum of individual utilities in the objective matrix (Bacharach, 1999: 120). Therefore, when players are in “we frames,” they \textit{respecify} the objective game in a “group payoff matrix” (\textit{ibid.}, 11).

\textsuperscript{23} However, Bacharach fails to endogenize the probability with which players are in I or We frames (see Larrouy, 2014).

\textsuperscript{24} He is well aware of the literature on social psychology and the debates between psychologists – especially between cognitivists and the “interdependence theorists” – who do not agree on the different conditions which prompt a sense of group-identity in players’ minds. For more details, refer to Bacharach (in Gold, Sugden, 2006, p. 77-78).
Recall that common interest, co-power and interdependence, are exactly the conditions on which Schelling insists in strategic interactions and which tend to enhance a *transitory* collective. In Schelling’s account, the concept of co-power, because of players’ complementary, is the cornerstone of this phenomenon. However, in the TR theory, players may not perceive this “common problem mechanism.” Bacharach explains that the characteristics underlying this mechanism are more noticeable in some games than in others, as is group-identification (*ibidem*). In some games, the riskiness of cooperation may be more salient than the “common problem mechanism.” As a result, group-identification may not be elicited (in Gold, Sugden, 2006, p. 87). Team reasoners remain strategic thinkers. They have to form beliefs on other players’ possible behaviors. Hence, in “unreliable contexts” (Bacharach, 1999) they do not cooperate systematically; it depends on the probability that others cooperate.25

To ensure systematic cooperation in every mixed-motive game, the only missing part in Bacharach’s TR theory – comparatively to Schelling – is players’ capacity to signal their intentions in a dynamic process of interactions. It would enable players’ “mutual recognition,” i.e. “the psychological capacity of persons with a certain disposition – e.g. to cooperate in some sense – to recognize each other” (Bacharach, 1997, p. 2-3). We could guess that such a purpose was part of Bacharach’s research program before his death (see Bacharach, 2001b).26

### 5. Schelling and Bacharach: different purposes but convergent methodologies?

Gold and Sugden (2006, p. 27) argue that “Bacharach’s and Schelling’s theories are perhaps better thought of as radically different explanations of a common phenomenon.” They claim that, according to Bacharach, the existence of a solution for games cannot be stated a priori whereas for Schelling, each game possesses a priori a solution (*ibid.*, 24-25). There are indeed sensible differences in Schelling and Bacharach’s conception of salience, focal point and equilibrium selection in games. However, on one hand, if in fact Schelling assumes that each game is solvable, the solution does not exist a priori. Instead, it progressively emerges during the interactions.27 This solution cannot be determined *a priori* because it relies on the way players interact, their knowledge about each other, the context, etc. Some incidental details during the interaction process can drastically change the result of the game, and it cannot be anticipated. In Schelling’s account, the social world implies “radical uncertainty” (Latsis, 2006). Acting is a commitment for Schelling ([1960]1980, chap.1): during the interaction, according to players’ behaviors, certain potential solutions progressively appear

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25 This possibility of “vacillation” is developed and formalized by Smerilli (2012).

26 Bacharach (2001b) argues that TR is at the crossroad of non-cooperative and cooperative game theory and multi-agents systems. These systems allow economists (i) to pass from static to dynamic games, and (ii) to introduce emergence in their models. We find here a similarity with Schelling who is considered as the precursor of agent-based modeling (e.g. by Aydinonat, 2005, 2007; Cohendet et al., 2003; Epstein and Axtell, 1996; Epstein, 2005).

27 For a comparative claim, see Innocenti (2007).
while some others disappear. On the other hand, both in the VFT and the TR theory Bacharach respecifies the standard payoff matrices in order to provide one unique Pareto optimal equilibrium and therefore ensures that a solution exists thanks to the “principle of coordination.”

In addition, Sugden and Zamarrón (2006) assert that Schelling draws strategic interactions as “open-systems,” faced by real individuals in real “game-like situations” while “Bacharach’s aim is to find formal representations of modes of valid reasoning that are accessible to game-players” (Gold, Sugden, 2006, p. 27).

“Schelling’s discussion of focal points is not a theory as economists normally understand the term. There is no shortage of models, but these are not self-contained worlds in which agents act according to pre-specified principles. They are open-ended coordination problems, designed to be faced by two or more real (as opposed to model) individuals.” (Sugden, Zamarrón, 2006, p. 611)

It seems therefore in their analysis, that Bacharach proposes “closed-systems” and consider both the VF and TR theories as “model worlds.” It is true that Bacharach uses “pre-specified principles” of reasoning expressed in the four principles of rational decision which he edicts. Players maximize their expected utility. However, I will attempt to demonstrate in this section that the VF and TR theories are “open-systems”,28 even in a diminished form compared to Schelling.

Schelling and Bacharach have different purposes – with respect to the different contexts in which their works are embedded. There are therefore differences in their respective contributions. Nonetheless, taking into account these differences should not hide a much deeper issue. Bacharach’s VF and TR theories give some clues to formalize into a game theoretic framework some parts of Schelling’s conception of a “theory of interdependent decisions”.29 Furthermore, they show the limits imposed by a game theoretic formalism on the possibility to consider strategic interactions as “open-systems” in which the context as well as personal experience and collective determinants (institutions and conventions, collective identity, social positions, etc.) intervene into players’ decision-making. Accordingly, I will aim to show (i) why Schelling and Bacharach challenge the usual methodological individualism adopted by game theory in a comparative way, (ii) why the methodological consequence is a conception of strategic interactions, Likewise economics, as “open-systems”, and (iii) why this in turn gives such a great role to intersubjectivity, empathy and eventually sympathy in the TR theory.

In Schelling’s account, games are conceived as “open-systems” for various reasons. First, the social world acts as an external constraint on players’ decision-making. As stated above (cf. section 2) in order to coordinate, players may rely on institutions or traditions, etc., i.e. on established coordination devices stemming from the social world. In other words, some

\[28\] It is precisely for that reason that some conceptual and methodological difficulties appear in his VF and TR theories (see Larrouy, 2014).

\[29\] Subsequently, it contradicts the idea developed, for instance by Innocenti (2007), that Schelling’s account of game theory cannot be formalized.
‘social facts’ that belong to individuals’ socio-cultural background affect the rationale of their reasoning. These social facts constraint players’ decisions because they think of themselves as members of a community. Individuals’ collective identity explains why institutions, for instance, have a normative content or are value-laden. Because players recognized themselves as members of a specific community they make use of the social components of this community in their reasoning process (Hédoin, 2014). Second, interactions affect players’ behavior: players are mutually influencing each other. This implies that during interactions, individuals’ subjective characteristics, i.e. their perceptions, intentions and accordingly their reason for acting, are constantly evolving. Hence, more generally, players’ personal identity (i.e. their personal experience) is constituted not in isolation but in relation with others and the social world. Third, ‘the other’ is no longer seen as an event which implies uncertainty and insecurity. She gives information about her identity and about how, together, the players will be able to find a solution. This capacity to communicate (her identity, perceptions, intentions, etc., i.e. some cognitive and psychological states) through action is explained by individuals’ capacity of empathy. To coordinate, players must tacitly agree on an outcome. In this perspective they must have an insight into each other’s expectations. Therefore, they have to be able to imagine themselves as another person, to progressively refine their understanding of the other’s mental state. Again, players’ possess this faculty because they are socially skilled (Latsis, 2006). And finally, the way a set of players interacts is specific to this set. Through their interactions, players build their own mode of reasoning, they build their own rules and may create their own conventions. Once more, the players recognize the new conventions because they acknowledge that they form a collective, which appeals to players’ collective identity. We have already referred to all of these aspects present in analogies with the philosophy of intersubjectivity.

Now in Bacharach’s VF and TR theories, players’ objective function no longer depends on their own preferences but on the context, their perceptions, their beliefs, others’ perceptions, a cultural determinism, and on self-identities (which in turn influence their perceptions). As a consequence, Bacharach’s formalization of strategic interactions clearly violates the usual “closed system” methodology of the game theoretic framework.

First, both in the VF and TR theories, players’ objective function is context-dependent since it relies on players’ subjective representations which are context-dependent. As a consequence, the principle of extensionality, which states that the descriptions of individuals’ options do not change their preferences, is violated (Bacharach, 2001a, p. 2) and players’ choices do not respect the axiom of “consistency of choices”. This echoes the influence of the physical environment surrounding the game in Schelling’s contribution. In addition, in the VFT, players’ reasons for acting (or preferences) depend on their beliefs about others’ subjective representations. Players’ rationality therefore encloses a strong sense of ‘otherness,’ the rationale of players’ decision intrinsically depends on the other players. Players’ capacity of empathy dominates in their ability to determine their rational options. By contrast, in standard

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30 How and why framing entails a violation of the standard conception of the individual decision theory, and especially the expected utility theory, is well argued in Bacharach (2001a).
game theory, preferences are totally distinct from players’ beliefs about others’ choices or beliefs (Hargreaves Heap, Varoufakis, 2004 [1995]).

Second, in the VFT, Bacharach assumes that “the rational solutions of some games depend on the culture of the players” (Bacharach, 1993, p. 271). He explicitly integrates the impact of players’ culture in their utility function through the availability function of their frames. The variations of values of this availability function translate the effects of culture on individuals’ perceptions (ibidem). Players’ frames are therefore constrained by their culture. Different cultural backgrounds induce different structure of frames and this fact is taken into account in Bacharach’s formalism. Besides,

“[W]ithin a same culture the parameters of a conceptual scheme – its membership, its clustering, and the readiness to mind of the clusters in a given situation – are essentially shared. Furthermore, they are shared in this strong sense: not only does everyone have certain conceptual competences by virtue of belonging to the community, but every member knows that every member has them” (ibid., 259).

This propensity of shared perceptions within a common culture (or community) induces a tendency for mutual consistent beliefs with respect to the members’ perceptions. That is, beliefs about each member’s frames (and availability functions) tend also to be shared (Gold, Sugden, 2006, p. 8). Therefore, players can ground their reasoning on the way others generally perceive the coordination context they face and on what they have learned about coordination devices inherited from this culture. Since players think of salience strategically, it means that they think about what is salient for others. Intersubjectivity and players’ capacity of empathy are again at the basis of Bacharach’s methodology to explain players’ capacity to solve games. In this perspective, they use the knowledge their culture gives them. Indeed, players cannot think of others’ perceptions if they are not of the same background (Bacharach, 1991, 1993, 2001; Bacharach, Bernasconi, 1997), which implies that each player’s perception must be embedded in a common conceptual framework, i.e. in a common cultural legacy. Moreover, all of the VFT models incorporate language (recall that players’ options are descriptions of actions, hence they necessarily involve language). Players must share a common language to play a game. Again we identify the same postulate in Schelling’s work. Players must share a common background to interact (like for instance being a mathematician). This common background is compatible with a strong heterogeneity among players in Schelling’s methodology (Innocenti, 2007) while it tends to lessen this heterogeneity in Bacharach’s work. Even though, in the latter, players remain heterogeneous because they have subjective perceptions which depend on their personal identity (Scazzieri, 2008). The non-dynamic theoretic framework of Bacharach’s VFT mainly explains this difference. Players cannot signal their perceptions through their interactive behaviors, thus players cannot progressively update their beliefs about others. The radical uncertainty induced by the incompleteness of players’ frames (Bacharach, 1991, 1993, 2001a, 1997, 2006) requires compatible perceptions and beliefs. Since players are unable to conceive the game  

31 See Mathea et al. (1994) and Bacharach, Bernasconi (1997) for experimental confirmations of this statement.
32 For a detailed version of the evolutionary – i.e. historical – content of players’ frames according to their personal experience, see Scazzieri (2008).
through perceptions that do not belong to their background, they are therefore unable to see the game through others’ eyes, if these coplayers’ perceptions do not match with their own.

Third, Bacharach argues:

“[A] personhood is to some extent constituted by group membership […] personhood is the resultant, to the extent that it is so constituted, of a set of group identities; more exactly, the person is defined by the intersection of her group identities.” (Bacharach, in Gold, Sugden, 2006, p. 88-9)

He states his conception of the connection between collective and individual agency on psychology within self-categorization theory and more specifically on Tajfel and Turner (1985) who assert: “the sense of group identity precedes, developmentally, the sense of personal identity” (Bacharach, in Gold, Sugden, 2006, p. 88-89). Individuals’ personal identities are therefore socially grounded for Bacharach. Individuals’ characteristics are built through continuous interactions with other individuals and with collectives. Individuals and the social worlds are interdependent. This statement is at the basis of the philosophy of intersubjectivity.

Finally in the TR theory, players do not follow their individual preferences if they team reason. Players’ collective identity enhances their proclivity to be cooperative and in turn pushes forward the realization of the joint action of the team. Team reasoning possesses its own requirements in order to be valid: “cooperative reasoning is sui generis and not derived from the standard (individualistic, instrumental) type of reasoning” (Bacharach, 1997, p. 25). It is the collective profile of actions of the team which is reason-giving. Since each member of the team is concerned by such a purpose, when she pursues her available action in the collective profile of action, she realizes at the same time the collective and the personal objectives of each other member of the team. As a consequence, team reasoners are concerned by the collective’s, and in turn other members’, well-being. This strong form of identification implies that a sympathy feeling drives players. In Marciano’s (2002, p. 36) words it is a form of “emotional commitment.”

To conclude, because in Schelling and Bacharach’s account of strategic interactions, intersubjectivity and empathy are the cornerstones of players’ capacity to solve games, game theory cannot be conceived as a closed-system. Those are mainly psychological phenomena. In addition, the integration of players’ perceptions in their respective work exhibits the limitations of enclosing game theory in mathematical frontiers. The epistemological consequence of the way they portray players as socially skilled individuals implies the necessity to build bridges with the other social sciences like sociology, psychology or social psychology. With respect to the limitations of game theory Schelling identifies, he highlights that “the question arises whether the game theory trail ramifies indefinitely over the whole domain of social psychology or leads into a more limited area particularly congenial to game theory” (1980[1960], p. 165). Besides, according to him experimental psychology can give new insights into the cognitive and psychological phenomena at work in the convergence of
individual expectations (*ibid*., 113). Along those lines, Bacharach explicitly draws on psychology (Kahneman, Tversky, 1979; Tversky, Kahneman, 1981, 1986) because of the use of framing and on social psychology (Tajfel, 1972, 1981; Tajfel, Turner, 1985; Turner, 1985; Turner et al., 1987) and evolutionary biology in the TR theory (Gold, Sugden, 2006, xviii-xix). For instance, according to Bacharach, investigating how players attribute to their co-players perceptions and mental states is a part of the game theorist’s job and it relies on psychology and especially on the theory of attribution (Heider, 1958; Hewstone, 1983).

6. **Conclusion**

A straightforward aspect of both Schelling and Bacharach’s thought is that game theory is conceived as a research program and not as a toolbox as is generally the case for game theorists. They both provide new ideas, concepts, and methodological grounds to develop a distinctive game theory. Schelling lays the basis without formalism while Bacharach attempts to enrich the conceptual core of game theory with a formalized account.

As I show in this contribution, both Schelling and Bacharach develop a very specific vision of game theory which challenges its usual foundations. They question the meaning of interactive rationality by reconsidering the impact of players’, identity, rationality and interactions on the solutions of games. They provide an original insight on the condition of possibility to provide determinate solutions for games when players are no longer defined symmetrically and no longer draw their reasoning on the mathematical structure of games as happens in standard game theory. Both Schelling and Bacharach take into account that strategic interactions generally among heterogeneous players. Their strong account of heterogeneity goes much further than any other behavioral game theory since in the latter heterogeneity is generally restricted to different information but remains anchored to the “principle of rational determinacy” (Sugden, 1991); that is, there is still one way to decide and to act in all of the possible types of games. We saw that both Schelling and Bacharach provide the basis to bypass such a methodological ground. The methodological consequences of such an account of game theory are challenging. Both Schelling and Bacharach no longer impose (i) common knowledge, (ii) ‘transparency of reasons,’ and (iii) reduction of “strategic uncertainty” to “physical uncertainty.” Therefore, they both methodologically resort to empathy (and eventually sympathy in the TR theory) as a way to break the radical uncertainty of situations of interdependence, i.e. of the social world. Their respective account of game theory is peopled by intersubjective agents since games are no longer self-contained worlds. Therefore, by following Schelling’s methodological innovations, Bacharach opened up new research agenda in order to build an intersubjective account of game theory.

For a long time, Schelling and Bacharach remained isolated and underestimated. Game theory was indeed very far from their concerns. It was long believed that their respective work on game theory would never have an impact on economics. However, this is no longer the case.

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33 Schelling’s interdisplinarity is well documented in Ayson (2004).
A trend of research on social preferences that crosses “other regarding preferences” and psychological games opens the door to the methodological advances offered by Schelling and Bacharach. The underlying framework of that trend allows the introduction of players’ frames. It therefore offers the theoric grounds to incorporate some of the advances provided in both Schelling and Bacharach’s work. Besides a subfield of this literature which is growing rapidly, mixes epistemic games and psychological games. Thus, it provides the basis to integrate Schelling and Bacharach’s intersubjective account of game theory.

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