Unconscious and Game Theory

LUCA FLABBI AND MARIA GABRIELLA PEDICONI

ABSTRACT

The paper compares psychoanalysis and non-cooperative Game Theory and asks if the concepts used in Game Theory are compatible with and add to the knowledge about human thinking and human actions provided by psychoanalysis. We propose a common and novel ground in which this interdisciplinary comparison can be articulated: both Game Theory and the unconscious posit a Law. Our main result is that the law of satisfaction describing the Freudian unconscious and the law of strategic interaction implied by Game Theory are not simply incompatible but in frontal opposition to each other; they create a crossroad at which the imputable individual has the possibility to choose either one law or the other. Copyright © 2013 John Wiley & Sons, Ltd.

Key words: Game Theory, strategic interaction, partnership, law of satisfaction, unconscious

INTRODUCTION

Flectere si nequeo Superos, Acheronta movebo (Freud, 1900)

How do human beings live, think, interact with one another, establish institutions, and generate collective outcomes? Many social sciences have the ambition to answer these questions; generating answers that at times complement but often conflict with each other. Frequently, the language and tools used make the comparison difficult and the interdisciplinary approach almost impossible.

In this paper we focus on psychoanalysis and non-cooperative Game Theory and we ask if the concepts used in Game Theory are compatible with and add to the knowledge about human thinking and behavior provided by psychoanalysis. Our question has two motivations. First, there is a rich tradition providing quantitative and highly formalized models of the unconscious (see for example Bion, 1952, 1962, 1970; Matte-Blanco, 1975). A view revived by recent advances in the neurosciences, where the unconscious coincides with the neural pattern and texture responsible for the working of the brain about the relation between psychoanalysis and neuroscience (see Damasio, 1999; Solms & Turnbull, 2002; specifically Tallis,

2002; Scalzone & Zontini, 2004) and therefore lends itself to be described in highly formalized language. Game Theory is a potentially appropriate language to provide such formalization. As a result, the comparison between psychoanalysis and Game Theory may shed light on the debate if such formalization is useful in advancing our understanding of the Freudian unconscious. Second, there are some recent interesting contributions at the intersection between economics and psychoanalysis (see for example Tuckett, 2011; Tuckett & Taffler, 2008) and, moreover, economics has been promoting its view about individual interactions and decision-making in many other social sciences. Game Theory is at the core of the formalization of individual behavior in economics and therefore an interdisciplinary comparison is due and it has the potential to be genuinely informative.

We provide two main contributions. The first contribution is the proposal of a common and relatively novel ground in which the comparison between psychoanalysis and non-cooperative Game Theory can be done. Interdisciplinary comparisons are always difficult, despite their great potential, and providing a language to make a successful comparison between two important disciplines that have been relatively separated from each other is highly valuable. The second contribution is our conclusion that the law established by Game Theory and the law established by the unconscious are not simply incompatible but in opposition to each other, constituting a veritable crossroad in the life of the individual.

We understand that a large group of both economists and psychoanalysts may already think that there are so many major differences between the Freudian unconscious and Game Theory that the comparison is unlikely to generate interesting results. Our recognition that this is a challenge is why our first effort was to provide a common ground were the comparison could take place. We also think that our conclusion stating that the unconscious and Game Theory generates acts and thoughts in opposition to each other goes beyond a simple acknowledgment of differences.

The paper is organized as follows. Following this introduction, we establish in the second section that the unconscious posits a Law. By this we mean that the unconscious is never fully described or contained by the causality of the natural laws, nor fully explained by customs, social norms, or experiences. Instead, the unconscious always aims at the satisfaction; it is the name of the law of satisfaction for the individual.

In the third section, we establish – after a brief review of a few fundamental concepts – that Game Theory also has the ambition to posit a law describing human actions and thoughts. Thanks to this juridical and legislative approach, we create a common ground in which the unconscious and Game Theory can be compared in a novel way.

In the fourth section, we articulate our main result: the laws established by Game Theory and by the unconscious are not simply incompatible but at odds, in opposition to each other. They take two opposite routes with respect to the fundamental questions about how human beings live, think, interact with one another, establish institutions, and generate collective outcomes.

In the final section, we summarize our main results and we close with a word of caution: If Game Theory is in opposition with our legislative definition of the Freudian unconscious, we speculate it may be compatible with other interpretations of the unconscious in psychoanalysis, in particular those that share the ambition of providing a mathematical formalization of human behavior (see Bion, 1952, 1962, 1970; Matte-Blanco, 1975, 2006; Lombardi, 2006; Langs & Badalamenti, 1994; Palombo, 1997).

UNCONSCIOUS AS LAW OF SATISFACTION

A small, ancient town in Italy; a man enters a café for his usual espresso: he stands at the bar, chatting with the lady who is preparing the coffee. A few steps back, the other barista – a man and well known to the client – is cleaning out and mumbling. Satisfied after the coffee, the man leaves and says to the two baristas: "Good bye, ladies!". The other clients immediately realize the slip but the man who said it does not. Why? What happened?

The slip (or Freudian's *lapsus*) has collected a huge amount of information, making explicit and public a judgment, almost a sentence. By building the slip, the man's unconscious has registered the presence of the other barista and his feminine movements while cleaning, even if the man himself has never explicitly acknowledged the presence of the other barista. The good-bye sentence was short but the collection of observations leading to the slip has been long: the knowledge of the place, and the knowledge of the two baristas. And finally, an opportunity for the unconscious: the satisfaction with the espresso, the close resemblance of the words ladies and gentleman in Italian (signor*e* and signor*i*, respectively), a public audience (the other clients) and a stage (the bar).

Slips and dreams are the common experiences of everyday life that Freud has used to document the presence of the unconscious: "All the attributes which we value highly in our trains of thought, and which characterize them as complex achievements of a high order, are to be found once more in dream-thoughts. (…) The most that we can conclude from this is that it proves that *the most complicated achievements of thought are possible without the assistance of consciousness* (…)" (Freud, 1900, p. 540, emphasis added). From them, Freud has derived the definition of unconscious: "The unconscious is the true psychical reality" (Freud, 1900, p. 557).

Going back to the example. What is the aim and direction of the slip? It is easily observable that the slip has a direction, a movement toward an end. It is also public: the slip could have not happened without a public audience, the other clients, and a stage, the café. Freud is explicit about it: "All thinking is no more than a circuitous path from the memory of satisfaction (a memory which has been adopted as a purposive idea) to an identical cathexis of the same memory which is hoped to attain once more through an intermediate stage of motor experiences" (Freud, 1900, p. 548). We can say with Freud that the unconscious gives a direction to the full range of human behavior; it is the

reference for any movement toward the satisfaction just as a law is a reference for all the individuals that freely decide to subscribe it. Thanks to the unconscious, any human act has the possibility to reach an end, to be a *moto a meta* (a movement toward an end) (Contri, 2007).

What end? Do different ends exist or do we know the one end representing the pacific conclusion of all the different human actions?[1] The slip suggests an answer. Thanks to the slip, the man at the café was able to obtain the satisfaction of making explicit the judgment he was not able to make directly, due to resistance. A talented comedian would have been able to transform the slip in a joke, completing the satisfaction with a laugh.[2] The unconscious establishes not only the existence of an end in any human action but also that this end is the satisfaction. The unconscious always aims at satisfaction in all human actions.

Freud always considered the working of the unconscious at the level of observable phenomena, including the act of talking: "If the distinction between conscious and unconscious motivation is taken into account, our feeling of conviction informs us that conscious motivation does not extend to all our motor decisions. *De minimis non curat lex*.[3] But what is thus left free by one side receives its motivation from the other side, from the unconscious; and in this way determination in the psychical sphere is still carried out without any gap" (Freud, 1901, p. 254). Determination that psychoanalysts have often mistakenly described as a concept equal to the causality found in the natural sciences, calling it *psychic determinism*.[4] But what Freud is talking about here is motivation not natural causation. For example, the actual behavior of two partners agreeing on a meeting is decisive to the success of the initiative. The agreement between the two establishes a law. Then the partners may decide to follow it or not, a decision that will lead to different sanctions: gratitude and satisfaction in the first case, break up and resentment in the second. The sanction is the result following a judgment and not the effect following a cause.

The unconscious is therefore the name of the capacity of thinking, a capacity that offers and proposes, establishing a law. A law that, given its objective, we can call Law of Satisfaction. The unconscious is never fully described or contained by the causality of the natural laws, nor fully explained by customs, social norms, or experiences. The unconscious always aims at satisfaction, finding expression in everyday life and working with partners and friends. Partners and friends can potentially be any member of the entire universe as long as they freely choose the same law of satisfaction. As a result, satisfaction is the actual test of the unconscious and defines what we mean by psychopathology: in the healthy individual, satisfaction guarantees the attainment of the aims and objectives of the unconscious; in the pathological individual, satisfaction becomes an unattainable, tyrannical imperative. The law of satisfaction promoted by the unconscious is subject to repression (*Verdrängung*) in the neuroses while it is actively rejected (*Verleugnung*) in perversions (Freud, 1924; Lacan, 1966).

The law of satisfaction is the same law that we find at the beginning of life, in the newborn, and that Freud has articulated in four moments: *Quelle-Drang-Objekt-Ziel*. The memory of this first experience and judgment of satisfaction will carry through the entire life of the individual: "Feeding me, my mother (*Drang*) excited me (*Quelle*) to the benefit of being satisfied (*Ziel*) through another (*Objekt*)" (Contri, 2007). Freud is the first who has posited the existence of the Unconscious (as part of his topographic theory) and who has identified the *Ziel* of such a law in satisfaction: the law of satisfaction is a Freudian law.

GAME THEORY AS LAW OF STRATEGIC INTERACTION

Game Theory is heavily used in many social sciences: Economics, political science, sociology, law, diplomacy, and mathematical psychology are just examples of a growing list of social sciences employing this specific mathematical language. Microeconomists and applied mathematicians have been at the forefront of the development of Game Theory since the publication of the first major book on the subject: Von Neumann and Morgenstern's *Theory of Games and Economic Behavior*, published in 1944. The interest of microeconomists in the tools and language of Game Theory arises from the ambition of developing a formal model of individual agents operating not only within strict economic activities but also in the broader context of any human activity. In this respect, the original model used in microeconomics – atomistic agents maximizing their utility under the constraints of scarce resources – began to seem quite limited following World War II.

Any public policy intervention taking place at the time involved the prediction of complex social interactions between individual agents. One possible choice economists could have made at the time was turning toward the contemporaneous and momentous development in psychology and psychoanalysis. Freud himself envisioned the possibility of the use of psychoanalysis as a major public policy tool in the aftermath of major conflicts (Jones, 1957).[5] Instead, microeconomists chose mathematical psychology (notably the contribution by Tversky[6]) and game theory. We claim the model that microeconomists developed starting from these considerations constitutes a law as we have defined it in the previous section of the paper, a law that can be compared with the law of satisfaction defined by the Freudian unconscious. We label the law defined by Game Theory as the Law of Strategic Interaction to emphasize the crucial feature that characterizes it.

Core Concepts in Non-cooperative Game Theory

Von Neumann and Morgenstern's (1944) book establishes the first two core concepts in the use of Game Theory to generate a model of human interaction. The first is the concept of "strategic interaction" between agents: each agent is assumed to act while *consciously* taking into account that the other will re-act to it and will form expectations about this action and reaction. The second is

the concept of equilibrium as solution of a game. Their original application was to the so-called "zero-sum" games, i.e. games where one player's gain is exactly balanced by the other player's loss so that the sum of total gains and total losses always equals zero. The equilibrium of the game, i.e. a state of stasis from which no deviations will take place unless some exogenous shock hits, is reached if both agents obey to a "minimax" strategy: agent A assumes that agent B will act in the worst possible way for agent A (mini-), and chooses a course of action that maximizes his payoff under this assumption (−max). This tension between the two agents is clearly influenced by the type of games under consideration – zero-sum games – but will find application also in more general classes of games. It is a tension that speaks to a classic concept in microeconomics, the concept of "trade-off": Measuring trade-offs at the margin is the main characteristics of the model of behavior of microeconomics, dating back to the Marginalist Revolution of the late nineteenth century.

With the development of Game Theory in the 1950s and 1960s, looking for "equilibrium" becomes synonymous with finding a solution for the game. In the early 1950s, John Nash (1951, 1953) developed the most influential and successful of such concepts applied to non-cooperative games,[7] a concept that became known as the "Nash equilibrium". Its definition is as follows: a game reaches the Nash equilibrium when all players act optimally given the actions of the other players and the expectations about the players' actions are correct.

After the 1960s two main objections to the concept of the Nash equilibrium emerged. The first objection concerns the non-uniqueness of the equilibrium. In many situations there is more than one combination of actions that satisfies the Nash equilibrium conditions, strongly reducing the predictive power of the concept. The solution proposed by game theorists and economists has been to "refine" the concept of equilibrium, i.e. impose more stringent conditions to what may constitute an equilibrium. A prominent example is the "subgame perfect equilibrium" proposed by Selten (1965). To satisfy this definition, an equilibrium must be a Nash equilibrium for the game and for all the possible subgames that can be obtained from the original game. The objective of the definition is to rule out all the "non-credible threats". The constant presence of a threat is an important characteristic of the model of behavior implied by the application of Game Theory to microeconomics. Another refinement proposed by Selten is the concept of "trembling". The idea is that the equilibrium should survive the assumption that any player's unintended actions have a positive, if arbitrarily small, probability of being taken. The resulting "trembling hand perfect equilibrium" (Selten, 1975) reduces the equilibrium multiplicity by eliminating the least "plausible" equilibria, i.e. the equilibria that do not survive the minimum perturbation of the system implied by the "trembling".

The second objection concerns the assumption of complete information implicit in the solution concept proposed by Nash. If all agents must act optimally given the actions of the others and if the expectations about others' actions must be correct then individuals should fully know the preferences and all the possible

actions of the other agents. This assumption has been judged by many authors to be too stringent and in 1965 John Harsanyi (Harsanyi, 1965) proposed a way to solve games of incomplete information. Harsanyi's idea is to associate each agent to a given "type" and then develop preferences and possible actions for each type. Agents, then, will not fully know each individual player but only a limited numbers of types to which each agent belongs with a given probability. This approach is very similar to the approach used in experimental psychology where individual variations are reduced and aggregated in qualitative categories or clusters (McBurney, 1983).

Game Theory has entered a cycle of methodological consolidation at the end of the 1980s, focusing on non-cooperative games with perfect or quasi-perfect information and generating a paradigm that synthesizes and systematizes the contributions of Nash, Selten and Harsanyi. Gibbons (1992) and Fudenberg and Tirole (1991) are among the first authors proposing a complete treatment of the paradigm, followed by graduate textbooks as Mas-Colell, Whinston and Green (1995) and Osborne and Rubinstein (1999). The field can be described by two concepts, combined to generate four categories of games:

(1) static games with complete information;
(2) dynamic games with complete information;
(3) static games with incomplete information;
(4) dynamic games with incomplete information.

In a *static game*, players choose actions simultaneously and only once. As a result, each player's action corresponds with her strategy. In a *dynamic game*, the strategy of a player, instead, may be constituted by a series of actions. If all the actions are observables by all players and all the elements of the game are common knowledge to all the players, the information is said to be *complete*. If this is not the case, the information is said to be *incomplete*.

In our elaboration and comparison of Game Theory with the law of satisfaction, we will focus on static games with two players and complete information. We will just touch on the notion of equilibrium in dynamic games with complete information when discussing one specific example. We only focus on these games because we judge they are enough to discuss the main contributions of the paper and because they do not require a sophisticated technical treatment. We think that the extensions provided by the dynamic approach have been very successful in solving some conceptual problems present in static games (for example, the concept of "Bayesian equilibrium" has been very successful in auction theory[8]) but we speculate that they do not fundamentally change the main results of our paper, collected in the fourth section. It is necessary to note that recent approaches investigating the epistemic foundation of Game Theory,[9] emphasizing the importance of learning processes in games (Fudenberg & Tirole, 1991), and looking at the role of adaptive thinking in bounded-rationality contexts (for a recent and complete collection of articles on the topic, see Gigerenzer & Selten, 2001) are

sufficiently important departures from the established paradigm in Game Theory to deserve a separate treatment. Such a treatment goes beyond the scope of the current paper and we defer it to future work.

How Game Theory provides a Law of Strategic Interaction

Game theory applied to social sciences in general and to economics in particular provides a way to model human actions and thinking, attributing to human thinking the capacity to forecast and the capacity to take into account that other agents will react to one's own action. Moreover, Game Theory postulates that human actions have an objective posited by the player and, therefore, recognizing that human behavior is not fully described or contained by the causality of the natural laws. This feature opens Game Theory to the possibility of being investigated as a law.

A useful starting point to concisely describe this investigation is to look directly at the definition of the concept.[10] A very popular and respected graduate textbook (Osborne & Rubinstein, 1999) provides the following:

> Game Theory is a bag of analytical tools designed to help us understand the phenomena that we observe when decision-makers interact.

We are therefore talking about "interaction" and not rapport or relationship. From a methodological point of view the choice is on "analytical tools" where "analytical" means logical statements expressed in statistical and mathematical language.

> The basic assumptions that underlie the theory are that decision-makers pursue well-defined exogenous objectives (they are rational)… .

In this respect the emphasis is not different from the standard microeconomic model of individuals maximizing utility. As in the standard model, also in the model derived from Game Theory the assumption is that individuals are making their choices based on objectives that are fixed and well defined. The exogeneity posits a clear difference with respect to the Freudian unconscious or with any conceivable definition of the pleasure principle. If the objectives are exogenous, it means that they are determined *outside* the relationship or partnership with other human beings, even if the actions taken by the other players are correlated with the actual payoffs. The definition also feels compelled to emphasize that the objectives should be "well defined", assuming a lack of conflict within the individual which is at odds with most of Freud's work. In Game Theory, the other player is predetermined by her position or function with respect to the model of behavior. In the Freudian drive, the other partner in the relationship is real and determined but never predetermined and fixed.

> … and take into account their knowledge or expectations of other decision-makers' behavior (they reason strategically).

This is the novelty of Game Theory: the existence of other human beings, i.e. the existence of agents assumed to have the same capacity and competence of the subject deciding about her actions, is acknowledged. Moreover, their role has a direct impact on the production of individual benefit/utility/payoff. With respect to standard microeconomics this is a new contribution: agents are not only "rational" but also able to conceive that other agents exist, are rational, are conscious of being rational, and may enter in an interaction with others. However, what is emphasized about the relation with other players is the "expectation" of their behavior and not the fact that they can be the very source of the benefit and satisfaction for the subject. The relation between human beings is fully described in Game Theory by the concept of "strategic interaction".

The concept of interaction derives from the language of physics, adding "strategic" means that the physical body under consideration forecasts that other physical bodies with which it will enter in interaction will react to its own actions. These forecasts about the future have an effect on present actions and may change future interactions. When the forecasts are aligned with actual actions an equilibrium will emerge. The state of equilibrium is the state in which most agents are supposed to be. The strategic component is therefore the part of the concept that differentiates "interaction" in Game Theory from the concept of interaction in physics.

Strategic interaction can potentially characterize human acting and thinking in legislative terms and therefore it can be compared with the law of satisfaction of the Freudian unconscious. Strategic interaction can be characterized as a law because it possesses the following three characteristics. First, the agent posits the law, i.e. a player *chooses* to act strategically and is not *caused* to act strategically. Second, once posited, the law binds other agents to following it or not. Third, compliance or lack of compliance to the law is followed by a sanction, which in the case of Game Theory is fully characterized by the payoffs differential.

THE ECONOMIC IN THE UNCONSCIOUS: GAME THEORY AND THE LAW OF SATISFACTION

We base our legislative definition of the unconscious on the recent work by Contri (2007, 2010). Contri states that the Freudian pleasure principle is a juridical law that the single individual posits in relationship with other individuals in order to obtain benefit through them. The articulation of this law emphasizes the imputability of the individual in any rapports and partnerships with any other individual. In this respect, Contri's work is inspired by Kelsen's judgment that the individual is not imputable because he is free, but he is free because he is imputable (Kelsen, 1967).[11] Contri called the act establishing this law *Pensiero di Natura*.[12] In working with this definition, it is useful to introduce two terms: subject and other. They are terms taken from Lacan (1966) but redefined by Contri as simply being the names of two positions with respect to the law of satisfaction.[13] Crucial to the definitions is that the positions are not fixed by the law but they become fixed and predetermined only in psychopathology, i.e. when the law is not coming to a conclusion or is perverted.

This is the law governing the unconscious as described by Freud and that we have called the law of satisfaction, as articulated the second section. Using this as a starting point, in the third section we have also characterized the model proposed by non-cooperative Game Theory as a law, which we called the law of strategic interaction. We are now equipped to ask if these two laws share similar objectives, create similar lives and generate compatible views of human thinking.

Our conclusion is that the two laws are not only incompatible with each other but actually in opposition to each other. In other words, and in extreme synthesis, the man of strategic interaction would be considered a pathological man by the man of the law of satisfaction. Some individuals may regulate their lives and their relationships with others by interacting strategically but this mode of behavior does not allow the development of their full potential as human beings, it actually hinders the work of the unconscious as a law of satisfaction. A law establishing strategic interaction as the mode of behavior in a relationship may only lead to a state of equilibrium, stasis, repetition, and lack of pleasure and excitement. All of which are conditions that Freud identifies as symptoms in the different forms of psychopathology.

We illustrate our claim and judgment by comparing and discussing two crucial concepts of the law of satisfaction – as elaborated by Contri (1987, 2007, 2010) in the *Pensiero di Natura* – and by presenting two examples from influential static two-player games with complete information (see earlier for a definition of games with complete information).

The Positions of the Subject: Either Symmetric or Asymmetric

Earlier, we have reformulated the Freudian unconscious as the law of satisfaction. By this we mean that the unconscious is not governed by the causality of the natural laws but always aims at satisfaction by establishing laws of relations between human beings. A typical example is the agreement to meet between two partners. The agreement constitutes a law since: (i) it is established by the partners (it does not exist in nature); (ii) each of the two partners may decide to conform to it or not (for example, by coming to the meeting or not); and (iii) following this action, each of the two partners will judge the conformity to the law and will produce a sanction (for example, gratitude or resentment; satisfaction or frustration). We claim this law is established at the beginning of life, as initially expressed in the "four moments" articulation proposed by Freud that through the Contri (2007) reinterpretation can be expressed as: "Feeding me, my mother (*Drang*) excited me (*Quelle*) to the benefit of being satisfied (*Ziel*) through another (*Objekt*)". Contri has emphasized that this law is based on an asymmetry of the positions subject/other, where the subject is the position of the one who is excited by the other. This asymmetry is by no means fixed. Actually, psychopathology starts when the positions subject–other are fixed in a relationship and not constantly and dynamically changing between the two partners.

In opposition, symmetry and fixed positions are crucial elements of the law of behavior derived from Game Theory. A typical description of a game assigns payoffs to the individuals in a matrix, often a numerical matrix, where both players are both subjects receiving a payoff that depends on the actions of the other players. This dependence, and the consciousness of this dependence, is the only element of relationship between the two agents. If the other subject were a computer mechanically adjusting the payoffs, the subject receiving the payoff would not be able to appreciate any difference in behavior.[14] The other partner in Game Theory "exists only as the causal agent" (Contri, 2003, p. 106) of the payoff where the reference is again to the causality of the natural laws. She is a causal agent because from any given action will come always and only that given reaction. Tellingly, the optimal behavior induced by the strategic reaction in Game Theory is called "reaction function". In other words, game theory describes interactions as implemented in a mathematical function: a given input maps always and immutably to a given output. This is essential to the definition of function in mathematics but it is the opposite of the concept of drive that, by definition, needs the other to be established in the subject.

The Economic in the Unconscious: Either Trade-off or Partnership

The concept of trade-off is at the center of the model of behavior proposed in microeconomics: adding Game Theory does not change this fundamental postulate. The concept of trade-off is in frontal opposition with the concept of partnership (see Flabbi, 2004). Partnership is a possible name of the institution created by the application of the law of satisfaction in its whole form, without the limitations of the psychopathology. In a partnership a subject gains satisfaction through the other partner, works to pre-dispose and well-dispose the other to produce surplus; a surplus beneficial for the subject, but also for the other partner, as long as the positions subject–other are not fixed. This disposition is crucially important: if only one of the two partners is thought as being the receiver of the satisfaction, no satisfaction can be reached by either of them.

In a trade-off regime, even when a surplus is produced, all the emphasis is on how to split the surplus between the two subjects (or, if truly adhering to this law, no more subjects but objects). The contribution of the strategic interaction can only be on how to allocate the surplus between the agents but it is ultimately silent on how the surplus is produced or on what may constitute a surplus (or pleasure or satisfaction). More than that, the emphasis on the trade-off of each choice and action generates an unavoidable paranoia: the other is not working to partner with me to the creation of surplus but he is only interest in obtaining the maximum amount of surplus at my expense. A real partnership does not fail while in the trade-off regime the threat of failure is an ever-present concern. The threat of abandoning any form of cooperation or even any productive engagement is the "outside option" of any game used in microeconomics. That is we could name this: "doubting the existence of the other" (Contri, 2003, p. 103; see also Lacan, 1966).

Ruling out failure is the constitutive act of establishing a partnership. Not worrying about failure is a liberating act, freeing up individual thinking and by itself creating surplus. What the specific content of that surplus will be is not forecasted or detailed (and by no means described in a numerical matrix or a deterministic or probabilistic function). The statement that the partnership cannot fail is therefore just an empirical statement: the subject knows that by pre- and well-disposing herself and the other to produce surplus, the benefit will generate a satisfying outcome. Taking the other route – forecasting all the possible actions of the other and assigning predetermined payoffs to the resulting outcomes – is a pathological act, interrupting the flow of the unconscious working through the individual.

This does not mean that forecasting or probabilistic calculations are not part of human thinking or that they cannot be useful in everyday life. It means that in our juridical view of the unconscious human thinking and feelings are not governed by the causality of the natural laws. In the judgments about what they like or do not like, human beings may well be using forecasts and probabilistic calculation but this use is not the crucial point. The crucial point is that, eventually, they will make a judgment, and that judgment is not a deterministic or probabilistic outcome. In this respect, we think Tuckett's (2011) work is particularly illuminating. He is working with individuals (bond traders and financial operators) routinely dealing with expected probabilities and forecasts. The puzzle Tuckett is set to study is why collective actions and individual judgments about what bond or financial product to buy or sell do not conform to those forecasts and expectations. What Tuckett finds, through in depth interviews with the subjects involved, is that there is always *something else* on top of forecasts and probabilistic calculations that is affecting individual decisions. Tuckett provides his own articulation of what this something else and we provide our own articulation but we fundamentally agree on emphasizing that the crucial elements in unlocking individual decisions are not mainly attributable to a deterministic or probability function. Moreover, the uncertainty coming from market volatility and the uncertainty coming from the relationship with another human being are different. When an individual is participating in the relationship with a partner – i.e. another human being subscribing to a common law of satisfaction – is involved and vested in the relationship with thoughts, emotions, fantasies, and investments. All these elements constitute material favoring the satisfaction, a satisfaction that may be unexpected but that is never independent from individual judgment. In the market, instead, uncertainty is lack of information, a friction hampering the signaling function provided by prices.

Law of Satisfaction and Law of Strategic Interaction: Examples

As our last comparison between Game Theory and the law of satisfaction, we present some specific examples of individual behavior that have been extensively studied in Game Theory.

Prisoner's dilemma

The first example is the so called Prisoner's Dilemma game,[15] a game showing how lack of cooperation may lead to worse outcomes for all the players involved. It also shows the power, and limitations, of the concept of dominant strategy: a more convenient outcome for both players is available but strategic interactions prevent them from reaching it. Given the potential big losses involved, the puzzle has sparked quite an extensive literature, trying to assess how cooperation can be reached or induced.[16] We claim that if the two players were conforming to the law of satisfaction we have defined so far, then coordination would arise naturally and the "dilemma" would not arise.

We first start with a standard and concise formulation of the game. To simplify the discussion, we will call *players* the individuals positing and subscribing to the law of strategic interaction and we will call *partners* the individuals positing and subscribing to the law of satisfaction. A four-by-four matrix summarizes all the crucial elements of the game: players, actions and payoffs. The matrix is reported and explained below:

	Cooperate	Non-cooperate
Cooperate	3, 3	0, 4
Non-cooperate	4, 0	1, 1

There are two players in the game: the player represented by the header column (call him Colin) and the player represented by the header row (call her Rowena). They can engage in two actions: cooperate or non-cooperate with each other. Based on their actions, they will receive a payoff represented by the number in each cell of the table. The first number refers to the payoff for Colin and the second number to the payoff for Rowena. Strategic interaction implies that every time one player thinks about a possible action takes into account that the other player may react to that given action. As a result, each player forms expectations about the other player's reaction and makes assumptions about the other player's knowledge. We assume both players know all the elements of the game and all actions are fully observed. We additionally assume that players will make their decisions once and for all. We are therefore focusing on a static game with complete information, as defined earlier.

The standard way to proceed in solving a static game with complete information is to look for a Nash equilibrium (again see earlier for the definition). Solving the game is all Game Theory can say about the acts and thoughts of the two subjects involved in this example. The Nash equilibrium for the game is simple but unsettling. By looking at the payoffs carefully, we notice that there is one action that is always better for both players *no matter* what the other players does, i.e. the optimal strategy is a *dominant* strategy. Consider first Colin. If he thinks that Rowena will cooperate, it will be better for him to choose non-cooperate since he will obtain a payoff of four which is larger than the payoff of three he would get for cooperating. If he thinks that Rowena will non-cooperate, it will still be

better for him to choose the action non-cooperate since he will obtain a payoff of one instead of zero. As a result, he will always choose the action non-cooperate no matter what Rowena will do. Rowena will engage exactly in the same reasoning. The final outcome is that both players will choose non-cooperate, obtaining a payoff equal to one each. The puzzle, or "dilemma", is that if they had both chosen to cooperate, they would have each gained a payoff three times higher.

We now consider what would happen to the outcome of the game if two partners, i.e. two individuals subscribing to the law of satisfaction, were to be found in the same situation. It is useful to go back to the Freudian law established at the beginning of life: the baby excited by the mother to the benefit of being satisfied through another. The baby does not doubt the action of the mother: if he thinks about her and he is excited by her, it is only because he will receive a benefit leading to the satisfaction. Once the memory is created, he has no reason to doubt that the benefit is received through her unless the systematic action of a pathogenic agent (possible the mother herself) starts to instill the doubt. Instilling such doubt is a deviation from the original law and, in our judgment, it is crucial to obtain results and action conforming to strategic interaction. Players act strategically because they have doubt about the existence of the other, they think the other operates by trade-offs. Colin acts strategically because he thinks he can receive benefits and reach satisfaction outside the partnership with Rowena. It is also important to notice that the doubt about the existence of the other – i.e. the notion that the other may not be a partner, after all – is not *caused* by something, it does not arise "naturally" in the baby but it is the result of systematic action by a pathogenic agent, by someone who is already conforming to another law (possibly but not exclusively the law of strategic interaction) which is not the law of satisfaction.

To summarize, not only is the Nash equilibrium a different outcome from the outcome generated by the law of satisfaction but the puzzle, the problem itself that generates the "dilemma" of lack of cooperation is not existent once the law of satisfaction is established. In other words, the two players solving the Prisoner's Dilemma have already chosen to establish a law, a law that is in frontal opposition with the law of satisfaction. The difference is not in the outcomes (the outcomes, *per se*, cannot be in opposition; they may be different but not in conflict or opposition), it is in the law: individuals choose to establish *either* one law *or* the other.

Battle of the sexes
The second example is the so-called Battle of the Sexes game, which studies *coordination* issues. The name derives from one of the possible stories that can be used to describe the game: a couple deciding about a night out. Suppose Colin and Rowena have decided to spend the night out and they have to decide where. They both know their preferences, Colin prefers a movie while Rowena prefers a play, and they also know that they prefer to go out together and not alone. This preference for staying together is the source of the coordination problem. A possible payoff matrix for the game is the following:

	Movie	Theater
Movie	3, 2	0, 0
Theater	0, 0	2, 3

In the static complete information form, the game has two Nash equilibria: one where they both go to the movie and one where they both go to the theater. To see this, imagine first what Colin would do if he conforms to the law of strategic interaction. If he thinks that Rowena will decide to go to the movie, he will choose to go to the movie, too (three is higher than zero). If he thinks Rowena will go to the theater, he will go to the theater because despite two being lower than three (his payoff if they both go to the movie), it is still larger than zero (his payoff if he goes to the movie while Rowena goes to the theater). Rowena will reason in the same way and as a result both coordinated outcomes – i.e. outcomes in which both players choose the same action – are an equilibrium. However, any of the two outcomes is unfair to one of the two agents, in particularly if repeated over time. The solution proposed by Game Theory has been to refine the concept of equilibrium by using the concept of *correlated equilibrium* (Aumann, 1974) in place of that of Nash equilibrium. In a correlated equilibrium, each player chooses the action after observing some public signal. For example, Rowena and Colin may decide to toss a coin and agree on the following strategy: going to the movie if the result of the coin toss is tail and going to the theater if the result is head. The outcome is perceived as fair because none of the two is ex-ante favored. Moreover, if the game is repeated, both players will have the possibility to go to their favored event the same number of times in the long run.

We use this example in the specific application to the life of a couple. We think it is telling of the impact of strategic interaction when applied to the main subject of Freud's work: everyday life. Game Theory has frequently the same ambition: generate applications to everyday life both as motivation for new methodological contributions and as application for the popularization of sophisticated game theoretic concept. If we were to apply the law of satisfaction to the same specific everyday life situation, what would we obtain? Would the actions be the same? Different? Opposite?

First, we notice that the unfairness discussed in the game is quite common in many pathological relationships: one of the two subjects is dominant, the other is dominated. Again, pathological here means departure from the law of satisfaction: the two partners subscribing to the law of satisfaction do not engage in domination. In the law of satisfaction there can be asymmetry (for example, today I am the one taking the initiative, tomorrow it will be you) but not hierarchy (one "above" gaining three and one "below" gaining two). Second, we think that the strong emphasis on coordination underlines a common theory: since we are married (or we are together, or we are mother and son) then we are "supposed to" love each other and therefore we "must" prefer to go together. This theory or model, identified by Contri (2007) as theory of the *amore presupposto* (the supposed love), implies that our acts and initiatives are dictated by our perceived role

in the interaction with others and not by our desire to reach satisfaction. It is a theory recalling a loyalty imposed by our roles and not a loyalty chosen by the convenience of a common gain. For example, if in the same situation Colin and Rowena had decided to subscribe as partners to the law of satisfaction, they could have found the following solution: Why doesn't each of us go to his or her own favorite event? Then, when we will meet again, we will share our pleasure and satisfaction with what we have just seen and participated in. This *Drang* may generate the condition for a future occasion of satisfaction where we will prefer to go to our favorite event and this event will happen to be the same.

What we think these two examples illustrate is that the partners of the law of satisfaction always aim at the satisfaction and not at the supposed actions that their roles may imply. Contrary to the structure of strategic interaction, the law of satisfaction is open to the creation of new and additional satisfaction, an unpredictable *Ziel* that needs the exit from the state of equilibrium to be realized and that cannot be represented in a payoff matrix.

CONCLUSIONS

Today, after Freud, the term unconscious is commonly known. But it is frequently defined in the negative, as something that it is *not* something else. It is an absence that, however, imposes and commands; a parallel power, like a *second mind*.[17] This is a view of the unconscious that negates its positive and normative capacity. We found an alternative, positive view in Contri (2003, p. 161): "Unconscious means thinking, individual thinking. It is thinking in movement and able to move. It is not a πρῶτον κινοῦν ἀκίνητον[18]; it is not a cause but a movement toward an end".

This is the way, in our view, to go back to Freud. Freud is able to satisfy our desire to describe the unconscious by a metaphor. He describes it as a *city* at the beginning of *Civilization and its Discontents*: It is *caput cogitationis* just as Rome was *caput mundi*. Lacan (1966, p. 883) follows him on the same path: "The unconscious is at the core of the Freudian experience. The unconscious is made from what is working to build the subject". For a city, just as it is for the subject, it is a matter of Constitution to establish a civilization. The unconscious establishes a law for the individual, it is the name of the individual's capacity for thinking and judging, a capacity with the aim to reach the satisfaction.

This law of satisfaction established by the unconscious is compared in this paper with the articulation of Game Theory as a law of strategic interaction. We argue that the law established by Game Theory not only does not share the main features of the Freudian unconscious but it is actually in frontal opposition to it. The two laws constitute a crossroad in the life of the subject: individuals either posit a law emphasizing individual judgment and imputability or they posit a law emphasizing deterministic or probabilistic decision functions typical of the causality found in the natural sciences; individuals either aim at satisfaction through the other or they maximize payoffs taking the other as a

simple correlate of the potential outcome; either the unconscious is *Geschehen*,[19] is "the true psychical reality" (Freud, 1900, p. 557) or it is the name of a human function lacking individual imputability. (Freud, 1915b; 1916–1917; 1924)

If Game Theory is in opposition with our legislative definition of the Freudian unconscious, we speculate it may be compatible with other interpretations of the unconscious in psychoanalysis, in particular those – as works by Bion (1952, 1962, 1970)[20] or Matte-Blanco (1975)[21] and, more recently, Langs and Badalamenti (1994) – that share the ambition of providing a mathematical formalization of human behavior. However, the still unmet challenge for Game Theory is how to solve the issue that Bion himself identified with respect to the mathematical formalization in psychoanalysis. In his later works (Bion, 1973, 1974), Bion doubted the actual feasibility of including all the fundamental psychoanalytic elements within a formalized logical system. He affirmed that the concept of mathematical function – a concept which is still at the core of the formalization provided by Game Theory – does not provide a comprehensive description of dynamic relationships, psychic mechanisms and Bion's relational triad [L, H, and K] that constitute human thinking and guide human actions.

We also want to clarify that our judgment about Game Theory does not mean that some of the *tools* developed by Game Theory cannot find useful applications in psychoanalysis. For example, Palombo (1997) used the Prisoner's Dilemma game (described earlier) to model how the therapeutic alliance evolves during the psychoanalytic treatment. It is an example of how the competence of Game Theory in reproducing patterns of behavior can be fruitfully used in reproducing those unconscious mental activities that are patterned and structured. Still, this does not change the fact that if the whole of human thinking is reduced to patterned, structured and expected behavior then we are not favoring nor focusing on the law of satisfaction, i.e. a law that has the satisfaction through another as its eminent objective and that gathers the legacy of the unconscious as originally articulated by Freud.

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NOTES

1   Freud (1915a, p. 122) posed the same question: "The aim (*Ziel*) of an instinct is in every instance satisfaction (…). But although the ultimate aim of each instinct remains unchangeable, there may yet be different paths leading to the

same ultimate aim (…)". We agree with the authors, for example Anna Freud or Lear (2005), which consider the translation of *Trieb* with instinct as incorrect: we prefer – and we will use in the rest of the paper – the term *drive*.

2 Freud has described this dynamic in the essay on Witz, see Freud (1905).

3 Literally, the law does not concern itself with trifles.

4 See the influential textbook by Charles Brenner (1955). Brenner explicitly states that the *psychic determinism* is the same determinism that we find in the causality of physical phenomena.

5 The episode reported by Jones refers to the possibility to open clinics to treat neurosis caused during World War I.

6 The contributions of Amos Tversky, in particular his collaborations with Daniel Kahneman, have led to the creation of another influential field in microeconomics: *behavioral economics*. See for example Kahneman and Tversky (1979). Behavioral economics develops another law of behavior that could be interesting to compare with the Freudian law, see for example Pediconi (2009)

7 It is therefore a concept that allows for the solution of a larger class of games than the Von Neumann and Morgenstern minimax principle.

8 In a Bayesian (Nash) equilibrium the problem of incomplete information is solved by specifying for each player beliefs about the types of the other players interacting in the game. For a review, see Klemperer (1999).

9 The espitemic approach focuses on improving the language to express how each player thinks about the knowledge and beliefs of the other players. See for example, Battigalli and Bonanno (1999).

10 See Flabbi and Pediconi (2008) for an analogous discussion of how the model proposed by Game Theory and microeconomics can be described as a law.

11 The original sentence by Kelsen (1967) is: "One does not impute a sanction to an individual's behaviour because he is free, but the individual is free because one imputed a sanction to his behaviour." In the same book, Kelsen defines imputation as follows: "The principle, different from causality, that we apply when describing a normative order of human behavior, may be called *imputation*."

12 A possible translation is "Thinking *de natura*", using the latin genitive case. An alternative translation could be "Thinking Nature", similar to the construction used in the expression "talking business".

13 In Contri, both positions are set in order to reach satisfaction. Satisfaction's fruit will constitute the background, knowledge and material to renew the satisfaction in the future, engaging the same or new partners.

14 A literal example of this is in the literature on repeated games where decision-makers are modeled as *automata* (i.e. the Moore machines used for the study of computer operation). See for example, Rubinstein (1986) and Piccione and Rubinstein (1993).

15 The literature on the Prisoner's Dilemma is extremely large and keeps growing. For a good overview, see Poundstone (1992). The name originates from

one of the possible stories used to describe the game: the example of two alleged criminals under police custody that have to decide about confessing a crime or not. A typical economic application is in oligopolistic markets where firms have to decide if starting a price war or colluding.

16 Dynamic versions of the game have been the focus of the more recent literature. The possibility of repeating the game allowing for punishment of players deviating from cooperation seemed a promising added factor to solve the "dilemma". However, if the number of times the game is repeated is finite and known, backward induction will imply essentially the same outcome of a static game. If the length of the game is infinite or unknown, then there is no fixed optimum strategy, and the research has focused on algorithms that may generate the best punishment strategy so as to reduce deviations. *Tit for tat* (i.e. play cooperate in the first move, and subsequently *reciprocate* (i.e. do the same) what the other player did on the previous move) is considered to be the most robust basic strategy (see Axelrod, 1984).

17 We subscribe to the criticism of this term briefly but effectively provided in Lear (2005).

18 The term refers to the "independent divine eternal unchanging immaterial substance" used in Aristotle's *Metaphysics* to develops his theology of the Prime Mover.

19 *Geschehen* is a typical Freudian term that could only be partially translated with the verb *to happen* or *to occur*.

20 Other authors have generated interesting contribution starting from Bion's ideas (for example López-Corvo, 2005; Ferro, 2006; Ogden, 2007) but without progressing toward a mathematization of psychoanalysis and may have less common ground with the approach proposed by the Game Theory.

21 For example, the maximizing behavior assumed in Game Theory and the grouping of individuals by types promoted by Harsanyi share a striking similarity with the unconscious as emotion maximizing "the characteristics of the object" and "not recognizing individuals but only classes" described by Matte Blanco (citations from Ginzburg, 2006).

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Luca Flabbi

Department of Economics, Georgetown University, Washington, DC, USA
and
Società Amici del Pensiero – Sigmund Freud (SAP), Milan, Italy
luca.flabbi@gmail.com

Maria Gabriella Pediconi
Società Amici del Pensiero – Sigmund Freud (SAP), Milan, Italy
and
Dipartimento di Psicologia e del Territorio, Facoltà di Scienza della Formazione,
Università degli Studi di Urbino "Carlo Bo", Urbino, PU, Italy
maria.pediconi@uniurb.it