The 15-years-long Emergency, the Burial-of-the-dead Conflict and the Ultimatum Game.

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by *Salvatore Villani*

ABSTRACT

The selection of the most appropriate techniques to manage efficiently (efficient management, i.e. having short-period features, should be long-lasting and steady) and adequately (adequate management implies that the parties willingly accept the decision or the agreement terms so as to strengthen the aforementioned concepts of stability and lastingness) environmental problems and – above all – the so-called "high-impact location problems" (related to public works and plants) is being discussed by scholars interested in analyzing how public bodies take their decisions.

Anyway, each selected technique is still in progress, like a universe to create and explore.

In this paper, we will focus on the most relevant problems starting from the analysis of a recent practical case – the so-called "15-years-long emergency", burst out in Naples and the surrounding area – and we will suggest as well some theoretical proposals to arrange an innovative interpreting model of public bodies' decision-taking processes, taking into account the improvements of two new sciences: Evolutionary Game Theory and Cognitive Economics, both sharing their investigation field with Law and Economic Science.

JEL Classification: D700, D710, D740, C700, C710, C730, D870.

Keywords: Noxious facilities siting; NIMBY syndrome; Collective decision analysis; Public decision-taking theory; Conflict (re)solution; Game theory; Cooperative games; Evolutionary game theory; Neuroeconomics; Bargaining theory.

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SUMMARY

1. Preface

The " Prisoner's Dilemma" has been defined "the rubber toy-bone of game theory", since "one can chew it again and again"[1] not only to deal with economic matters, but also everyday-life situations and important psychological concepts as well[2]. I wondered about this matter time ago, while I was surveying some dated textbooks on game theory and, surfing the net, I enjoyed myself finding out anectodes, new, chronicles. My research purpose was to analyze them with the students of *Master in Economics, Accountancy and Finance of Local Governments* at the University Federico II in Naples, so as to show how such theories are interesting and motivated and can unexpectedly be used in various fields of human knowledge. I think, in fact, that not only physicians and mathematicians, but also economists, jurists and all those who run a governmental agency should know – at least intuitively – the logic-mathematical devices to analyze interactions or cross-relations among various phenomena and businessmen.

In particular, my attention was caught from a long-standing piece of news[3], since:

1) the matter is the most ancient kinship conflict, i.e. daughter-in-law vs mother-in-law;
2) it pivots around a tragicomic conflict for the burial of a young dead man, the twowomen's son and husband, respectively, who died in a hospital after cancer and left in the morgue waiting for the judge's sentence as which of the two parties (daughter-in-law or mother-in-law) should have the right to choose the burial place;
3) it lets us compare the case of the dead young man and the astonishing ecosystem of Campania, not yet collapsed, but seriously threatened from the emergency situation established recently;
4) it lets us analyze and explain the causes of the crisis – which has been going on for 14 years and has been called "the 15-years-long emergency"[4] – as well as to suggest a new methodological approach to the problems regarding public bodies decision-taking processes in Italy.

2. The "Burial-of-the-Dead" Conflict, the Incinerator Game, the Prisoner's Dilemma

[1] L. Méró (1996), p.45.
[2] L. Méró (1996), pp. 65-67.
[3] Refer to the article *Accordo suocera-nuora per la salma contesa*, published on " Corriere della Sera", January 14, 1997.
[4] C. Giannone (2008), p. 275-287.

The mentioned news item, which the game illustrated in this paragraph refers to, is undoubtedly dramatic and horrific. I have decided to fit it with brilliant particulars taken from the famous American comedy "Monster-in-law" featured by J. Fonda and J. Lopez and directed by R. Luketic, so that any reference to real events and characters might be fictional. In such a way, the study case may result more interesting and motivating on the theoretical point of view.

The game plot of the "burial-of-the-dead conflict" is the following: Julia and Charles are in love and decide to get married. Valery, Charles's mother disagrees; she dislikes Julia and wants her to realize it clearly: the two young people love each other so much that they get married at once. A titanic conflict follows: the mother-in-law acts and the daughter-in-law reacts. The conflict goes on long after Charles's death. Both women's deep drudge decreases neither at their son/husband's death and turns into a true burial-of-the-dead conflict. They appeal to the judge: the dead young man's mother wants him to be buried in a cemetery nearby her home town, while the dead young man's wife wants the burial to take place in her home town (where she had lived with her beloved husband), six km far from her mother-in-law's town. The judge's decision is further troubled by discordant witnesses: the ones in favour of the dead young man's mother stated that he wanted to be buried where he was born and beside his father's tomb. The other ones just stated the contrary: the witnesses were so confusing that on the same day Charles should have been in three different places. Thus, the judge refused all witnesses' statements and sentenced the "dead" should be buried in a neutral cemetery 5 km far from both women's home towns: a quite right, but unsatisfactory, sentence to both parties[5].

The plot can be summarized in a table.

Table 1

The logic of the facts is the same as in the case of the "Prisoner's Dilemma": M and D are the game players, i.e. mother-in-law and daughter-in-law in the tragicomic story just described, but they might also be the members of two communities that are unable to find an agreement on the localization of a high-impact (polluting) plant (for example, a dump or an incinerator); the players' strategies may be "to cooperate" (i.e., to offer or to accept damage compensations due to the high-impact plant location) or "to compete" (i.e., to refuse firmly the plant location); the game payoffs are registered in the box corresponding to the bimatrix; the first number in each box indicates the first community's payoff (M), while the second number refers to the second community's payoff (D). Therefore, such game may also be called "Incinerator or Dump Game". The payoff numbers are negative since they represent a negative earning (the distance to cover to visit the relative's tomb, in the case of the burial-of-the-dead conflict; the environmental damage, in the case of high-impact plant).

As in the typical configuration of the Prisoner's Dilemma, the players are asked for taking a decision simultaneously, without knowing each others' decision ("incomplete information game"). Moreover, the action scheme has only one decision ("one shot game"), since each player can take only one decision. In other words, the natural game solution is to maintain "status quo". Both players have no bargaining behaviour and decide to impose their "dominant strategy", i.e. to compete[6]. In the case of the high-impact plant location, the public work will not

[5] Truly speaking, in the case in point that has inspired the game, the decision was different. The judge first proposed burial in a third cemetery, then – since the decision still created conflict – decided to choose a hybrid solution, equally sub-optimal. There was a further and useless distinction between funeral and burial, the former kept in the wife's town, the latter in the cemetery indicated by the mother. It was also stated that the corpse should stay temporarily there all over the mother's life, when the wife would have the right to indicate a new cemetery where her husband could be buried and rest in peace. A complicated solution that I have not illustrated particularly, because out of the purpose of the game. For detailed particulars, refer to *Accordo suocera-nuora per la salma contesa*, " Corriere della Sera", January 14, 1997.

[6] Note that "compete"–"compete" is a game equilibrium. In fact, where the outcome is achieved ,no player would accept to change his own strategy. It is the only game equilibrium and also its solution. According to Nash's principle, in fact, if there is equilibrium in a game, it corresponds to the game solution.

be built, the service will not be supplied, and both communities, but above all the astonishing ecosystem in Campania – just like the poor dead husband/son, that two women conflict for – will be negatively affected.

In this case – differently from the standard statements of the Prisoner's Dilemma – the situation is further worsened for the fact that a cooperative solution (that is a second best solution for each players, but the most profitable for the whole) is not easily attainable[7]. The players should be open to share costs (since they already share benefits), but this rarely occurs, because:

a) in practice, there are some situations, when the citizens who are subjected to the negative externalities due to the location of a plant in a certain area cannot voice their likes, since they cannot organize a committee or can do it only when the project has fully started[8];
b) there are technical and economic drawbacks which hinder or discourage the subdivision of the service to offer or the plant to install: moreover, even if so many mini-dumps and mini-incinerators might be built, the existing charges – i.e. the presence of other plants or polluting industries in the area – should be taken into consideration[9];
c) the sufferances caused from a high-impact plant are usually considered (by the community subjected to them) as relevant harms, "out of the market", and so every exchange proposal will be unfair[10];
d) in general, compensations are offered to Municipalities, but they seldom show interest, will and ability to pay them off to the citizens, after considering the different risk-level they are exposed to; moreover, mayors seem more interested in the compensation than citizens, since "they would permit balance-settlement (especially in small Municipalities), while each citizen more difficultly can realize that compensations can produce real benefits to himself[11].

Thus, when the cooperative solution is not available, the problem cannot be solved, if not through an unbalanced charge-sharing (solution "compete"–"cooperate" or "cooperate"–"compete"). As a result, one or more local communities (where the plant is located) accept or must bear the costs of the installation, to the benefit of the "whole community". Anyway, these local communities can defend themselves and they can often rally round the projects which will affect them negatively or are supposed to be harmful. Therefore, there may be such an impasse – whose solution will be difficult – also on account of the " inadequate law and technical strategies governments use to face these problems"[12].

3. Nimby's syndrome and plant-delocation problem

As we can note, such a problem has become so wide that a special phrase has been created to describe it. In fact, we can often people speak of "Nimby's syndrome", an acronym of Not in My Backyard. At first, the phrase was used by those who wanted to denounce the hedges local communities placed against the construction of general-interest public works (i.e., urban infrastructures), in order to neglect them. At present, yet we recognize local communities may be quite right to block such works, so there is a sort of dualism between "Good Nimby" and "Bad Nimby"[13].

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7 In my opinion, this is the reason why a game like "the Burial-of-the dead conflict" is more feasible than the "Prisoner's Dilemma" to illustrate the situation. Mother/daughter-in-law could agree, if the burial took place at a middle way cemetery from each other's town: anyway, such a cemetery might not really exist, so that "cooperate"–"cooperate" solution may not be attainable.

8 Refer to L. Bobbio (1996), pp.86-88.

9 Cf. L. Bobbio (2002), pp. 25-26.

10 Some scholars suppose "compensation trust" is excessive. Location charges should be integrated with "participation charges" to finance preliminary activities related to negotiations and conflict resolutions.

11 Cf. L. Bobbio (2002), p. 26.

12 IRES (1994), p. 12.

13 Cf. G. Santilli (2007).

The problem is always the same and follows this pattern: a general-interest public work (i.e., a toxic and noxious waste dump, an electric power plant or a thermoelectric power station) is hedged locally being hazardous to the environment, landscape and human health. The conflictual parties have two different points of view: the pro-side party includes the supporters of the public work (the organizing committee and its followers) indicated by the letter A, on the con-side, there are the antagonists (environmental groups and local community opposition groups) indicated by the letter B. The contest comes from the fact that the public work causes an inequal distribution of costs and benefits: collectivity's benefits (having a spread feature) are balanced from specific costs (having a concentrated feature) for the most directly involved community: the problem-solving activity – after a detailed costs and benefits analysis – will state whether the concerned public work should be delocated or not.

Assuming that we know the likes of the parties involved, there are two alternative hypothesis depending on the allocation of the ownwership: in the first hypothesis (I), the policy maker (or the enterprise authorized to build the public work) is fully entitled to choose the location, notwithstanding B's likes: in the second hypothesis (II), the opposing group B is entitled to veto its location in the area. The situation is synthetically illustrated in Table 2.

Table 2

As regards hypothesis I, the minimum sum group A asks to accept plant delocation is marked "−", the maximum sum group B will pay to this purpose is marked "+"; on the contrary, as regards hypothesis II, the maximum sum group A will pay to install the plant in the designed area is marked "+", while the minimum sum group B is supposed to ask, is marked "−".

As it has been showed[14], if we influenced the groups' likes as far as the hypotheses just described, the situation proposed in Table 2 might realize. Moreover, in each case, "the advantages allocated to the situation opposed to the present one will be considerably lower than the damages caused from getting away from it"[15].

The conflictual groups perceive the mentioned situation as a "zero-sum game" (a game in which what each party wins is exactly what the other party loses) and, since in these games a Nash equilibrium is also a limit point (that is to say, it solves a *minimax/maximin* problem), there are high probabilities to stay again in a situation similar to the one in Table 2, so that each *status quo* variation is systematically contested whatever it might be. It is a form of the old-standing and troubling "cake cutting" problem[16], which implies a conflict between progressists and conservatives, the former want to change the situation, while the latter want to maintain it.

After such considerations, it is difficult to agree or at least to cooperate so that each party will get some advantages or fewer damages at least. To illustrate this fact, I will apply some typical principles and statements of Game Theory[17].

4. The Incinerator Game as a zero-sum and non-cooperative game

Let us focus on the aforementioned bargaining approach. It is a zero-sum and non-cooperative game, in which two local communities (X and Y) shall determine their "cake" (U) sharing. They can realize well that they shall cooperate to overcome mutual disagreement (D), but they may not realize or think this cannot happen since there are not practicable solutions, unless one of the two parties changes its behaviour. When mutual disagreement exceeds bargaining limit (i.e., $D \notin U$) – for example, bargaining requests are much greater than *status quo* – the chances of a right conclusion of the conflict lower greatly or fade away. Let us state why.

[14] See F. Pica (1987), p. 170-171.

[15] F. Pica (1987), p. 171.

[16] A whole review on this subject can be found in J. Robertson, W. Webb (1998), J. Stewart (2006).

[17] This refers to the specific science devoted to study strategically cross-related situations and feasible solutions. Refer to R. Gibbons (1992); G. Costa, P.A. Mori (1994); M. Osborne, A. Rubinstein (1994); G. Owen (1995); R.J. Aumann, S. Hart (1992, 1994, 2002); F. Colombo (2003).

We will illustrate the problem and its solutions through some examples.

First example – Incinerator Game with Mutual Disagreement that Exceeds Bargaining Limit: X asks Y for €5M (u_X = 1) to have an incinerator being built in the designated area. Besides, X will not accept fewer than €3M (d_X = 3). On his side, Y does not want to pay €5M to the other party (u_Y = 5), but his offer is €2M (p_Y = 2), since he wants to save €3M ($d_Y = u_Y - p_Y = 5 - 2 = 3$).

Let us state the problem and draw a Cartesian coordinate system representing the game (see Figure 1). On the abscissa, we indicate X's sums and, on the ordinate, Y's sums.

Figure 1

M is the maximum satisfaction point for both players, this is clearly impossible, since they cannot earn €5M each (M $\notin$ U). D(3,3) is the mutual disagreement point, the players will not negotiate on its left side and below it, since the point represents both players BATNA (Best Alternatives To a Negotiated Agreement)[18].

The AB straight line stands for "bargaining limit", which represents all the possible sum sharing included from A(0,5), where X earns nothing (since Y does not pay €5M), and B(5,0), where X earns the €5M paid by Y. This limit has a constant inclination (i.e., Marginal Substitution Rate, MSR), since it is a zero-sum game (in fact, what X earns is exactly what Y pays). Besides, X accepts each offer $y(p^*)$ so that $d_X \leq p_Y^* \leq u_X$.

OAB is the bargaining zone which includes all the possible negotiations. Outside this area, we can identify desirable solutions, i.e. D(3,3) and M(5,5), but unfeasible since they overcome the game-stake (i.e. 3 + 3 = 6 > 5).

DM is the path indicating both parties' wishes (the so-called "wish-path") which lies on an infinite straight line representing the players' whole possible exchange values. This straight line can be divided into three parts: beyond M(5,5) it indicates irrational values (or solutions), since payoffs exceed $max(u_X, u_Y)$; the segment EM indicates rational but unreal values, since payoffs exceed the real exchange border AB (in fact, EM – E $\notin$ U); at last AB indicates rational and real values, since payoffs do not exceed $max(u_X, u_Y)$. This segment stands for the mentioned communities' needs engaged in a zero-sum bargaining game (DM inclination is constant; this means that what a party wins, the other one loses).

Since disagreement point D(3,3) is outside the bargaining area OAB:

a) if the communities keep their demands firm, there will be no bargaining and the angular solution A(0,5) will occur;
b) if X changes his demands and accepts the counterparty's offer ($d_X^* = p_Y$) bargaining will occur at C(2,3);
c) if Y rises his the offer up to €3M ($p_Y^* = d_X$), bargaining will occur at u_i = (3,2) according to X's wishes;
d) if Y offers whatever sum $p_Y^* > d_X$, X will accept it;
e) if the communities cooperate ($d_X^* < d_X$; $d_Y^* < d_Y$), bargaining will occur at $E\left(\frac{5}{2}, \frac{5}{2}\right)$.

The solution of mutual equilibrium (E) is called "Kalai-Smorodinsky's Solution" and is represented from the intersection point between the straight line bearing DM and the border limit AB. Both communities compare the real bargaining possibilities with their mutual likes at this point. Anyway, the compromise does not satisfy the parties' interests (E is lower and more to the left than BATNA), except that one of them does not change behaviour, i.e. threaten to apply to a third party (judge or governmental authority). In this case, the threat might change payoff-distribution (U) so that D $\notin$ U, thus cancelling the impasse situation.

[18] This concept was first utilized in R. Fischer, W. Ury, B. Patton (1981, 1991).

Second example - The Incinerator Game with the Threat to Apply to a Judge: X can threaten[19] to apply to a judge so that he will decide how "to share the cake", thus following the hypothesis to demand €12M to have the incinerator being built. Y knows that if he does not agree, he may have to pay much more: at least €8M, according to probability calculations. The threat to apply to the judge implies a greater risk and changes the initial situation, i.e. each parties' range of possibility, establishing new equilibrium solutions in E_1 and E_2 (Figure 2). The two parties must choose among E_0, E_1, E_2.

Figure 2

We must note that it is difficult to reach a mutually satisfactory solution even when BATNA is included in the bargaining area ($D \in U$). Let us analyze why.

Figure 3

On the Cartesian coordinate system illustrating the game (*Incinerator game with BATNA Included in the Bargaining Area*, see Figures 3 and 4), there is a mutual disagreement point $D(d_X, d_Y)$ on its left and below it no negotiation is allowed.

$A(0,x^*)$ is X's demand, fully paid by Y and, viceversa, $B(y^*,0)$ is Y's demand fully paid by X. The segment AB stands for the bargaining limit, which includes the set U of real solutions (even if sub-optimal, since they do not share the whole sum) and indicates the set of optimal solutions all over its length. The projections of the points A and B indicate the point $M \notin U$ of maximum general satisfaction, which allocates unreal outcomes, even if both players like them.

DM is the path indicating the possible agreements that can satisfy X's and Y's wishes.

Figure 4

The bargaining parties know their mutual disagreement (D) and start gradual improvement of bargaining outcomes. In fact, they reduce their bargaining area from OAB to the area limited from the triangle DA_DB_D, whose catheti are the orthogonal projections of the point D on the segment AB and whose hypothenuse is the track A_DB_D on the segment AB. Thus, X realizes he cannot demand more than $x(B_D)$ and, at the same time, Y realizes he cannot demand more than $y(A_D)$: if X could get $x^* > x(B_D)$, moving to the right and to the bottom on the segment AB, Y should accept a quantity $y^* < y(B_D)$, i.e. $y^* < y(d_Y)$, thus Y should accept a proposal which is not included within his disagreement limit (d_Y); for the same reason, X will not accept a proposal allocating him a quantity $x^* < x(A_D)$, i.e. $x^* < d_X$, for the demand $y^* > y(A_D)$.

Once the two limits (A_D and B_D) have been stated, we shall set the maximum satisfaction point as a function of mutual demands, $M_D \notin U$, which allocates both parties lower outcomes than those corresponding to the general maximum satisfaction point ($M_D < M$).

E_0 is Kalai-Smorodinsy's Solution, indicated from the intersection of the bargaining limit AB with the wish-path DM.

E_1 is Kalai-Smorodinsky's Solution with M_D average maximum satisfaction point, instead of M.

E_2 is the solution obtained by comparing M_D and M. The segment MM_D also represents a wish-path and, more exactly, the path which indicates X's and Y's wishes.

Once these solutions have been stated, the bargaining area is further restricted to the segment E_0E_2 on the limit AB[20].

[19] As regards threatening in negotiation games, see J.F. Nash (1953), pp.128-140. "Threatening is a common negotiating weapon. Threatening is really fundamental to the theory illustrated here. The game solution indicated not only the utility deriving from each player's negotiation, but also suggests the player which threaten he should utilize in the course of negotiation."

[20] For further developments about the outcome improvement process in negotiating games, see O.D. Rossi (2007c).

5. The Incinerator Game as positive-sum game

As just explained, only after long dealing rounds the parties can reach an agreement. But, after an improvement process, we can be sure that the final outcome may satisfy both parties. This may be true even in the case of BATNA included within the bargaining area. In fact, the parties perceive this situation as a zero-sum game, starting from the assumption that they can share only limited gains, i.e. a sort of fixed cake sharing – and thus what one party wins, the other one loses.

On the contrary, they do not deal with a zero-sum game, but a "not-zero-sum game" or "a positive-sum game" and the conventional bargaining approach (i.e. "distributive approach") does not let the parties change the conflictual situation so as to achieve a mutual gain (this idea is at the basis of a new and efficient bargaining approach, called " integrative approach" or "mutual gains approach", that aims to recognize and value the conflict generating differences more than to neglect them). As a result, win-lose solution is not the usual outcome of a conflict; all the parties can win[21], if the situations are best exploited, i.e. aiming to increase "the cake to share" so that each party can have a bigger cake-share, and not simply to share it[22].

The efficacy of the mutual gains approach with reference to environmental problems is well explained in the following extract from a well-known work by László Méró:

"Not-zero-sum games are also called mixed expectations games. In such games, one party can both win or lose what the other loses or wins, but there might be losses or gains which the parties could both exploit or neglect only through cooperation. Global and individual expectations are mixed. Environment protection is a mixed expectations game.
On one side, the polluting party expects to spend the least for de-polluting operations, since they do not produce an immediate gain, on the other side the community expects environment protection"[23].

The cases, in which the parties can increase an agreement outcome before sharing it, are so many that some recent Game Theory textbook focus on the "need of a global innovative theory which takes into account such interesting situations"[24].

You can formally represent the strategy that is the key to this new approach to trading through a simple chart based on the model of bargaining J.F. Nash[25].

Figure 5

The bargaining limit is represented from the curve AB which can be called "Pareto's Border", since each point on it indicates situations in which one of the parties wins without the other one loses. D(d_X,d_Y), as just noted (see par. 4) represents both parties mutual disagreement point and the mutual BATNA crossover, on the left and below which the parties will not negotiate. Anyway, this does not mean the parties are not supposed to search an outcome which may be higher or similar to their own BATNA.

In this situation, Y prefers the solutions approaching F, while X prefers agreements approaching G. E, i.e. Kalai-Smorodinsky's Solution, represents both parties' favourite outcomes with respect to D: the more the parties move towards it, the more mutual gains they can get.

6. To negotiate or to partake? This is the problem!

Integrative approach, as illustrated (parr. 4 and 5) works well in zero-sum game conflict types, or highly conflictual disputes. Most of these situations can be defined as *structurally*

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21 Such solutions, called "win-win", have been also studied on a mathematical side by S.J. Brooms and A.D. Taylor (1999).

22 This does not only mean the players may gain the same sum. The fact that they are satisfied with the negotiated outcome grants the agreement stability and long-lasting (See M. Bartolomeo, R. Lewanski, 2005, pp.110-120).

23 L. Méró (1996), p. 138.

24 R. Lucchetti, S. Tijs (2003), p. 30.

25 Refer to J.F. Nash (1953), p. 128-140.

integrative ones, but may become distributive situations because of a wrong assessment (an over-assessment of the conflict) by the parties.

An example (first proposed by R. Fischer, W. Ury and B. Patton) may be used to understand easily the case concerned: "Two children quarrel for an orange. At the end the two agree and split the fruit 50/50. The girl eats the pulp and throws the peel away, the boy takes the peel to make a cake and throws the pulp away"[26].

By analyzing carefully this dealing, we can note that:

1) the dealing object is one (the orange);
2) the parties' self-interaction leads to an agreement (the orange is halved);
3) the parties' satisfaction degree is exactly the same;
4) the agreement achieved is "satisfying" but not "optimal"[27].

By assessing the parties' real outcomes, we can note that they are not interested in the whole orange. In fact, the girl wanted to keep the pulp, while the boy wanted to utilize the whole peel to make a cake. Thus, if the parties had been less selfish and had openly stated their demands or better examined the other one's demands, they both would have improved the agreement outcome and maximized their expectations.

We can summarize that most situations in which the object of the conflict is one resource, as previously explained, are "only seemingly distributive", since the competitors' expectations could easily converge or concern some parts or different aspects of the same resource. This would seem to depend on both parties' assessment error: these would tend to overestimate the conflict, while – by an easy cognitive effort – they could picture the situation better and change it into a not-zero-sum game, following the suggestions of the supporters of the integrative approach: starting a bargaining process would let them realize their mutual expectations and they might exploit these differences to find mutual advantages[28].

Obviously, bargaining approach is not "the feasible solution for the whole situations"[29]. There are some situations (see par. 2) where the diseconomies caused from a high-impact location are perceived (by the communities suffering them) as not-measureable damages, "out of the market"; in such cases, any each bargaining proposal is considered to be unfair. Thus, there is no "bargaining zone".

Let us illustrate the situation graphically. Let us use A to indicate the supporter of the plant and B to indicate the opposed party. Let us assume that B owns the property rights and can veto the plant location in the area.

A will pay €6M to purchase the property rights. This means he expects to pay from 0 to 6 and he will compete so as to spend the least possible sum (i.e., a sum from €6M to €0M). His position is called "minimizing agent", or "minimizer", since he tends to lower price.

B expects to accept A's offer starting from a minimum level of €2M, and will tend to agree on 2M or more, trying to get the most of it. His position is called "maximizing agent", or "maximizer", since he tends to maximize the selling price.

Figure 6

With reference to the drawing (see Figure 6), we can clearly note the presence of a bargaining zone overlapping the parties' expectations.

On the bargaining process, the alternative parties' stakes (B demands €8M, A offers 2; then B demands €7M and A offers 3 and so on) might drive to an agreement on an average sum of €4M (demand-offer equilibrium).

[26] R. Fischer, W. Ury, B. Patton (1981, 1991).

[27] R. Fischer, W. Ury, B. Patton note that, "defining the objectives and devising a solution, might have been an optimal conflict solution: she would have the whole pulp, he the whole peel".

[28] Cf. H. Raiffa (1982); R. Fischer, W. Ury (1983).

[29] As regards this aspects, refer to L. Bobbio (1996), pp. 86-90.

But, the parties' expectations might not overlap, thus there would not exist any bargaining zone (see Figure 7). If B considered his sacrifice unmeasureable or expected more than €4M and A would not pay more than 3, there would be an impasse.

Figure 7

The impasse could be overcome, as assumed in the preface (par. 1), by means of a careful analysis of decision-taking processes (regarding both political and administrative sphere) and of public bodies decision-taking problems in Italy. International experiences and failure causes as well as planning difficulties in Italy suggest that these problems should be faced by an innovative approach that aims to improve decision-taking processes and to incentivate partaking processes. Thus, such sciences as Evolutionary Game Theory[30] and Cognitive Economics[31] together with Economic Science, Political Science and Law, can be utilized to understand whether and how the outcomes of public politics may be improved. For this purpose, I will utilize schemes, principles and assumptions taken from the game theory.

7. Incinerator Game as Ultimatum Game and the "Fate Cross-Check"

Let us consider the game scheme in Figure 8. It is clearly a variation of the well-known Ultimatum Game, a highly successful game[32] in economic studies which lets us describe the previous impasse situation (refer to par. 6 and Figure 7) in a different way.

Figure 8

The game, purposedly defined " Incinerator Game as Ultimatum Game", regards two conventional communities conflicting on the location of a high-impact plant: on one side, the supporting party is indicated by the letter A, on the opposite one the antagonist party is indicated by the letter B. Let us suppose that B owns the property rights and can veto the plant location. A owns a big amount of money (N) – €100M as everybody knows –supplied by its national government to establish the plant and offer the counterparty (B) a compensation c > 0, in case of positive agreement. A is supposed to do a sharing proposal, stating the amount to keep (from 1 to 99, since we suppose 1M is the smallest value of currency value), while B can accept A's offer, thus purchasing also the benefits from service supply (plus the compensation sum N – c), or reject it, since it is unfair. In this second case, the service will not be supplied and the community will be damaged. After this round, the game ends (one-shot game).

The idea of future rationality implies that, stating the offer, A tends to anticipate B's behaviour to every value of c: hypothetically, if B expects only an amount whatsoever (for example, since it will settle the municipality balance), we can note that this community will accept any offer corresponding to c, since it wants to gain any possible amount. A realizes B will accept any offer and, since its payoff is decreasing at level c, it will offer the smallest possible amount, i.e. €1M. Backward induced solution (Nash's perfect equilibrium in sub-games) requires, thus, that A offers €1M and B accepts the offer.

[30] This type of survey rose in the 70s in Evolutionary Biology and differs from the "classic" game theory, since it suggests to study the dynamics of strategy change more than the characteristics of equilibrium situations. Further developments are found in E. Van Damme (1994), pp. 847-858; J. Weibull (1995); F. Vega Redondo (1996); L. Samuelson (1998); S. Faccipieri (2003); R. Festa (2007), pp. 148-181.

[31] This branch of Economics wants "to enhance the explanatory power of economics basing on more realistic cognitive basis, so that – utilizing procedural aspects and individual decisions in economics – we might arrange new and useful theoretical approaches, better anticipations and more efficient economic policy choices (see M.Motterlini, F. Guala, 2005, p. 26). Further developments are found in C. Camerun, G. Loewenstein (2003), M. Motterlini (2003), pp. 107-115; A. Rustichini (2005), pp. 201-202.

[32] It gives the opportunity to illustrate the so-called "Backward Induction Paradoxes", i.e. those situations where a difference exists between the common concept of rationality and the technical one used in game theory. Among the most outstanding studies about Ultimatum Game, see W. Guth, R. Tietz (1990), pp. 417-449.

Anyway, some scholars have illustrated experimentally that, in case A keeps more than 70 % N, the probability B will accept the offer is very low. In particular, modal offer is 50 %, the average offer is a little lower and offers lower than 30% are often rejected. The outcome depends both on the offer amount and on the cake size. In fact, B tends to reject offers with a very low value of c, while the minimal value to accept the offer increases as much as the value of N. It seems that B tends to punish A, also to his great disadvantage, when he perceives the offer is "too selfish" and "deeply unfair".

As stated by some scholars[33], this does not mean that such outcomes are different from Game Theory anticipations, but simply that B's expectations are not limited to money or economic interests, but include some other factors (i.e. aspects of equity, justice, compensation) or values (such as personal reputation, safeguard of man's rights, human dignity, respect for the environment) which B tends to regard much more important.

This is the reason why bargaining process is often hard in the cases of high-impact location. In fact, if B is not interested in the amount of money received and perceives the externalities the plant produces as health or life-quality risks or as an environmental risk, there will not be any worth compensation. Moreover, we can state that "compensation expectations are excessive" and it might be more useful to speak of "partaking sacrifices" more than "location sacrifices", that is to say it would be better to speak of resources aimed not only to finance the plant establishment, but all the strategies preliminary to parties' interaction and conflict resolution[34]. Such strategies allow the parties' dialogue and information transfer and could favour change of expectations and behaviours, so that they would cooperate and look for long-lasting and satisfactory agreements. This conclusion is surely more reliable when facing environment-protection problems. The following principles from L. Méró's work can be applied in these cases:

1) in the course of our life, our fate often interacts with other individuals' one, even if we all go on realizing our own wishes;
2) in the case of "Fate Cross-Check", the lack of knowledge may hider co-operation;
3) not-co-operative games may be turned into co-operative situations, on the condition that the parties communicate and try to know each other's wants and expectations.

Let us analyze the following extract from L. Méró's work:

"Fate Cross-Check is a classic experimental situation in social psychology. Two individuals – or players – are sitting in two different rooms. They neither can see each other nor communicate in any way. They have two push-buttons in front of them, L/left and R/right. Neither of them knows their function but, whenever they hear a shrill sound, they must press one of the push-buttons. The shrill sound is followed from aloud sound, after which the result is announced: each player will get a reward or a punishment. The reward may be an amount of money and the punishment a heavy sound, a light electric shock, or simply nothing.

The real procedure of the game is that the players send rewards or punishments to one another. Pressing R, one player will send the other one a reward, while pressing L he is allocating a punishment. But, neither of them knows the rules of the game. The problem is to state if it is possible cooperation enhancement, that is whether the parties can attain such cooperation as to exchange rewards only.

The players can suppose the existence of a relationship between push-button and reward/punishment, but they do not really know the right procedure. In some experiments, the players do not even know the existence of another player, in some other ones they only know there is another person who is in a similar situation in another room.

Neither of the players can understand the game rules, since neither of them has got the peculiar information, i.e. they do not know if the other player wins or loses. Each players can only state that, after pressing a push-button, he will get a reward or a punishment.

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33 See, for example, F. Colombo (2003), pp. 193-198, F. Petrone (2007), p. 7.
34 Cf. M. Bartolomeo (2007).

The game is not fully cooperative. Each player his expectations and outcomes only, thus he does not care whether to send rewards or punishments, he only expects to get rewards. Anyway, to send punishments and get rewards is not a feasible improvement of the game, since it never occurs practically. We can win only if we can teach the other player what we want, i.e. if we can start some form of co-operation, so as to start a mutual reward exchange. Such experiments will determine a pure cooperative development approach.

There are many variations of this game, and being very skilled, we can hope to understand the general rules of cooperation"[35].

8. Final considerations and proposals for an innovative interpreting model

By considering what previously analyzed (particularly, at the end of par.7), we can state that the key to manage high-impact location problems (in general, as regards environmental conflicts) is to study the "rules" which the famous Hungarian psychologist and mathematician referred to, that is to say the processes that incentivate, or simply facilitate cooperation. Such processes are fundamental to build up a new theory of public decisions, as well as the Periodic Table of Elements was to Chemistry and the so called Simmetry Atlas was to Mathematics and Physics.

I would like the reader to follow an experiment through which we can realize the difficulty of this work. The experiment has taken the form of a reality in a famous TV programme and it is based on the well-known ultimatum game. In particular, I refer to the show Unan1mous (Unanimous) first broadcast in the USA in March 2006 and later in Italy, Spain and the UK.

The game, which the experiment was based on, is the following. Nine people enter a bunker where they will have to stay until they decide unanimously who the rich jackpot is to be awarded. They are isolated from the world outside and they had never met before entering the bunker. The programme schedule is uncertain: it might end after the first part, if they reach unanimity, or it might last 5 weeks. The game ends when the nine individuals reach unanimity about who will be the jackpot payee, receiving eight votes (anonymously expressed) by the other players. If one of the players decided to leave the game voluntarily, the jackpot would be reduced by one-third.

Neither nomination nor proxy vote is admitted. Before achieving unanimity, the nine players go on voting, but on voting-breaks, they can interact and discuss on social and political themes. They can canvass, make pacts and also tell lies about their life: charity promises are forbidden. TV-cameras the bunker-life continuously, each player has his own room and there is a meal-catering service. If voting is not unanymous, some penalties are imposed (i.e. jackpot steady lowers) in order to keep the players under pressure and have them to choose an unanymous solution. Someone can be temporarily eliminated: he cannot longer compete for the final victory, but goes on living in the bunker and voting. If an unanymous agreement is not achieved within the pre-fixed period (five weeks), the jackpot will not be awarded.

As we can see, it is a not-merely cooperative game with the purpose to check whether among an interactive group of individuals can be enhanced or not any form of cooperation meant to achieve mutual goals or values, such as equity and justice (we can suppose the existence of a deliberative act and the function of public debate to change the individuals' original tastes so that they can achieve a final agreement which binds the whole community).

This experiment should illustrate how to start or incentivate cooperation as well as to achieve the best efficiency in decisional processes, especially as regards "inclusive strategies", that is to say the ones involving the subjects interested in the final decision (careful readers will have noted, in fact, that the eliminated player can no longer win the jackpot, but still goes on voting). Anyway, it is not an easy behaviour "to reject limitations of our own points of view and accept

[35] L. Méró (1996), pp. 142-143.

the qualities of decisional processes"[36]. In these cases, we are supposed to resolve the parties' communication and cooperation problem; such a problem can no longer be faced by means of conventional theoretical approaches, which often neglect that most decisional problems (and the participants/players) are neither perfectly rational nor completely illogical. It is not sufficient to plan approaches including the outcomes of the participation of citizens, enterprises, or other pressure groups[37] more or less involved in these procedures in order to set up a right reconstruction, but we shall consider them as "moderately intelligent processes performed by players who know what they want", but who cannot figure the situation clearly, they mistake, change their own expectations, do not want to get the same goals"[38]. We shall change the conventional economic point of view in order to assume:

1) agents who are bound from various forms of limited rationality and are satisfied with the least possible outcome, i.e. the first satisfactory solution;
2) an internal theory of expectations related to deliberative processes;
3) communication as a strategic activity intended to influence the agents' original expectations;
4) decisional processes where the individuals can learn through the outcomes of their actions and experiences, i.e. "learning paths" or "adaptation paths" in which a continuous balancing process between goals and means is realized;
5) social rules ,costumes, behavioural and cultural growth are important aspects to explain collective and individual acts;
6) innovative notions such as "Evolutionary Stable Strategies"[39];
7) new survey techniques such as " Replicators' Dynamic Techniques"[40] (40)

The mentioned operation is extremely necessary, if we consider the experimental results (see Table 3) have indirectly confirmed the inefficacy of the current theoretical models, in particular the suggestions supported by deliberative democrats, i.e. those who support the improving abilities of discussion and deliberation. The nine game-players, even achieving unanimity three times on four, only once could get such a high sum to change one player's life style. Therefore, we shall conclude that those who study public-decision processes, at present cannot explain the mechanisms which incentivate or facilitate cooperation and that dialogue and deliberation cannot yet be considered exact sciences, but a "world in-progress"[41], a world to explore and create with the help of Evolutionary Game Theory and Cognitive Economics.

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[36] The supporter of deliberative democracy attribute this function to discussion and deliberation. See D. Held (2006), pp. 410-411.

[37] Pressure groups also must include criminal organizations. The last Italian Home Affairs Ministry issue on DIA results and investigations, points out that criminal organizations are eagerly interested in waste disposal cycle and they supply waste disposal enterprises with both capital and technical means. Some criminal groups try to manage the waste disposal cycle by running abusive dumps and harmful garbage collection management (see Home Affairs Ministry, 2008, p.163-164, and T. Pittelli, 2008, p. 17).

[38] L. Bobbio (1996), p. 24.

[39] Concerning Game Theory, the notion of ESS (Evolutionarily Stable Strategies) has allowed to find out the conditions which make Nash equilibrium face the challenge of other strategies. ESS is a strategy which cannot be improved, if most of the citizens use it. In fact, nobody will find it more useful to replace this strategy with any another one.

This concept was stated by J.M. Smith, Biology professor at Sussex University, who applied it to Biology. The concept rose from evolutionary biology theory, then applied to any other case implying some form of interaction. It represents both an equilibrium and a stability condition, since any variation is balanced from a mechanism of natural selection (cf. J.M. Smith, 1997).

[40] The term replicator was first used by the English zoologist Dawkins (R. Dawkins, 1976), who associates this term with gene. The scientist thought the gene should be considered as a replicator, i.e. a living unity able to evolve through successive living stages.

In Dynamic Game Theory, replicator is related to strategies. These are copied without errors, they "replicate" in the context of the situation. Their life will depend on their fitness degree (the ability of a genotype to reproduce itself). Thus, replicators' success will depend on advantages/disadvantages resulting from interactive strategies the players use.

[41] Refer to R. Lewanski (2007), pp.743-754.

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10. Appendix
Graphs and tables

Table 1
The Burial-of-the-dead Conflict Game (or Incinerator Game)

		D: Cooperates	D: Competes
M	Cooperates	- 3, - 3	- 6, - 0
M	Competes	- 0, - 6	- 5, - 5

Table 2
Application of costs-benefits analysis to delocation problems

	Group A	Group B	Difference
Hypothesis I	– 200	+ 80	– 120
Hypothesis II	+ 120	– 180	– 60

Figure 1
Incinerator Game with Mutual Disagreement

$$G = \{U, D\}; D \notin U; U\{u_x, u_y\}; D(d_x, d_y)$$

$$u_x = 5; d_x = 3$$

$$u_y = 5; p_y = 2; d_y = u_y - p_y = 5 - 2 = 3$$

$$M(5,5); D(3,3); E\left(\frac{5}{2}, \frac{5}{2}\right)$$

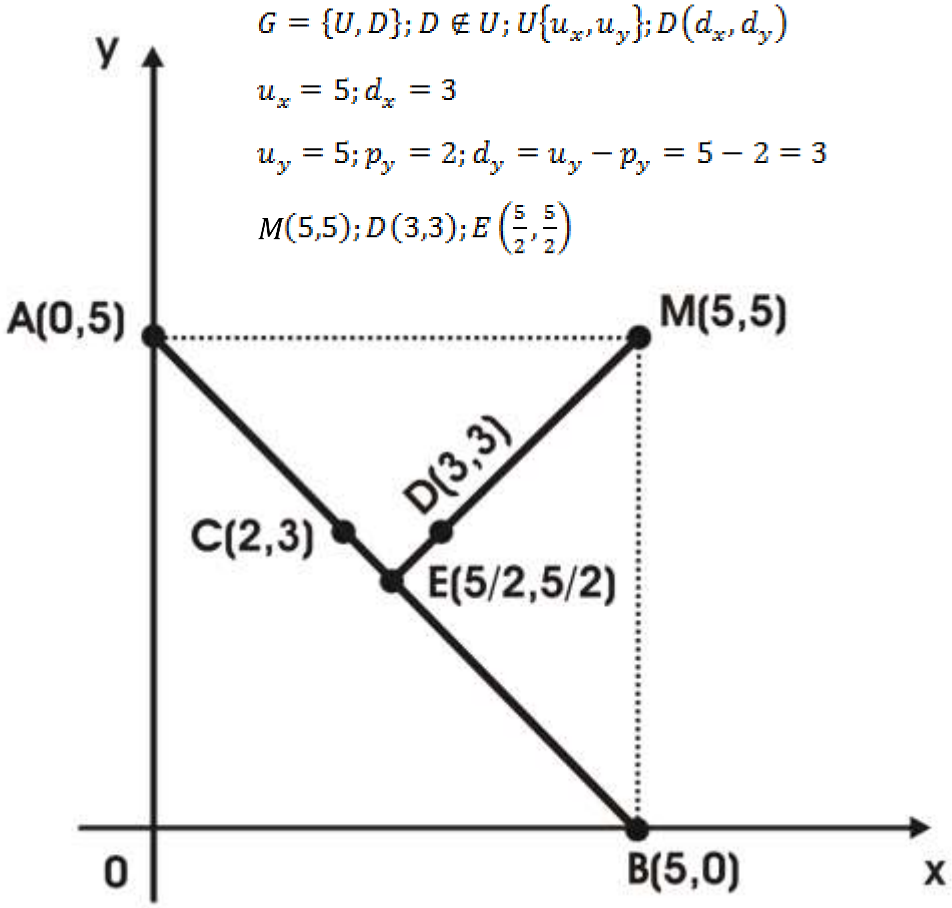
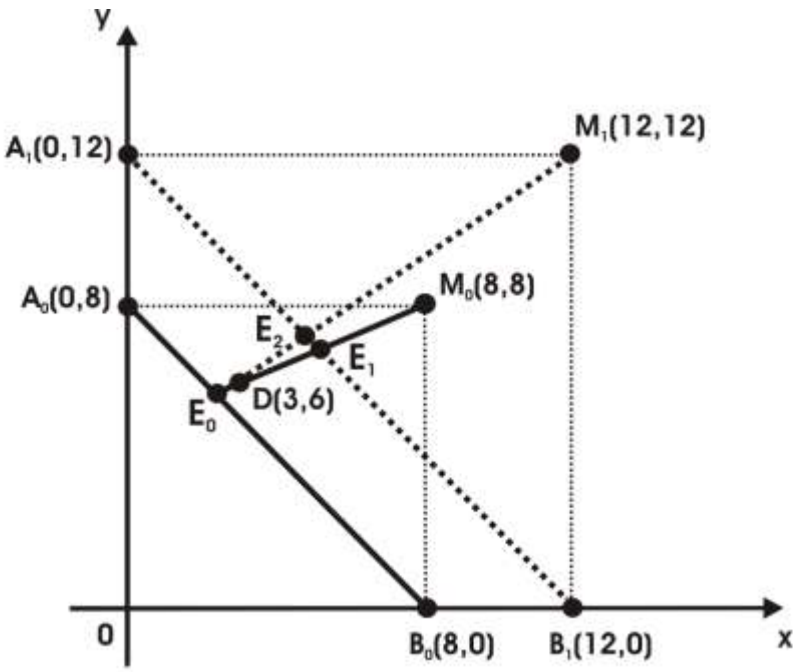


Figure 2

Incinerator Game with Threat to Apply to a Judge



I = starting situation that take into account the risk

II = threatened situation

III = situation in which the threat is realized

$G = \{U, D\}; D \notin U; U\{u_x, u_y\}; D(d_x, d_y)$

$$I: \begin{cases} u_x = 8; d_x = 3 \\ u_y = 8; p_y = 2; d_y = u_y - p_y = 8 - 2 = 6 \\ M_0(8{,}8); D(3{,}6); E\left(\frac{16}{7}, \frac{40}{7}\right) \end{cases}$$

$$II: \begin{cases} u_x = 12; d_x = 3 \\ u_y = 12; p_y = 2; d_y = u_y - p_y = 8 - 2 = 6 \neq 12 - 2 = 10, \\ \text{because } u_x = 12 \text{ it is only a threat} \\ M_0(8{,}8), \text{ because } u_x = 12 \text{ it is only a threat} \\ D(3{,}6); E_1\left(\frac{36}{7}, \frac{48}{7}\right) \end{cases}$$

$$III: \quad M_1(12{,}12); E\left(\frac{24}{5}, \frac{36}{5}\right)$$

Figure 3

Incinerator Game with BATNA Included in the Bargaining Area: starting situation

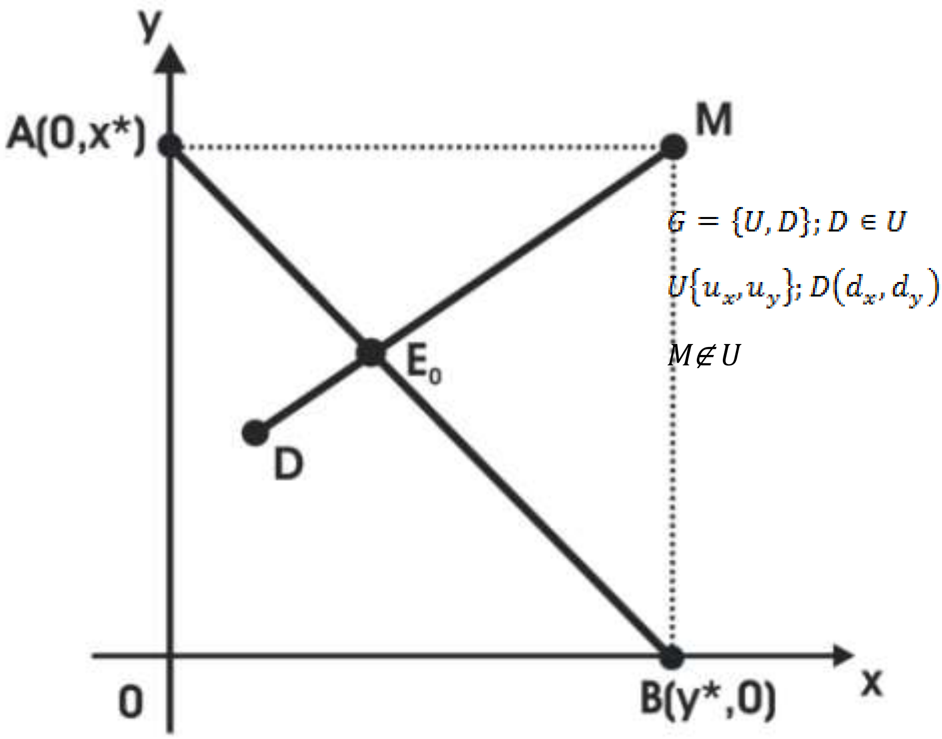


Figure 4

Incinerator Game with BATNA Included in the Bargaining Area:
gradual improvement process of bargaining outcomes

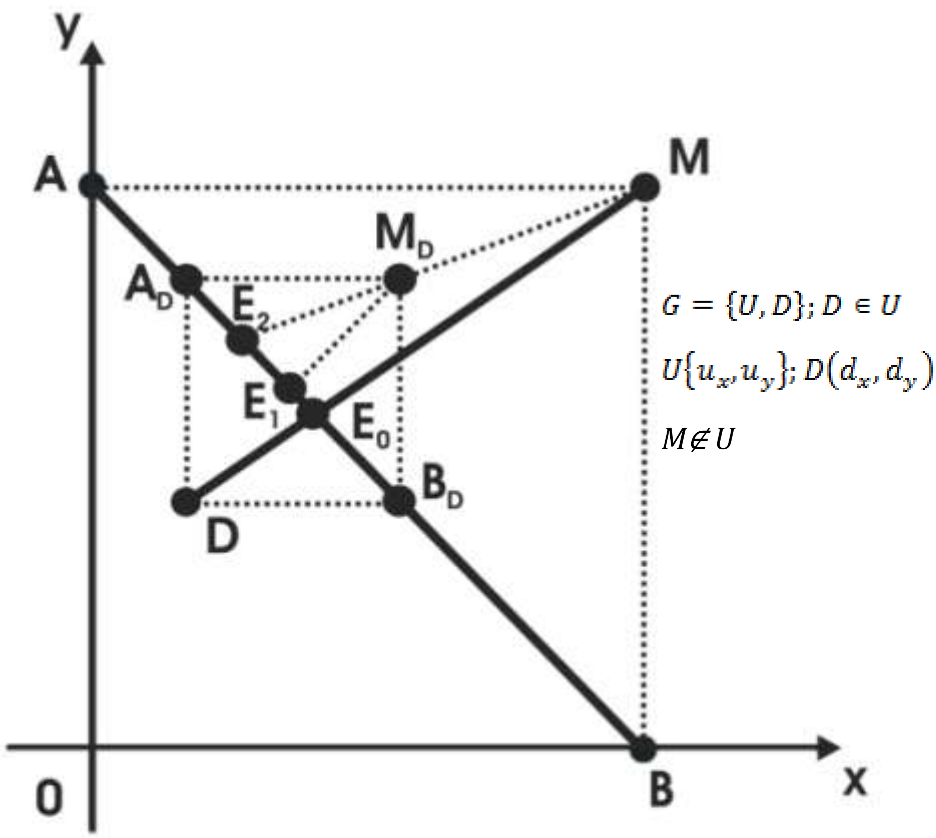
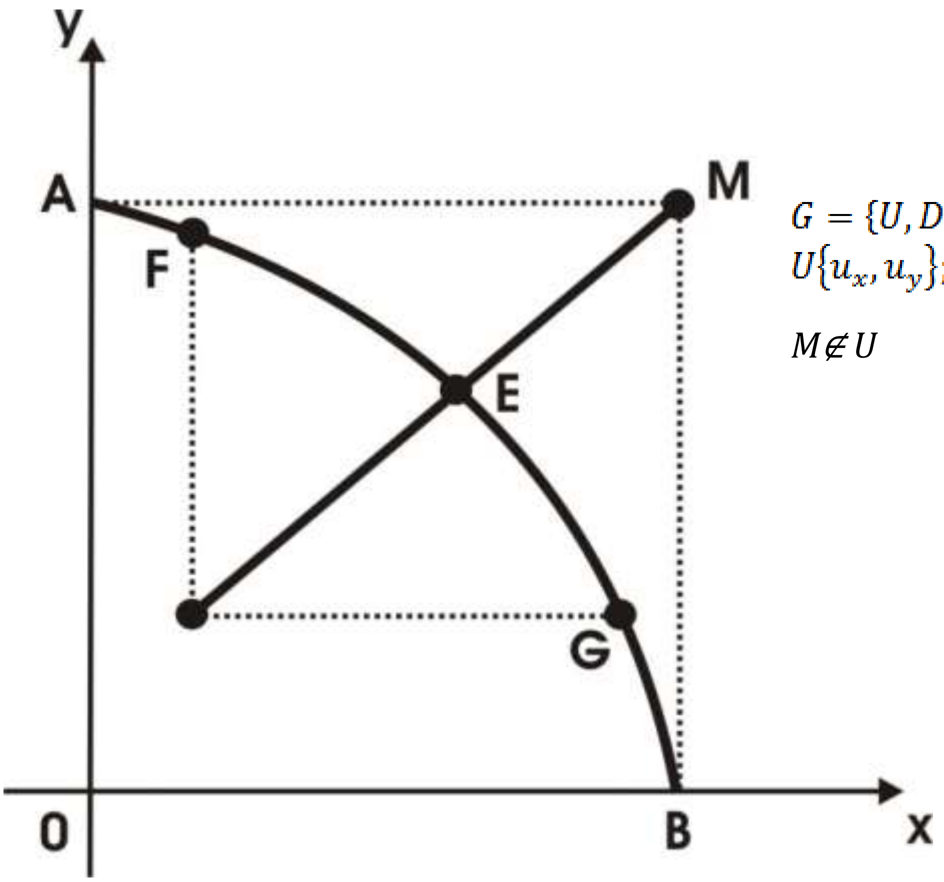


Figure 5
Two players, positive-sum game: an integrative approach



$$G = \{U, D\}; D \in U$$
$$U\{u_x, u_y\}; D(d_x, d_y)$$
$$M \notin U$$

Figure 6
Negotiation in presence of a Bargaining Zone

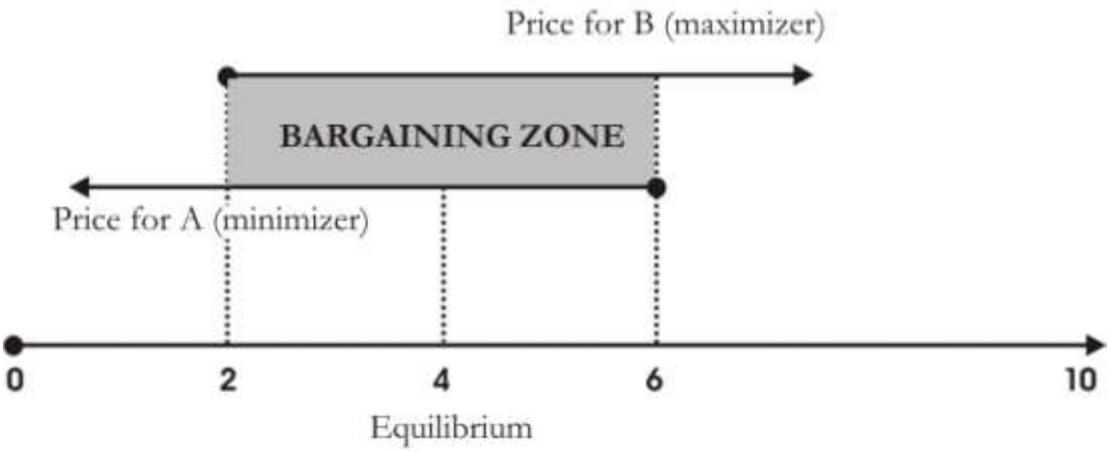


Figure 7
Negotiation in absence of a Bargaining Zone

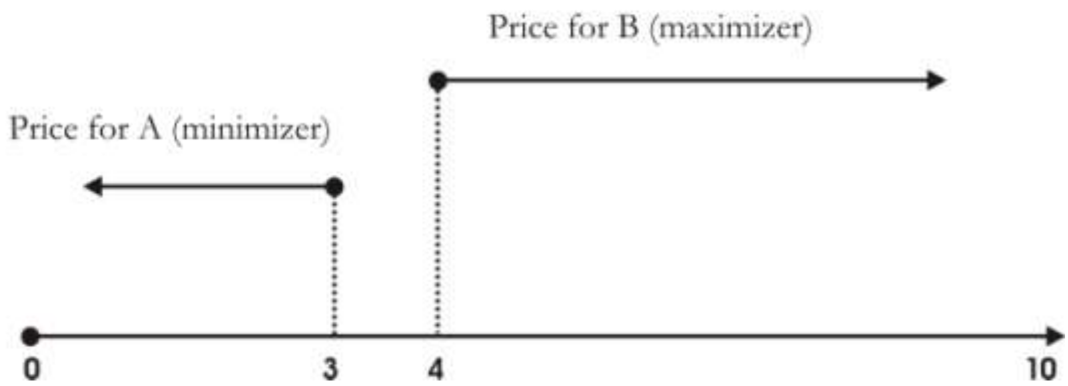


Figure 8
Incinerator Game as Ultimatum Game

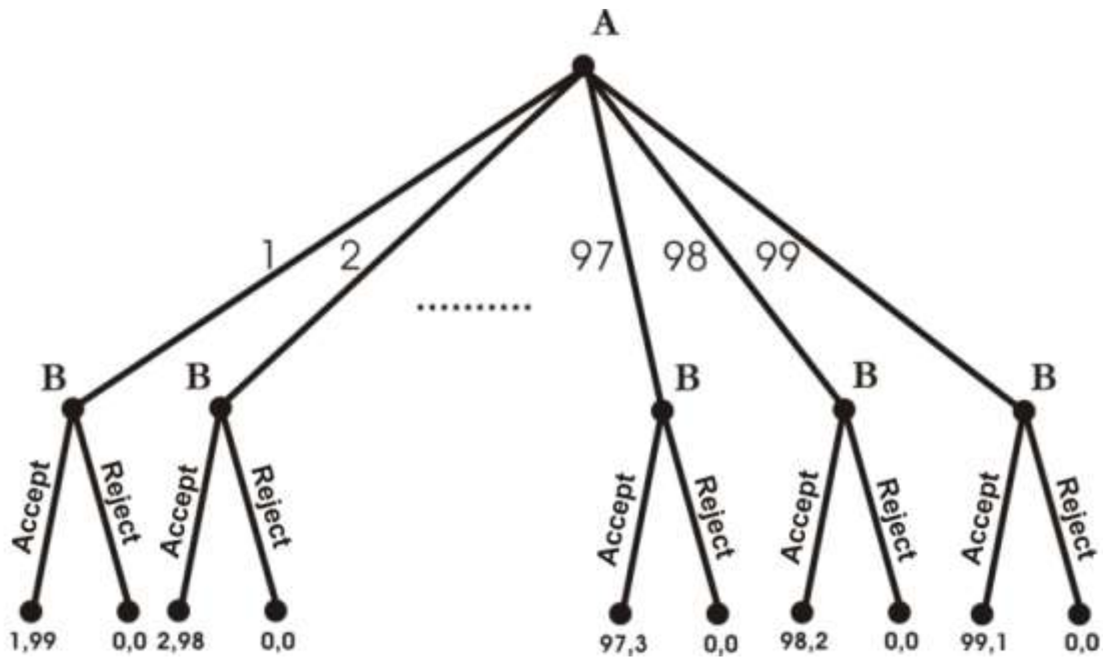


Table 3

Unan1mous: the results of the experiment in TV

Table 3.1: UNAN1MOUS (American Edition: U.S.A.)		
Original channel:		Fox
Narrated by:		Jeselle Hicks
Contestant:	1. Adam (poker player)	Outcast
	2. Jameson (human resources manager)	Active
	3. Jamie (choreographer)	Left
	4. Jonathan (real estate agent)	Active
	5. Kelly (minister)	Left
	6. Richard (writer, temp worker)	Active
	7. Steve (truck driver)	Outcast
	8. Tarah (handbag designer)	Winner
	9. Vanessa (teacher)	Outcast
Jackpot:		$1.5 million
Original run: 49 days		22/03/2006-10/05/2006
Finale: unanimity has been reached in favour of Tarah, who has received the 6 votes (on 7, given that his vote was for Jameson) required to win the game, gaining as premium for a sum equal to 382,193 dollars.		

Table 3.2: UNAN1MOUS (Italian Edition)		
Original channel:		Canale 5
Narrated by:		M. De Filippi
Contestant:	1. Ciro (workman)	Outcast
	2. Anna (direct farmer)	Outcast
	3. Eugenio (electrician)	Outcast
	4. Monica (housewife)	Winner
	5. Marco (real estate agent)	Outcast
	6. Silvia (bodyguard)	Outcast
	7. Maurizio (fashion agent)	Outcast
	8. Tiziana (dance teacher)	Outcast
	9. Pierluigi (mathematician)	Left
Jackpot:		€1.5 million
Original run: 13 days		01/09/2006-13/09/2006
Finale: unanimity has been reached in favour of Monica, who has received the 7 votes required (since a contestant, Pierluigi, had withdrawn) to win the game, gaining as premium a sum equal to 575,316.17 euro.		

Segue Table 3

Unan1mous: the results of the experiment in TV

Table 3.3: UNANIMOUS (English Edition: Regno Unito)		
Original channel:		Channel 4
Narrated by:		A. Humes
Contestant:	1. Sian (young mum, studying law)	Winner
	2. Beverley (art dealer)	Active
	3. Kamran (property developer)	Active
	4. Kelly (lap dancer)	Active
	5. Lusipher (unemployed)	Active
	6. Alex (law student)	Outcast
	7. Pip (nurse)	Outcast
	8. Andy (athlete)	Outcast
	9. Anna (business woman)	Left
Jackpot:		€1.5 million
Original run: 49 days		27/10/2006-15/12/2006
Finale: unanimity has been reached in favour of Sian, who has received the 7 votes required (since a contestant, Anna, had withdrawn) to win the game, gaining as premium a sum equal to 106,562 pounds.		

Table 3.4: UNAN1MOUS (Hispanic Edition)		
Original channel:		Antena 3
Narrated by:		X. Rovira
Contestant:	1. Carmen (ex-prisoners)	
	2. Yolanda (young woman bankrupt entrepreneur)	
	3. Victoria (tv-operator)	
	4. Nassera (Moroccan ex-soldier Belgian woman)	
	Sonia (Colombian emigrant)	
	5. Gustavo (Argentine merchant)	
	6. Javier (policeman)	
	7. Martin Miguel (gigolò)	
	8. David (poker player)	
Jackpot:		€1 million
Original run: 14 days		28/01/2007-11/02/2007
Final: no winner; unanimity has not been reached.		