

Pereau, Jean Christophe; Caparrós, Alejandro; Tazdaït, Tarik

**Working Paper**

## Bargaining with Non-Monolithic Players

Nota di Lavoro, No. 95.2005

**Provided in Cooperation with:**

Fondazione Eni Enrico Mattei (FEEM)

*Suggested Citation:* Pereau, Jean Christophe; Caparrós, Alejandro; Tazdaït, Tarik (2005) : Bargaining with Non-Monolithic Players, Nota di Lavoro, No. 95.2005, Fondazione Eni Enrico Mattei (FEEM), Milano

This Version is available at:

<https://hdl.handle.net/10419/74298>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

## **Bargaining with Non-Monolithic Players**

Alejandro Caparrós, Jean-Christophe Perea  
and Tarik Tazdaït

NOTA DI LAVORO 95.2005

**JULY 2005**

CTN – Coalition Theory Network
--------------------------------

Alejandro Caparrós, *Spanish Council for Scientific Research (CSIC), Department of Economics,  
Institute of Economics and Geography (IEG), Madrid*  
Jean-Christophe Perea, *University of Marne-la-Vallée - O.E.P*  
Tarik Tazdaït, *C.N.R.S - E.H.E.S.S - CIRED*

This paper can be downloaded without charge at:

The Fondazione Eni Enrico Mattei Note di Lavoro Series Index:  
<http://www.feem.it/Feem/Pub/Publications/WPapers/default.htm>

Social Science Research Network Electronic Paper Collection:  
<http://ssrn.com/abstract=771264>

The opinions expressed in this paper do not necessarily reflect the position of  
Fondazione Eni Enrico Mattei  
Corso Magenta, 63, 20123 Milano (I), web site: [www.feem.it](http://www.feem.it), e-mail: [working.papers@feem.it](mailto:working.papers@feem.it)

# Bargaining with Non-Monolithic Players

## Summary

This paper analyses strategic bargaining in negotiations between non-monolithic players, i.e. agents starting negotiations can split up in smaller entities during the bargaining process. We show that the possibility of scission in the informed coalition implies that it loses its information advantages. We also show that when the possibility of a scission exists the uninformed player does not focus on his or her beliefs about the strength of the informed coalition but on the proportion of weak/strong players within this coalition. Finally, our results show that the possibility of a scission reduces the incentives for the leader to propose a high offer to ensure a global agreement. We apply this framework to international negotiations on global public goods and to wage negotiations.

**Keywords:** Strategic bargaining, Non-monolithic players, Scission, Noncooperative game-theory

**JEL Classification:** C72, D74, Q28

*We wish to thank comments and suggestions by the participants at the Public Choice 2005 conference in New Orleans (United States) and the Public Economic Theory 2005 conference (Coalition Theory Network sessions) in Marseille (France).*

*Address for correspondence:*

Jean Christophe Pereau  
Université de Marne-la-Vallée  
UFR de Sciences Economiques  
Cité Descartes, 5 bd Descartes  
Champs sur Marne  
77454 Marne-la-Vallée Cedex 2  
France  
Phone: 0160957150  
Fax: 0160957060  
E-mail: Jean-Christophe.Pereau@univ-mlv.fr

## 1. Introduction

We are interested in the impact on negotiations of the fact that one of the players is not monolithic. Using Lax and Sebenius's (1992) terminology, we are interested in multiparty or multilateral bargaining and more precisely in what they call party arithmetic (adding or subtracting parties). As Lax and Sebenius pointed out over a decade ago, most of the work on bargaining within the strategic framework started by Rubinstein's (1982) seminal paper has been done assuming bilateral bargaining between two monolithic players. Nevertheless, there are a number of relevant bargaining situations where this assumption is not pertinent.

International negotiations on trade tariffs, on agricultural subsidies in the Northern countries, or on climate change mitigation generally take place between coalitions of countries. Standard coalitions in these negotiations are the countries of the European Union, which have, however, kept their autonomy at the international arena, or the G77 and China, a highly heterogeneous coalition regrouping large developing countries (China, India or Brazil), rich oil producers (Saudi Arabia) and extremely poor countries (the Least Developed Countries). In recent negotiations between the United States and its allies (mainly the European Union) on the terms and conditions of a military intervention in Iraq, the weakness of the coalition formed by the European Union has been evident once more. Negotiations started between the United States and the European Union, but once the possibility to split up the coalition was clear, the United States did not any more focus on the demands of the coalition as a whole, but on the demands of a particular sub-coalition, the one formed by the countries meeting at the Azores (United Kingdom, Spain, Portugal and Poland). However, not always apparently weak coalitions split-up. In the long negotiations on climate change, G77 and China have essentially managed to talk with a single voice during all the negotiation process<sup>2</sup>, and this in spite of the very different impacts that climate change, or an agreement to fight climate change, could have on their economies. As stated above, G77 and China regroups oil producers which would be harmed by any climate agreement (Saudi Arabia), large developing countries whose main interest is not to be constraint in their urgently needed development (China and India), but also small islands (AOSIS) or extremely poor countries (The Least Developed Countries) which are the most vulnerable to climate change (Caparrós *et al.*, 2004).

The importance of not negotiating between monolithic parties is also obvious in negotiations between an entrepreneur and the trade union representing his or her employees.

---

<sup>2</sup> With some exceptions, as in the first meeting in Argentina.

Lax and Sebenius (1992) illustrate their point by recalling negotiations between the National Football League (NFL) and its Player's Association (the NFLPA) over a contract in 1981. The NFLA was a coalition made up of a few "stars" and numerous "journeymen". Although all players benefited, to some extent, by a union that could create a unified front with respect to the league, different contracts could confer relative advantage to stars or to journeymen. When the NFL's original proposal failed and a strike began, it floated an offer for limited free agency that suited the stars. When some of the stars began crossing the picket line, the union's resolve appeared to weaken. As Lax and Sebenius pointed out, "analyzing this situation as if it were two monolithic parties would overlook crucial coalitional dynamics".

During the nineties multilateral coalitional bargaining, within the strategic framework, has been an important research issue. However, the models developed focus mainly on coalition formation, without externalities (Chatterjee *et al.*, 1993; Perry and Reny, 1994) and with externalities (Bloch, 1996; Ray and Vohra, 1999). The issue typically modeled is the formation of a coalition where one party proposes a coalition structure and other parties accept it or propose an alternative coalitional structure. Nevertheless, these models do not explicitly address the particularities of a negotiation between two (or more) non-monolithically parties over a particular issue: a money transfer from the North to the South as development aid, a technology transfer to fight climate change, the conditions of a military intervention in Iraq or simply a salary to be paid by the entrepreneur to his workers. In addition, the models quoted above assume that the coalitions are formed having in mind the problem under consideration. However, in many real life situations the coalitions that start negotiating are formed in a pre-game phase, so that the question is if they will negotiate as a monolithic coalition or if they will split up. Using the examples above, the European Union was not formed having in mind the military intervention in Iraq, the G77 and China was not created to deal with climate change and the NFLPA was also not created to negotiate the 1981 contract.

Manzini and Mariotti (2005) analyze, as we do, negotiations that do not occur between individuals but among groups (they use companies, trade unions or political parties as examples). However, they analyze the impact on the negotiations outcome of different voting rules (unanimity or majority) and do not explicitly analyze the impact of a potential scission. Although Manzini and Mariotti refer to alliances, their paper assumes, as ours, a bargaining framework à la Rubinstein and differs therefore from standard literature on alliances (see Sandler and Hartley (2001) for a survey of the economics of alliances and Garfinkel (2004) for a recent development that does not assume that "peace" prevails within the alliance).

To analyze this kind of negotiation we develop a simple dynamic bargaining model where one monolithic party negotiates with a non-monolithic party that has private information. We assume that the uninformed party has a leader role in the negotiations. Thus, he, she or it (he from now on) moves first and proposes an offer which is accepted or not, and in case of refusal, proposes a new offer. This model is well suited to analyze negotiations between the United States and the European Union described above (where the United States play a leader role but do not know exactly the minimum demands of the European Union) and also to model negotiations between an entrepreneur and his workers (the NFL has an obvious leader role but it does not know the minimum requirements of its players). Finally, it can also shed some light on the issue of negotiations between the industrialized countries and G77 and China, as long as we assume that the industrialized countries are a monolithic party<sup>3</sup>.

Our results show that the possibility of a scission<sup>4</sup> increase the chances to obtain an agreement while it reduces the chances to obtain an agreement based on a significant amount of transfers from the leader to the informed party. We also show that the possibility of scission implicitly implies that the informed party loses the advantages that it had from its private information. Thus, the informed party may benefit if it can commit before the game starts to preclude any kind of scission, since banning the possibility of a scission leads to ‘more aggressive’ negotiation tactics. This result is, to some extent, similar to the result obtained in Manzini and Mariotti (2005) that the unanimity rule favors more aggressive negotiation tactics.

Finally, we show that while in a static game the leader still “sees” the original coalition, in the dynamic game his beliefs about the original coalition disappear completely from the expression that shapes his offers. That is, in a static game, even with the possibility of a scission, the leader offers an amount or another taking into account his beliefs about the strength or the weakness of the non-monolithic coalition that he is facing. However, in a dynamic context, his offers are by no means shaped by his beliefs upon the original coalition, but only on his beliefs about the *proportion* of weak or strong members of this coalition.

That is, when the United States negotiate with the European Union about an issue (the military intervention in Iraq or agricultural subsidies) they take into account its beliefs about the strength or the weakness of the EU demands only if they are convinced that a scission

---

<sup>3</sup> In the case of climate change negotiations, the United States actually rejected the common position of the industrialized countries of ratifying Kyoto. However, the model proposed in this paper could eventually be applied to future negotiations between Annex I countries that have ratified Kyoto and the G77 and China.

<sup>4</sup> We use the term “scission” to distinguish it from the closely related term of “deviation” used in cooperative game theory and from the conceptually totally different term “player splitting” (Perea y Monsuete *et al.*, 2000).

among the European Union cannot happen. On the contrary, if they think that a scission may in fact occur, and the negotiations take longer than a single period (as they usually do) the United States do not take into account the demands of the European Union as a whole while shaping its offers, but just the proportion inside the European Union of strong or weak parties. Of course, turning the argument up-side-down provides a strong incentive for potentially unstable coalitions (the EU or G77 and China) to preclude any scission. In fact, this is the behavior that G77 and China has tried to keep during the climate change negotiations, where they have managed to preclude any scission in despite of their internal diversity. The stability of that coalition could be seen as a consequence of the presence of asymmetric information.

We will also show, however, that the straightforward strategy of assuming directly that a given non-monolithic coalition does in fact not exist (focusing on the smallest units) is not pertinent either, since under a given set of circumstances the perfect Bayesian equilibrium will in fact imply that the coalition acts as a single coalition during the whole game.

The rest of the article is organized as follows. Section 2 presents the basic model and solves it assuming that both parties are monolithic. Section 3 relaxes the assumption that parties are monolithic and puts forward the link between the possibility of scission and the shape of the agreement. Section 4 concludes.

## **2. The model without scission**

The basic model that we are going to use is inspired by Fudenberg and Tirole (1983). Let  $N=\{1,2\}$  be two players negotiating over the transfer that player 1 will grant player 2 to obtain a product or service that benefits both to some given extent. The good under consideration can be the provision of a public good (e.g. fight against international terrorism or climate change mitigation) or the provision of a good to be sold in the market (cars, or football matches as in the example above). Player 1 is a monolithic party, a single country as the United States, an entrepreneur or any coalition which is assumed to be stable over the complete game. This monolithic party has a leader role in the game, because he is the owner of the company, because the country suffered a large terrorist attack and internal pressure forces it to act, or because it regroups a group of countries responsible for the degradation of a common good such as climate (see footnote 2). We will call this party the “leader” of the negotiations. Player 2 is a coalition of agents (the countries forming the European Union or the football players), which we will assume, for the time being, to be a monolithic coalition.

We will call this group of agents the original coalition, or just the coalition. We note  $e_i$  the level of effort and  $\pi_i$  the welfare function of player  $i$ ,  $i \in N$ . Welfare functions are supposed to be continuous and concave:

$$p_1(e_1 + e_2, t_1) = B_1(e_1 + e_2) - C_1(e_1, t_1) \quad (1)$$

$$p_2(e_1 + e_2, t_1) = B_2(e_1 + e_2, t_1) - C_2(e_2), \quad (2)$$

where  $B_i$  is the benefit obtained by player  $i$  from the efforts undertaken by both players and  $C_i$  are the costs of the efforts for player  $i$ .  $t_1$  refers to the transfers (money, technology transfers, concessions in other subjects) received by the coalition from the leader to incentive its efforts to provide the (public) good. This transfer is proposed by the leader and satisfies the following assumptions:

$$\frac{\partial C_1}{\partial t_1} > 0 \quad \text{and} \quad \frac{\partial B_2}{\partial t_1} > 0. \quad (3)$$

Thus, the transfer is a ‘loss’ for the leader and a ‘gain’ for the coalition. That is, both players perform an effort to provide the good (the United States and the European Union both fight terrorism, the industrialized countries and the G77 and China both fight climate change, the NFL and the NFLPA both provide and effort to perform football games), both benefit from the provision of the public good (this is probably more obvious in the case of public goods such as international terrorism or climate change than in the case of the football games, although fame could be an additional benefit for players beyond salary), and finally the leader is ready to transfer some benefit to the coalition (this may be political concessions in the case of the US-EU negotiations, technology or money transfers in the case of climate change negotiations and the salary in the case of the football League negotiations). This means that even if both players are concerned about the (public) good, their interests diverge.

Given the leadership role that we have assigned to player 1 (the leader), he plays first and proposes, at the same time, his level of effort ( $e_1$ ) and the amount of transfer granted to the coalition to incentive its efforts. If the coalition accepts the offer, the agreement is struck and it provides the agreed efforts. If the coalition does not accept, negotiations go on with a new proposition from the leader, formed by a new program of efforts and a new amount of transfers. If this offer is accepted, an agreement is concluded; otherwise, no agreement is reached and both players act independently.

All features of the negotiation are known with certainty by both parties, except that the leader does not know the real capacities (demands) of the coalition. We assume that the total



level of effort that the leader needs to obtain, adding the effort performed by the coalition and the effort performed by himself, is given. We further assume that a strong coalition, in the sense that it is able to perform a high level of effort, will have high demands, while a weak one will have low demands. Using the example of the NFL: a coalition dominated by stars will only play with a high salary, while a coalition of journeymen will play for less money although unmotivated stars may perform poorly (therefore, the owner will need to perform an important additional effort if he wants to have spectators in the matches). In climate change negotiations (or in negotiations on efforts against international terrorism), if a coalition with high emission reduction capacities gets a high amount of transfers it will be able to perform a high level of abatement, while a coalition with low capacities will only be able to perform small emission reductions, whatever the level of transfers granted. However, the coalition with high capacities, knowing its key role, will have high demands as well. This was the case of Russia during the negotiations on the Kyoto Protocol, where it demanded, and obtained, a significant amount of concessions.

To simplify, we assume that the capacities (demands) of the coalition take one of the two following values:  $e_2^-$  and  $e_2^+$ , where  $e_2^- < e_1 < e_2^+$ . Either the capacities of the coalition are low (a “weak” coalition), or they are high (a “strong” coalition). We can reduce the model from two decision variables to only one, the amount of transfers, by setting:

$$e_2^- = e_2^-(t_2^-), \quad e_2^+ = e_2^+(t_2^+) \quad . \quad (4)$$

That is, we distinguish the type of coalition in function of the transfers granted (i.e. we have a  $t_2^+$  and a  $t_2^-$  coalition, with  $t_2^- < t_1 < t_2^+$ ). That is, we will note  $t_1$  the amount of transfer proposed by the player 1 (leader) and  $t_2$  the demands of player 2, the coalition, which actually defines the type of the coalition. Hence, a  $t_2^+$ -coalition will only accept a certain level of effort in exchange of a significant transfer ( $t_2^+$ ). On the contrary, a  $t_2^-$ -coalition will provide the effort as soon as it gets a transfer equal to  $t_2^-$ . We assume further that the leader wishes to reach a global target  $\bar{e}$  which can be obtained by two ways: a low (respectively high) level of effort for the leader and a high (respectively low) effort for the coalition, such that  $\bar{e} = e_1^- + e_2^+$  or  $\bar{e} = e_1^+ + e_2^-$ . In the first case, when the leader believes that he is faced with a coalition able to provide a high level of effort, the leader has to offer a high level of transfer  $t_2^+$  to get a high effort. However, given the asymmetry of information, a high amount of transfer does not guarantee a high level of effort. That is, the outcome may be a lower level effort as initially expect by the leader, implying that the target is missed:  $e_1^- + e_2^- < \bar{e}$ .

The leader has an *a priori* distribution of probability on  $[t_2^-, t_2^+]$ :

$$p(t_2^+) = p_1^+, \quad p(t_2^-) = p_1^- = 1 - p_1^+. \quad (5)$$

This probability distribution implicitly refers to  $[t_2^-, t_2^+]$ , as the efforts provided are a function of the amount of transfer granted.

We set, without loss of generality:

$$p_1(e_1^+, t_2^-) = 0, \quad (6)$$

This means that the leader's welfare is normalized to zero when he offers a small amount of transfers ( $t_1 = t_2^-$ ) to a  $t_2^+$ -coalition. Since the demands of this coalition are high, it will refuse to cooperate.

A family of conditional probabilities for the leader is an application that associates for every history of transfer propositions and corresponding answers, a distribution of probabilities on  $[t_2^-, t_2^+]$ . Since the game has only two periods and finishes at the first period in case of agreement, only conditional probabilities on the type of the coalition in case of a refusal to the transfer  $t_1$  proposed at the first period are relevant. We note  $[p_{11}^-, p_{11}^+]$  the distribution of probabilities of the leader at the beginning of the second period when the amount  $t_1$  proposed in the first period was refused:

$$p_{11}^- = p(t_2^- / \text{refusal } t_1) \quad \text{and} \quad p_{11}^+ = p(t_2^+ / \text{refusal } t_1) = 1 - p_{11}^-. \quad (7)$$

A pure strategy for the leader is a pair  $(t_1, t_{11}(\cdot))$  where  $t_1$  is the amount proposed at the first period and  $t_{11}(\cdot)$  a function that associates a transfer  $t_{11}$  in the second period to any transfer  $t_1$  refused in the first period (i.e., we note  $t_{11}$  the transfer proposed by player 1, the leader, in the second period). A mixed strategy for the leader is formed by a distribution of probabilities on  $\mathfrak{R}^+$  and an application that associates, for any transfer  $t_1$  refused in the first period, a distribution of probabilities on  $\mathfrak{R}^+$  (the set of possible transfers for the second period).

A pure strategy for the coalition is a pair of applications  $(f_2(\cdot), f_{22}(\cdot))$ . The first application associates to its private information  $t_2 \in [t_2^-, t_2^+]$  and to any transfer  $t_1$ , an element  $f_2(t_2, t_1)$  of the set  $\{a, r\}$  of possible answers. The second application associates to the private information, to any transfer  $t_1$  refused and to any transfer  $t_{11}$ , an element  $f_2(t_2, t_1, t_{11})$  of  $\{a, r\}$ . A mixed strategy for the coalition is composed by (i) a family of

distribution of probabilities on  $\{a, r\}$ , which are conditional to  $(t_2, t_1)$  and noted  $\mathbf{m}_2(f_2 / t_2, t_1)$ , and (ii) a family of distribution on  $\{a, r\}$ , which are conditional to  $(t_2, t_1, t_{11})$  and that we note  $\mathbf{m}_2(f_{22} / t_2, t_1, t_{11})$ .

The equilibrium concept used is the perfect Bayesian equilibrium. The strategies of both players in each period of the game, together with the associated beliefs, form a perfect Bayesian equilibrium if the constraints of sequential rationality and Bayesian coherence hold: (i) at every step of the game, the strategies are a Nash Bayesian equilibrium, given the beliefs; (ii) following the equilibrium path, beliefs are determined according to Bayes' rule.

We note  $\mathbf{d}_1$  and  $\mathbf{d}_2$  the discount factors of players 1 and 2 (with  $0 < \mathbf{d}_i < 1$ ,  $i=1,2$ ). The highest transfer accepted at the first period by the  $t_2^-$ -coalition when it anticipates that the transfer proposed in the second period will be  $t_{11}=t_2^+$  is noted  $\hat{t}_2$ . Thus,  $\hat{t}_2$  is defined by:

$$(1-\mathbf{d}_2)C_2(e_2^-) = B_2(e_1^+ + e_2^-, \hat{t}_2) - \mathbf{d}_2 B_2(e_1^- + e_2^-, t_2^+). \quad (8)$$

We only consider variations of the game corresponding to pure strategies of the leader (i.e. we exclude the possibility that the leader proposes a lottery, since this is not pertinent in the kind of situations that we are modeling).

### Definition

*A perfect Nash Bayesian equilibrium (PNBE) of a game is a quadruplet of strategies  $[(e_1, t_1), (e_{11}(\cdot), t_{11}(\cdot)), f_1(\cdot), f_2(\cdot)]$  and a system of beliefs  $[(p_1^-, p_1^+), (p_{11}^-(\cdot), p_{11}^+(\cdot))]$  that satisfies properties (1) and (2):*

*(1) For the system of beliefs  $[(p_1^-, p_1^+), (p_{11}^-(\cdot), p_{11}^+(\cdot))]$  and for any stage of the game the strategies of both players  $[(e_1, t_1), (e_{11}(\cdot), t_{11}(\cdot)), f_1(\cdot), f_2(\cdot)]$  form a Nash Bayesian equilibrium (NBE).*

*(2) For the equilibrium strategies, the system of beliefs follows Bayes' rule.*

Formally, this type of equilibrium is obtained by backward induction (Selten, 1965). In the next section we will determine the Nash Bayesian equilibria in anyone of the two periods of the game (since the rules of the game and the space of strategies are essentially the same in the first and in the second period).

## 2.2. Nash Bayesian equilibria

We will start by analyzing the outcome of the sub-game that takes place in each of the two periods under consideration as if it would be a static game in itself. This will allow us to compare the results in a static environment with the results in a dynamic framework. However, and in order to be able to use the results in the next sub-section, we will use the concept of Bayesian equilibrium.

In this game, a pure strategy for the leader is an amount of transfer  $t_1$ , and a mixed strategy is a distribution of probability on  $\mathfrak{R}^+$  (the set of all possible transfers). A pure strategy for the coalition is a function  $f_2(.)$  which associates to its private information  $t_2 \in [t_2^-, t_2^+]$  and to every proposed transfer  $t_1$  an element  $f_2(t_2, t_1)$  of the set of possible answers  $\{a, r\}$ . A mixed strategy for the coalition (noted  $\mathbf{m}_2(f_2/t_2, t_1)$ ) is a family of probability distributions on  $\{a, r\}$  conditional to  $(t_2, t_1)$ .

Given our assumptions, we can limit the pure strategies of the leader (uninformed) to the non-dominated strategies  $t_1 = t_2^+$  and  $t_1 = t_2^-$ , and to the mixed strategy  $t_1 = \alpha t_2^+ + (1-\alpha)t_2^-$  for  $\alpha \in [0,1]$ . If the leader adopts the pure strategy  $t_1 = t_2^-$ , the expected gain is:

$$E\mathbf{p}_1^- = p_1^- \mathbf{p}_1(e_1^+ + e_2^-, t_2^-) + p_1^+ \mathbf{p}_1(e_1^+, t_2^-), \quad (9)$$

and the  $t_2^+$ -coalition will not accept the offer because the amount of transfer is lower than its expected amount. If the leader chooses  $t_1 = t_2^+$ , the expected gain is:

$$E\mathbf{p}_1^+ = p_1^- \mathbf{p}_1(e_1^- + e_2^-, t_2^+) + p_1^+ \mathbf{p}_1(e_1^- + e_2^+, t_2^+). \quad (10)$$

The pure strategy  $t_1 = t_2^+$  is optimal if and only if the expected gain associated to  $t_1 = t_2^+$  is strictly higher than the expected gain associated to  $t_1 = t_2^-$ . This gives:

$$p_1^+ > \frac{[\mathbf{p}_1(e_1^+ + e_2^-, t_2^-) - \mathbf{p}_1(e_1^- + e_2^-, t_2^+)]}{\mathbf{p}_1(e_1^- + e_2^+, t_2^+) + [\mathbf{p}_1(e_1^+ + e_2^-, t_2^-) - \mathbf{p}_1(e_1^- + e_2^+, t_2^+)]} = G. \quad (11)$$

When this condition holds, the Bayesian equilibrium is, for the leader, to play the strategy  $t_1 = t_2^+$ . That is, G gives us the minimum probability of being matched with a  $t_2^+$ -coalition for which the leader is interested in offering a high amount of transfer. This transfer will be accepted by both types of coalition, since it is the maximum and they cannot expect a better offer.

If the inequality is reversed:

$$p_1^+ < G, \quad (12)$$

it is beneficial for the leader to propose  $t_1 = t_2^-$ . This is the minimum transfer and only the  $t_2^-$ -coalition (the coalition that will provide the lowest level of effort) will accept it.

Finally, if we have:

$$p_1^+ = G, \quad (13)$$

the Bayesian equilibrium consists for the leader to play the strategy  $t_1 = t_2^+$  with probability  $\alpha$  and  $t_1 = t_2^-$  with probability  $(1 - \alpha)$ , for  $\alpha \in [0, 1]$ . This means that the leader is indifferent about playing  $t_2^+$  or  $t_2^-$ . The coalition will accept the level of transfer  $t_1$  if it is at least equal to the requested amount of transfer  $t_2$ . This allows us to write the following proposition:

### Proposition 1

*The Nash Bayesian equilibrium is:*

*(i) for the leader to propose:*

$t_1 = t_2^+$  if the beliefs of the uninformed player about the probability of being faced with a strong coalition are high ( $p_1^+ > G$ );

$t_1 = t_2^-$  if this beliefs are low ( $p_1^+ < G$ );

$t_1 = \alpha t_2^+ + (1 - \alpha)t_2^-$  for  $\alpha \in [0, 1]$  if this beliefs are  $p_1^+ = G$ .

*(ii) for the coalition to accept any transfer such that  $t_1 \geq t_2$ .*

The term in brackets in  $G$  (always positive) can be seen as the cost born by the leader when it proposes  $t_2^+$  to a  $t_2^-$ -coalition (i.e. the cost associated to the asymmetry of information in favor of the coalition). Thus,  $G$  can be seen as a measure of the relative importance of this cost compared to the benefit obtained when  $t_2^+$  was the right amount to offer since the coalition was  $t_2^+$  (i.e.  $\mathbf{p}_1(e_1^- + e_2^+, t_2^+)$ ). When this cost is high, the leader tends to offer a low amount of transfer whereas he tends to offer a low transfer if the opposite is true.

Formally, we can rewrite the results in proposition 1 and specify each of the Nash Bayesian equilibria based on the amount of transfers:

- either  $t_1 = t_2^+$  and  $[\mathbf{m}_2(a/t_2^-, t_1) = 1 \text{ and } \mathbf{m}_2(a/t_2^+, t_1) = 1]$ ;
- or  $t_1 = t_2^-$  and  $[\mathbf{m}_2(a/t_2^-, t_1) = 1 \text{ and } \mathbf{m}_2(a/t_2^+, t_1) = 0]$ ;
- or  $t_1 = \alpha t_2^+ + (1 - \alpha)t_2^-$  for  $\alpha \in [0, 1]$  and  $[\mathbf{m}_2(a/t_2^-, t_1) = 1 \text{ if } t_1 \geq t_2^-, = 0; \text{ and } \mathbf{m}_2(a/t_2^+, t_1) = 1 \text{ if } t_1 \geq t_2^+, = 0]$ .

As expected, the asymmetry of information reduces the optimality of negotiations, since several inefficient issues are conceivable. No-agreement may be the outcome or an agreement that does not reflect the type of the coalition. Actually, the responsibility for a positive outcome corresponds to the leader. The signature of an agreement depends upon its capacity to overcome the additional cost associated to the asymmetry of information. Even if this loss is tolerable (i.e. it is compensated by the gain resulting from cooperation), it reduces the expected gain of the leader.

### 2.3 Negotiation outcomes

We will now analyze the complete two stage game. We assume only two periods since we are interested in investigating the impact of the minimal amount of dynamics on the results. However, the approach could easily be extended to any (finite) number of periods. Nevertheless, increasing the number of periods does not really add anything substantial, while it obviously complicates the resolution. The negotiation outcomes are summarized in equations (2) and (3).

#### **Proposition 2**

*If  $p_1^+ > G$ , a unique perfect Bayesian equilibrium exists:*

*(i) for the leader:*

$$\text{either } t_1 = t_2^+ \text{ and } t_{11}(t_1) = t_2^+,$$

$$\text{or } t_1 = \hat{t}_2 \text{ and } t_{11}(t_1) = t_2^+;$$

*(ii) for the coalition:*

$$\mathbf{m}_2(a / t_2^+, t_1) = 1 \text{ for } t_1 \geq t_2^+, = 0 \text{ otherwise,}$$

$$\mathbf{m}_2(a / t_2^-, t_1) = 1 \text{ for } t_1 \geq \hat{t}_2,$$

$$\mathbf{m}_2(a / t_2, t_1, t_{11}) = 1 \text{ for } t_{11} \geq t_2, = 0 \text{ otherwise.}$$

*Proof* : see appendix 1.

Consequently, with the conditions associated to proposition (2), we can distinguish two possible perfect Bayesian equilibria. In the first one, the leader proposes the highest amount of transfers at any period of the game. This is accepted in the first period by the coalition, whatever its type. In the second possible equilibrium, the leader proposes the average amount

$\hat{t}_2$  in the first period and the maximum transfer  $t_2^+$  in the second period. If the coalition is a  $t_2^-$ -coalition, it accepts  $\hat{t}_2$  in the first period. If it is a  $t_2^+$ -coalition, it will wait until the second period.

### Proposition 3

If  $p_1^+ < G$ , there is a unique perfect Bayesian equilibrium:

(i) for the leader:

either  $t_1 = t_2^+$  and  $[t_{11}(t_1) = t_2^+ \text{ or } t_{11}(t_1) = t_2^-]$ ,

or  $t_1 = \hat{t}_2$  and  $t_{11}(t_1) = t_2^+$ ,

or  $t_1 = t_2^-$  and  $t_{11}(t_1) = t_2^-$  with probability

$$e(t_1) > \frac{p_2(e_1^+ + e_2^-, t_1) - d_2 p_2(e_1^- + e_2^-, t_2^+)}{d_2 [B_2(e_1^+ + e_2^-, t_2^-) - B_2(e_1^- + e_2^-, t_2^+)]};$$

(ii) for the coalition:

$m_2(a/t_2^+, t_1) = 1$  for  $t_1 \geq t_2^+$ ,  $= 0$  otherwise,

$m_2(a/t_2^-, t_1) = 1$  for  $t_1 \geq \hat{t}_2$ ,  $= \frac{G - p_1^+}{G(1 - p_1^+)}$  otherwise,

$m_2(a/t_2, t_1, t_{11}) = 1$  for  $t_{11} \geq t_2$ ,  $= 0$  otherwise.

*Proof* : see appendix 2.

Proposition (3) shows that, depending on the parameters of the model, three equilibria are possible. If the leader opens the negotiations by offering the maximum amount of transfer, the coalition accepts it in the first period, whatever the type of the coalition. On the contrary, if the leader proposes the average amount of transfer  $\hat{t}_2$ , only a  $t_2^-$ -coalition accepts it. In this case, the leader proposes in the second period the maximum transfer, which is always accepted. Thus, the asymmetry of information tends to reduce the leading position of the leader. Finally, if the minimum amount of transfer is proposed in the first period and again, with a probability  $e(t_1)$ , in the second period, the coalition accepts only if it is a  $t_2^-$ -coalition. More precisely, the coalition accepts the offer with a certain probability in the first period, and always in the second period if they refused it in the first.

Extending negotiations for a finite number of periods does not ensure a less costly agreement for the leader. Even more, the repetition can be disadvantageous for them. Indeed, even if negotiations begin with a low amount of transfer, a coalition that has low requirements and that anticipates for the following period a higher proposition (with a probability  $1 - e(t_1)$ ), may behave as if it had higher demands. Thus, a refusal will not necessarily provide reliable information about the type of the coalition. Moreover, when the leader gets a refusal, it has to wait longer to obtain an agreement, which is an additional cost. In any case, propositions (2) and (3) show that, although information is acquired during the negotiation due to the Bayesian revision of the *a priori* probabilities, this does not ensure the signature of the agreement in the first period. Thus, a first rank optimum will not necessary be obtained, since the discount factors are strictly lower than one.

### 3. The model with the possibility of scission in the coalition

#### 3.1 Nash Bayesian equilibria

Until now, we have considered the coalition as a stable coalition. This assumption reduces the space of strategies of the members forming this coalition. Although this member can be countries, football players or whatever, we will call them countries from now on to simplify the exposition. When the coalition is a  $t_2^+$  coalition, its behavior is rather intransigent: it commits itself only with an agreement on a high amount of transfer. We now consider that a coalition with high claims may adapt its behavior to the offer of the leader. For a small offer of amount of transfer, this coalition may split up into two sub-coalitions. Countries for which the transfer that is proposed is equal to the sum of their claims form one sub-coalition (the  $t_2^-$ -coalition). More demanding countries form another sub-coalition (the  $(t_2^+ - t_2^-)$ -sub-coalition). We assume that the total sum of demands of both sub-coalitions still equals  $t_2^+$ , with  $t_2^+ - t_2^- > t_2^-$ . In this context, negotiations may finish in the first period with one sub-coalition and continue only with the stronger sub-coalition in the second period.

We suppose that the sub-coalition which has more (respectively less) demanding claims, ie the  $(t_2^+ - t_2^-)$ -sub-coalition (respectively the  $t_2^-$ -sub-coalition), represents a proportion equal to  $\mathbf{b}$  (respectively  $1 - \mathbf{b}$ ). We obtain for a offer  $t_1 = t_2^-$  of the leader:

$$Ep_1^- = p_1^- p_1 (e_1^+ + e_2^-, t_2^-) + p_1^+ [\mathbf{b} p_1 (e_1^+, t_2^-) + (1 - \mathbf{b}) p_1 (e_1^+ + e_2^-, t_2^-)]. \quad (14)$$

When he offers  $t_1 = t_2^+$ ,  $Ep_1^+$  is given by equation (10). Using:



$$H = \frac{\mathbf{p}_1(e_1^+ + e_2^-, t_2^-) - \mathbf{p}_1(e_1^- + e_2^-, t_2^+)}{\mathbf{p}_1(e_1^- + e_2^+, t_2^+) + \mathbf{b}\mathbf{p}_1(e_1^+ + e_2^-, t_2^-) - \mathbf{p}_1(e_1^- + e_2^-, t_2^+)} \quad , \quad (15)$$

we can write the following proposition:

#### Proposition 4

*With the possibility of scission in the coalition, the Nash Bayesian equilibrium is:*

- (i) *if  $p_1^+ > H$ , the leader proposes  $t_1 = t_2^+$ , which is accepted by the coalition whatever its type;*
- (ii) *if  $p_1^+ < H$ , the leader proposes  $t_1 = t_2^-$ , which is accepted by a  $t_2^-$ -coalition and by a  $t_2^-$ -sub-coalition;*
- (iii) *if  $p_1^+ = H$ , the leader proposes  $t_1 = t_2^+$  with any probability and  $t_1 = t_2^-$  with the complementary probability. The offer is accepted by a  $t_2^-$ -coalition if  $t_1 \geq t_2$  and by a  $t_2^-$ -sub-coalition if  $t_2 > t_1$ .*

Comparing Propositions (1) and (4) we can write the following corollary:

#### Corollary 1

*The probability of reaching an agreement is larger with the possibility of a scission. The probability of reaching an agreement based on a high amount of transfers is smaller with this option.*

*Proof:* direct from propositions (1) and (2) since  $G \leq H$  given that  $0 \leq \mathbf{b} \leq 1$ .

Hence, while the space of strategies is wider for a  $t_2^+$ -coalition with the possibility of scission, the possibility of reaching an agreement based on a high amount of transfer is reduced. Thus, the leader will be more willing to propose a higher level of transfer in the game where it may deal with an uncompromising  $t_2^+$ -coalition (i.e. a coalition without the possibility of scission) than in the case where a scission may occur. The intuition behind this result lies in the difficulty to reach an agreement. In the game where the coalition may be either a  $t_2^-$ -coalition or an uncompromising  $t_2^+$ -coalition, negotiations may fail if the offer of the leader is not high enough (if the coalition is of the type  $t_2^+$ ). By adopting the "all or nothing" strategy, an uncompromising coalition faces the leader with an ultimatum. Since the coalition knows its influence, it will reject any compromise which fails to meet its demands.

To avoid the failure of negotiations, the leader has to offer  $t_1 = t_2^+$ . This ultimatum situation overwhelms the problem of potential free-riding by the  $t_2^-$ -coalition. On the contrary, in the game with the possibility of scission, since some of the members of the coalition may accept to adapt to the offer of the leader, the leader takes the signature of an agreement for granted. Since he is no longer threatened by a negotiations failure, the leader will try to minimize the risk of opportunist behavior from a  $t_2^-$ -coalition. Thus, the leader will be more willing to propose a low amount of transfer and the probability of reaching an agreement on a high amount of transfer shrinks. This is confirmed by the fact that the H-bound is a decreasing function of  $\mathbf{b}$ . The higher the proportion of the coalition that would refuse the  $t_2^-$  offer, the nearer we come to the situation where the coalition is uncompromising. Therefore, the leader is interested in avoiding the failure of negotiations.

### 3.2. Negotiation outcomes

We will now analyze the complete two period game with the possibility of scission. In this configuration, if a proposition  $t_1$  during the first period is strictly lower than  $t_2^+$ , then a  $t_2^+$  coalition may split up (or not). In this last section, we combine the three main characteristics of negotiations: dynamics, asymmetric information and the possibility of scission. We can write propositions (5) and (6).

#### Proposition 5

*If the proportion ( $\mathbf{b}$ ) of countries inside the coalition with strong demands checks*

$$\mathbf{b} > \frac{2\mathbf{m}_2(r/\bar{t}_2, t_1)}{1 + \mathbf{m}_2(r/\bar{t}_2, t_1)}, \quad (16)$$

*there is a unique perfect Bayesian equilibrium. The equilibrium strategies for the leader are:*

$$t_1 \in [t_2^-, t_2^+] \text{ and } t_{11}(t_1) = t_2^+ \text{ or } t_{11}(t_1) = t_2^+ - t_2^-,$$

*and for the coalition:*

$$\mathbf{m}_2(a/t_2^+, t_1) = 1 \text{ for } t_1 \geq t_2^+, = 1 - \mathbf{b} \text{ for } t_2^+ > t_1 \geq \hat{t}_2, = 0 \text{ otherwise,}$$

$$\mathbf{m}_2(a/t_2^-, t_1) = 1 \text{ for } t_1 \geq \hat{t}_2, = 0 \text{ otherwise,}$$

$$\mathbf{m}_2(a/t_2, t_1, t_{11}) = 1 \text{ for } t_{11} \geq t_2, = 0 \text{ otherwise.}$$

*Proof:* see appendix 3.

### Proposition 6

If the proportion (  $\mathbf{b}$  ) of countries inside the coalition with strong demands checks

$$\mathbf{b} < \frac{2\mathbf{m}_2(r/\bar{t}_2, t_1)}{1 + \mathbf{m}_2(r/\bar{t}_2, t_1)}, \quad (17)$$

there is a unique perfect Bayesian equilibrium. The equilibrium strategies for the leader are:

either  $t_1 \in [t_2^-, \hat{t}_2[$  and  $t_{11}(t_1) = t_2^-$  or  $t_{11}(t_1) = t_2^+ - t_2^-$

or  $t_1 \in [\hat{t}_2, t_2^+]$  and  $t_{11}(t_1) = t_2^+$  or  $t_{11}(t_1) = t_2^+ - t_2^-$ ;

and for the coalition:

$\mathbf{m}_2(a/t_2^+, t_1) = 1$  for  $t_1 \geq t_2^+$ ,  $= 1 - \mathbf{b}$  for  $t_2^+ > t_1 \geq \hat{t}_2$ ,  $= 0$  otherwise

$\mathbf{m}_2(a/t_2^-, t_1) = 1$  for  $t_1 \geq \hat{t}_2$ ,  $= 0$  otherwise

$\mathbf{m}_2(a/t_2, t_1, t_{11}) = 1$  for  $t_{11} \geq t_2$ ,  $= 0$  otherwise.

*Proof* : same principle as the proof in appendix (3).

Proposition (5) shows that when the offer is rejected in the first period, an agreement will always be signed at the second period, based on the maximum transfer. Since the proportion of countries with strong demands inside the coalition is high, the leader will offer  $t_2^+$  in the second period. With an offer in the interval  $[t_2^-, t_2^+]$ , a refusal in the first period leads the leader to determine with certainty his interlocutor's type. If the initial offer was rejected by the whole coalition, the leader will propose  $t_2^+$  in the second period. If a scission appeared in the first period and only a sub-coalition rejected the offer (i.e. when the initial offer checked  $t_2^+ > t_1 \geq \hat{t}_2$ ), the leader will propose  $(t_2^+ - t_2^-)$  to this sub-coalition in the second period.

As Proposition (6) shows, when the proportion of strong countries within the coalition is low, the leader proposes  $t_2^-$  in the second period. When the leader is faced with a refusal to an offer comprised in  $[t_2^-, \hat{t}_2[$  in the first period, he is not able to determine with certainty the type of the coalition. Thus, he will adopt a precautionary strategy and offer  $t_2^-$  in the second period. This may lead to the failure of the negotiations if the type of the coalition is  $t_2^+$ . Finally, if the weak coalition ( $t_2^-$ -coalition) refuses the proposition in the first period to accept that of the second period, we get a configuration for which by prolonging the negotiation, it loses all the advantages that it had due to its private information.

Remark that in propositions (5) and (6) the bound separating one or another proposal from the leader is not anymore the beliefs about the strength/weakness of the coalition ( $p_1^+$  or  $p_{11}^+$ ) but the proportion of strong (weak) members forming the original coalition ( $\mathbf{b}$ ). That is:

### Corollary 2

*If a scission is possible and the proportion of weak/strong members of the coalition is known, the system of beliefs  $\left[ (p_1^-, p_1^+), (p_{11}^-(\cdot), p_{11}^+(\cdot)) \right]$  plays no role in shaping the offers of the leader.*

*Proof:* direct from propositions (5) and (6).

At least since Riker (1962) we know that coalitions tend to split up to its minimum expression, however, what we have shown here is that even before they have split up the leader of the negotiation does not anymore “see” the nominal coalition and already focuses on the proportion of strong/weak members while shaping his offers. However, whatever the value of  $\mathbf{b}$  we have situations where the coalitions stays together and only single offers and unique answers are observed, so that a model assuming that the coalition does not really exist would miss the point.

We can now compare negotiations with and without the possibility of scission. Without the possibility of scission, an agreement will only be reached if the coalition gets at least its minimum requirements. On the contrary, with the possibility of scission we can obtain as many possible agreements as possible amounts of transfers exist. Therefore, the leader should prefer to enter negotiations when a scission is still possible. The scission allows the formation of a sub-coalition that adapts its behavior to the leader’s proposal, even if the initial coalition was potentially able to demand more. The probability of reaching an agreement is higher, but based on reduced objectives.

From the point of view of a strong coalition ( $t_2^+$ -coalition), the absence of the possibility of scission increases its credibility vis-à-vis the leader. Since the  $t_2^+$ -coalition knows its informational power, it will choose, if this option is available, not to have the possibility of scission to make this power effective. This alternative is even more attractive since this commitment implies significant transfers. Thus, it becomes possible to explain the stability of the coalition based on the capacity of the members of the coalition to preserve their private

information. The asymmetry of information strategically favors them as long as they remain within the same coalition. Producing a scission will automatically reveal the characteristics of the coalition. Thus, in spite of the asymmetry of information, the game will turn in favor of the leader. On the contrary, banning the possibility of a scission forces the leader into a negotiation with a reduced probability of reaching an agreement, and forces him to propose a high amount of transfers.

Coming back to our examples, we have shown that when negotiating with the United States the European Union should try to preclude any scission if it wants to keep the advantages of its private information and to have high chances to obtain an important transfer (e.g. political concessions). Of course, on the other hand, the United States are interested in “dividing to conquer” if the scission is possible. As stated above, the G77 and China have tried to follow the first line in climate change negotiations, while the National Football League followed the second line in the 1981’s labor negotiations.

#### **4. Conclusion**

This paper has analyzed strategic bargaining in negotiations between non-monolithic players, in the sense that the agents starting negotiations can split-up in smaller entities during the bargaining process. We have shown that the possibility of scission in the informed coalition implies that it loses its information advantages. We have also shown that with the possibility of scission the uninformed player does not focus on his or her beliefs about the strength of the informed coalition but on the proportion of weak/strong players within this coalition. Finally, we have shown that the absence of the possibility of scission increases the chances to obtain an agreement based on high amount of transfers, while the possibility of scission increases the chances to obtain an agreement, but based on more modest objectives. Examples in international negotiations on global public goods, such as war against international terrorism or climate change, and in wage negotiations have shown the relevance of explicitly considering the possibility of scission when modeling negotiations between non-monolithic players (i.e. a coalition of countries, such as the European Union or the G77 and China, or a trade union).

## References

- Bloch, F., 1996. Sequential Formation of Coalitions in Games with Externalities and Fixed Payoff Division. *Games and Economic Behavior* 14: 90-123.
- Caparrós A., Péreau J.C. and Tazdaït T., 2004. North-South Climate Change Negotiations: A Sequential Game with Asymmetric Information. *Public Choice* 121: 455-480.
- Chatterjee, K., Dutta, B., Ray, D. and Sengupta, K., 1993. A Noncooperative Theory of Coalitional Bargaining. *Review of Economic Studies* 60: 463-477.
- Fudenberg, D. and Tirole, J., 1983, Sequential Bargaining with Incomplete Information, *Review of Economic Studies* 50, 221-247.
- Garfinkel, M.R., 2004. Stable alliance formation in distributional conflict. *European Journal of Political Economy* 20: 829-852.
- Lax, D. and Sebenius, J.K., 1992. Thinking coalitionally: parthy arithmetic, process opportunism, and strategic sequencing. In: H-P. Young (ed.) *Negotiation Analysis*. The University of Michigan Press, Michigan.
- Manzini, P. and Mariotti, M., 2005. Alliances and Negotiations. *Journal of Economic Theory* 121(1): 128-141.
- Perea y Monsuwé, P., Jansen, M. and Vermeulen, D., 2000. Player Splitting in Extensive Form Games. *International Journal of Game Theory* 29: 433-450.
- Perry M. and Reny P., 1994. A Non-Cooperative View of Coalition Formation and the Core. *Econometrica* 62: 795-817.
- Ray D. and Vohra R., 1999. A Theory of Endogenous coalition Structure. *Games and Economic Behavior* 26: 286-336.
- Riker, W., 1962. *The Theory of Political Coalitions*. Yale University Press, New Haven.
- Rubinstein, A., 1982. Perfect Equilibrium in a Bargaining Model. *Econometrica* 50: 97-108.
- Sandler, T. and Hartley, K., 2001. Economics of alliances: the lessons for collective action. *Journal of Economic Literature* 39: 869-896.
- Selten, R., 1965. Spieltheoretische Behandlung eines Oligopolmodelles mit Nachfrageträgheit. *Zeitschrift für die Gesamte Staatswissenschaft* 12: 301-324.

## Appendix 1: Proof of proposition (2)

- Suppose an equilibrium in which the transfer announced during the first period by the leader is  $t_1 \in [t_2^-, t_2^+]$ . If this transfer is refused, the leader reviews its beliefs with Bayes' rule:

$$p_{11}^- = \frac{p(e_2^-, r/t_1)}{p(r)} = \frac{\mathbf{m}_2(r/t_2^-, t_1) p_1^-}{p(r)},$$

with:

$$p(r) = \mathbf{m}_2(r/t_2^-, t_1) p_1^- + \mathbf{m}_2(r/t_2^+, t_1) p_1^+.$$

Since  $\mathbf{m}_2(r/t_2^+, t_1) = 1$  for  $t_1 < t_2^+$ , we get:

$$p_{11}^- = \frac{\mathbf{m}_2(r/t_2^-, t_1) p_1^-}{\mathbf{m}_2(r/t_2^-, t_1) p_1^- + p_1^+} \quad \text{and} \quad p_{11}^+ = 1 - p_{11}^- = \frac{p_1^+}{\mathbf{m}_2(r/t_2^-, t_1) p_1^- + p_1^+}.$$

Since we are in the case where:  $p_1^+ > G$ , for any  $t_1 \in [t_2^-, t_2^+]$  and for any  $\mathbf{m}_2(r/t_2^-, t_1)$ , we have

$p_{11}^- < p_1^-$ ,  $p_{11}^+ > p_1^+$  and  $E p_{11}^+ > E p_{11}^- \geq E p_{11}^-$ . This last condition gives:

$$p_{11}^- p_1 (e_1^- + e_2^-, t_2^+) + p_{11}^+ p_1 (e_1^- + e_2^+, t_2^+) > p_{11}^- p_1 (e_1^+ + e_2^-, t_2^-) \geq p_{11}^+ p_1 (e_1^+ + e_2^-, t_2^-).$$

The left hand side of the inequality is the net expected gain of the leader at the second period, estimated at the beginning of the second period when  $t_2^+$  was proposed. The right hand side represents the net gain when  $t_2^-$  was proposed. Thus, for any equilibrium satisfying  $t_1 \in [t_2^-, t_2^+]$  and where the coalition refuses the offer, the leader will propose  $t_2^+$  in the second period.

- In any equilibrium with  $t_1 \in [t_2^-, t_2^+]$ , only the  $t_2^-$ -coalition could accept the offer in the first period and, by definition of  $\hat{t}_2$ , we have  $\mathbf{m}_2(a/t_2^-, t_1) = 1$  if  $t_1 \geq \hat{t}_2$ ,  $= 0$  otherwise. Proposition (2) indicates the coalition's behavior in the second period. In any equilibrium of this kind, the expected gain for the leader is:  $p_{11}^- p_1 (e_1^+ + e_2^-, t_1) + d_1 p_{11}^+ p_1 (e_1^- + e_2^+, t_2^+)$  if  $t_1 \geq \hat{t}_2$ .

- The leader is not interested in deviating from this equilibrium. Since his characteristics are known by the coalition, he cannot modify the coalition's beliefs by playing a strategy outside the equilibrium.

- The coalition is not interested in deviating from the equilibrium either. A deviation consists for the coalition in changing its response to the first proposition of the leader. However, since the leader will play at the equilibrium, in any case,  $t_2^+$  in the second period, such deviation is unfavorable for the coalition.

## Appendix 2: Proof of proposition (3)

- If  $t_1 = t_2^+$ , the coalition accepts the offer whatever its type. Indeed:  $\mathbf{m}_2(a/t_2, t_2^+) = 1 \quad \forall t_2 \geq t_2^+$ . The negotiation is over in the first period and the net gain for the leader is:

$$E\mathbf{p}_1^+ = p_1^- \mathbf{p}_1(e_1^- + e_2^-, t_2^+) + p_1^+ \mathbf{p}_1(e_1^- + e_2^+, t_2^+).$$

- If  $t_1 \in [\hat{t}_2, t_2^+]$ , by definition of  $\hat{t}_2$ , the coalition does not accept if it is an  $t_2^-$ -type, since in this case  $\mathbf{m}_2(a/t_2^-, t_1) = 1$ , by definition of  $\hat{t}_2$  since in all cases  $t_2 \leq t_2^+$ . On the contrary, if the coalition is a  $t_2^+$ -type, it will refuse the offer since  $\mathbf{m}_2(a/t_2^+, t_1) = 0$ . Hence:  $p_{11}^+ = 1$ . Thus, in case of refusal in the first period, the leader knows that it faces a  $t_2^+$ -coalition and will propose  $t_2^+$ . Their expected gain is  $p_1^- \mathbf{p}_1(e_1^+ + e_2^-, t_1) + \mathbf{d}_1 p_1^+ \mathbf{p}_1(e_1^- + e_2^+, t_2^+)$ . This expression is maximal for  $t_1 = \hat{t}_2$ .

- If  $\hat{t}_2 > t_1 \geq t_2^-$ , we will suppose that the proposition  $t_1$  has been refused, in order to determine the offer in the second period. In this case:  $\mathbf{m}_2(a/t_2^+, t_1) = 0$ .

Let  $\mathbf{g}$  be the value of  $\mathbf{m}_2(a/t_2^-, t_1)$  that leaves the leader indifferent between  $t_2^-$  and  $t_2^+$  in the second period when the  $t_2^+$ -coalition refuses  $t_1$ .

As shown in appendix (1), the reviewed distribution of probabilities of the leader about the type of the coalition is:

$$p_{11}^- = \frac{(1-\mathbf{g})p_1^-}{(1-\mathbf{g})p_1^- + p_1^+} = \frac{(1-\mathbf{g})p_1^-}{1-\mathbf{g}p_1^-} \quad \text{and} \quad p_{11}^+ = 1 - p_{11}^- = \frac{1-p_1^-}{1-\mathbf{g}p_1^-}.$$

But, since the leader is indifferent about the gains obtained by strategies  $t_{11} = t_2^+$  and  $t_{11} = t_2^-$ ,  $\mathbf{g}$  satisfies:

$$\frac{p_1^+}{1-\mathbf{g}p_1^-} \mathbf{p}_1(e_1^- + e_2^+, t_2^+) + \frac{(1-\mathbf{g})p_1^-}{1-\mathbf{g}p_1^-} \mathbf{p}_1(e_1^- + e_2^-, t_2^+) = \frac{(1-\mathbf{g})p_1^-}{1-\mathbf{g}p_1^-} \mathbf{p}_1(e_1^+ + e_2^-, t_2^-)$$

or:

$$\mathbf{g} = \frac{G - p_1^+}{G(1-p_1^+)} < 1.$$

Hence, we will show that when  $\hat{t}_2 > t_1 \geq t_2^-$ :

$$\mathbf{m}_2(a/t_2^-, t_1) = \mathbf{g}.$$

We know that undominated pure strategies of the leader in the second period are  $t_{11} = t_2^+$  and  $t_{11} = t_2^-$ . Thus,  $t_2^+$  is preferred to  $t_2^-$  if and only if:



$$\mathbf{m}_2(a/t_2^-, t_1) > \frac{G - p_1^+}{G(1 - p_1^+)} .$$

In general: (i) the leader plays  $t_{11}(t_1) = t_2^+$  if and only if  $\mathbf{m}_2(a/t_2^-, t_1) > \mathbf{g}$ ; (ii) plays  $t_{11}(t_1) = t_2^-$  if and only if  $\mathbf{m}_2(a/t_2^-, t_1) < \mathbf{g}$ ; and (iii) plays some mixed strategy on  $[t_2^-, t_2^+]$ , that we note  $[\mathbf{e}(t_1), 1 - \mathbf{e}(t_1)]$ , if and only if  $\mathbf{m}_2(a/t_2^-, t_1) = \mathbf{g}$ . Consequently, three cases have to be considered.

*1<sup>st</sup> case:*  $\mathbf{m}_2(a/t_2^-, t_1) > \mathbf{g}$ .

In this case the leader plays  $t_{11}(t_1) = t_2^+$  in the second period. The  $t_2^-$ -coalition which anticipates this strategy, never accepts a proposition  $t_1 < \hat{t}_2$  in the first period. Hence,  $\forall t_1 \in [t_2^-, \hat{t}_2[$   $\mathbf{m}_2(a/t_2^-, t_1) = 0$ , which contradicts the hypothesis  $\mathbf{m}_2(a/t_2^-, t_1) > \mathbf{g}$ . Thus, this case is impossible.

*2<sup>nd</sup> case:*  $\mathbf{m}_2(a/t_2^-, t_1) < \mathbf{g}$ .

The coalition knows that the leader will propose  $t_{11} = t_2^-$  in the second period. They are interested in accepting any offer  $t_1 \in [t_2^-, \hat{t}_2[$ . Hence,  $\mathbf{m}_2(a/t_2^-, t_1) = 1 \forall t_1 \in [t_2^-, \hat{t}_2[$ , and we find another contradiction. Thus,  $\forall t_1 \in [t_2^-, \hat{t}_2[$  we must have:

$$\mathbf{m}_2(a/t_2^-, t_1) = \gamma .$$

In this case both coalitions adopt a mixed strategy. The question is now how to make the associated probabilities compatible to get a perfect Bayesian equilibrium.

Since the  $t_2^-$ -coalition plays a mixed strategy (to accept the strategy  $t_1$  with a probability  $\mathbf{g} \in ]0, 1[$ ), it is indifferent about accepting  $t_1$  or refusing  $t_1$ . If it accepts, its net gain is:  $\mathbf{p}_2(e_1^+ + e_2^-, t_1)$ . If it refuses, its expected net gain is:

$$E\mathbf{p}_2(e_1^+ + e_2^-, t_{11}) = \mathbf{d}_2[\mathbf{e}(t_1)\mathbf{p}_2(e_1^+ + e_2^-, t_1^-) + (1 - \mathbf{e}(t_1))\mathbf{p}_2(e_1^- + e_2^-, t_2^+)] .$$

Thus, we must have:

$$\mathbf{p}_2(e_1^+ + e_2^-, t_1) = E\mathbf{p}_2(e_1^+ + e_2^-, t_{11}) ,$$

or:

$$\mathbf{e}(t_1) = \frac{\mathbf{p}_2(e_1^+ + e_2^-, t_1) - \mathbf{d}_2\mathbf{p}_2(e_1^- + e_2^-, t_2^+)}{\mathbf{d}_2[B_2(e_1^+ + e_2^-, t_2^-) - B_2(e_1^- + e_2^-, t_2^+)]} .$$

Since we know the values of  $\mathbf{g}$  and  $\mathbf{e}(t_1)$ , we can calculate the expected gain for the leader associated to this mixed strategy:

$$Ep_1 = p_1 g_1 p_1 (e_1^+ + e_2^-, t_1) + \frac{(1-g)p_1^-}{1-gp_1^-} d_1 p_1 (e_1^+ + e_2^-, t_2^-).$$

This gain is maximized with  $t_1 = t_2^-$ . Thus, the leader adopts the strategy:  $t_1 = t_2^-$ ,  $t_{11}(t_1) = t_2^-$  with a probability  $e(t_1)$ , and  $t_{11}(t_1) = t_2^+$  with the complementary probability.

### Appendix 3: Proof of proposition (5)

To have a complete proof, follow the same reasoning as for proposition (2). We will just show that in the second period, the leader will propose  $t_2^+$  under condition (16). We consider the case in which: (i) the offer  $t_1$  has been refused, and (ii) the leader reviews its beliefs according to Bayes' rule and adopts the optimal strategy  $t_{11}(t_1) = t_2^+$  if and only if  $Ep_{11}^+ > Ep_{11}^-$ . Thus:

$$p_{11}^- = \frac{\mathbf{m}_2(r/t_2^-, t_1)(2-\mathbf{b})p_1^-}{p(r)} \quad \text{and} \quad p_{11}^+ = \frac{\mathbf{b}p_1^+}{p(r)},$$

with:

$$\begin{aligned} p(r) &= \mathbf{m}_2(r/t_2^-, t_1)p_1^- + \mathbf{m}_2(r/t_2^-, t_1)(1-\mathbf{b})p_1^- + \mathbf{m}_2(r/t_2^+ - t_2^-, t_1)\mathbf{b}p_1^+ \\ &= \mathbf{m}_2(r/t_2^-, t_1)(2-\mathbf{b})p_1^- + \mathbf{b}p_1^+ \end{aligned}$$

Condition (16) can be deduced from the following inequalities:

$$p_{11}^- < p_1^- \quad \text{and} \quad p_{11}^+ > p_1^+ \quad .$$

# NOTE DI LAVORO DELLA FONDAZIONE ENI ENRICO MATTEI

## Fondazione Eni Enrico Mattei Working Paper Series

Our Note di Lavoro are available on the Internet at the following addresses:

<http://www.feem.it/Feem/Pub/Publications/WPapers/default.html>

<http://www.ssrn.com/link/feem.html>

<http://www.repec.org>

## NOTE DI LAVORO PUBLISHED IN 2004

IEM	1.2004	Anil MARKANDYA, Suzette PEDROSO and Alexander GOLUB: <u>Empirical Analysis of National Income and So2 Emissions in Selected European Countries</u>
ETA	2.2004	Masahisa FUJITA and Shlomo WEBER: <u>Strategic Immigration Policies and Welfare in Heterogeneous Countries</u>
PRA	3.2004	Adolfo DI CARLUCCIO, Giovanni FERRI, Cecilia FRALE and Ottavio RICCHI: <u>Do Privatizations Boost Household Shareholding? Evidence from Italy</u>
ETA	4.2004	Victor GINSBURGH and Shlomo WEBER: <u>Languages Disenfranchisement in the European Union</u>
ETA	5.2004	Romano PIRAS: <u>Growth, Congestion of Public Goods, and Second-Best Optimal Policy</u>
CCMP	6.2004	Herman R.J. VOLLEBERGH: <u>Lessons from the Polder: Is Dutch CO2-Taxation Optimal</u>
PRA	7.2004	Sandro BRUSCO, Giuseppe LOPOMO and S. VISWANATHAN (lxv): <u>Merger Mechanisms</u>
PRA	8.2004	Wolfgang AUSENNEGG, Pegaret PICHLER and Alex STOMPER (lxv): <u>IPO Pricing with Bookbuilding, and a When-Issued Market</u>
PRA	9.2004	Pegaret PICHLER and Alex STOMPER (lxv): <u>Primary Market Design: Direct Mechanisms and Markets</u>
PRA	10.2004	Florian ENGLMAIER, Pablo GUILLEN, Loreto LLORENTE, Sander ONDERSTAL and Rupert SAUSGRUBER (lxv): <u>The Chopstick Auction: A Study of the Exposure Problem in Multi-Unit Auctions</u>
PRA	11.2004	Bjarne BRENDSTRUP and Harry J. PAARSCH (lxv): <u>Nonparametric Identification and Estimation of Multi-Unit, Sequential, Oral, Ascending-Price Auctions With Asymmetric Bidders</u>
PRA	12.2004	Ohad KADAN (lxv): <u>Equilibrium in the Two Player, k-Double Auction with Affiliated Private Values</u>
PRA	13.2004	Maarten C.W. JANSSEN (lxv): <u>Auctions as Coordination Devices</u>
PRA	14.2004	Gadi FIBICH, Arie GAVIOUS and Aner SELA (lxv): <u>All-Pay Auctions with Weakly Risk-Averse Buyers</u>
PRA	15.2004	Orly SADE, Charles SCHNITZLEIN and Jaime F. ZENDER (lxv): <u>Competition and Cooperation in Divisible Good Auctions: An Experimental Examination</u>
PRA	16.2004	Marta STRYSZOWSKA (lxv): <u>Late and Multiple Bidding in Competing Second Price Internet Auctions</u>
CCMP	17.2004	Slim Ben YOUSSEF: <u>R&amp;D in Cleaner Technology and International Trade</u>
NRM	18.2004	Angelo ANTOCI, Simone BORGHESI and Paolo RUSSU (lxvi): <u>Biodiversity and Economic Growth: Stabilization Versus Preservation of the Ecological Dynamics</u>
SIEV	19.2004	Anna ALBERINI, Paolo ROSATO, Alberto LONGO and Valentina ZANATTA: <u>Information and Willingness to Pay in a Contingent Valuation Study: The Value of S. Erasmo in the Lagoon of Venice</u>
NRM	20.2004	Guido CANDELA and Roberto CELLINI (lxvii): <u>Investment in Tourism Market: A Dynamic Model of Differentiated Oligopoly</u>
NRM	21.2004	Jacqueline M. HAMILTON (lxvii): <u>Climate and the Destination Choice of German Tourists</u>
NRM	22.2004	Javier Rey-MAQUIEIRA PALMER, Javier LOZANO IBÁÑEZ and Carlos Mario GÓMEZ GÓMEZ (lxvii): <u>Land, Environmental Externalities and Tourism Development</u>
NRM	23.2004	Pius ODUNGA and Henk FOLMER (lxvii): <u>Profiling Tourists for Balanced Utilization of Tourism-Based Resources in Kenya</u>
NRM	24.2004	Jean-Jacques NOWAK, Mondher SAHLI and Pasquale M. SGRO (lxvii): <u>Tourism, Trade and Domestic Welfare</u>
NRM	25.2004	Riaz SHAREEF (lxvii): <u>Country Risk Ratings of Small Island Tourism Economies</u>
NRM	26.2004	Juan Luis EUGENIO-MARTÍN, Noelia MARTÍN MORALES and Riccardo SCARPA (lxvii): <u>Tourism and Economic Growth in Latin American Countries: A Panel Data Approach</u>
NRM	27.2004	Raúl Hernández MARTÍN (lxvii): <u>Impact of Tourism Consumption on GDP. The Role of Imports</u>
CSRM	28.2004	Nicoletta FERRO: <u>Cross-Country Ethical Dilemmas in Business: A Descriptive Framework</u>
NRM	29.2004	Marian WEBER (lxvi): <u>Assessing the Effectiveness of Tradable Landuse Rights for Biodiversity Conservation: an Application to Canada's Boreal Mixedwood Forest</u>
NRM	30.2004	Trond BJORN DAL, Phoebe KOUNDOURI and Sean PASCOE (lxvi): <u>Output Substitution in Multi-Species Trawl Fisheries: Implications for Quota Setting</u>
CCMP	31.2004	Marzio GALEOTTI, Alessandra GORIA, Paolo MOMBRINI and Evi SPANTIDAKI: <u>Weather Impacts on Natural, Social and Economic Systems (WISE) Part I: Sectoral Analysis of Climate Impacts in Italy</u>
CCMP	32.2004	Marzio GALEOTTI, Alessandra GORIA, Paolo MOMBRINI and Evi SPANTIDAKI: <u>Weather Impacts on Natural, Social and Economic Systems (WISE) Part II: Individual Perception of Climate Extremes in Italy</u>
CTN	33.2004	Wilson PEREZ: <u>Divide and Conquer: Noisy Communication in Networks, Power, and Wealth Distribution</u>
KTHC	34.2004	Gianmarco I.P. OTTAVIANO and Giovanni PERI (lxviii): <u>The Economic Value of Cultural Diversity: Evidence from US Cities</u>
KTHC	35.2004	Linda CHAIB (lxviii): <u>Immigration and Local Urban Participatory Democracy: A Boston-Paris Comparison</u>

KTHC	36.2004	<i>Franca ECKERT COEN and Claudio ROSSI (Ixviii): <u>Foreigners, Immigrants, Host Cities: The Policies of Multi-Ethnicity in Rome. Reading Governance in a Local Context</u></i>
KTHC	37.2004	<i>Kristine CRANE (Ixviii): <u>Governing Migration: Immigrant Groups' Strategies in Three Italian Cities – Rome, Naples and Bari</u></i>
KTHC	38.2004	<i>Kiflemariam HAMDE (Ixviii): <u>Mind in Africa, Body in Europe: The Struggle for Maintaining and Transforming Cultural Identity - A Note from the Experience of Eritrean Immigrants in Stockholm</u></i>
ETA	39.2004	<i>Alberto CAVALIERE: <u>Price Competition with Information Disparities in a Vertically Differentiated Duopoly</u></i>
PRA	40.2004	<i>Andrea BIGANO and Stef PROOST: <u>The Opening of the European Electricity Market and Environmental Policy: Does the Degree of Competition Matter?</u></i>
CCMP	41.2004	<i>Micheal FINUS (Ixix): <u>International Cooperation to Resolve International Pollution Problems</u></i>
KTHC	42.2004	<i>Francesco CRESPI: <u>Notes on the Determinants of Innovation: A Multi-Perspective Analysis</u></i>
CTN	43.2004	<i>Sergio CURRARINI and Marco MARINI: <u>Coalition Formation in Games without Synergies</u></i>
CTN	44.2004	<i>Marc ESCRIHUELA-VILLAR: <u>Cartel Sustainability and Cartel Stability</u></i>
NRM	45.2004	<i>Sebastian BERVOETS and Nicolas GRAVEL (Ixvi): <u>Appraising Diversity with an Ordinal Notion of Similarity: An Axiomatic Approach</u></i>
NRM	46.2004	<i>Signe ANTHON and Bo JELLES MARK THORSEN (Ixvi): <u>Optimal Afforestation Contracts with Asymmetric Information on Private Environmental Benefits</u></i>
NRM	47.2004	<i>John MBURU (Ixvi): <u>Wildlife Conservation and Management in Kenya: Towards a Co-management Approach</u></i>
NRM	48.2004	<i>Ekin BIROL, Ágnes GYÓVAI and Melinda SMALE (Ixvi): <u>Using a Choice Experiment to Value Agricultural Biodiversity on Hungarian Small Farms: Agri-Environmental Policies in a Transition al Economy</u></i>
CCMP	49.2004	<i>Gernot KLEPPER and Sonja PETERSON: <u>The EU Emissions Trading Scheme. Allowance Prices, Trade Flows, Competitiveness Effects</u></i>
GG	50.2004	<i>Scott BARRETT and Michael HOEL: <u>Optimal Disease Eradication</u></i>
CTN	51.2004	<i>Dinko DIMITROV, Peter BORM, Ruud HENDRICKX and Shao CHIN SUNG: <u>Simple Priorities and Core Stability in Hedonic Games</u></i>
SIEV	52.2004	<i>Francesco RICCI: <u>Channels of Transmission of Environmental Policy to Economic Growth: A Survey of the Theory</u></i>
SIEV	53.2004	<i>Anna ALBERINI, Maureen CROPPER, Alan KRUPNICK and Nathalie B. SIMON: <u>Willingness to Pay for Mortality Risk Reductions: Does Latency Matter?</u></i>
NRM	54.2004	<i>Ingo BRÄUER and Rainer MARGGRAF (Ixvi): <u>Valuation of Ecosystem Services Provided by Biodiversity Conservation: An Integrated Hydrological and Economic Model to Value the Enhanced Nitrogen Retention in Renaturated Streams</u></i>
NRM	55.2004	<i>Timo GOESCHL and Tun LIN (Ixvi): <u>Biodiversity Conservation on Private Lands: Information Problems and Regulatory Choices</u></i>
NRM	56.2004	<i>Tom DEDEURWAERDERE (Ixvi): <u>Bioprospection: From the Economics of Contracts to Reflexive Governance</u></i>
CCMP	57.2004	<i>Katrin REHDANZ and David MADDISON: <u>The Amenity Value of Climate to German Households</u></i>
CCMP	58.2004	<i>Koen SMEKENS and Bob VAN DER ZWAAN: <u>Environmental Externalities of Geological Carbon Sequestration Effects on Energy Scenarios</u></i>
NRM	59.2004	<i>Valentina BOSETTI, Mariaester CASSINELLI and Alessandro LANZA (Ixvii): <u>Using Data Envelopment Analysis to Evaluate Environmentally Conscious Tourism Management</u></i>
NRM	60.2004	<i>Timo GOESCHL and Danilo CAMARGO IGLIORI (Ixvi): <u>Property Rights Conservation and Development: An Analysis of Extractive Reserves in the Brazilian Amazon</u></i>
CCMP	61.2004	<i>Barbara BUCHNER and Carlo CARRARO: <u>Economic and Environmental Effectiveness of a Technology-based Climate Protocol</u></i>
NRM	62.2004	<i>Elissaios PAPYRAKIS and Reyer GERLAGH: <u>Resource-Abundance and Economic Growth in the U.S.</u></i>
NRM	63.2004	<i>Györgyi BELA, György PATAKI, Melinda SMALE and Mariann HAJDÚ (Ixvi): <u>Conserving Crop Genetic Resources on Smallholder Farms in Hungary: Institutional Analysis</u></i>
NRM	64.2004	<i>E.C.M. RUIJGROK and E.E.M. NILLESEN (Ixvi): <u>The Socio-Economic Value of Natural Riverbanks in the Netherlands</u></i>
NRM	65.2004	<i>E.C.M. RUIJGROK (Ixvi): <u>Reducing Acidification: The Benefits of Increased Nature Quality. Investigating the Possibilities of the Contingent Valuation Method</u></i>
ETA	66.2004	<i>Giannis VARDAS and Anastasios XEPAPADEAS: <u>Uncertainty Aversion, Robust Control and Asset Holdings</u></i>
GG	67.2004	<i>Anastasios XEPAPADEAS and Constadina PASSA: <u>Participation in and Compliance with Public Voluntary Environmental Programs: An Evolutionary Approach</u></i>
GG	68.2004	<i>Michael FINUS: <u>Modesty Pays: Sometimes!</u></i>
NRM	69.2004	<i>Trond BJØRNDAL and Ana BRASÃO: <u>The Northern Atlantic Bluefin Tuna Fisheries: Management and Policy Implications</u></i>
CTN	70.2004	<i>Alejandro CAPARRÓS, Abdelhakim HAMMOUDI and Tarik TAZDAÏT: <u>On Coalition Formation with Heterogeneous Agents</u></i>
IEM	71.2004	<i>Massimo GIOVANNINI, Margherita GRASSO, Alessandro LANZA and Matteo MANERA: <u>Conditional Correlations in the Returns on Oil Companies Stock Prices and Their Determinants</u></i>
IEM	72.2004	<i>Alessandro LANZA, Matteo MANERA and Michael MCALEER: <u>Modelling Dynamic Conditional Correlations in WTI Oil Forward and Futures Returns</u></i>
SIEV	73.2004	<i>Margarita GENIUS and Elisabetta STRAZZERA: <u>The Copula Approach to Sample Selection Modelling: An Application to the Recreational Value of Forests</u></i>

CCMP	74.2004	<i>Rob DELLINK and Ekko van IERLAND</i> : <u>Pollution Abatement in the Netherlands: A Dynamic Applied General Equilibrium Assessment</u>
ETA	75.2004	<i>Rosella LEVAGGI and Michele MORETTO</i> : <u>Investment in Hospital Care Technology under Different Purchasing Rules: A Real Option Approach</u>
CTN	76.2004	<i>Salvador BARBERÀ and Matthew O. JACKSON</i> (lxx): <u>On the Weights of Nations: Assigning Voting Weights in a Heterogeneous Union</u>
CTN	77.2004	<i>Àlex ARENAS, Antonio CABRALES, Albert DÍAZ-GUILERA, Roger GUIMERA and Fernando VEGA-REDONDO</i> (lxx): <u>Optimal Information Transmission in Organizations: Search and Congestion</u>
CTN	78.2004	<i>Francis BLOCH and Armando GOMES</i> (lxx): <u>Contracting with Externalities and Outside Options</u>
CTN	79.2004	<i>Rabah AMIR, Effrosyni DIAMANTOUDI and Licun XUE</i> (lxx): <u>Merger Performance under Uncertain Efficiency Gains</u>
CTN	80.2004	<i>Francis BLOCH and Matthew O. JACKSON</i> (lxx): <u>The Formation of Networks with Transfers among Players</u>
CTN	81.2004	<i>Daniel DIERMEIER, Hülya ERASLAN and Antonio MERLO</i> (lxx): <u>Bicameralism and Government Formation</u>
CTN	82.2004	<i>Rod GARRATT, James E. PARCO, Cheng-ZHONG QIN and Amnon RAPOPORT</i> (lxx): <u>Potential Maximization and Coalition Government Formation</u>
CTN	83.2004	<i>Kfir ELIAZ, Debraj RAY and Ronny RAZIN</i> (lxx): <u>Group Decision-Making in the Shadow of Disagreement</u>
CTN	84.2004	<i>Sanjeev GOYAL, Marco van der LEIJ and José Luis MORAGA-GONZÁLEZ</i> (lxx): <u>Economics: An Emerging Small World?</u>
CTN	85.2004	<i>Edward CARTWRIGHT</i> (lxx): <u>Learning to Play Approximate Nash Equilibria in Games with Many Players</u>
IEM	86.2004	<i>Finn R. FØRSUND and Michael HOEL</i> : <u>Properties of a Non-Competitive Electricity Market Dominated by Hydroelectric Power</u>
KTHC	87.2004	<i>Elissaios PAPYRAKIS and Reyer GERLAGH</i> : <u>Natural Resources, Investment and Long-Term Income</u>
CCMP	88.2004	<i>Marzio GALEOTTI and Claudia KEMFERT</i> : <u>Interactions between Climate and Trade Policies: A Survey</u>
IEM	89.2004	<i>A. MARKANDYA, S. PEDROSO and D. STREIMIKIENE</i> : <u>Energy Efficiency in Transition Economies: Is There Convergence Towards the EU Average?</u>
GG	90.2004	<i>Rolf GOLOMBEK and Michael HOEL</i> : <u>Climate Agreements and Technology Policy</u>
PRA	91.2004	<i>Sergei IZMALKOV</i> (lxv): <u>Multi-Unit Open Ascending Price Efficient Auction</u>
KTHC	92.2004	<i>Gianmarco I.P. OTTAVIANO and Giovanni PERI</i> : <u>Cities and Cultures</u>
KTHC	93.2004	<i>Massimo DEL GATTO</i> : <u>Agglomeration, Integration, and Territorial Authority Scale in a System of Trading Cities. Centralisation versus devolution</u>
CCMP	94.2004	<i>Pierre-André JOUVET, Philippe MICHEL and Gilles ROTILLON</i> : <u>Equilibrium with a Market of Permits</u>
CCMP	95.2004	<i>Bob van der ZWAAN and Reyer GERLAGH</i> : <u>Climate Uncertainty and the Necessity to Transform Global Energy Supply</u>
CCMP	96.2004	<i>Francesco BOSELLO, Marco LAZZARIN, Roberto ROSON and Richard S.J. TOL</i> : <u>Economy-Wide Estimates of the Implications of Climate Change: Sea Level Rise</u>
CTN	97.2004	<i>Gustavo BERGANTIÑOS and Juan J. VIDAL-PUGA</i> : <u>Defining Rules in Cost Spanning Tree Problems Through the Canonical Form</u>
CTN	98.2004	<i>Siddhartha BANDYOPADHYAY and Mandar OAK</i> : <u>Party Formation and Coalitional Bargaining in a Model of Proportional Representation</u>
GG	99.2004	<i>Hans-Peter WEIKARD, Michael FINUS and Juan-Carlos ALTAMIRANO-CABRERA</i> : <u>The Impact of Surplus Sharing on the Stability of International Climate Agreements</u>
SIEV	100.2004	<i>Chiara M. TRAVISI and Peter NIJKAMP</i> : <u>Willingness to Pay for Agricultural Environmental Safety: Evidence from a Survey of Milan, Italy, Residents</u>
SIEV	101.2004	<i>Chiara M. TRAVISI, Raymond J. G. M. FLORAX and Peter NIJKAMP</i> : <u>A Meta-Analysis of the Willingness to Pay for Reductions in Pesticide Risk Exposure</u>
NRM	102.2004	<i>Valentina BOSETTI and David TOMBERLIN</i> : <u>Real Options Analysis of Fishing Fleet Dynamics: A Test</u>
CCMP	103.2004	<i>Alessandra GORIA e Gretel GAMBARELLI</i> : <u>Economic Evaluation of Climate Change Impacts and Adaptability in Italy</u>
PRA	104.2004	<i>Massimo FLORIO and Mara GRASSEN</i> : <u>The Missing Shock: The Macroeconomic Impact of British Privatisation</u>
PRA	105.2004	<i>John BENNETT, Saul ESTRIN, James MAW and Giovanni URG</i> : <u>Privatisation Methods and Economic Growth in Transition Economies</u>
PRA	106.2004	<i>Kira BÖRNER</i> : <u>The Political Economy of Privatization: Why Do Governments Want Reforms?</u>
PRA	107.2004	<i>Pehr-Johan NORBÄCK and Lars PERSSON</i> : <u>Privatization and Restructuring in Concentrated Markets</u>
SIEV	108.2004	<i>Angela GRANZOTTO, Fabio PRANOVI, Simone LIBRALATO, Patrizia TORRICELLI and Danilo MAINARDI</i> : <u>Comparison between Artisanal Fishery and Manila Clam Harvesting in the Venice Lagoon by Using Ecosystem Indicators: An Ecological Economics Perspective</u>
CTN	109.2004	<i>Somdeb LAHIRI</i> : <u>The Cooperative Theory of Two Sided Matching Problems: A Re-examination of Some Results</u>
NRM	110.2004	<i>Giuseppe DI VITA</i> : <u>Natural Resources Dynamics: Another Look</u>
SIEV	111.2004	<i>Anna ALBERINI, Alistair HUNT and Anil MARKANDYA</i> : <u>Willingness to Pay to Reduce Mortality Risks: Evidence from a Three-Country Contingent Valuation Study</u>
KTHC	112.2004	<i>Valeria PAPPONETTI and Dino PINELLI</i> : <u>Scientific Advice to Public Policy-Making</u>
SIEV	113.2004	<i>Paulo A.L.D. NUNES and Laura ONOFRI</i> : <u>The Economics of Warm Glow: A Note on Consumer's Behavior and Public Policy Implications</u>
IEM	114.2004	<i>Patrick CAYRADE</i> : <u>Investments in Gas Pipelines and Liquefied Natural Gas Infrastructure What is the Impact on the Security of Supply?</u>
IEM	115.2004	<i>Valeria COSTANTINI and Francesco GRACCEVA</i> : <u>Oil Security. Short- and Long-Term Policies</u>

ITEM	116.2004	<i>Valeria COSTANTINI and Francesco GRACCEVA: <u>Social Costs of Energy Disruptions</u></i>
ITEM	117.2004	<i>Christian EGENHOFER, Kyriakos GIALOGLOU, Giacomo LUCIANI, Maroeska BOOTS, Martin SCHEEPERS, Valeria COSTANTINI, Francesco GRACCEVA, Anil MARKANDYA and Giorgio VICINI: <u>Market-Based Options for Security of Energy Supply</u></i>
ITEM	118.2004	<i>David FISK: <u>Transport Energy Security. The Unseen Risk?</u></i>
ITEM	119.2004	<i>Giacomo LUCIANI: <u>Security of Supply for Natural Gas Markets. What is it and What is it not?</u></i>
ITEM	120.2004	<i>L.J. de VRIES and R.A. HAKVOORT: <u>The Question of Generation Adequacy in Liberalised Electricity Markets</u></i>
KTHC	121.2004	<i>Alberto PETRUCCI: <u>Asset Accumulation, Fertility Choice and Nondegenerate Dynamics in a Small Open Economy</u></i>
NRM	122.2004	<i>Carlo GIUPPONI, Jaroslav MYSLIAK and Anita FASSIO: <u>An Integrated Assessment Framework for Water Resources Management: A DSS Tool and a Pilot Study Application</u></i>
NRM	123.2004	<i>Margaretha BREIL, Anita FASSIO, Carlo GIUPPONI and Paolo ROSATO: <u>Evaluation of Urban Improvement on the Islands of the Venice Lagoon: A Spatially-Distributed Hedonic-Hierarchical Approach</u></i>
ETA	124.2004	<i>Paul MENSINK: <u>Instant Efficient Pollution Abatement Under Non-Linear Taxation and Asymmetric Information: The Differential Tax Revisited</u></i>
NRM	125.2004	<i>Mauro FABIANO, Gabriella CAMARSA, Rosanna DURSI, Roberta IVALDI, Valentina MARIN and Francesca PALMISANI: <u>Integrated Environmental Study for Beach Management: A Methodological Approach</u></i>
PRA	126.2004	<i>Irena GROSFELD and Iraj HASHI: <u>The Emergence of Large Shareholders in Mass Privatized Firms: Evidence from Poland and the Czech Republic</u></i>
CCMP	127.2004	<i>Maria BERRITTELLA, Andrea BIGANO, Roberto ROSON and Richard S.J. TOL: <u>A General Equilibrium Analysis of Climate Change Impacts on Tourism</u></i>
CCMP	128.2004	<i>Reyer GERLAGH: <u>A Climate-Change Policy Induced Shift from Innovations in Energy Production to Energy Savings</u></i>
NRM	129.2004	<i>Elissaios PAPYRAKIS and Reyer GERLAGH: <u>Natural Resources, Innovation, and Growth</u></i>
PRA	130.2004	<i>Bernardo BORTOLOTTI and Mara FACCIO: <u>Reluctant Privatization</u></i>
SIEV	131.2004	<i>Riccardo SCARPA and Mara THIENE: <u>Destination Choice Models for Rock Climbing in the Northeast Alps: A Latent-Class Approach Based on Intensity of Participation</u></i>
SIEV	132.2004	<i>Riccardo SCARPA Kenneth G. WILLIS and Melinda ACUTT: <u>Comparing Individual-Specific Benefit Estimates for Public Goods: Finite Versus Continuous Mixing in Logit Models</u></i>
ITEM	133.2004	<i>Santiago J. RUBIO: <u>On Capturing Oil Rents with a National Excise Tax Revisited</u></i>
ETA	134.2004	<i>Ascensión ANDINA DÍAZ: <u>Political Competition when Media Create Candidates' Charisma</u></i>
SIEV	135.2004	<i>Anna ALBERINI: <u>Robustness of VSL Values from Contingent Valuation Surveys</u></i>
CCMP	136.2004	<i>Gernot KLEPPER and Sonja PETERSON: <u>Marginal Abatement Cost Curves in General Equilibrium: The Influence of World Energy Prices</u></i>
ETA	137.2004	<i>Herbert DAWID, Christophe DEISSENBERG and Pavel ŠEVČIK: <u>Cheap Talk, Gullibility, and Welfare in an Environmental Taxation Game</u></i>
CCMP	138.2004	<i>ZhongXiang ZHANG: <u>The World Bank's Prototype Carbon Fund and China</u></i>
CCMP	139.2004	<i>Reyer GERLAGH and Marjan W. HOFKES: <u>Time Profile of Climate Change Stabilization Policy</u></i>
NRM	140.2004	<i>Chiara D'ALPAOS and Michele MORETTO: <u>The Value of Flexibility in the Italian Water Service Sector: A Real Option Analysis</u></i>
PRA	141.2004	<i>Patrick BAJARI, Stephanie HOUGHTON and Steven TADELIS (Ixxi): <u>Bidding for Incomplete Contracts</u></i>
PRA	142.2004	<i>Susan ATHEY, Jonathan LEVIN and Enrique SEIRA (Ixxi): <u>Comparing Open and Sealed Bid Auctions: Theory and Evidence from Timber Auctions</u></i>
PRA	143.2004	<i>David GOLDREICH (Ixxi): <u>Behavioral Biases of Dealers in U.S. Treasury Auctions</u></i>
PRA	144.2004	<i>Roberto BURGUET (Ixxi): <u>Optimal Procurement Auction for a Buyer with Downward Sloping Demand: More Simple Economics</u></i>
PRA	145.2004	<i>Ali HORTACSU and Samita SAREEN (Ixxi): <u>Order Flow and the Formation of Dealer Bids: An Analysis of Information and Strategic Behavior in the Government of Canada Securities Auctions</u></i>
PRA	146.2004	<i>Victor GINSBURGH, Patrick LEGROS and Nicolas SAHUGUET (Ixxi): <u>How to Win Twice at an Auction. On the Incidence of Commissions in Auction Markets</u></i>
PRA	147.2004	<i>Claudio MEZZETTI, Aleksandar PEKEČ and Ilia TSETLIN (Ixxi): <u>Sequential vs. Single-Round Uniform-Price Auctions</u></i>
PRA	148.2004	<i>John ASKER and Estelle CANTILLON (Ixxi): <u>Equilibrium of Scoring Auctions</u></i>
PRA	149.2004	<i>Philip A. HAILE, Han HONG and Matthew SHUM (Ixxi): <u>Nonparametric Tests for Common Values in First-Price Sealed-Bid Auctions</u></i>
PRA	150.2004	<i>François DEGEORGE, François DERRIEN and Kent L. WOMACK (Ixxi): <u>Quid Pro Quo in IPOs: Why Bookbuilding is Dominating Auctions</u></i>
CCMP	151.2004	<i>Barbara BUCHNER and Silvia DALL'OLIO: <u>Russia: The Long Road to Ratification. Internal Institution and Pressure Groups in the Kyoto Protocol's Adoption Process</u></i>
CCMP	152.2004	<i>Carlo CARRARO and Marzio GALEOTTI: <u>Does Endogenous Technical Change Make a Difference in Climate Policy Analysis? A Robustness Exercise with the FEEM-RICE Model</u></i>
PRA	153.2004	<i>Alejandro M. MANELLI and Daniel R. VINCENT (Ixxi): <u>Multidimensional Mechanism Design: Revenue Maximization and the Multiple-Good Monopoly</u></i>
ETA	154.2004	<i>Nicola ACOCELLA, Giovanni Di BARTOLOMEO and Wilfried PAUWELS: <u>Is there any Scope for Corporatism in Stabilization Policies?</u></i>
CTN	155.2004	<i>Johan EYCKMANS and Michael FINUS: <u>An Almost Ideal Sharing Scheme for Coalition Games with Externalities</u></i>
CCMP	156.2004	<i>Cesare DOSI and Michele MORETTO: <u>Environmental Innovation, War of Attrition and Investment Grants</u></i>

CCMP	157.2004	<i>Valentina BOSETTI, Marzio GALEOTTI and Alessandro LANZA: <u>How Consistent are Alternative Short-Term Climate Policies with Long-Term Goals?</u></i>
ETA	158.2004	<i>Y. Hossein FARZIN and Ken-Ichi AKAO: <u>Non-pecuniary Value of Employment and Individual Labor Supply</u></i>
ETA	159.2004	<i>William BROCK and Anastasios XEPAPADEAS: <u>Spatial Analysis: Development of Descriptive and Normative Methods with Applications to Economic-Ecological Modelling</u></i>
KTHC	160.2004	<i>Alberto PETRUCCI: <u>On the Incidence of a Tax on PureRent with Infinite Horizons</u></i>
IEM	161.2004	<i>Xavier LABANDEIRA, José M. LABEAGA and Miguel RODRÍGUEZ: <u>Microsimulating the Effects of Household Energy Price Changes in Spain</u></i>

#### NOTE DI LAVORO PUBLISHED IN 2005

CCMP	1.2005	<i>Stéphane HALLEGATTE: <u>Accounting for Extreme Events in the Economic Assessment of Climate Change</u></i>
CCMP	2.2005	<i>Qiang WU and Paulo Augusto NUNES: <u>Application of Technological Control Measures on Vehicle Pollution: A Cost-Benefit Analysis in China</u></i>
CCMP	3.2005	<i>Andrea BIGANO, Jacqueline M. HAMILTON, Maren LAU, Richard S.J. TOL and Yuan ZHOU: <u>A Global Database of Domestic and International Tourist Numbers at National and Subnational Level</u></i>
CCMP	4.2005	<i>Andrea BIGANO, Jacqueline M. HAMILTON and Richard S.J. TOL: <u>The Impact of Climate on Holiday Destination Choice</u></i>
ETA	5.2005	<i>Hubert KEMPF: <u>Is Inequality Harmful for the Environment in a Growing Economy?</u></i>
CCMP	6.2005	<i>Valentina BOSETTI, Carlo CARRARO and Marzio GALEOTTI: <u>The Dynamics of Carbon and Energy Intensity in a Model of Endogenous Technical Change</u></i>
IEM	7.2005	<i>David CALEF and Robert GOBLE: <u>The Allure of Technology: How France and California Promoted Electric Vehicles to Reduce Urban Air Pollution</u></i>
ETA	8.2005	<i>Lorenzo PELLEGRINI and Reyer GERLAGH: <u>An Empirical Contribution to the Debate on Corruption Democracy and Environmental Policy</u></i>
CCMP	9.2005	<i>Angelo ANTOCI: <u>Environmental Resources Depletion and Interplay Between Negative and Positive Externalities in a Growth Model</u></i>
CTN	10.2005	<i>Frédéric DEROLAN: <u>Cost-Reducing Alliances and Local Spillovers</u></i>
NRM	11.2005	<i>Francesco SINDICO: <u>The GMO Dispute before the WTO: Legal Implications for the Trade and Environment Debate</u></i>
KTHC	12.2005	<i>Carla MASSIDDA: <u>Estimating the New Keynesian Phillips Curve for Italian Manufacturing Sectors</u></i>
KTHC	13.2005	<i>Michele MORETTO and Gianpaolo ROSSINI: <u>Start-up Entry Strategies: Employer vs. Nonemployer firms</u></i>
PRCG	14.2005	<i>Clara GRAZIANO and Annalisa LUPORINI: <u>Ownership Concentration, Monitoring and Optimal Board Structure</u></i>
CSRM	15.2005	<i>Parashar KULKARNI: <u>Use of Ecolabels in Promoting Exports from Developing Countries to Developed Countries: Lessons from the Indian LeatherFootwear Industry</u></i>
KTHC	16.2005	<i>Adriana DI LIBERTO, Roberto MURA and Francesco PIGLIARU: <u>How to Measure the Unobservable: A Panel Technique for the Analysis of TFP Convergence</u></i>
KTHC	17.2005	<i>Alireza NAGHAVI: <u>Asymmetric Labor Markets, Southern Wages, and the Location of Firms</u></i>
KTHC	18.2005	<i>Alireza NAGHAVI: <u>Strategic Intellectual Property Rights Policy and North-South Technology Transfer</u></i>
KTHC	19.2005	<i>Mombert HOPPE: <u>Technology Transfer Through Trade</u></i>
PRCG	20.2005	<i>Roberto ROSON: <u>Platform Competition with Endogenous Multihoming</u></i>
CCMP	21.2005	<i>Barbara BUCHNER and Carlo CARRARO: <u>Regional and Sub-Global Climate Blocs. A Game Theoretic Perspective on Bottom-up Climate Regimes</u></i>
IEM	22.2005	<i>Fausto CAVALLARO: <u>An Integrated Multi-Criteria System to Assess Sustainable Energy Options: An Application of the Promethee Method</u></i>
CTN	23.2005	<i>Michael FINUS, Pierre v. MOUCHE and Bianca RUNDSHAGEN: <u>Uniqueness of Coalitional Equilibria</u></i>
IEM	24.2005	<i>Wietze LISE: <u>Decomposition of CO2 Emissions over 1980–2003 in Turkey</u></i>
CTN	25.2005	<i>Somdeb LAHIRI: <u>The Core of Directed Network Problems with Quotas</u></i>
SIEV	26.2005	<i>Susanne MENZEL and Riccardo SCARPA: <u>Protection Motivation Theory and Contingent Valuation: Perceived Realism, Threat and WTP Estimates for Biodiversity Protection</u></i>
NRM	27.2005	<i>Massimiliano MAZZANTI and Anna MONTINI: <u>The Determinants of Residential Water Demand Empirical Evidence for a Panel of Italian Municipalities</u></i>
CCMP	28.2005	<i>Laurent GILOTTE and Michel de LARA: <u>Precautionary Effect and Variations of the Value of Information</u></i>
NRM	29.2005	<i>Paul SARFO-MENSAH: <u>Exportation of Timber in Ghana: The Menace of Illegal Logging Operations</u></i>
CCMP	30.2005	<i>Andrea BIGANO, Alessandra GORIA, Jacqueline HAMILTON and Richard S.J. TOL: <u>The Effect of Climate Change and Extreme Weather Events on Tourism</u></i>
NRM	31.2005	<i>Maria Angeles GARCIA-VALIÑAS: <u>Decentralization and Environment: An Application to Water Policies</u></i>
NRM	32.2005	<i>Chiara D'ALPAOS, Cesare DOSI and Michele MORETTO: <u>Concession Length and Investment Timing Flexibility</u></i>
CCMP	33.2005	<i>Joseph HUBER: <u>Key Environmental Innovations</u></i>
CTN	34.2005	<i>Antoni CALVÓ-ARMENGOL and Rahmi İLKILIÇ (Ixxii): <u>Pairwise-Stability and Nash Equilibria in Network Formation</u></i>
CTN	35.2005	<i>Francesco FERI (Ixxii): <u>Network Formation with Endogenous Decay</u></i>
CTN	36.2005	<i>Frank H. PAGE, Jr. and Myrna H. WOODERS (Ixxii): <u>Strategic Basins of Attraction, the Farsighted Core, and Network Formation Games</u></i>

CTN	37.2005	<i>Alessandra CASELLA and Nobuyuki HANAKI</i> (lxxii): <u>Information Channels in Labor Markets. On the Resilience of Referral Hiring</u>
CTN	38.2005	<i>Matthew O. JACKSON and Alison WATTS</i> (lxxii): <u>Social Games: Matching and the Play of Finitely Repeated Games</u>
CTN	39.2005	<i>Anna BOGOMOLNAIA, Michel LE BRETON, Alexei SAVVATEEV and Shlomo WEBER</i> (lxxii): <u>The Egalitarian Sharing Rule in Provision of Public Projects</u>
CTN	40.2005	<i>Francesco FERI</i> : <u>Stochastic Stability in Network with Decay</u>
CTN	41.2005	<i>Aart de ZEEUW</i> (lxxii): <u>Dynamic Effects on the Stability of International Environmental Agreements</u>
NRM	42.2005	<i>C. Martijn van der HEIDE, Jeroen C.J.M. van den BERGH, Ekko C. van IERLAND and Paulo A.L.D. NUNES</i> : <u>Measuring the Economic Value of Two Habitat Defragmentation Policy Scenarios for the Veluwe, The Netherlands</u>
PRCG	43.2005	<i>Carla VIEIRA and Ana Paula SERRA</i> : <u>Abnormal Returns in Privatization Public Offerings: The Case of Portuguese Firms</u>
SIEV	44.2005	<i>Anna ALBERINI, Valentina ZANATTA and Paolo ROSATO</i> : <u>Combining Actual and Contingent Behavior to Estimate the Value of Sports Fishing in the Lagoon of Venice</u>
CTN	45.2005	<i>Michael FINUS and Bianca RUNDSHAGEN</i> : <u>Participation in International Environmental Agreements: The Role of Timing and Regulation</u>
CCMP	46.2005	<i>Lorenzo PELLEGRINI and Reyer GERLAGH</i> : <u>Are EU Environmental Policies Too Demanding for New Members States?</u>
IEM	47.2005	<i>Matteo MANERA</i> : <u>Modeling Factor Demands with SEM and VAR: An Empirical Comparison</u>
CTN	48.2005	<i>Olivier TERCIEUX and Vincent VANNETELBOSCH</i> (lxx): <u>A Characterization of Stochastically Stable Networks</u>
CTN	49.2005	<i>Ana MAULEON, José SEMPERE-MONERRIS and Vincent J. VANNETELBOSCH</i> (lxxii): <u>R&amp;D Networks Among Unionized Firms</u>
CTN	50.2005	<i>Carlo CARRARO, Johan EYCKMANS and Michael FINUS</i> : <u>Optimal Transfers and Participation Decisions in International Environmental Agreements</u>
KTHC	51.2005	<i>Valeria GATTAI</i> : <u>From the Theory of the Firm to FDI and Internalisation: A Survey</u>
CCMP	52.2005	<i>Alireza NAGHAVI</i> : <u>Multilateral Environmental Agreements and Trade Obligations: A Theoretical Analysis of the Doha Proposal</u>
SIEV	53.2005	<i>Margaretha BREIL, Gretel GAMBARELLI and Paulo A.L.D. NUNES</i> : <u>Economic Valuation of On Site Material Damages of High Water on Economic Activities based in the City of Venice: Results from a Dose-Response-Expert-Based Valuation Approach</u>
ETA	54.2005	<i>Alessandra del BOCA, Marzio GALEOTTI, Charles P. HIMMELBERG and Paola ROTA</i> : <u>Investment and Time to Plan: A Comparison of Structures vs. Equipment in a Panel of Italian Firms</u>
CCMP	55.2005	<i>Gernot KLEPPER and Sonja PETERSON</i> : <u>Emissions Trading, CDM, JI, and More – The Climate Strategy of the EU</u>
ETA	56.2005	<i>Maia DAVID and Bernard SINCLAIR-DESGAGNÉ</i> : <u>Environmental Regulation and the Eco-Industry</u>
ETA	57.2005	<i>Alain-Désiré NIMUBONA and Bernard SINCLAIR-DESGAGNÉ</i> : <u>The Pigouvian Tax Rule in the Presence of an Eco-Industry</u>
NRM	58.2005	<i>Helmut KARL, Antje MÖLLER, Ximena MATUS, Edgar GRANDE and Robert KAISER</i> : <u>Environmental Innovations: Institutional Impacts on Co-operations for Sustainable Development</u>
SIEV	59.2005	<i>Dimitra VOUVAKI and Anastasios XEPAPADEAS</i> (lxxiii): <u>Criteria for Assessing Sustainable Development: Theoretical Issues and Empirical Evidence for the Case of Greece</u>
CCMP	60.2005	<i>Andreas LÖSCHEL and Dirk T.G. RÜBBELKE</i> : <u>Impure Public Goods and Technological Interdependencies</u>
PRCG	61.2005	<i>Christoph A. SCHALTEGGER and Benno TORGLER</i> : <u>Trust and Fiscal Performance: A Panel Analysis with Swiss Data</u>
ETA	62.2005	<i>Irene VALSECCHI</i> : <u>A Role for Instructions</u>
NRM	63.2005	<i>Valentina BOSETTI and Gianni LOCATELLI</i> : <u>A Data Envelopment Analysis Approach to the Assessment of Natural Parks' Economic Efficiency and Sustainability. The Case of Italian National Parks</u>
SIEV	64.2005	<i>Arianne T. de BLAEIJ, Paulo A.L.D. NUNES and Jeroen C.J.M. van den BERGH</i> : <u>Modeling 'No-choice' Responses in Attribute Based Valuation Surveys</u>
CTN	65.2005	<i>Carlo CARRARO, Carmen MARCHIORI and Alessandra SGOBBI</i> : <u>Applications of Negotiation Theory to Water Issues</u>
CTN	66.2005	<i>Carlo CARRARO, Carmen MARCHIORI and Alessandra SGOBBI</i> : <u>Advances in Negotiation Theory: Bargaining, Coalitions and Fairness</u>
KTHC	67.2005	<i>Sandra WALLMAN</i> (lxxiv): <u>Network Capital and Social Trust: Pre-Conditions for 'Good' Diversity?</u>
KTHC	68.2005	<i>Asimina CHRISTOFOROU</i> (lxxiv): <u>On the Determinants of Social Capital in Greece Compared to Countries of the European Union</u>
KTHC	69.2005	<i>Eric M. USLANER</i> (lxxiv): <u>Varieties of Trust</u>
KTHC	70.2005	<i>Thomas P. LYON</i> (lxxiv): <u>Making Capitalism Work: Social Capital and Economic Growth in Italy, 1970-1995</u>
KTHC	71.2005	<i>Graziella BERTOCCHI and Chiara STROZZI</i> (lxxv): <u>Citizenship Laws and International Migration in Historical Perspective</u>
KTHC	72.2005	<i>Elsbeth van HYLCKAMA Vlieg</i> (lxxv): <u>Accommodating Differences</u>
KTHC	73.2005	<i>Renato SANSA and Ercole SORI</i> (lxxv): <u>Governance of Diversity Between Social Dynamics and Conflicts in Multicultural Cities. A Selected Survey on Historical Bibliography</u>
IEM	74.2005	<i>Alberto LONGO and Anil MARKANDYA</i> : <u>Identification of Options and Policy Instruments for the Internalisation of External Costs of Electricity Generation. Dissemination of External Costs of Electricity Supply Making Electricity External Costs Known to Policy-Makers</u> <u>MAXIMA</u>



IEM	75.2005	<i>Margherita GRASSO and Matteo MANERA: <u>Asymmetric Error Correction Models for the Oil-Gasoline Price Relationship</u></i>
ETA	76.2005	<i>Umberto CHERUBINI and Matteo MANERA: <u>Hunting the Living Dead A “Peso Problem” in Corporate Liabilities Data</u></i>
CTN	77.2005	<i>Hans-Peter WEIKARD: <u>Cartel Stability under an Optimal Sharing Rule</u></i>
ETA	78.2005	<i>Joëlle NOAILLY, Jeroen C.J.M. van den BERGH and Cees A. WITHAGEN (lxxvi): <u>Local and Global Interactions in an Evolutionary Resource Game</u></i>
ETA	79.2005	<i>Joëlle NOAILLY, Cees A. WITHAGEN and Jeroen C.J.M. van den BERGH (lxxvi): <u>Spatial Evolution of Social Norms in a Common-Pool Resource Game</u></i>
CCMP	80.2005	<i>Massimiliano MAZZANTI and Roberto ZOBOLI: <u>Economic Instruments and Induced Innovation: The Case of End-of-Life Vehicles European Policies</u></i>
NRM	81.2005	<i>Anna LASUT: <u>Creative Thinking and Modelling for the Decision Support in Water Management</u></i>
CCMP	82.2005	<i>Valentina BOSETTI and Barbara BUCHNER: <u>Using Data Envelopment Analysis to Assess the Relative Efficiency of Different Climate Policy Portfolios</u></i>
ETA	83.2005	<i>Ignazio MUSU: <u>Intellectual Property Rights and Biotechnology: How to Improve the Present Patent System</u></i>
KTHC	84.2005	<i>Giulio CAINELLI, Susanna MANCINELLI and Massimiliano MAZZANTI: <u>Social Capital, R&amp;D and Industrial Districts</u></i>
ETA	85.2005	<i>Rosella LEVAGGI, Michele MORETTO and Vincenzo REBBA: <u>Quality and Investment Decisions in Hospital Care when Physicians are Devoted Workers</u></i>
CCMP	86.2005	<i>Valentina BOSETTI and Laurent GILOTTE: <u>Carbon Capture and Sequestration: How Much Does this Uncertain Option Affect Near-Term Policy Choices?</u></i>
CSRM	87.2005	<i>Nicoletta FERRO: <u>Value Through Diversity: Microfinance and Islamic Finance and Global Banking</u></i>
ETA	88.2005	<i>A. MARKANDYA and S. PEDROSO: <u>How Substitutable is Natural Capital?</u></i>
IEM	89.2005	<i>Anil MARKANDYA, Valeria COSTANTINI, Francesco GRACCEVA and Giorgio VICINI: <u>Security of Energy Supply: Comparing Scenarios From a European Perspective</u></i>
CCMP	90.2005	<i>Vincent M. OTTO, Andreas LÖSCHEL and Rob DELLINK: <u>Energy Biased Technical Change: A CGE Analysis</u></i>
PRCG	91.2005	<i>Carlo CAPUANO: <u>Abuse of Competitive Fringe</u></i>
PRCG	92.2005	<i>Ulrich BINDSEIL, Kjell G. NYBORG and Ilya A. STREBULAEV (lxv): <u>Bidding and Performance in Repo Auctions: Evidence from ECB Open Market Operations</u></i>
CCMP	93.2005	<i>Sabrina AUCI and Leonardo BECCHETTI: <u>The Stability of the Adjusted and Unadjusted Environmental Kuznets Curve</u></i>
CCMP	94.2005	<i>Francesco BOSELLO and Jian ZHANG: <u>Assessing Climate Change Impacts: Agriculture</u></i>
CTN	95.2005	<i>Alejandro CAPARRÓS, Jean-Christophe PEREAU and Tarik TAZDAÏT: <u>Bargaining with Non-Monolithic Players</u></i>

- (lxv) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications” organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003
- (lxvi) This paper has been presented at the 4<sup>th</sup> BioEcon Workshop on “Economic Analysis of Policies for Biodiversity Conservation” organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL) , Venice, August 28-29, 2003
- (lxvii) This paper has been presented at the international conference on “Tourism and Sustainable Economic Development – Macro and Micro Economic Issues” jointly organised by CRENoS (Università di Cagliari e Sassari, Italy) and Fondazione Eni Enrico Mattei, and supported by the World Bank, Sardinia, September 19-20, 2003
- (lxviii) This paper was presented at the ENGIME Workshop on “Governance and Policies in Multicultural Cities”, Rome, June 5-6, 2003
- (lxix) This paper was presented at the Fourth EEP Plenary Workshop and EEP Conference “The Future of Climate Policy”, Cagliari, Italy, 27-28 March 2003
- (lxx) This paper was presented at the 9<sup>th</sup> Coalition Theory Workshop on "Collective Decisions and Institutional Design" organised by the Universitat Autònoma de Barcelona and held in Barcelona, Spain, January 30-31, 2004
- (lxxi) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications”, organised by Fondazione Eni Enrico Mattei and Consip and sponsored by the EU, Rome, September 23-25, 2004
- (lxxii) This paper was presented at the 10<sup>th</sup> Coalition Theory Network Workshop held in Paris, France on 28-29 January 2005 and organised by EUREQua.
- (lxxiii) This paper was presented at the 2nd Workshop on "Inclusive Wealth and Accounting Prices" held in Trieste, Italy on 13-15 April 2005 and organised by the Ecological and Environmental Economics - EEE Programme, a joint three-year programme of ICTP - The Abdus Salam International Centre for Theoretical Physics, FEEM - Fondazione Eni Enrico Mattei, and The Beijer International Institute of Ecological Economics
- (lxxiv) This paper was presented at the ENGIME Workshop on “Trust and social capital in multicultural cities” Athens, January 19-20, 2004
- (lxxv) This paper was presented at the ENGIME Workshop on “Diversity as a source of growth” Rome November 18-19, 2004
- (lxxvi) This paper was presented at the 3rd Workshop on Spatial-Dynamic Models of Economics and Ecosystems held in Trieste on 11-13 April 2005 and organised by the Ecological and Environmental Economics - EEE Programme, a joint three-year programme of ICTP - The Abdus Salam International Centre for Theoretical Physics, FEEM - Fondazione Eni Enrico Mattei, and The Beijer International Institute of Ecological Economics

**2004 SERIES**

<b>CCMP</b>	<i>Climate Change Modelling and Policy</i> (Editor: Marzio Galeotti )
<b>GG</b>	<i>Global Governance</i> (Editor: Carlo Carraro)
<b>SIEV</b>	<i>Sustainability Indicators and Environmental Valuation</i> (Editor: Anna Alberini)
<b>NRM</b>	<i>Natural Resources Management</i> (Editor: Carlo Giupponi)
<b>KTHC</b>	<i>Knowledge, Technology, Human Capital</i> (Editor: Gianmarco Ottaviano)
<b>IEM</b>	<i>International Energy Markets</i> (Editor: Anil Markandya)
<b>CSRM</b>	<i>Corporate Social Responsibility and Sustainable Management</i> (Editor: Sabina Ratti)
<b>PRA</b>	<i>Privatisation, Regulation, Antitrust</i> (Editor: Bernardo Bortolotti)
<b>ETA</b>	<i>Economic Theory and Applications</i> (Editor: Carlo Carraro)
<b>CTN</b>	<i>Coalition Theory Network</i>

**2005 SERIES**

<b>CCMP</b>	<i>Climate Change Modelling and Policy</i> (Editor: Marzio Galeotti )
<b>SIEV</b>	<i>Sustainability Indicators and Environmental Valuation</i> (Editor: Anna Alberini)
<b>NRM</b>	<i>Natural Resources Management</i> (Editor: Carlo Giupponi)
<b>KTHC</b>	<i>Knowledge, Technology, Human Capital</i> (Editor: Gianmarco Ottaviano)
<b>IEM</b>	<i>International Energy Markets</i> (Editor: Anil Markandya)
<b>CSRM</b>	<i>Corporate Social Responsibility and Sustainable Management</i> (Editor: Sabina Ratti)
<b>PRCG</b>	<i>Privatisation Regulation Corporate Governance</i> (Editor: Bernardo Bortolotti)
<b>ETA</b>	<i>Economic Theory and Applications</i> (Editor: Carlo Carraro)
<b>CTN</b>	<i>Coalition Theory Network</i>