Contest with Attack and Defence: Does Negative Campaigning Increase or Decrease Voters' Turnout?

Raphaël Soubeyran

NOTA DI LAVORO 128.2005

OCTOBER 2005

PRCG – Privatisation, Regulation, Corporate Governance

Raphaël Soubeyran, *GREQAM Université de la Mediterrannée*

Contest with Attack and Defence: Does Negative Campaigning Increase or Decrease Voters' Turnout?

Summary

We present a general model of two players contest with two types of efforts. Contrary to the classical models of contest, where each player chooses a unique effort, and where the outcome depends on the efforts of all the players, contestants are allowed to reduce the effort of the opponent. Defence increases one's chance of winning while attack annihilates the defence of the opponent. This model has many applications like political campaigning, wars, competition among lobbies, job promotion competitions, or sport contests. We study the general model of contest with attacks and defence and propose an application to negative political campaigns, where two candidates arbitrate between disparaging their opponent or enhancing their own image. We propose sufficient conditions for the existence and uniqueness of a symmetric Nash equilibrium of the contest game. In the application, we contribute to the empirically debated question dealing with the effect of attack on voters turnout, and show that the conclusion depends on the distribution of voters sensitivity to defence and attack. Furthermore, contrary to the literature, we show that an underdog candidate may be less aggressive than his opponent.

Keywords: Contest, Rent-seeking, Sabotage, Negative campaigning, Turnout

JEL Classification: D74, D72, C72

The author thanks Francis Bloch for his advice and help.

Address for correspondence:

Raphaël Soubeyran
GREQAM Université de la Mediterrannée
Château Lafarge
Route des Milles
13290 Les Milles
France
E-mail: raphsoub@univ-aix.fr

1 Introduction

There exist two ways of winning a competition, by increasing one's chances of winning or by decreasing one's opponents chances of winning. We refer to this as the difference between positive and negative competition. There exist many real life situations in which individuals have a choice between positive or negative competition. In political campaigns, candidates can promote their image, their ideas and their program or denigrate their opponent ideas, image or program. In lobbies competitions, one lobby can try to promote his interest or to attack the interest of an other lobby. In job seeking competitions, candidates can invest in productive activities or try to discourage the firm to hire another candidate. In wars, armies can defend or attack a territory. In industrial advertizing competitions, a firm can promote the qualities of a product or can denigrate a competitor's product. There is no reason to think that positive and negative efforts have identical effects.

We propose a theoretical model of contest that allows to differentiate between positive and negative activities. Contrary to classical models of contest, where each player chooses a unique level of effort, and where the result depends on the efforts of the players, we suppose, as in the literature on sabotage in contests, that players are allowed to reduce the effective effort of their adversaries. In this effort, we do not focus attention on the dissipation of the rent but on the choice between positive and negative efforts. That is why we suppose that contestants have fixed budgets. In the first part of the paper, we study the general model of contest with attacks and defences and give sufficient conditions for the existence and uniqueness of a symmetric Nash equilibrium. In a second part, we propose an application to negative political campaigns inspired by Shachar and Nalebuff (1999), where two candidates choose between disparaging their opponent or enhancing their own image. In this application, we contribute to the hotly debated question on the effect of attacks on voters turnout, and show that the conclusion depends on voters sensitivity to defences and attacks. Furthermore, we show that an underdog candidate may attack less than his adversary.

The huge literature on contest has been mainly focused on one-dimensional efforts. In these models, each competitor chooses an effort level that increases his probability of winning a prize. Following the seminal work by Tullock (1967), this literature has considered a large number of variations on the contest model. There exist a small number of papers studying positive and negative efforts in contests, in which negative effort is called "sabotage". The first paper that has addressed this topic is the one by Lazear (1989). Chen (2003) considers a model of job promotion tournament with n players, where the effective efforts (resulting from classical rent-seeking efforts and sabotage) is additively separable in positive and negative efforts. The main result of this paper is that the contestant which is the more productive in positive lobbying is the most attacked in any equilibrium. In a different setting, Kräkel (2004) proposes a two stage model with either help or sabotage. In the first stage, contestants choose to help, to sabotage or to do nothing, and in the second stage, players choose their rent-seeking effort. The main result of this paper is that there can exist asymmetric equilibria in which one contestant helps his adversary and the second uses sabotage. The closest paper to ours (first part) is certainly the one by Konrad (2000) who proposes a model of contest with sabotage with n players and linear costs. The main result of this paper is that in a symmetric equilibrium, sabotage can be eliminated when the number of contestants is large and sabotage can lower or increase the rent dissipation. In the present paper, we consider the case of two contestants with fixed budgets. We give sufficient conditions for the existence and the uniqueness of a symmetric equilibrium.

The main contribution of the paper is the application to negative campaigning. We try to clarify the empirical debate started by the work by Ansolabehere, Iyengar, Simon and Valentino (1994) (AISV in the following). Their experiment reveals that negative advertisements lower voters turnout. They confirm the experimental result for the case of 1992 U.S. Senate election. They propose an explanation of the candidates rationality in going negative: a candidate who criticizes her opponent will reinforce his partisans'

support and will give to her opponent supporters reasons not to vote for their favored candidate. This result has been challenged by Wattenberg and Brians (1999) in an empirical analysis based on NES data from 1992 and 1996 U.S. elections. On the contrary, they conclude that negative campaigning raises voters participation. This result would come from the fact that negative advertising may have a positive informative effect on voters; Ansolabehere, Iyengar and Simon (1999) respond to this "criticism" in reanalyzing NES data from 1992 and confirm their first conclusion. As for Finkel and Geer (1998), using NES survey data set of presidential campaign advertisement from 1960 to 1992, they find that attack has no negative effect on voters turnout. Delving deeper into details, Kahn and Kenney (1999) , distinguish two kinds of negative campaign advertising: useful negative advertising and mudslinging. They use 1990 U.S. Senate election data and find that relevant negative advertising was an incentive to vote whereas mudslinging disgusted voters and pushed them to choose not to go to the election booth. There has been so far no theoretical model to study the effect of negative campaigning on voters' turnout.

An other question addressed in the application is whether or not an underdog candidate is more or less aggressive than his opponent. Skaperdas and Grofman (1995) have studied a model of negative campaigning in which defence efforts make voters change their votes and attack efforts lead initial candidates supporters to abstain. They define the underdog candidate as the one with the smallest initial support. The model is specified such that, with the same negative advertising effort, the number of voters that will abstain is proportional to the initial support. Skaperdas and Grofman [15], as Harrington and Hess (1996), show that the underdog is more aggressive. In our model, an underdog candidate is the one with the smallest financial support. We show that the underdog candidate may be less aggressive than his adversary (in absolute as well as in relative terms).

The paper is organized as follows. In section 2 we present the general model of attack-defence contest, in section 3 we analyze the equilibrium

properties, in section 4 we examine the application to negative political campaigns, in section 5, we discuss the case of heterogeneous candidates and the case of proportional election with N candidates, and we conclude in section 6.

2 The Model

Two players, L and R compete in a contest and choose two types of actions, a defence level d and an attack level a. The probability of victory is given by the comparison of the effective efforts resulting of attacks and defences. Let ψ be the synergy function of the contest. Each player is associated with a value of the synergy function that represents his effective effort in the competition. Let ψ^R be the effective effort of player R and ψ^L the effective effort of player L. Formally, as in classical models of contest, the probability of victory π^R of player R is given by the following logit-form:

$$\pi^R = \frac{\psi^R}{\psi^R + \psi^L},$$

We suppose that the effective effort of player R depends on his defence and the attack of the adversary. The function ψ (twice continuously differentiable on $\Re_+ \times \Re_+$ and three times differentiable) increases with the defence of the player and decreases with the attack of his adversary. Formally,

$$\psi^R = \psi\left(d_R, a_L\right),$$

and,

$$\begin{aligned} \psi_1^R &= \frac{\partial \psi}{\partial d_R}\left(d_R, a_L\right) > 0, \\ \psi_2^R &= \frac{\partial \psi}{\partial a_L}\left(d_R, a_L\right) < 0 \end{aligned}$$

The two types of effort can have different interpretation in real world, depending on the context. In electoral campaigns, d is a positive campaigning

effort and a is a negative advertisement effort. In a war, d can be interpreted as the spending for weapons and a as the spending for anti-weapons forces. In a job promotion competition, d is the productive activity and a is a sabotage effort (see Chen (2003)).

We suppose that defence and attack have decreasing marginal effects on $\varphi = \ln \psi$. Furthermore, we consider that ψ is (strictly) log-concave in d and (strictly) log-convex in a. Here, the log-convexity in a is *not a strong assumption*, this is simply the symmetric hypothesis with the log-concavity in d, because φ increases with d and decreases with a.

$$\varphi_{11}^R = \frac{\partial^2 \varphi}{\partial d_R^2}(d_R, a_L) < 0,$$

and,

$$\varphi_{22}^R = \frac{\partial^2 \varphi}{\partial a_L^2}(d_R, a_L) > 0.$$

This assumption signifies that the marginal effect of attack on the adversary's effective effort is decreasing. In other words, the more a player attacks his opponent, the less the decrease of the adversary effective effort is important.

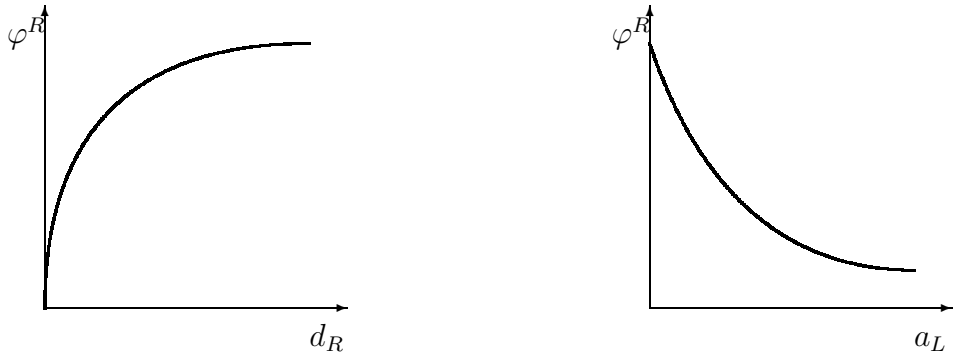

Figure 1: Synergy function and efforts

We suppose that, players have an incentive to defend and attack, that is $\lim_{d\to 0}\varphi_1(d,a) = +\infty$ and $\lim_{a\to 0}\varphi_2(d,a) = -\infty$. As in classical contest models, we suppose that players incur a cost of effort. In the present model, the cost depends on the attack and the defence levels. When player R chooses a defence level d_R and an attack level a_R, he pays the cost $C(d_R + a_R)$. This functional form implicitly assumes that positive and negative campaigning have similar costs. Indeed, the cost of an advertising campaign is independent of its contents. We suppose that C is twice continuously differentiable, strictly increasing ($C' > 0$) and convex ($C'' \geq 0$).

We are interested in the trade-off between attack and defence and we do not study total spending choices. We suppose that players have (identical) fixed budgets.[1] Let B be the budget of contestants R and L. Player R faces the following budget constraint:

$$C(d_R + a_R) \leq B.$$

Player R has to choose the levels of attack and defence which maximize his probability of victory subject to his budget constraint. Hence, the optimization program of player R is (the value of the rent is normalized to 1):

$$\begin{aligned} \underset{(d_R,a_R)}{Max} \left[\pi^R = \frac{\psi(d_R, a_L)}{\psi(d_R, a_L) + \psi(d_L, a_R)}\right], \\ s.t. : \ C(d_R + a_R) \leq B \end{aligned}$$

At this point, it is important to note that attacking and defending have different effects on the probability that a player wins the tournament. Consider an infinitesimal increase of ψ^R and an infinitesimal decrease of ψ^L. The relative effect on the probability that R wins the contest is:

$$\left|\frac{\frac{\partial \pi^R}{\partial \psi^L}}{\frac{\partial \pi^R}{\partial \psi^R}}\right| = \frac{\psi^R}{\psi^L},$$

Hence, the effect of an increase in one candidate's effective effort will be greater than a decrease in the opponent's one if the opponent has a higher

[1] We provide an example where this assumption is relaxed in the final discussions.

effective effort. This remark underlines an incentive, for a strong player to attack a weakest one, and an incentive, for a weak player, to defend.

3 Equilibrium

In this section, we study the equilibrium properties (existence and unicity) of the general model with two players presented above, when the budgets are equal. We note f^R the value of function f in (d_R, a_L), f^L the value of function f in (d_L, a_R), and f_k the partial derivative of the function f with respect to its k^{th} argument.

Straightforwardly, with our assumptions, the budget constraints will be satisfied with equality. Then, d_R can be defined as a function of a_R, noted δ, such that:

$$\delta(a_R) = C^{-1}(B) - a_R, \tag{1}$$

Hence, we can focus on the choice of a_R, with equation 1 determining the corresponding unique value of d_R. The first order condition for candidate R is given by:

$$\frac{\varphi_2^L}{\varphi_1^R} = -1, \tag{2}$$

This condition says that in an interior equilibrium, the rate of marginal effects of attack and promotion must be equal to the rate of the marginal costs . This implicitly define the reaction correspondence of candidate R to the attack of candidate L. Let us denote by $\Gamma(a_L)$ candidate's R best reply, defined by:

$$\varphi_1(\delta(\Gamma(a_L)), a_L) = -\varphi_2(\delta(a_L), \Gamma(a_L)), \tag{3}$$

Proposition 1 *There exists a unique symmetric equilibrium of the negative campaigning game.*

The strategic effects are driven by the marginal cross-effect of attack and defence, $\frac{\partial^2 \varphi}{\partial a \partial d}$. This represents the effect of simultaneous attack and defence

on a player's effective effort. Differentiating equation 3 leads to the following expression of the slope of candidate's R reaction function:

$$\Gamma'(a_L) = \frac{\varphi_{12}^L - \varphi_{12}^R}{\varphi_{22}^L - \varphi_{11}^R},$$

The denominator is equal to the second order derivative of the payoff and is positive because $\varphi_{22}^L > 0$ and $\varphi_{11}^R < 0$ (for second order conditions, see the proof of proposition 1). Finally, the sign of the slope of candidate's R best-reply function is given by:

$$\Gamma'(a_L) \propto \varphi_{12}(\delta(a_L), \Gamma(a_L)) - \varphi_{12}(\delta(\Gamma(a_L)), a_L), \tag{4}$$

Since the sign of the right-hand side may change, the attacks are not always strategic substitutes or always strategic complements. Let ε_a be the elasticity of effective effort with respect to attack and ε_d the elasticity of effective effort with respect to defence:

$$\varepsilon_d(d,a) = \frac{\psi_1(d,a)}{d\psi(d,a)} \text{ and } \varepsilon_a(d,a) = \frac{\psi_2(d,a)}{a\psi(d,a)},$$

Hence, we obtain the following result:

Proposition 2 *(i) If* $\frac{\partial^2 \varepsilon_d}{\partial a^2}, \frac{\partial^2 \varepsilon_a}{\partial d^2} < 0$ *the equilibrium is unique.*
(ii) If $\frac{\partial^2 \varepsilon_d}{\partial a^2}, \frac{\partial^2 \varepsilon_a}{\partial d^2} > 0$ *the equilibrium is unique.*

The proof uses the result of proposition 1. Since there exists a unique symmetric equilibrium, there exists a unique value $a^* = \Gamma(a_L^*) = \Gamma(a_R^*)$ such that $a_L^* = a_R^*$. In both cases (i) and (ii), when the levels of attack are different, the attack of a player is a strategic complement of the opponent's one, and the attack of the opponent is a strategic substitute of the player's attack. Since the symmetric equilibrium is unique, the reaction functions can not cross in any other point. The following graphs illustrate this remark:

In the case where $\frac{\partial^2 \varepsilon_d}{\partial a^2}, \frac{\partial^2 \varepsilon_a}{\partial d^2} < 0$ (i), the reaction functions are quasi-convex:

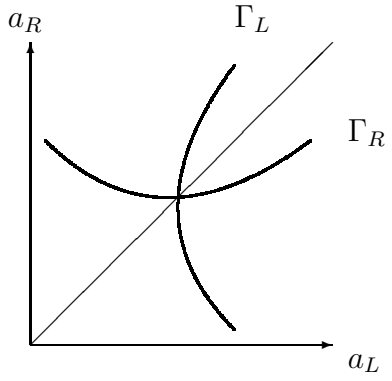

Figure 2: Reaction curves (case (i))

In the case $\frac{\partial^2 \varepsilon_d}{\partial a^2}, \frac{\partial^2 \varepsilon_a}{\partial d^2} > 0$ (ii), the reaction functions are quasi-concave:

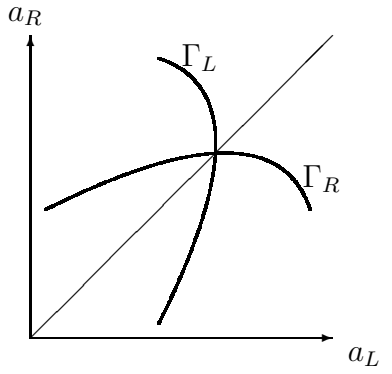

Figure 3: Reaction curves (case (ii))

Our assumptions are verified for a natural example, when candidate image is the outcome of a contest between attack and defence:

Corollary 3 *If* $\psi(d,a) = \frac{d^\alpha}{d^\alpha + a^\beta}$ *with* $\alpha, \beta \in]0,1[$, *then the equilibrium is unique and symmetric.*

This example will illustrate the debate on the link between participation and the tone of the campaign:

4 Application: does negative campaigning increase or reduce turnout?

In this section, we analyze the important application to the political campaigns. Political advertisements can be of different natures, politicians can choose to defend their ideas, their image, their morality... They can also choose to attack their opponent's program, image or morality... How do these two kinds of advertisement influence voters' choice? Will they be more or less likely to vote? Will an underdog candidate be more or less aggressive? In this section, we try to clarify these questions. The model is inspired on Shachar and Nalebuff (1999), who state that voters do not choose whether or not to vote strategically. We consider that the population is split into two types of agents. On the one hand, we consider the leaders (lobbies, medias, candidates...), the agents who spend resources to support the campaign of one candidate. These agents strategically (and cooperatively) choose whether to invest or not for their preferred candidate. On the other hand, we consider the followers, the voters, who choose whether or not to vote for a candidate non strategically. We suppose that the followers are influenced by campaign spending. Abstention is due to the existence of a positive cost of voting[2]. Candidates' payoffs depend on candidate images and on the cost of voting which is the dominant factor for explaining voters turnout and abstention (see Xu, 2002; Börgers, 2001; Ledyard, 1981; and Palfrey and Rosenthal, 1983, 1985). To study the effect of negative advertising, we introduce a campaign game in which leaders have fixed budgets and have to choose between positive and negative advertising. In other words, leaders decide whether they denigrate their opponent or promote their favorite candidate. The can-

[2](for a model of abstention in a spatial competition setting, see Llavador, 2000)

didate's image is positively related to the candidate's amount of positive campaigning activities and negatively related to the other candidate's negative campaigning activities. In the spirit of Shachar and Nalebuff [14], we suppose that a candidate image is not affected by the candidate's attack and by the opponent's positive campaigning. This assumption is justified by the fact that these effects are weaker than the ones we consider. Making a voter change his vote is harder than making him not to vote for his favored candidate. Indeed to make a citizen change his vote, he would have first to be convinced not to vote for his favored candidate, and, secondly, to be convinced to vote for the adversary. We now explain how the attack-defence contest can be applied to this campaigning game.

4.1 Negative Campaigning: a follow the leader approach

We introduce attack and defence in the model by Shachar and Nalebuff [14]. We suppose that two candidates, R and L compete in a winner-take-all election. The population is divided into two types of agents. The leaders engage resources in the campaign, and voters choose whether or not to vote for their favored candidate.

The followers*:* the population of voters, with mass 1, is divided into two types. Let r be the share of citizens preferring candidate R to candidate L with the cumulative H and the density h with support $[0,1]$ and h has strictly positive values. H is an increasing and continuous function. When this citizen chooses to vote for his preferred candidate, he gets a benefit ψ^R and he faces a cost of voting μ, where μ is an idiosyncratic component drawn from a uniform distribution over $[0,1]$. Then she chooses to vote for R if and only if:

$$\mu \leq \psi^R,$$

The leaders*:* in Shachar and Nalebuff [14], ψ^R depends on E_R, that is the leaders spending in favor of candidate R. Since we want to study attack

advertising, we will modify this assumption by assuming that the leaders' spending in favor of candidate R is a vector with two components a_R and d_R, where a_R is the negative advertising effort of leaders supporting R to attack his opponent, and d_R represents their promotion effort in favor of candidate R. The benefit of voting for candidate R is an increasing function of his promotion effort and a decreasing function of his opponent attack effort. Formally:

$$\psi^R \equiv \psi\left(d_R, a_L\right),$$

The probability that R wins the election is equal to the probability that he gets more votes than L, i.e. the probability that $r\psi^R \geq (1-r)\,\psi^L$, or the probability that $r \geq \frac{\psi^L}{\psi^R+\psi^L}$. Then, the probability that R wins the election, noticed Π^R is:

$$\Pi^R = 1 - H\left(\frac{\psi^L}{\psi^R+\psi^L}\right),$$

The participation is the expected sum of the votes of both sides, formally,

$$P = \int_0^1 r\psi^R + (1-r)\,\psi^L dH\left(r\right),$$

Furthermore, we keep the same assumptions on function ψ as in section 2. We now present our main example and draw conclusions on the (de)mobilizing effect of negative campaigning.

4.2 Main example

Suppose that a candidate's image results from a contest between her promotion and her adversary's attack. If the electorate's sensitivity to promotion is α and the sensitivity to attack is β, then candidate's R image function can be written as:

$$\psi^R\left(d_R, a_R\right) = \frac{\left(d_R\right)^\alpha}{\left(d_R\right)^\alpha + \left(a_L\right)^\beta},$$

with $\alpha, \beta \in]0,1[$. Furthermore, suppose that the cost function is linear:

$$C\left(d_R + a_R\right) = d_R + a_R.$$

Let B_R and B_L be the respective budgets of leader R and leader L. With these specifications, Candidate R's program is:

$$\underset{d_R,a_R\geq 0}{Max}\left[\Pi^R = 1 - H\left(\frac{\frac{(d_L)^\alpha}{(d_L)^\alpha+(a_R)^\beta}}{\frac{(d_R)^\alpha}{(d_R)^\alpha+(a_L)^\beta}+\frac{(d_L)^\alpha}{(d_L)^\alpha+(a_R)^\beta}}\right)\right],$$

such that the budget constraint is not violated.

This example would be complicated to solve directly because of the embedded logit-form functions, but the general results of section 2 enable us to compute it easily.

4.3 Negative campaigning: Increasing or decreasing turnout?

In this section we analyze the main example when the budgets are identical, $B_R = B_L = 1$.

Proposition 4 *There exists a unique equilibrium, and the equilibrium levels of attack and promotion are given by:*

$$a_R^* = a_L^* = \frac{\beta}{\beta+\alpha},$$

and,

$$d_R^* = d_L^* = \frac{\alpha}{\beta+\alpha}.$$

Not surprisingly, the more voters are sensitive to attack, the higher the level of equilibrium attacks, and the more voters are sensitive to promotion, the higher the equilibrium promotion levels.

The equilibrium participation rate is:

$$P^* = \psi^*,$$

Then,

$$P^* = \frac{\left(\frac{\alpha}{\beta+\alpha}\right)^\alpha}{\left(\frac{\alpha}{\beta+\alpha}\right)^\alpha+\left(\frac{\beta}{\beta+\alpha}\right)^\beta},$$

Now, we can analyze the sign of the correlation between attack and participation. Suppose to simplify that $\beta = 1 - \alpha$. Then β measures the voters' relative sensitivity to attacks. Comparing the outcomes of an election in different States in U.S., or different national elections, there is no reason to think that β will be equal in each State or at each election. The empirical result can be summarized with a graph. Each point of the graph represents the participation rate and the corresponding attack equilibrium level in the State. Here, we suppose that β varies across States or national elections, and then look at the variations of participation and the variations of attack levels in the different equilibria. The equilibrium turnout rate is:

$$P^*(\alpha) = \frac{(1-\beta)^{1-\beta}}{(1-\beta)^{1-\beta} + \beta^{\beta}},$$

and, the equilibrium attack level is also a function of β, denoted $a(\beta) = \beta$.

The following proposition states that the participation can be high in one election when the campaign is negative and the participation can be low when the campaign tone is positive.

Proposition 5 *$a'(\beta) P^{*\prime}(\beta) \leq 0$ if and only if $\beta \in \left[\frac{1-\sqrt{1-\frac{4}{e^{-2}}}}{2}, \frac{1+\sqrt{1-\frac{4}{e^{-2}}}}{2}\right]$.*

Hence, when β is small enough or large enough, when the equilibrium attack level increases, the equilibrium turnout rate increases. That is states where leaders are more aggressive can present higher participation rates. The following graph illustrates the proposition, it represents the variations of the equilibrium attack and the participation when β increases:

[Insert Figure 4 about here]

To understand Proposition 5, notice that there are two competing effects. The first effect is a direct effect on equilibrium attack and promotion levels. When the sensitivity to attack increases, then the equilibrium attack level increases and the equilibrium promotion decreases. This effect makes participation fall. A second effect is the "impact effect". When the sensitivity to attack increases, the relative effect of attack decreases and participation

rises. The first effect is constant while the second effect changes when the sensitivity to attack increases. Since the marginal effects of attack and promotion on a candidate's effective effort are decreasing (because $\beta < 1$), the "impact effect" is high for heterogeneous values of attack and promotion and is small for homogeneous values of attack and promotion levels. Then, when comparing different States elections or National elections, one compares heterogeneous populations in term of sensitivities to attack and promotion, and then, one can observe a positive correlation between attack and participation (when the populations are almost equally sensitive to both tones) like in Wattenberg and Brians (1999), or a negative correlation (when the populations are very sensitive to one of the tone) like in AISV (1994) , or one can observe no correlation (when the range of sensitivities is large) like in Finkel and Geer (1998).

5 Discussions

In this section, through two different examples, we relax two assumptions of the model. In a first sub-section, we relax the equal budget hypothesis and derive a relation between the budget and the level of aggressiveness of a candidate. In the second sub-section, we compare the case of a proportional election with N players to the case of majority election with two candidates.

5.1 Is an underdog candidate more aggressive?

In our context, we consider an underdog candidate who has less financial support than her adversary. Let R be the underdog candidate and L the advantaged candidate, with $B_R < B_L$. Unfortunately, it seems difficult to obtain general results with this assumption. In different models, Skaperdas and Grofman (1995) and Harrigton and Hess (1996) show that the underdog candidate, defined as the candidate with the smaller initial popular support, is more aggressive than his adversary. We provide an example in which the underdog candidate is, in equilibrium, less aggressive than the advantaged

candidate. Consider the main example with $\alpha = \beta$. Candidate R's optimization program is equivalent to:

$$\underset{d_R, a_R > 0}{Max} \left[\Pi^R = 1 - H \left(\frac{\frac{d_L^\alpha}{d_L^\alpha + a_R^\alpha}}{\frac{d_R^\alpha}{d_R^\alpha + a_L^\alpha} + \frac{d_L^\alpha}{d_L^\alpha + a_R^\alpha}} \right) \right],$$

s.t.:

$$B_R = d_R + a_R.$$

The equilibrium of this campaign game is unique and the candidates efforts in negative and positive advertisement are given in the following proposition:

Proposition 6 *There exists a unique equilibrium. The underdog candidate levels of promotion and attack are:*

$$\begin{aligned} d_R^* &= \frac{(B_L)^\alpha}{(B_R)^\alpha + (B_L)^\alpha} B_R, \\ a_R^* &= \frac{(B_R)^\alpha}{(B_R)^\alpha + (B_L)^\alpha} B_R, \end{aligned}$$

the advantaged candidate levels of promotion and attack are:

$$\begin{aligned} d_L^* &= \frac{(B_R)^\alpha}{(B_R)^\alpha + (B_L)^\alpha} B_L, \\ a_L^* &= \frac{(B_L)^\alpha}{(B_R)^\alpha + (B_L)^\alpha} B_L, \end{aligned}$$

And the participation rate is:

$$P^* = \frac{(B_L)^\alpha + [(B_R)^\alpha - (B_L)^\alpha] E(r)}{(B_L)^\alpha + (B_R)^\alpha},$$

with $E(r) = \int_0^1 r dH(r)$.

Contrary to the case where candidates have equal budgets, the equilibrium participation depends on the expected value of candidate R support share, $E(r)$. Since $B_L > B_R$, then the more candidate L expected support $(1 - E(r))$ is large, the higher the participation rate. Indeed, the advantaged candidate can generate more participation ($\psi^{L*} > \psi^{R*}$), but he is more aggressive than the underdog, in relative and absolute terms:

Corollary 7 *The underdog candidate is less aggressive than the advantaged candidate:*

$$a_R^* < a_L^*,$$

And he is relatively less aggressive than the advantaged candidate:

$$\frac{a_R^*}{d_R^*} < \frac{a_L^*}{d_L^*}.$$

This result directly follows from proposition 6. The underdog candidate is less aggressive than the advantaged one and he is relatively less aggressive. The intuition of this result is linked to the remark made in section 2. A strong candidate has an incentive to be more aggressive, and a weak candidate has an incentive to be more defensive. This result can be understood in the light of the remark made in section 2, that is a candidate with a better image increases his level of attack. When a candidate has a greater budget, he can easily have a better image than her adversary, and then is more aggressive. Indeed, when a candidate's image is high, the marginal effect of promotion becomes small compared to the marginal effect of aggressiveness. Concerning contests in general, this result seems to be realistic, in a conflict, the more aggressive being generally the strongest contestant. In the context of elections, this is certainly not always the case, but we think that other important effects would have to be considered, as incumbency. Indeed, the effect of attacking a party which have never been in power is certainly smaller than attacking a governing party with verifiable arguments.

5.2 Majority VS Proportionality

We now discuss the question addressed by Konrad [10]. The question is whether or not an increase in the number of candidates leads to an increase of aggressiveness. Konrad [10] shows that in a symmetric equilibrium, when budgets are not fixed, sabotage can be eliminated if the number of players is large enough. Through an example, we conclude that, in equilibrium, candidates attacks decrease with the number of candidates. We suppose that

candidates maximize their share of votes. Consider N candidates competing in the proportional election. The share of votes of candidate i is given by the following expression:

$$\pi^i = \frac{\psi^i}{\sum\limits_{j=1,...,N} \psi^j},$$

We specify the model such that:

$$\psi\left(d_i, (a)_{j\neq i}\right) = e^{\sqrt{d_i} - \sum\limits_{j\neq i} \sqrt{a_{ji}}},$$

where a_{ij} is the level of attack from i targeted on candidate j, d_i is the level of defence of player i, $(a)_{j\neq i} = (a_1, ..., a_{i-1}, a_{i+1}, ..., a_N)$ is the vector of attacks targeted on i. The cost function is linear and the budget fixed to 1, so that the budget constraint of candidate i can be written:

$$d_i + \sum_{j\neq i} a_{ij} = 1,$$

The main difference with the two candidates case is the effect of a candidate's attack on the payoff of the candidates that are not targeted. The derivative of candidate's k vote share when i increases his attack against j is:

$$\frac{\partial \pi^k}{\partial a_{ij}} = -\frac{\partial \psi^j}{\partial a_{ij}} \frac{\psi^i}{\sum\limits_{j=1,...,N} \psi^j} > 0,$$

Thus, an attack from i to j generates positive externalities on the other candidates. Solving this example leads to the following result:

Proposition 8 *In the proportional election with N candidates there is a unique equilibrium and the attack levels decrease with the number of candidates:*

$$\frac{\partial a_i^*}{\partial N} < 0.$$

Finally, the more candidates in the competition, the less they are aggressive. The intuition underlying this result stems from the positive externalities of attacks on the other candidates. This externality leads candidates to reduce their attack level, and this reduction is even greater the larger the number of candidates.

6 Conclusion

We have presented a model of contest with two players choosing between positive or negative campaigning and given sufficient conditions for the existence and the uniqueness of a symmetric equilibrium. We have proposed an application to negative political campaigns. Through an example, our results suggest that the relation between attack and participation can be positive or negative, depending on the distribution of the sensitivities to positive and negative advertisements in the electorate. Furthermore, we have shown that a candidate with a smaller financial support may be less aggressive than his adversary.

7 Appendix

Proof of Proposition 1: A symmetric equilibrium exists only if the following equation has a solution a^* in $[0, C^{-1}(B)]$

$$\varphi_1(\delta(a), a) + \varphi_2(\delta(a), a) = 0, \tag{5}$$

Let $f(a) = \varphi_1(\delta(\Gamma(a)), a) + \varphi_2(\delta(a), \Gamma(a))$, its derivative is given by:

$$f'(a) = [\varphi_{22}(\delta(a), a) - \varphi_{11}(\delta(a), a)] + [\varphi_{12}(\delta(a), a) - \varphi_{21}(\delta(a), a)],$$

Since φ is twice continuously differentiable, the second term in brackets is null, then $f'(a) > 0$. Since $\lim_{a \to 0^+} f(a) = -\infty$ and $\lim_{a \to C^{-1}(B)^-} f(a) = +\infty$. Hence, there exists at most one a^* such that (a^*, a^*) is a symmetric equilibrium. The second order conditions are verified:

$$\frac{d^2\pi^R}{da_R^2} = \pi^R\left(1 - \pi^R\right)\left[\left(-\varphi_1^R - \varphi_2^R\right)\left(1 - 2\pi^R\right) + \left(\varphi_{11}^R - \varphi_{22}^L\right)\right],$$

Then, in the symmetric equilibrium,

$$\frac{d^2\pi^{R*}}{da_R^2} = \left(\varphi_{11}^R - \varphi_{22}^L\right) < 0.$$

Then there exists a unique symmetric equilibrium.

Proof of Proposition 2: The condition $\frac{\partial^2 \varepsilon_d}{\partial a^2}, \frac{\partial^2 \varepsilon_a}{\partial d^2} > 0$ is equivalent to $\varphi_{112}, \varphi_{221} > 0$. We first show that if $a_L \neq a_R$, then $\varphi_{112}, \varphi_{221} > 0$ or $\varphi_{112}, \varphi_{221} < 0 \Rightarrow \frac{d\Gamma^R}{da_L}(a_L)\frac{d\Gamma^L}{da_R}(a_R) < 0$. Indeed:
Suppose $\varphi_{112}, \varphi_{221} > 0$. Consider the case $a_L > a_R$, then $\delta(a_L) < \delta(a_R)$. These two inequalities implies that $\varphi_{12}(\delta(a_R), a_L) > \varphi_{12}(\delta(a_L), a_R)$, hence, $\frac{d\Gamma^R}{da_L}(a_L) < 0$ and $\frac{d\Gamma^L}{da_R}(a_R) > 0$. Now consider $a_R > a_L$, with the same reasoning, we obtain: $\frac{d\Gamma^R}{da_L}(a_L) > 0$ and $\frac{d\Gamma^L}{da_R}(a_R) < 0$.
Suppose $\varphi_{112}, \varphi_{221} < 0$. if $a_L > a_R$, then $\frac{d\Gamma^R}{da_L}(a_L) > 0$ and $\frac{d\Gamma^L}{da_R}(a_R) < 0$. If $a_R > a_L$, then $\frac{d\Gamma^R}{da_L}(a_L) < 0$ and $\frac{d\Gamma^L}{da_R}(a_R) > 0$.

Since in the unique symmetric equilibrium the two reaction functions derivatives are null, $\varphi_{112}, \varphi_{221} > 0$ implies that if $a_L \neq a_R$, then $\Gamma^R(a_L) \neq \Gamma^L(a_R)$. Then there does not exist any asymmetric equilibrium.

Proof of Corollary 3: The example verifies the assumptions of the previous propositions. Indeed, when $a, d \neq 0$, $\varphi(d,a) = \alpha \ln d - \ln\left((d)^{\alpha} + (a)^{\beta}\right)$, then

$$\begin{aligned}
\psi_1(d,a) &= \frac{\alpha (d)^{\alpha-1} (a)^{\beta}}{\left((d)^{\alpha} + (a)^{\beta}\right)^2} > 0, \\
\psi_2(d,a) &= -\frac{\beta (d)^{\alpha} (a)^{\beta-1}}{\left((d)^{\alpha} + (a)^{\beta}\right)^2} < 0.
\end{aligned}$$

and, second order derivatives,

$$\psi_{11}(d,a) = \alpha (a)^{\beta} \frac{(\alpha-1)(d)^{\alpha-2}\left((d)^{\alpha} + (a)^{\beta}\right)^2 - 2\alpha\left((d)^{\alpha} + (a)^{\beta}\right)(d)^{2\alpha-2}}{\left((d)^{\alpha} + (a)^{\beta}\right)^4} < 0,$$

Then φ is concave in d.

$$\varphi_{22}(d,a) = -\beta \frac{(\beta-1)(a)^{\beta-2}\left((d)^{\alpha} + (a)^{\beta}\right) - \beta (a)^{2\beta-2}}{\left((d)^{\alpha} + (a)^{\beta}\right)^2} > 0,$$

Then φ is convex in a. Furthermore,

$$\varphi_{12}(d,a) = \alpha\beta \frac{(a)^{\beta-1}(d)^{\alpha-1}}{\left((d)^{\alpha} + (a)^{\beta}\right)^2},$$

Hence, with simple computations, we obtain:

$$\varphi_{221}(d,a) \propto \alpha\beta\left((\beta-1) d^{\alpha} - (\beta+1) a^{\beta}\right) < 0,$$

and,

$$\varphi_{112}(d,a) \propto \alpha\beta\left((\alpha-1) a^{\beta} - (\alpha+1) d^{\alpha}\right) < 0,$$

This example also verify the Inada conditions: $\lim_{d\to 0} \varphi_1(d,a) = +\infty$, and $\lim_{a\to 0} \varphi_2(d,a) = -\infty$. Finally, with proposition 2, there exists a unique equilibrium.

Proof of Proposition 4: With proposition 2 and corollary 3, since H is a strictly increasing function, the example admits a unique equilibrium and it is symmetric. The equilibrium attack level is given by the following equation:

$$\frac{\beta (a^*)^{\beta-1}}{(B-a^*)^{\alpha}+(a^*)^{\beta}} = \frac{\alpha}{B-a^*} - \frac{\alpha (B-a^*)^{\alpha-1}}{(B-a^*)^{\alpha}+(a^*)^{\beta}},$$

Then,

$$\beta (B-a^*) = \alpha a^*,$$

Thus,

$$\begin{aligned} a^* &= \frac{\beta}{\beta+\alpha} B, \\ d^* &= \frac{\alpha}{\beta+\alpha} B. \end{aligned}$$

Proof of Proposition 5:
Simple computations lead to: $a'(\beta) P^{*\prime}(\beta) \propto -2 - \ln(\beta(1-\beta))$, then $a'(\beta) P^{*\prime}(\beta) \propto e^{-2} + \beta^2 - \beta$. Furthermore $\frac{1-\sqrt{1-\frac{4}{e^{-2}}}}{2}$ and $\frac{1+\sqrt{1-\frac{4}{e^{-2}}}}{2}$ are the roots of $e^{-2} + \beta^2 - \beta = 0$. Hence, the result holds.

Proof of Proposition 6: Candidate R's first order condition is:

$$(d_R^{\alpha} + a_L^{\alpha})(d_L^{\alpha} + a_R^{\alpha}) = d_R^{\alpha}(d_L^{\alpha} + a_R^{\alpha}) + (d_R^{\alpha} + a_L^{\alpha}) a_R^{\alpha-1} d_R,$$

Then,

$$\frac{a_L^{\alpha}}{a_R^{\alpha-1} d_R} = \frac{d_R^{\alpha} + a_L^{\alpha}}{d_L^{\alpha} + a_R^{\alpha}}, \tag{6}$$

Symmetrically, candidate L's first order condition is:

$$\frac{a_L^{\alpha-1} d_L}{a_R^{\alpha}} = \frac{d_R^{\alpha} + a_L^{\alpha}}{d_L^{\alpha} + a_R^{\alpha}},$$

Then,

$$d_L d_R = (B_L - d_L)(B_R - d_R),$$

Finally,

$$d_L = \frac{B_L}{B_R}(B_R - d_R),$$

With 6, we obtain:

$$\left(\frac{B_L}{B_R}\right)^{\alpha}\left(\left(\frac{B_L}{B_R}\right)^{\alpha}+1\right) d_R^{\alpha}(B_R - d_R)^{\alpha} = (B_R - d_R)^{\alpha-1} d_R^{\alpha+1}\left(\left(\frac{B_L}{B_R}\right)^{\alpha}+1\right),$$

Finally,

$$d_R^* = \frac{(B_L)^{\alpha}}{(B_R)^{\alpha}+(B_L)^{\alpha}} B_R,$$

And,

$$d_L^* = \frac{(B_R)^{\alpha}}{(B_R)^{\alpha}+(B_L)^{\alpha}} B_L.$$

Hence, the equilibrium effective efforts are:

$$\psi^R = \frac{(B_R)^{\alpha}}{(B_R)^{\alpha}+(B_L)^{\alpha}},$$

and,

$$\psi^L = \frac{(B_L)^{\alpha}}{(B_R)^{\alpha}+(B_L)^{\alpha}},$$

And the equilibrium participation is:

$$P^* = \int_0^1 r\psi^R + (1-r)\psi^L dH(r) = \psi^L + \left[\psi^R - \psi^L\right] E(r),$$

with $E(r) = \int_0^1 r dH(r)$.

Proof of Proposition 8:

$$\psi(d_i, a_{-i}) = e^{\sqrt{1-\sum_{j\neq i} a_{ij}} - \sum_{j\neq i}\sqrt{a_{ji}}},$$

Then, the first order condition of candidate's i maximization program is given by the following $N-1$ equations: for all j,

$$\pi^j = \frac{\sqrt{a_{ij}}}{\sqrt{1-\sum_{k\neq i} a_{ik}}},$$

And the same is true for each candidate i. Then, a few computation leads to, for all i:

$$a_i = a = \frac{\sum (\pi^j)^2}{1+\sum (\pi^j)^2},$$

Then,

$$\sqrt{1-a} = \sum_{j\neq i} \sqrt{a_{ji}},$$

And, for all i,

$$\pi^i = \frac{1}{N},$$

Finally,

$$a = \frac{1}{1+N},$$

Furthermore, the Hessian matrix of candidate's i payoff is:

$$Hess^i = -\frac{1}{4}\frac{\psi^i}{1-\sum_{j\neq i} a_{ij}} \begin{pmatrix} 1 & ... & 1 \\ ... & ... & ... \\ 1 & ... & 1 \end{pmatrix},$$

Then the second order conditions are verified.

References

[1] Ansolabehere, S., S. Iyengar, and A. Simon (1999), "Replicating Experiments Using Aggregate and Survey Data: The Case of Negative Advertising and Turnout", *American Political Science Review* 93, 4, December: 901-909.

[2] Ansolabehere, S., S. Iyengar (1995), *Going Negative: How Political Advertisements Shrink and Polarize the Electorate.* New York: Free Press.

[3] Ansolabehere, S., S. Iyengar, A. Simon, and N. Valentino (1994), "Does Attack Advertising Demobilize the Electorate", *American Political Science Review* 88, December: 829-838.

[4] Chen, K.P (2003), "Sabotage in Promotion Tournament", *Journal of Law, Economics, and Organization* 19, 1: 119-139.

[5] Herrera, H., Levine D.K., and C. Martinelli (2005), "Voting Leaders and Voting Participation", *2005 North American Winter Meeting of the Econometric Society.*

[6] Finkel, S.E., and J.G. Geer (1998), "A Spot Check: Casting Doubt on the Demobilization Effect of Attack Advertising", *American Journal of Political Science* 42, 2, April: 573-595.

[7] Harbring, Irlenbush, Kräkel, and Selten (2004), "Sabotage in Asymmetric Contests: An Experimental Analysis", *Bonn Econ Discussion Papers*, 12/2004.

[8] Harrington, J.E., Jr., and G.D. Hess (1996), "A Spatial Theory of Positive and Negative Campaigning", *Games and Economic Behavior* 17: 209-229.

[9] Kahn, K.F. and P.J. Kenney (1999), "Do Negative Campaigns Mobilize or Suppress Turnout ? Clarifying the Relationship between Negativity

and Participation", *American Political Science Review* 93, 4, December: 877-890.

[10] Konrad, K. (2000), "Sabotage in Rent-seeking contests", *Journal of Law, Economics, and Organization* 16, 1: 155-165.

[11] Kräkel, M. (2004), "Helping and Saboting in Tournaments", *International Game Theory Review* (forthcoming).

[12] Lazear (1989), "Pay Equality and Industrial Politics", *Journal of Political Economy* 97: 561-80.

[13] Ledyard, J. (1981), "The pure theory of two candidates elections", *Public Choice* 44: 7-41.

[14] Shachar R. and B. Nalebuff (1999), "Follow the Leader: Theory and Evidence on Political Participation", *American Economic Review* 89, 3: 525-547.

[15] Skaperdas, S., and B. Grofman (1995), "Modeling Negative Campaigning", American Political Science Review 89, 1, March: 49-61.

[16] Tullock, G. (1967), "The welfare costs of tariffs, monopolies and theft", *Western Economic Journal* 5: 224-232.

[17] Wattenberg, M.P. and C.L. Brians (1999), "Negative Campaign Advertising: Demobilizer or Mobilizer ?", *American Political Science Review* 93, 4, December: 891-900.

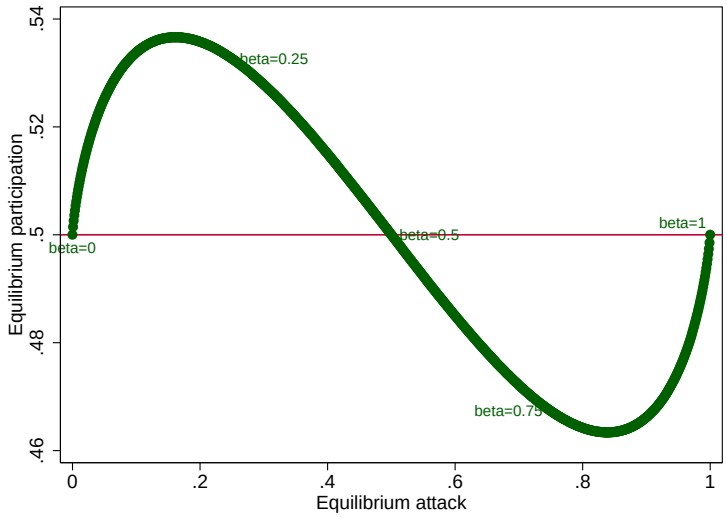

Figure 4: Equilibrium Participation and Attack when β increases

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

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

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

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

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

NOTE DI LAVORO PUBLISHED IN 2005

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

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

IEM	75.2005	*Margherita GRASSO and Matteo MANERA*: Asymmetric Error Correction Models for the Oil-Gasoline Price Relationship
ETA	76.2005	*Umberto CHERUBINI and Matteo MANERA*: Hunting the Living Dead A "Peso Problem" in Corporate Liabilities Data
CTN	77.2005	*Hans-Peter WEIKARD*: Cartel Stability under an Optimal Sharing Rule
ETA	78.2005	*Joëlle NOAILLY, Jeroen C.J.M. van den BERGH and Cees A. WITHAGEN* (lxxvi): Local and Global Interactions in an Evolutionary Resource Game
ETA	79.2005	*Joëlle NOAILLY, Cees A. WITHAGEN and Jeroen C.J.M. van den BERGH* (lxxvi): Spatial Evolution of Social Norms in a Common-Pool Resource Game
CCMP	80.2005	*Massimiliano MAZZANTI and Roberto ZOBOLI*: Economic Instruments and Induced Innovation: The Case of End-of-Life Vehicles European Policies
NRM	81.2005	*Anna LASUT*: Creative Thinking and Modelling for the Decision Support in Water Management
CCMP	82.2005	*Valentina BOSETTI and Barbara BUCHNER*: Using Data Envelopment Analysis to Assess the Relative Efficiency of Different Climate Policy Portfolios
ETA	83.2005	*Ignazio MUSU*: Intellectual Property Rights and Biotechnology: How to Improve the Present Patent System
KTHC	84.2005	*Giulio CAINELLI, Susanna MANCINELLI and Massimiliano MAZZANTI*: Social Capital, R&D and Industrial Districts
ETA	85.2005	*Rosella LEVAGGI, Michele MORETTO and Vincenzo REBBA*: Quality and Investment Decisions in Hospital Care when Physicians are Devoted Workers
CCMP	86.2005	*Valentina BOSETTI and Laurent GILOTTE*: Carbon Capture and Sequestration: How Much Does this Uncertain Option Affect Near-Term Policy Choices?
CSRM	87.2005	*Nicoletta FERRO*: Value Through Diversity: Microfinance and Islamic Finance and Global Banking
ETA	88.2005	*A. MARKANDYA and S. PEDROSO*: How Substitutable is Natural Capital?
IEM	89.2005	*Anil MARKANDYA, Valeria COSTANTINI, Francesco GRACCEVA and Giorgio VICINI*: Security of Energy Supply: Comparing Scenarios From a European Perspective
CCMP	90.2005	*Vincent M. OTTO, Andreas LÖSCHEL and Rob DELLINK*: Energy Biased Technical Change: A CGE Analysis
PRCG	91.2005	*Carlo CAPUANO*: *Abuse of Competitive Fringe*
PRCG	92.2005	*Ulrich BINDSEIL, Kjell G. NYBORG and Ilya A. STREBULAEV* (lxv): Bidding and Performance in Repo Auctions: Evidence from ECB Open Market Operations
CCMP	93.2005	*Sabrina AUCI and Leonardo BECCHETTI*: The Stability of the Adjusted and Unadjusted Environmental Kuznets Curve
CCMP	94.2005	*Francesco BOSELLO and Jian ZHANG*: Assessing Climate Change Impacts: Agriculture
CTN	95.2005	*Alejandro CAPARRÓS, Jean-Christophe PEREAU and Tarik TAZDAÏT*: Bargaining with Non-Monolithic Players
ETA	96.2005	*William BROCK and Anastasios XEPAPADEAS* (lxxvi): Optimal Control and Spatial Heterogeneity: Pattern Formation in Economic-Ecological Models
CCMP	97.2005	*Francesco BOSELLO, Roberto ROSON and Richard S.J. TOL* (lxxvii): Economy-Wide Estimates of the Implications of Climate Change: Human Health
CCMP	98.2005	*Rob DELLINK, Michael FINUS and Niels OLIEMAN*: Coalition Formation under Uncertainty: The Stability Likelihood of an International Climate Agreement
CTN	99.2005	*Valeria COSTANTINI, Riccardo CRESCENZI, Fabrizio De FILIPPIS, and Luca SALVATICI*: Bargaining Coalitions in the Agricultural Negotiations of the Doha Round: Similarity of Interests or Strategic Choices? An Empirical Assessment
IEM	100.2005	*Giliola FREY and Matteo MANERA*: Econometric Models of Asymmetric Price Transmission
IEM	101.2005	*Alessandro COLOGNI and Matteo MANERA*: Oil Prices, Inflation and Interest Rates in a Structural Cointegrated VAR Model for the G-7 Countries
KTHC	102.2005	*Chiara M. TRAVISI and Roberto CAMAGNI*: Sustainability of Urban Sprawl: Environmental-Economic Indicators for the Analysis of Mobility Impact in Italy
ETA	103.2005	*Livingstone S. LUBOOBI and Joseph Y.T. MUGISHA*: HIV/AIDS Pandemic in Africa: Trends and Challenges
SIEV	104.2005	*Anna ALBERINI, Erik LICHTENBERG, Dominic MANCINI, and Gregmar I. GALINATO*: Was It Something I Ate? Implementation of the FDA Seafood HACCP Program
SIEV	105.2005	*Anna ALBERINI and Aline CHIABAI*: Urban Environmental Health and Sensitive Populations: How Much are the Italians Willing to Pay to Reduce Their Risks?
SIEV	106.2005	*Anna ALBERINI, Aline CHIABAI and Lucija MUEHLENBACHS*: Using Expert Judgment to Assess Adaptive Capacity to Climate Change: Evidence from a Conjoint Choice Survey
CTN	107.2005	*Michele BERNASCONI and Matteo GALIZZI*: Coordination in Networks Formation: Experimental Evidence on Learning and Salience
KTHC	108.2005	*Michele MORETTO and Sergio VERGALLI*: Migration Dynamics
NRM	109.2005	*Antonio MUSOLESI and Mario NOSVELLI*: Water Consumption and Long-Run Urban Development: The Case of Milan
SIEV	110.2005	*Benno TORGLER and Maria A. GARCIA-VALIÑAS*: Attitudes Towards Preventing Environmental Damage
SIEV	111.2005	*Alberto LONGO and Anna ALBERINI*: What are the Effects of Contamination Risks on Commercial and Industrial Properties? Evidence from Baltimore, Maryland
SIEV	112.2005	*Anna ALBERINI and Alberto LONGO*: The Value of Cultural Heritage Sites in Armenia: Evidence from a Travel Cost Method Study
CCMP	113.2005	*Mikel GONZÁLEZ and Rob DELLINK*: Impact of Climate Policy on the Basque Economy
NRM	114.2005	*Gilles LAFFORGUE and Walid OUESLATI*: Optimal Soil Management and Environmental Policy

NRM	115.2005	*Martin D. SMITH and Larry B. CROWDER* (lxxvi): Valuing Ecosystem Services with Fishery Rents: A Lumped-Parameter Approach to Hypoxia in the Neuse River Estuary
NRM	116.2005	*Dan HOLLAND and Kurt SCHNIER* (lxxvi): Protecting Marine Biodiversity: A Comparison of Individual Habitat Quotas (IHQs) and Marine Protected Areas
PRCG	117.2005	*John NELLIS*: The Evolution of Enterprise Reform in Africa: From State-owned Enterprises to Private Participation in Infrastructure — and Back?
PRCG	118.2005	*Bernardo BORTOLOTTI*: Italy's Privatization Process and Its Implications for China
SIEV	119.2005	*Anna ALBERINI, Marcella VERONESI and Joseph C. COOPER*: Detecting Starting Point Bias in Dichotomous-Choice Contingent Valuation Surveys
CTN	120.2005	*Federico ECHENIQUE and Mehmet B. YENMEZ*: A Solution to Matching with Preferences over Colleagues
KTHC	121.2005	*Valeria GATTAI and Corrado MOLTENI*: Dissipation of Knowledge and the Boundaries of the Multinational Enterprise
KTHC	122.2005	*Valeria GATTAI*: Firm's Intangible Assets and Multinational Activity: Joint-Venture Versus FDI
CCMP	123.2005	*Socrates KYPREOS*: A MERGE Model with Endogenous Technological Change and the Cost of Carbon Stabilization
CCMP	124.2005	*Fuminori SANO, Keigo AKIMOTO, Takashi HOMMA and Toshimasa TOMODA*: Analysis of Technological Portfolios for CO_2 stabilizations and Effects of Technological Changes
CCMP	125.2005	*Fredrik HEDENUS, Christian AZAR and Kristian LINDGREN*: Induced Technological Change in a Limited Foresight Optimization Model
CCMP	126.2005	*Reyer GERLAGH*: The Value of ITC under Climate Stabilization
PRCG	127.2005	John *NELLIS*: Privatization in Africa: What has happened? What is to be done?
PRCG	128.2005	*Raphaël SOUBEYRAN*: Contest with Attack and Defence: Does Negative Campaigning Increase or Decrease Voters' Turnout?

(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 4th 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 9th 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 10th 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
(lxxvii) This paper was presented at the Workshop on Infectious Diseases: Ecological and Economic Approaches held in Trieste 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.

2004 SERIES	
CCMP	*Climate Change Modelling and Policy* (Editor: Marzio Galeotti)
GG	*Global Governance* (Editor: Carlo Carraro*)*
SIEV	*Sustainability Indicators and Environmental Valuation* (Editor: Anna Alberini)
NRM	*Natural Resources Management* (Editor: Carlo Giupponi)
KTHC	*Knowledge, Technology, Human Capital* (Editor: Gianmarco Ottaviano)
IEM	*International Energy Markets* (Editor: Anil Markandya)
CSRM	*Corporate Social Responsibility and Sustainable Management* (Editor: Sabina Ratti)
PRA	*Privatisation, Regulation, Antitrust* (Editor: Bernardo Bortolotti)
ETA	*Economic Theory and Applications* (Editor: Carlo Carraro)
CTN	*Coalition Theory Network*

2005 SERIES	
CCMP	*Climate Change Modelling and Policy* (Editor: Marzio Galeotti)
SIEV	*Sustainability Indicators and Environmental Valuation* (Editor: Anna Alberini)
NRM	*Natural Resources Management* (Editor: Carlo Giupponi)
KTHC	*Knowledge, Technology, Human Capital* (Editor: Gianmarco Ottaviano)
IEM	*International Energy Markets* (Editor: Anil Markandya)
CSRM	*Corporate Social Responsibility and Sustainable Management* (Editor: Sabina Ratti)
PRCG	*Privatisation Regulation Corporate Governance* (Editor: Bernardo Bortolotti)
ETA	*Economic Theory and Applications* (Editor: Carlo Carraro)
CTN	*Coalition Theory Network*