The Political Economy of the Internal Relations of International Organizations

Gil S. Epstein
Department of Economics, Bar Ilan University, Ramat Gan; IZA, Bonn; CReAM, London

Ira N. Gang
Department of Economics, Rutgers University; IZA, Bonn; CReAM, London

Abstract
October 22, 2007

International organizations are multi-layered and multi-dimensional bureaucracies with many departments. Given its assigned role a department works to try to find solutions to problems in different countries around the world. A department may come into conflict with other departments because of the development of rivalrous plans, at least partly overlapping jurisdictions, and/or the necessity of laying claim to having the bigger impact. Each department invests resources and effort into having an effect. However, each department can show part of the other departments' results as their own and by doing so free-ride on them to some extent. Thus, there are several sources of competition among departments.

We develop economic theory that considers how such a competition affects the resources invested by the departments, the performance of the international organization, and the impact it has on the country the international organization is to help. Moreover, we consider that the international organization may have several, possibly conflicting goals, including altruistic behavior towards recipient countries, satisfying the political requirements of its own member countries (or a subset of its member countries), or its own preservation and growth.

We consider alternative rewards systems for the departments. For example, absolute verses relative ranking in achieving the goals of the departments. We wish the see how such reward systems affect the implementations of the goals of the international organization and the free riding problem.

Correspondence: Ira Gang, Economics Department, Rutgers University, 75 Hamilton St, New Brunswick NJ 08901-1248 USA. email: gang@economics.rutgers.edu Tel : +1 732-932-7405. Fax : +1 732-932-7416.
Gil S. Epstein, Department of Economics, Bar-Ilan University, Ramat Gan, 52900, Israel, Email: epsteig@mail.biu.ac.il

INTRODUCTION

International organizations are multi-layered and multi-dimensional bureaucracies with many departments. Given its assigned role a department works to try to find solutions to problems in different countries around the world. A department may come into conflict with other departments because of the development of rivalrous plans, at least partly overlapping jurisdictions, and/or the necessity of laying claim to having the bigger impact. Each department invests resources and effort into having an effect. However, each department can show part of the other departments' results as their own and by doing so free-ride on them to some extent. Thus, there are several sources of competition among departments.

In international organizations multiple departments typically compete for support and rewards from a central administration. These rivalries can be characterized as contests – while the departments are part of the same organization and presumably face the same organizational goals, they struggle to increase their own rewards often at the expense of other departments. The structure of the contest can be a key element in the international organization attaining its goals. The competition among the departments is carried out by taking actions to help a common recipient – usually a country though possibly an intermediary such as a NGO – more than by engaging in specific actions against one another.

This framework can encompass a wide range of conflicts among sub-groups of an international organization. In the realm of questions about inter-departmental conflict this competition raises a very interesting one: Which department should lead in helping a country, or, indeed, should there be a lead department? Under alternative internal arrangements which department in the international organization wins and which loses? How does the organization do under these arrangements, and how does the recipient do? Can the recipient take actions to influence the effect of the outcomes on its own welfare?

It turns out that a convenient way for classifying alternative conflict structures is that of absolute versus relative ranking. For us the question is in what situations — and for whom — is an absolute ranking of departments desirable, and in what circumstances – and for whom – is such a ranking a detriment vis-à-vis a relative ranking scheme. We construct a very simple, highly stylized model to examine who benefits when there is absolute ranking in place, and who benefits when relative ranking is instead employed. Though not explicitly modeled, absolute ranking allows a department to coordinate activities, recruit members, negotiate with potential recipients, unite all departments to pursue a common goal, and perform other such functions. We assume there are fractious departments who seek to lead their organization in common cause to help a recipient country.

What each department is after is to help a country and to be recognized for doing so. Perhaps each department wants the authority and rewards for implementing its own plan, believing its proposal will best help the countries in need. This rather ethereal goal is termed rent, and our model is one of rent-seeking by the departments. Various conceptualizations of rent are possible in the context of our model. The source of all rent is the organization. The departments seek to lead the organization. The key to our analysis of who captures the rent and the consequences of rent-seeking for the recipient country is the rule structure and how it differs under absolute versus relative rent structures.

Absolute ranking can be seen as a contest between the departments where the winning department receives all the rents. We thus describe this as the all-pay auction contest where the group that inflicts the most against the enemy will receive (in the extreme case) all the rents.[1] On the other hand, instead the departments could compete against each other and obtain rents relative to the amount of effort invested in the contest. This can be seen as a lottery contest where each department obtains rent proportional to the effort invested. In both cases, in equilibrium, the rent obtained is a function of the efforts invested by the departments.

We determine the ranking structure under which each group is better off, as well as the circumstance the recipient country prefers. We are able to state simple and general conditions for each group and the common recipient to benefit.

We develop economic theory that considers how such a competition affects the resources invested by the departments, the performance of the international organization, and the impact it has on the country the international organization is to help. Moreover, we consider that the international organization may have several, possibly conflicting goals, including altruistic behavior towards recipient countries, satisfying the political requirements of its own member countries (or a subset of its member countries), or its own preservation and growth.

[1] In this situation the simultaneous bidders in the all-pay auction are the departments, and their bids are the actions they take against the common enemy. The group that takes the most action, or the group that is perceived to have taken the most action, wins, and acquires all the rents.

We consider alternative rewards systems for the departments. For example, absolute verses relative ranking in achieving the goals of the departments. We wish the see how such reward systems affect the implementations of the goals of the international organization and the free riding problem.

The next section first describes the model. It implements the lottery and all-pay decision rules in the context of the model, and compares the implications for each of the concerned parties. We then introduce measures that might be undertaking by the potential recipient and examine their implications. A concluding section follows.

THE MODEL

Consider the case where there exist two departments in the international organization that have overlapping jurisdictions. Each department has the same objective in terms of helping and finding solutions to problems in different countries around the world. Each department obtains a reward for being able to help countries. To simplify assume both departments are trying to help the same country and for this reason are competing in obtaining the reward for the outcome of what they have done.

Denote by R_i the maximum reward department i (i=1,2) can receive from the helping this country. One can think of winning the contest in probabilistic terms. The probability that department i wins the contest and receives a rent (stake) of R_i is equal to p_i. The rent department i expects to receive in this competition equals $p_i R_i$.[2]

We denote by x_i the amount of effort the departments invest in trying to help the country in need. The effort, x_i, can be seen as a monetary value, time, effort, etc. To simplify we assume that the cost of each unit of effort is one unit. Own effort, the efforts invested by the other department, the stakes and the contest success function; determine the probability of winning the contest.

Let w denote the net payoff received by a department. The expected net payoff (surplus)

[2] One can also look at p_i as the proportion of the rent that this department receives in the competition (Hirshleifer, 1989). Under our maintained assumption of risk neutrality, the probability of winning the rent and the proportion of the rent obtained are mathematically equivalent though conceptually distinct. In the two scenarios we present below, one naturally lends itself to a discussion in terms of the probability of winning the contest, while the intuition of the other is better when thinking about the proportion of the rent obtained.

for the risk neutral department is given by

$$E(w_i) = p_i R_i - x_i \quad for \ i = 1, 2. \tag{1}$$

We assume that the probability of winning the contest and capturing rent satisfies the following conditions:

a. The sum of the probabilities of winning the contest equals one, $p_1 + p_2 = 1$. This means that the international organization will only give one of the departments the rent for helping this country. A different alternative explanation would be that both departments get credit for what they did and as such obtain a proportion of the rent they could have won if there was only one department winning.

b. As a department increases its effort, it has a higher probability of winning, $\frac{\partial p_i}{\partial x_i} > 0$.

c. As department *j*, the "opponent" department in the international organization to department *i*, increases its effort, the probability of department *i* winning the rent decreases, $\frac{\partial p_i}{\partial x_j} < 0$.

d. The marginal increase in the probability of winning the rent decreases with investment in effort, $\frac{\partial^2 p_i}{\partial x_i^{\,2}} < 0$ (this inequality ensures that the second order conditions for maximization are satisfied).[3]

e. The effort invested by one department positively affects the probability of winning by the other department, as the people do not always know which department was really responsible for the action. Thus a proportion *b* of the effort invested by department *i* will be seen by the international organization as invested by department *j*. Therefore, if the departments invest efforts at a level of x_i and x_j then

[3] The function $p_i(.)$ is usually referred to as a contest success function (CSF). The functional forms of the CSFs commonly assumed in the literature satisfy these assumptions (see Nitzan, 1994).

their efforts as perceived by their “supervisors” are equal to x_i *(1-b)* + *b* x_j for department *i* and x_j *(1-b)* + *b* x_i for department *j*. We assume that $b<0.5$, namely the incorrect attribution of effort is less than one half.[4]

f. Rent, R_i, is a positive function of investment on the part of both departments. More specifically we assume that the rent of department 2, R_2, is $r + a\ (x_1+x_2)$ and the rent of department 1, R_1, is $c\ R_2 = c(r + a\ (x_1+x_2))$, where *a* is a parameter capturing the translation of investment into R_2, and *c* is the differential in this effectiveness for R_2 versus R_1. *c* represents the asymmetry between the two departments. Increased effort by one department increases the rent of both departments since increasing efforts increases the outcome the country will obtain. By assumption, $a<1$. Furthermore, the rent department number 1 obtains is at least as great as the value of department 2’s rent, $c \geq 1$. *r* represents the part of the rent of department 2 that is independent of the efforts of both departments. Thus (*c r*) represents the part of department 1’s rent that is independent of the department’s efforts.

The departments engage in a contest. We assume a Nash equilibrium outcome. Each department determines the level of its activities x_i so that its expected payoff, $E(w_i)\ \ for\ i=1,2$, is maximized. The first order condition for maximization is given by,

$$\frac{\partial E(w_1)}{\partial x_1} = \frac{\partial p_1}{\partial x_1} c\left(r + a(x_1 + x_2)\right) + p_1 ca \ -1 \ = 0$$

and (2)

$$\frac{\partial E(w_2)}{\partial x_2} = \frac{\partial p_2}{\partial x_2} \left(r + a(x_1 + x_2)\right) + p_2 a \ -1 \ = 0 \ .$$

Equation (2) is satisfied if and only if

---

[4] A different way at looking at this is that the players are sabotaging each other (on sabotage in rent seeking see Konrad (2000).

$$\frac{\partial p_1}{\partial x_1} = \frac{1 - p_1 ca}{c\left(r + a(x_1 + x_2)\right)}$$

and (3)

$$\frac{\partial p_2}{\partial x_2} = \frac{1 - p_2 a}{r + a(x_1 + x_2)} \quad .$$

We now describe two highly stylized (extreme) regimes:

1. Absolute ranking;
2. Relative ranking.

In the *Absolute ranking* we can have one winning department for each country being helped by the international organization even though both departments helped this country. Here the winner of the contest can obtain all the rent. On the other hand, in *Relative ranking* the two departments may well divide the rents relative to their achievements. These situations do not simultaneously coexist. However, comparing their outcomes provides useful insights, and we compare them after fully detailing each of the scenarios.

The Absolute Ranking

This ranking states that the department that invested the largest amount of effort wins the rent. This type of contest is defined by using the all pay action. In the all-pay auction the probability of winning is a function of the efforts invested by departments or the perceived by the organization. (Note that in equilibrium the efforts will be a function of the rents the departments can obtain).

$$p_i = \begin{cases} 1 & if \quad (1-b)x_i + b\,x_j > (1-b)x_j + b\,x_i \quad \forall i \neq j \\ \frac{1}{2} & if \quad (1-b)x_i + b\,x_j = (1-b)x_j + b\,x_i \quad \forall i \neq j \\ 0 & if \quad (1-b)x_j + b\,x_i > (1-b)x_i + b\,x_j \quad \forall i \neq j \end{cases} \quad . \qquad (4)$$

It can be verified that (4) becomes,

$$p_i = \begin{cases} 1 & if \quad x_i > x_j \quad \forall i \neq j \\ \\ \frac{1}{2} & if \quad x_i = x_j \quad \forall i = j \\ \\ 0 & if \quad x_i < x_j \quad \forall i \neq j \end{cases} \quad . \tag{4'}$$

Thus, *the possibility one department benefits from efforts invested by the other department* (0<b<0.5) *has no effect on departments' efforts.*

In equilibrium the expected payoff as stated in (1) for the two departments is,

$$E\left(w_1^*\right) = \frac{r\,(c-1)2c}{2c-a-ac} \quad and \quad E\left(w_2^*\right) = 0\,, \tag{5}$$

since $c \geq 1$ *and* $a < 1$ *then* $2c - a - ac > 0$, and the expected activity level for each department is

$$E\left(x_1^*\right) = \frac{c\,r}{2c-ac-a} \quad and \quad E\left(x_2^*\right) = \frac{r}{2c-ac-a} \quad . \tag{6}$$

In equilibrium, aggregate investment in the country needing help carried out by the two departments equals

$$E\left(X^*\right) = E\left(x_1^*\right) + E\left(x_2^*\right) = \frac{(c+1)r}{2c-ac-a} \quad . \tag{7}$$

In the literature this measure is called rent dissipation and usually has a negative connotation, i.e. the contest designer tries to decrease the rent dissipation. Here the rent dissipation can be seen in a positive light as it helps the country needing help. Notice, it is commonly assumed that departments do not affect the size of the rent (for example, this is commonly assumed in the rent seeking literature). If a = 0 and the rents are identical (i.e., c = 1), then

$E\left(x_1^*\right)=\dfrac{r}{2}$, $E\left(x_2^*\right)=\dfrac{r}{2}$ and $E\left(w_1^*\right)=E\left(w_2^*\right)=0$.

Thus, *increasing the impact of investment by each department on the size of the rent, a, increases aggregate effort invested in the country needing help and the investment by each department (see appendix for the calculations).*

The Relative ranking

Here we consider the case when departments compete with one another in a contest in which there is no single winner. Later we will compare the two extreme cases with one another: *the Absolute ranking* with *the Relative ranking*.

Without a winner taking all the rent each department fights to obtain its maximum possible portion. We assume the contest is characterized by the generalized lottery function (Lockard and Tullock, 2001), $p_i=\dfrac{z_i}{z_j+z_i}\ \forall i\neq j$. The value of z_j is the organization's perception of the effort invested by department *j*. z_j may differ from actual effort, as the efforts invested by one department positively affect the other department's probability of winning – the organization does not always know which department was really responsible for the action. This is assumption *e*, above.

From assumptions *e* and *f* we obtain that the expected payoff (surplus) for the risk neutral department is given by

$$E\left(w_1\right)=p_1R_1-x_1=p_1cR_2-x_1=\frac{\left((1-b)x_1+bx_2\right)}{x_1+x_2}c\left(r+a\left(x_1+x_2\right)\right)-x_1, \tag{8}$$

and,

$$E\left(w_2\right)=p_2R_2-x_2=\frac{\left((1-b)x_2+bx_1\right)}{x_1+x_2}\left(r+a\left(x_1+x_2\right)\right)-x_2 \quad . \tag{9}$$

Denote by $x_i^* \quad for\ i, j=1,2\ \ i \neq j$ the Nash equilibrium outcome of the contest that solves the first order conditions, equation 2. Solving the first order conditions defined in (2) and (3) for both departments using a Nash equilibrium[5], we find that the level of activities in which each department participates equals,

$$x_1^* = \frac{(1-2b)(1-a+ab)c^2\ r}{(1+c-2ac+2abc)^2}\ \ and\ \ \ x_2^* = \frac{(1-2b)(1-ac+abc)c\ r}{(1+c-2ac+2abc)^2}. \qquad (10)$$

As we can see, if the two departments are identical and have the same rent, i.e., c = 1, the effort exerted by both departments will be identical.

The expected equilibrium payoff for each department equals

$$E(w_1^*) = \frac{c\left(c^2-2ac^2+a^2c^2+b\left(1-c^2+2ac^2-a^2c^2+2c-3ac+2abc\right)\right)r}{(1+c-2ac+2abc)}\ , \qquad (11)$$

and

[5] The first order conditions are

$$\frac{\partial E(w_1)}{\partial x_1} = \frac{(1-b)(x_1+x_2)-((1-b)x_1+bx_2)}{(x_2+x_1)^2}\, c\left(r+a\left(x_1+x_2\right)\right)+c\,a\frac{\left((1-b)x_1\ \ +bx_2\right)}{x_1+x_2}\ -\ 1\ =0\ \ ,$$

and,

$$\frac{\partial E(w_2)}{\partial x_2} = \frac{(1-b)(x_1+x_2)-((1-b)x_2+bx_1)}{(x_2+x_1)^2}\left(r+a\left(x_1+x_2\right)\right)+a\frac{\left((1-b)x_2\ \ +bx_1\right)}{x_1+x_2}\ -\ 1\ =0\ \ .$$

$$E\left(w_2^*\right)= \frac{\left(1-2ac+a^2c^2+b\left(-1+2c+2ac+c^2-3ac^2-a^2c^2+2abc^2\right)\right)r}{\left(1+c-2ac+2abc\right)} \quad . \tag{12}$$

It can be verified that if both departments are identical both have the same expected payoff.

Finally, we can calculate the total amount of effort invested in helping the country in need by the two departments (rent dissipation). We denote this total effort in equilibrium by X^*,

$$X^* = x_1^* + x_2^* = \frac{\left(1-2b\right)c\ r}{1+c-2ac+2abc} .[6] \tag{13}$$

We can now calculate how changes in the parameters affect the total effort invested by the departments.

1. Taking the derivative of the total effort invested in the contest *X* with respect to *b* and using the fact that $0<b<0.5$, $0<a<1$ and $c \geq 1$ we obtain that increasing the credit a department receives from the efforts invested by the other department has a negative effect on the total effort invested by the departments, $\frac{\partial X^*}{\partial b} = \frac{2c\left(ac-1-c\right)r}{\left(1+c-2ac+2abc\right)^2} < 0$. Thus,

Increasing the credit a department receives from the efforts invested by the other department ($0<b<0.5$) *has a negative effect on the aggregate effort invested by the departments* (see the appendix for the exact calculations).

Here we see that credit a department receives from the effort invested by the other department is an externality that affects his probability of receiving the rent. As the externality effect increases

[6] In the case where $a = b = 0$ and $c = 1$, namely, each group only affects positively its own winning probability and the rent is independent of the efforts invested, then the total effort invested in the contest will equal half of the rent.

the total effort invested by the departments decrease. This (1) differs from that obtained in the Absolute ranking situation. On the other hand,

2. Increasing the effect the departments have on determining the size of the rent, *a*, increases the total resources/effort of the departments, $\frac{\partial X^*}{\partial a} = \frac{2(1-2b)(1-b)c^2 r}{(1+c-2ac+2abc)^2} > 0$. Thus,

Increasing the impact of investment by each department on the size of the rent, a, increases aggregate effort invested and the investment by each department (see appendix for the exact calculations).

This result (2) is similar to that obtained in the Absolute ranking situation.
Note that as defined above, the maximum rent that department 1 can obtain is greater or equal to that of the rent department 2 can obtain ($c \geq 1$ where c is the stake ratio). Increasing *c* means that the difference between the two department increases. Increasing *c* has an affect on the aggregate effort invested by the departments (see appendix),

3. Since 0<*b*<0.5 increasing the stake ratio, $c \geq 1$, increases the total effort invested by the departments, $\frac{\partial X^*}{\partial c} = \frac{(1-2b)\,r}{(1+c-2ac+2abc)^2} > 0$ and is independent of the value of c. Setting (14) as an equality we obtain that $\frac{(1-2b)c\,r}{1+c-2ac+2abc} - \frac{(c+1)\,r}{2c-ac-a} = 0$ which is identical to solving $(1-2b)cr(2c-ac-a)-(c+1)r(1+c-2ac+2abc)=0$. Setting *b=0* we obtain $-(1+a)c^2+(2-a)c+1=0$. Since the second derivative of this function is negative, this function has in inverse U shape. Solving $-(1+a)c^2+(2-a)c+1=0$ we obtain $c_{1,2} = \frac{2-a \pm \sqrt{8+a^2}}{2(1+a)}$. Since, $0 \leq a < 1$, it is clear that only one root is possible (the other will provide a negative value to *c*), $c^* = \frac{2-a+\sqrt{8+a^2}}{2(1+a)}$. Note that $\frac{\partial c^*}{\partial a} = \frac{-8+a-3\sqrt{8+a^2}}{2(1+a)^2\sqrt{8+a^2}} < 0$.

Thus,

Increasing the stake ratio, c, increases the aggregate effort invested by the departments $\left.\frac{\partial X^*}{\partial c}\right|_{c\geq 1} > 0$.

This result (3) states that as the stake of department 1 increases relative to that of department 2 the total effort of the departments increases.

Comparing the investment of effort of the departments under Both Situations

The departments do not have a choice between the *Absolute ranking* and *Relative ranking* contests we model above. They face what they face. Over time what they face may change; and we are interested in the outcomes of each of the situations. We now compare these two types of contests both from the perspective of the departments and the organization (which wishes to maximize the effort invested in the different countries needing help). The receiving country wishes to get as much help as possible. X^* gives the aggregate activity of the departments in equilibrium.[7]

Under the generalized lottery function, $p_i = \frac{(1-b)x_i + bx_j}{x_i + x_j}$, from (13) we obtain that the aggregate departments' activities is equal to $X^* = x_1^* + x_2^* = \frac{(1-2b)c\ r}{1+c-2ac+2abc}$. Under the all-pay auction, from equation (7) we obtain that total investment of the departments is equal to $E(X^*) = E(x_1^*) + E(x_2^*) = \frac{(c+1)\ r}{2c-ac-a}$.

The total amount of expenditure invested in the contest and aimed to help the country in need when the contest is a generalized lottery is less than or equal to expenditure in the all-pay auction regime, if

[7] For the case of stakes that do not depend on the efforts invested by the contestants, see Epstein and Nitzan (2006a, 2006b, 2007).

$$X_L^* = \frac{(1-2b)c\,r}{1+c-2ac+2abc} \leq \frac{(c+1)\,r}{2c-ac-a} = E(X^*). \tag{14}$$

Since we have seen that increasing the credit a department receives from the efforts invested by the other department, *b*, decreases total expenditure let us look at the case where *b=0*. If (14) holds for *b*= 0 then it will hold for any *b* > 0. Thus, if $c^* = \frac{2-a+\sqrt{8+a^2}}{2(1+a)}$, then the receiving country will be indifferent between the two regimes. However, the country will prefer the Absolute ranking contest, $X_L^* < E(X^*)$, if $c < \frac{2-a+\sqrt{8+a^2}}{2(1+a)}$, and will prefer the Relative ranking contest, $X_L^* > E(X^*)$, if $c > \frac{2-a+\sqrt{8+a^2}}{2(1+a)}$ (see appendix).

Therefore, we can conclude that,

If the ratio of rents that can be generated from investing effort in the country needing help is sufficiently small, i.e., $c < \frac{2-a+\sqrt{8+a^2}}{2(1+a)}$*, then the international organization and receiving country prefers the contest NOT TO BE an all-pay auction where the department that invests the most effort wins the contest. If each department has the same stake, i.e., c = 1, then the organization prefers the Absolute ranking.*

The more sensitive the rent is to changes in department efforts (the larger a), the smaller is the ratio between the rents, c, that makes the organization indifferent. (See appendix).

In order to analyze the preferences of the departments we must compare their expected payoffs under both the generalized lottery function and the all-pay auction regimes. Remember that we assumed, without loss of generality, that department 1 has at least as large a stake as department 2 $(i.e.,\ R_1 = cR_2,\ c \geq 1)$. The departments prefer the regime that generates for them the maximum expected equilibrium payoff, $E\left(w_i^*\right)$. Under the generalized lottery function the expected equilibrium payoff for department 2 (the weaker department) equals $E\left(w_2^*\right)=\dfrac{\left(1-2ac+a^2c^2+b\left(-1+2c+2ac+c^2-3ac^2-a^2c^2+2abc^2\right)\right)r}{\left(1+c-2ac+2abc\right)}>0$ while the expected equilibrium under the all-pay auction equals zero, $E\left(w_2^*\right)=0$. Therefore it is clear that,

The weaker department -- *the department that has less to gain from its investment* -- *will always prefer that there is Relative ranking.*

For the stronger department the expected equilibrium payoff under the generalized lottery function equals $E_L\left(w_1^*\right)=\dfrac{c\left(c^2-2ac^2+a^2c^2+b\left(1-c^2+2ac^2-a^2c^2+2c-3ac+2abc\right)\right)r}{\left(1+c-2ac+2abc\right)}$ while the expected equilibrium under the all-pay auction equals $E_p\left(w_1^*\right)=\dfrac{r\,(c-1)2c}{2c-a-ac}$. The expected payoff for department 1 under the generalized lottery regime is greater than that obtained under the all-pay auction regime, and thus this department prefers the lottery regime, if

$$E_L\left(w_1^*\right)=\frac{c\left(c^2-2ac^2+a^2c^2+b\left(1-c^2+2ac^2-a^2c^2+2c-3ac+2abc\right)\right)r}{\left(1+c-2ac+2abc\right)} \qquad (15)$$

$$> \frac{r\,(c-1)2c}{2c-a-ac} = E_p\left(w_1^*\right).$$

In the case of b=0 (15) becomes,

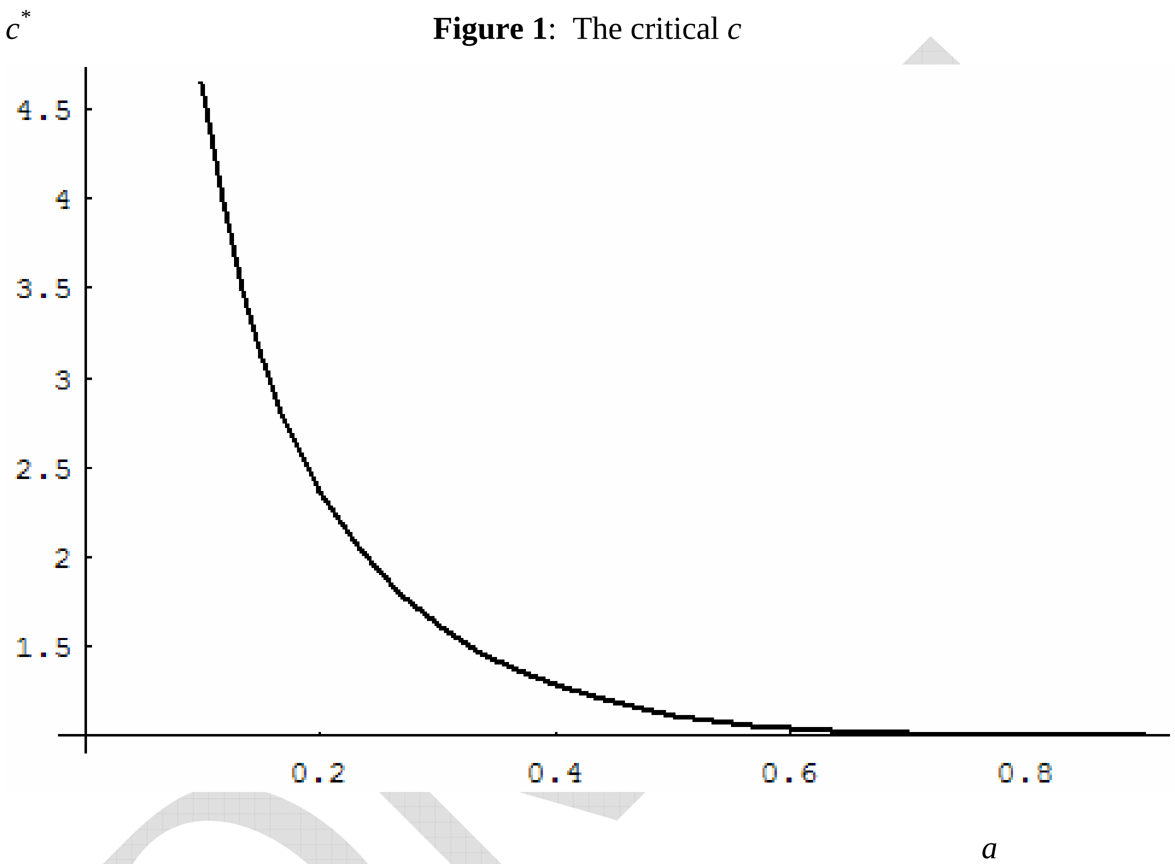
$$E_L\left(w_1^*\right)=\frac{\left(c^2-2ac^2+a^2c^2\right)r}{\left(1+c-2ac\right)}>\frac{(c-1)2}{2c-a-ac} = E_p\left(w_1^*\right). \qquad (16)$$

Denote the critical level of c under which equation (16) holds as equality by c^{**}.

In other words,

The department with the higher stake, with more to gain from the investment in the country needing help, prefers the Relative ranking to the Absolute ranking if the difference between the departments is not sufficiently large, $c < c^{**}$. *Moreover, as a increases* c^{**} *decreases. (See appendix figure 1)*

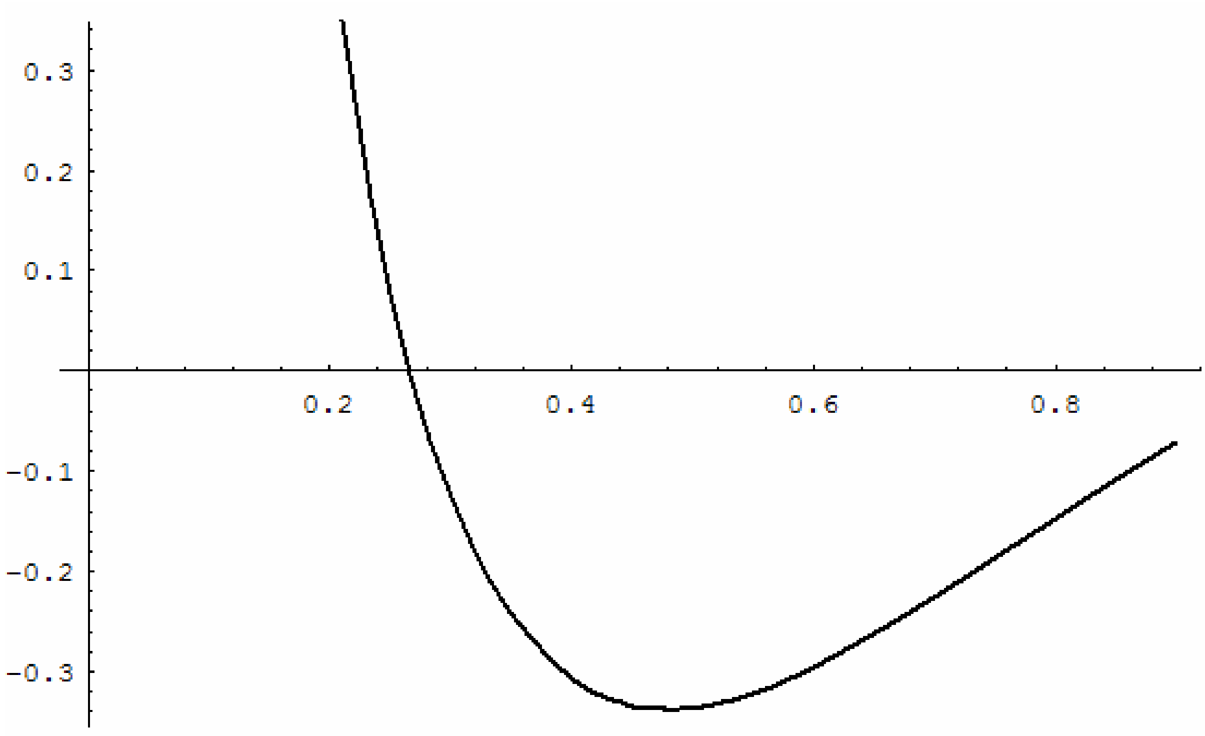
Figure 1: The critical *c*



As *a*, the parameter capturing the translation of investment into the rent increases, the critical ratio between the rents, c, that makes the stronger department indifferent between the two regimes, decreases.

We can compare the critical values *c** and *c*** which make the organization and the departments prefer the contest to the all-pay auction. As we can see from figure 2 there are critical values for which both *c** and *c*** are satisfied. Thus there exist situations under which the preferences of the departments and the organization **do not** coincide.

c^{**}-c^{*} **Figure 2:** The difference between the different critical levels.



Level of a

There exist critical values for which both c^* and c^{**} are satisfied. Thus there exist conditions under which the preferences of the departments and the organization DO NOT coincide.

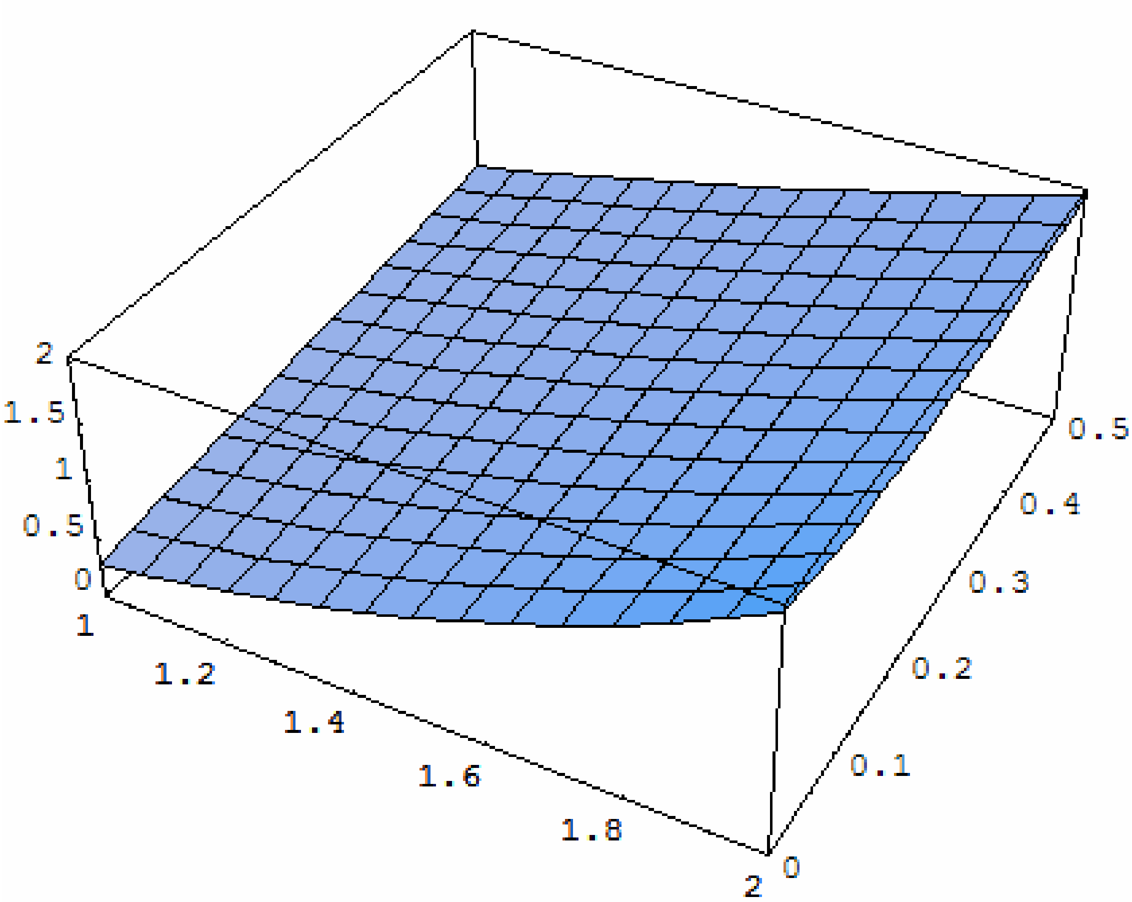
Note that it can be shown that for $a \leq 0.5$, an increase in b increases the expected payoff of the department (see for example figure 3 where a=0.5, r=1, c ranges from 1 to 2 and b from zero to 0.5).

Figure 3: The expected payoff of department 1

The expected payoff of department 1,

$$E_L\left(w_1^*\right) = \frac{c\left(c^2 - 2ac^2 + a^2c^2 + b\left(1 - c^2 + 2ac^2 - a^2c^2 + 2c - 3ac + 2abc\right)\right)r}{\left(1 + c - 2ac + 2abc\right)}.$$

For a=0.5, r=1, c ranges from 1 to 2 and b from zero to 0.5:



Level of c *Level of b*

Increasing both c (between 1 and 2) and b (between 0 and 0.5) increase the expected payoff of the department.

CONCLUSION

In a highly structured and simple model we characterize and compare two ex ante regimes: (1) the absolute reward scheme presented by an all-pay auction in which the winner takes all available rents; (2) the lack of a relative reward scheme in which the rent allocation rule is a lottery and each department obtains a proportion of their possible rent. In the former regime the equilibrium here is in mixed strategies, the "stronger" department could actually lose the contest and get nothing. However, the expected payoff for the weaker department is zero.

The contests we address are the fractious relationships among departments seeking help the country in need. We show that the organization and the country in need prefer that the Absolute ranking prevails. Moreover, this desire does not coincide with the wishes of both departments. They prefer the Relative ranking to the situation in which the Absolute ranking.

We conclude by pointing out that our approach and analysis goes beyond a standard rent-seeking contest, instead offering new theoretical insights for structuring international organizations when there are competing departments. Aside from the insights we are able to provide about the reward ranking scheme, our work is further distinguished by accounting for: (*i*) the possibility of recipient activities that can change the departments' ordering of the regimes, and (*ii*) recipients gain based on reward regime.

References

Basu, K. (1986) One Kind of Power. *Oxford Economics Papers* 38(2), 259-282.

Basu, K. (2000) Prelude to Political Economy: A Study of the social and political fundations of economics. Oxford University Press. UK.

Baye, M.R., Kovenock, D. and de Vries, C.G. (1993) Rigging the lobbying process: an application of the all-pay auction. *American Economic Review* 83(1), 289-294.

Ellingsen, T. (1991) Strategic buyers and the social cost of monopoly. *American Economic Review* 81(3), 648-657.

Epstein G.S. and Nitzan, S. (2007) *Endogenous Public Policy and Contests*, Springer.

Epstein G.S. and Nitzan, S. (2006a) Effort and performance in public policy contests. *Journal of Public Economic Theory* 8(2), 265-282.

Epstein G.S. and Nitzan, S. (2006b) Reduced prizes and increased effort in contests. *Social Choice and Welfare* 26(3), 447-453.

Hillman, A.L. and Riley, J.G. (1989) Politically contestable rents and transfers. *Economics and Politics* 1(1), 17-39.

Hirshleifer J. (1989) Conflict and rent-seeking success functions: Ratio vs. difference models of relative success. *Public Choice* 63(2), 101 – 112.

Konrad, K.A. (2000) Sabotage in rent seeking contests. *Journal of Law, Economics and Organization* 16, 155-65.

Lockard, A.A and Tullock, G. eds. (2001) *Efficient rent-seeking, chronicle of an intellectual quagmire*. Boston: Kluwer Academic Publishers.

Nitzan, S. (1994) Modelling rent-seeking contests. *European Journal of Political Economy* 10(1), 41-60 (also appears in Lockard and Tullock, 2001).

Appendix
The Absolute ranking: All-Pay Action

It is a standard result that there is no equilibrium in pure strategies in all-pay auctions. For a given R_1 and R_2 suppose department 2 bids $0 < x_2 \leq R_2$. Then the first department's optimal response is $x_1 = x_2 + \varepsilon < R_1$ (i.e., marginally higher than x_2). But then $x_2 > 0$ cannot be an optimal response to $x_1 = x_2 + \varepsilon$. Also, it is obvious that $x_1 = x_2 = 0$ cannot be an equilibrium. Hence, there is no equilibrium in pure strategies. There is a unique equilibrium in mixed strategies given by the following cumulative distribution functions (see Hillman and Riley (1989), Ellingsen (1991) and Baye, Kovenock, and de Vries, 1993)),

$$G_1(x_1) = \frac{x_1}{R_2} \quad for \;\; x_1 \in [0, n_2) \text{ and } G_2(x_2) = 1 - \frac{R_2}{R_1} + \frac{x_2}{R_1} \quad for \;\; x_2 \in [0, R_2).$$

The equilibrium cdf's show that department 1 bids uniformly on [0, R_2], while department 2 puts a probability mass equal to (1 –n_2 /n_1) on $x_2 = 0$. The expected lobbying expenditures are

$E(x_1) = \int_0^{R_2} x_1 dG_1(x_1) = \frac{R_2}{2} \quad and \quad E(x_2) = \int_0^{R_1} x_2 dG_2(x_2) = \frac{R_2{}^2}{2R_1}$. Note that in the all-pay auction

we can think probabilistically - i.e., the stronger department is more likely to win the contest.

Therefore, we obtain that the expected activity level for each department is

$$E(x_1^*) = \frac{R_2}{2} \;\; and \;\; E(x_2^*) = \frac{R_2^2}{2R_1} \quad .$$

The equilibrium probability of winning the contest for each department equals

$$\Pr_1^* = \frac{2R_1 - R_2}{2R_1} \quad and \quad \Pr_2^* = \frac{R_2}{2R_1} \quad .$$

The expected equilibrium payoff for each department equals

$$E(w_1^*) = R_1 - R_2 \qquad and \qquad E(w_2^*) = 0 \quad .$$

In equilibrium, the total amount of terrorist activities carried out by the departments' equals

$$E(X^*) = E(\; x_i^* + x_j^* \;) = \frac{n_2 \,(R_2 + R_1)}{2R_1} \quad .$$

Using the fact that $R_1 = c(r + a(E(x_1) + E(x_2)))$ *and* $R_2 = (r + a(E(x_1) + E(x_2)))$ we may calculate the equilibrium expected expenditures of both departments, $E(w_1^*) = \dfrac{r\,(c-1)2c}{2c - a - ac}$ *and* $E(w_2^*) = 0$. Since $c \geq 1$ *and* $a < 1$ *then* $2c - a - ac > 0$. The expected activity level for each department is $E(x_1^*) = \dfrac{c\,r}{2c - ac - a}$ *and* $E(x_2^*) = \dfrac{r}{2c - ac - a}$.

The effect of a change in *a* is, $\dfrac{\partial E(X^*)}{\partial a} = \dfrac{\partial(E(x_1^*) + E(x_2^*))}{\partial a} = \dfrac{(1+c)^2 r}{(2c - a - ac)^2} > 0$