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EVENT CORRUPTION: A GAME THEORETIC APPROACH

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Abstract. This article applies economics of doping theory (game theory) to corruption. Similarities and significant differences between the two topics are identified. As a consequence of such differences, the corruptive action – the bribe – is introduced as a decision variable for the players. Nash equilibria of the "corruption game" are structurally similar to the doping situation – e.g. "everybody is corrupt". However, the size of the bribe becomes, as a consequence of a significant revision of the basic models, "as high as possible"; indicating that the event corruption case should be at least as hard to handle as the doping problem and with possibly even more drastic adverse effects. Although the article focuses on corruption in sports and events, the results are also relevant for other types of corruptive action. Corruption in sports is a problem threatening the existence of professional sports. Hence, the methods for better understanding presented in this article are of vital importance for the professional sports business.

1. Introduction

International sports governing bodies have been hit by several cases of corruption over the years. This has involved both the IOC (The International Olympic Committee) and sports federations. Two recent examples are the 2016 Rio Olympics and the 2010 Tokyo Olympics where members of the IOC are currently, (in 2017) being investigated for taking bribes in connection with the awarding of the Games [2, 6]. Such cases are not new. Similar scandals appeared in connection with the awarding of the 1998 Winter Olympics to Nagano, Japan, and the 2002 Winter Olympics to Salt Lake City, USA. This resulted in the expulsion of several board members and the adoption of new IOC rules [9]. That the scandals repeat themselves can explain the criticism by Dick Pound, IOC's former vice president, who has accused IOC for "doing nothing" about its growing corruption crisis.

FIFA, the international football governing body has been ridden by similar corruption scandals related to the awarding of the World Cup. In 2015, seven current FIFA officials were arrested in Zürich when they were about to attend the 65th FIFA Congress. They were expected to receive US$150 million in bribes. There was also a simultaneous raid on the CONCACAF (Confederation of North, Central American and Caribbean Association Football) headquarters in Miami, and later, two further men handed themselves in to the police for arrest: Jack Warner and marketing executive Alejandro Burzaco. The arrests case triggered Australia, Columbia, Costa Rica, and Switzerland to open or intensify separate

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criminal investigations into top FIFA officials for corruption. A second criminal case was launched by Swiss prosecutors into the bids for the 2018 and 2022 World Cups, to be held in Russia and Qatar respectively [21]. In December, independent investigator Michael Garcia quit FIFA in protest against the way it handled its report into bidding for the 2018 and 2022 World Cups.

Another example is the International Athletic Association (IAAF) awarding of the 2021 World Athletics Championships to Eugene, Oregon, bypassing the usual formal bidding process, which came under investigation by the FBI and the Criminal Division of America's Internal Revenue Service (IRS). Eugene was handed the event despite strong interest from the Swedish city of Gothenburg. The IAAF scandal was the case when the ethics commission of the governing body IAAF banned Papa Massata Diack, a former marketing consultant to the International Association of Athletics Federations and also the son of the ex IAAF president, Lamine Diack, former Russian athletics chief Valentin Balakhnichev and coach Alexei Melnikov were banned from any involvement in athletics because they took bribes to cover up doping by Russian athletes [18].

Unfortunately, the list of scandals does not stop here. Other examples of sports federations involved in corrupt practise include [13];

- The International Weightlifting Federation (IWF), which has been accused of financial mismanagement with millions of dollars provided by the IOC.
- The International Volleyball Federation (IFVB), which has faced accusations of illegitimate political action to keep a leadership regime in power as well as accusations of financial mismanagement of funding.
- The International Cycling Union (UCI), with the doping scandal involving Lance Armstrong and his team-mates, has faced accusations of bribery and financial conflicts of interest.

The examples discussed above indicate that the corruption related to sports, and particularly to the awarding process of major events, can be substantial. If such mechanisms are allowed to develop further, it may be threatening for the global professional sport. After all, who would (in the future) be willing to make the necessary investments and preparations for bidding for events if things other than quality define the host. As a consequence, this paper tries to investigate the core of corruption problems, mainly related to event hosting, and offer some game theoretic explanation. Explanation that may be relevant for how such a problem may be both better understood and (ultimately) dealt with (or solved) in the future.

In the next section (Section 2), relevant literature is discussed. Section 3 contains game models and analyses, while Section 4 contains discussion, conclusions and suggestions for further research.

2. Literature

Microeconomic analyses of illicit activities, such as corruption and doping assume that the individuals are weighing the alternatives of illicit behaviour and legal activities as an optimization behaviour under specific given constraints. Such a perspective is based on the ideas of the well-known article by Gary Becker where he developed a framework for analysing illegal behaviour [4]

Susan Rose-Ackermann, a pioneer in the research on the economics of corruption, defines corruption as an illegal payment to an agent to obtain a benefit that may or may not be deserved in the absence of payoffs [16]. According to [5], (quote) "*the essence of corruption is that two individuals or groups act in concert to further their own interests at the expense of a third party*".

Although, the references above, as well as those in Section 1 indicate a fairly comprehensive research literature related to corruption, the availability of game theoretic modelling is far more sparse. Some noteworthy exceptions do however exist – see for instance [3, 11, 12]. Although these articles offer relevant and solid analyses of corruption games, a model framework used in the analyses of doping may offer simpler understanding ands results. We believe that our explicit modelling of bribes as player decision variables, as opposed to the authors mentioned above, open up for easier understanding as well as clearer and enhanced results.

3. Game models and analysis

In a simplified doping game, 2 players (Player I and II) compete to achieve a prize a[1]. The winner gets a, while the looser gets nothing. The players of the game, typically athletes of some kind, have a simple decision to make before the contest; whether to take drugs or not – $\{\mathcal{D}, \mathcal{ND}\}$. Combining simplifying assumptions of athletes being of equal strength, with a "perfect drug"[2], as well as to the existence of a given common knowledge probability of being revealed as a drug user, r, and an accompanying cost c[3], the following complete information (simultaneous) game matrix[4] is defined in Figure 1:

The analysis of the game in Figure 1 reveals a unique (dominant strategy) Nash equilibrium (NE) of $\{\mathcal{D}, \mathcal{D}\}$ if

$$\frac{1}{2}a - rc > 0. \tag{3.1}$$

Given a simple "empirical argument" such as: In the real world, the probability of exposure is low, and the cost of revelation is low[5] – although probably culturally and geographically different. As a consequence, the most practical half a's are much bigger than rc. That is, (3.1) is satisfied, and most athletes[6] ought to be very tempted to take drugs.

[1] We adopt the notation in [7].

[2] In this setting, perfectness points to an assumption securing that the drug-taker wins the prize a with certainty if the opponent keeps clean.

[3] All parameters a, r and c are simplified in our modelling – i.e., they are assumed equal for each player. They are in reality both culturally and nationally dependent. That is, the game types we consider in this paper, are simplified in these dimensions. However, several contributions in doping literature have both discussed and analysed the consequences of opening up for variations in a, c and r, see for instance [7, 8].

[4] Values within the matrix are expected pay-offs.

[5] A thorough discussion of these matters can for instance be found in [8] or [7]

[6] This model is extended to the multi-player case see [8], so it seems like a relatively solid result.

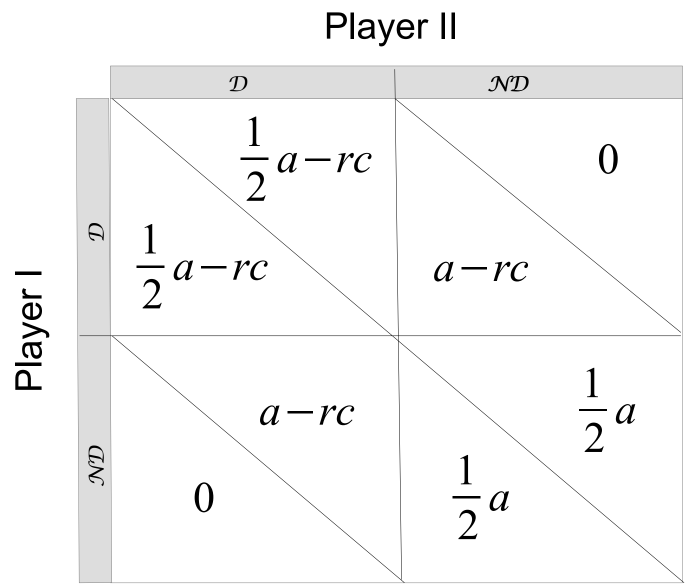

Figure 1. The simplest possible doping game in [7].

3.1. Similarities between economics of doping and corruption

Corruption, as discussed in Section 1, is a complex phenomenon. Most real world corruption cases would involve transactions of real money, but there are obvious examples where resources other than money are involved. There are also situations where the competitive elements of corruption are not as obvious as in the setting defined below. Still, at least in principle, corruption involves competition in one way or another.

The version of corruption of primary interest in our setting is the situation that may be labelled as *competitive corruption.* This situation involves a “master” with property rights of some material of immaterial object which is to be transferred to a single agent (typically one of many potential hosts) after some kind of selection process. A typical example may be a mega event of some kind; for instance Olympic Games. In such a situation, potential hosts compete to get the event, and the temptation to hand over[7] some extra funds (corruption) from one or several of potential hosts to the “master” is obvious. Although this description is tailor made for the event situation, other situations, such as a civil servant controlling some limited resource, or a school teacher controlling pupils’ grades have clear similarities.

[7]The obvious reason for such a temptation is of course a belief that such a transfer might have positive impact on the probability of getting the event.

Reverting to the event situation, it ought to be easy to see the similarities with the doping situation. If two potential event hosts compete to host a given event, they could play by the book and take part in the selection process (choose the no-doping or no-corruption strategy as we will call it here), or; they could choose to be corrupt in a suitable manner. Given that the assumption of equal quality athletes is kept; in this situation then redefined as equal quality hosts as well as adding the main difference, the actual transfer of "money" through a bribe, the situation is similar; some gain (positive utility) of getting the event, a[8], some probability of being revealed as corrupt, r, as well as some costs, c, assigned to existence of such a revelation. The consequence of such a redefinition is straightforward. Given that corruption is applied by any of the two potential hosts, Pay-offs given a choice of applying the corruption strategy are then:

$$\frac{1}{2}a - rc - B \text{ or } a - rc - B \tag{3.2}$$

where B[9] is the necessary bribe (measured in comparable units with a and c) and, for the time being, defined as a given common knowledge amount. Then, a simple cost redefinition like[10]:

$$c^* = c + \frac{B}{r} \tag{3.3}$$

produces the game as shown in Figure 2.

In Figure 2, $\mathcal{C}$ and $\mathcal{NC}$ denote choosing a corruption or not strategy respectively. If Figures 1 and 2 are compared, they describe the same game structurally. Then, differences in solutions between the corruption- and the doping game boil down to differences between c and c^* and potential changes in the behaviour of inequality (3.1). Let us analyse this in more detail. Initially, it seems reasonable to assume that

$$a \gg B. \tag{3.4}$$

After all, the opposite would indicate that the value of hosting the event should be smaller than the bribe. In such a situation, bribery and corruption would be non-existent – which definitely is **not** the case.

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[8]As opposed to the doping situation, where a is relatively easy to interpret (individual prize money for instance) the situation is slightly more complex for the corruption case. We can at least decompose the a into three categories, say $a = \sum_{i=1}^{3} a_i$ where a_1 could be commercial (net) revenue (increased tourism and economic activity, ticket reveues etc.), a_2 could be governemental subsidies, while a_3 could be some immaterial utility of glory, pride or simply beating your host competitor. Obviously, such a's could (or would) be different for different host players; another simplification in the model framework.

[9]Again, like for the a's discussed above, a single valued B is a simplification. In the event setting, it is not just about bribing a single policeman or teacher. Typically, more than one indivdial needs to be bribed. To complicate things even further, different events have different voting procedures. For instance, for events owned by IOC or FIDE (The World Chess Federation) all delegates have voting rights, while in events owned by FIFA and FIS (The International Ski Federation), only board members have voting rights. As a consequence, the number of people who need bribing could differ significantly between event types. In addition, the simple fact that a bribe does not guarantee a vote enhances the complexity even further.

[10]The reason for this redefinition should be evident as: $\frac{1}{2}a - rc^* = \frac{1}{2}a - r\left(c + \frac{B}{r}\right) = \frac{1}{2}a - rc - B$, and the correspondence with (3.2) is established.

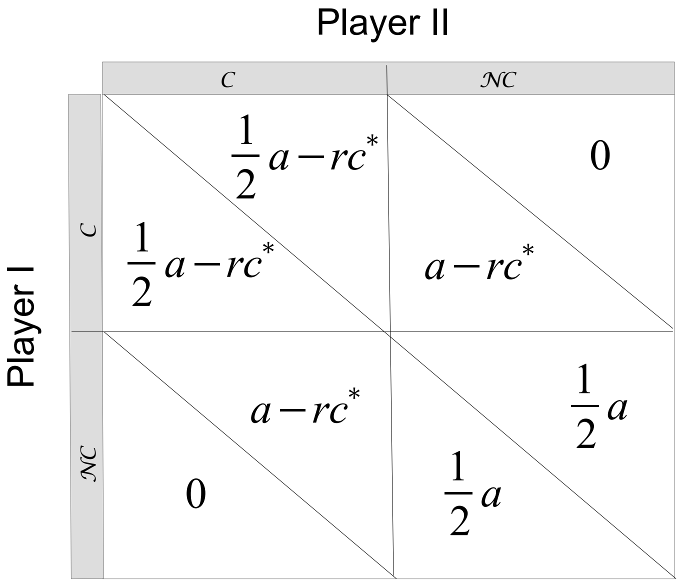

Figure 2. A simple corruption game.

Furthermore, both r – the probability of being revealed as corrupt – as well as actual costs of such a revelation, c, are small. Obviously, these two parameters are strongly both culturally and geographically dependent, but even in societies and cultures which traditionally are viewed as relatively "corruption-free", few would claim high c and r. Surely, empirical data that could support the above conclusion are more or less non-existing as of today. Some interesting initiatives [20] may perhaps change this. Still, as we see it, such data are far ahead in time. Again, this constitutes an obvious similarity with the doping situation.

Regardless of this, if r and c are small, then the product is even smaller ≈ 0. As a consequence, inequality (3.1) – or to be more correct, the corruption version (3.2) – approximates to:

$$\frac{1}{2}a > B. \tag{3.5}$$

And, by (3.4), (3.5) should hold. Hence, the corruption game in Figure 2 behaves (solution-wise) exactly as the original doping game in Figure 1. As a consequence, all main results from the doping model; "Everybody is corrupt" as well as the Prisoner's dilemma situation; "Nobody wants to be[11]" are transferable between these games.

[11] Of course, the event owner is not necessarily within the group of "Nobody."

3.2. A refined bribing model

In the game of Figure 2, the bribe, B, is assumed known, and common knowledge for the players. In certain (classical) corruption situations, such as bribing teachers or similar public servicemen, this may very well be the case. However, in an event situation, such information might not be available. If a bribing strategy was established, for instance to get football WC to Qatar or Russia, the question of bribe-size would be of interest. Of course, the question of other potential hosts' bribe size would be likewise interesting. Such a situation is significantly different from the situation underlying the simplistic corruption game in Figure 2. Now, the potential host must not only decide whether to bribe or not, but also if the corruption strategy is chosen: what value should the bribe have?

Surely, this has significant consequences for the game model itself. Still, we choose to attack this (slightly) different problem in a similar model framework. The simplest possible approximation within this framework, opening up for bribe-sized player decisions might be to add two possible bribes; say B_1 and B_2, $B_2 > B_1$[12]. In this situation (simply substituting the original B with two options B_1 and B_2), players can choose between no corruption, low corruption (B_1) or high corruption (B_2). Such a change does of course change the game, but (luckily) not much so that simple reasoning can help find a solution. This situation is shown in Figure 3[13]:

The game in Figure 3 is straightforwardly modelled as an extension to the game in Figure 2 with one important underlying assumption added. We assume, which seems very reasonable, that, if one player bribes B_1 while the other bribes B_2, B_2 wins. That is, an assumption of greed for the event owner is implicit.

An analysis of NE's of this game (Figure 3) is straightforward. The following previous assumptions;

$$\frac{1}{2}a - rc - B_2 > 0 \tag{3.6}$$

seem (as before) reasonable, as a bribe $B_2 > \frac{1}{2}a - rc$ makes the corruption problem non-existent.

Furthermore, as (by assumption) $B_2 > B_1$, we get:

$$\frac{1}{2}a - rc - B_1 > 0. \tag{3.7}$$

Likewise (of course):

$$a - rc - B_1 > a - rc - B_2. \tag{3.8}$$

Then, adding $\frac{1}{2}a$ to both sides of inequalities (3.6) and (3.7), we get:

$$a - rc - B_j > \frac{1}{2}a \ \forall j \in \{1, 2\}. \tag{3.9}$$

Utilizing inequalities (3.6), (3.8) and (3.9), the following subset of the best reply functions for the game in Figure 3 is found; as shown in Figure 4 – ellipses for Player I and rectangles for player II.

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[12] Without loss of generality.

[13] Note that the strategy space is reordered compared to the previous models. This turned out to be mathematically convenient.

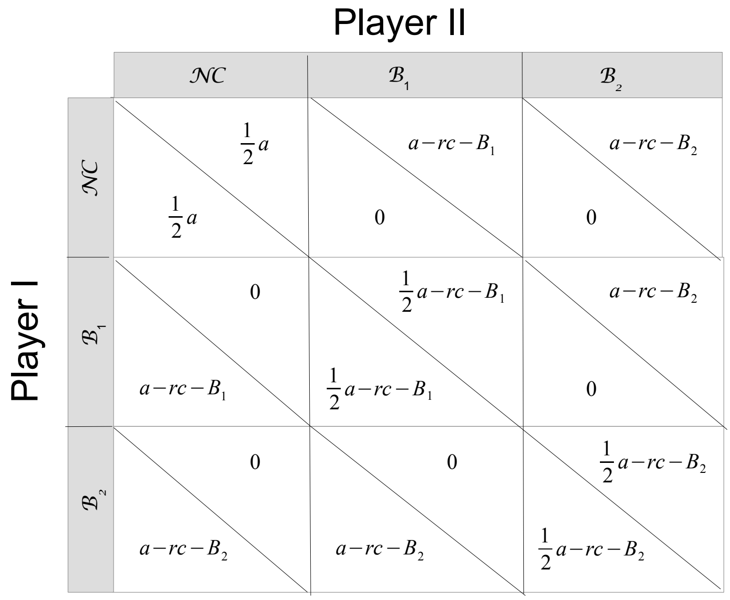

Figure 3. The revised corruption game.

As $\frac{1}{2}a - rc - B_1 > 0$ and $a - rc - B_2 > 0$, the only remaining relevant inequality to examine to complete the best reply functions for both players are:

$$\frac{1}{2}a - rc - B_1 < a - rc - B_2 \Rightarrow \frac{1}{2}a - B_1 < a - B_2 \Rightarrow B_2 - B_1 < \frac{1}{2}a. \qquad (3.10)$$

Consequently, as our argument in Subsection 3.1 leading to inequality (3.5) still holds, inequality (3.10) must hold, too. Then, the full set of the best reply functions can be observed in Figure 5.

As can be observed in Figure 5, the simplicity of the solution structure is kept from the original doping and corruption games from Figures 2 and 3. A single unique NE (in this case) of $\{B_2, B_2\}$ is the output. In layman terms, we could perhaps conclude as follows: Not only will a redesign towards a more realistic event hosting corruption game still give everybody as corrupt, they are even more corrupt than before. This conclusion can easily be extended to a situation where they are not only more corrupt, but, in fact, maximally corrupt.

This generalization can be done as follows: Let us now assume that we introduce a new higher bribe option, say $B_3 > B_2 > B_1$, but of course keeping the (reasonable) assumption of $\frac{1}{2}a - rc - B_3 > 0$. Then, we can argue as above. We will end up with a new row at the bottom of Figure 5 as well as a new column to the right. This is demonstrated in Figure 6 where the new row and column are coloured in dark grey.

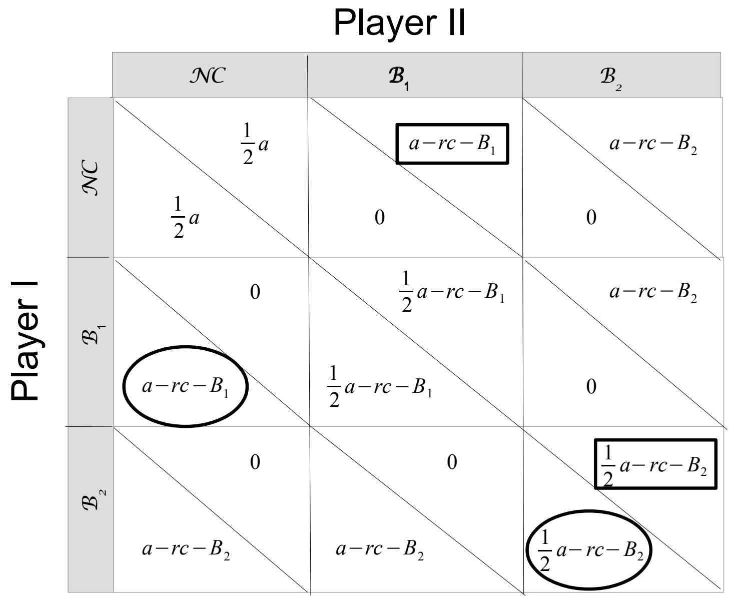

Figure 4. The revised corruption game – subset of the best reply functions.

In Figure 6, it is straightforward to observe what happens. Apart from the $\{B_2, B_2\}$, NE, all other best reply values remain unchanged. However, for this single matrix element, both the best reply values change. Player II's value shifts one column to the right, while Player I's element shifts one row downwards. A new NE is formed at the (new) lower right diagonal element.

It is now easy to realize that repeating this argument works the same way. That is, the following inequality will define a similar pattern (for any $B_j > B_{j-1}$ when $B_j < \frac{1}{2}a - rc$):

$$a - rc - B_j > \frac{1}{2}a - r - B_{j-1} \Rightarrow \frac{1}{2}a > B_j - B_{j-1}.$$

So, to conclude this part: The revised corruption game discussed above will have a single unique NE, $\{B_{max}, B_{max}\}$, for any $B \in \mathbb{R}$[14], $B_{max} < \frac{1}{2}a - rc$.

3.3. Relaxing the assumption of equal quality hosts

A problem, which is rarely analysed in the doping literature, may be labelled as the allocation problem. The allocation problem relates, in the doping setting, to whether the best athletes will win (at least in the long run) even if doping is present. Or, would certain NE's predict that the unqualified "doper" may win by using drugs and the non-doper star without drugs loose?

[14]The extension to the continuous strategy space is of course straightforward, as the string of B's can be chosen freely.

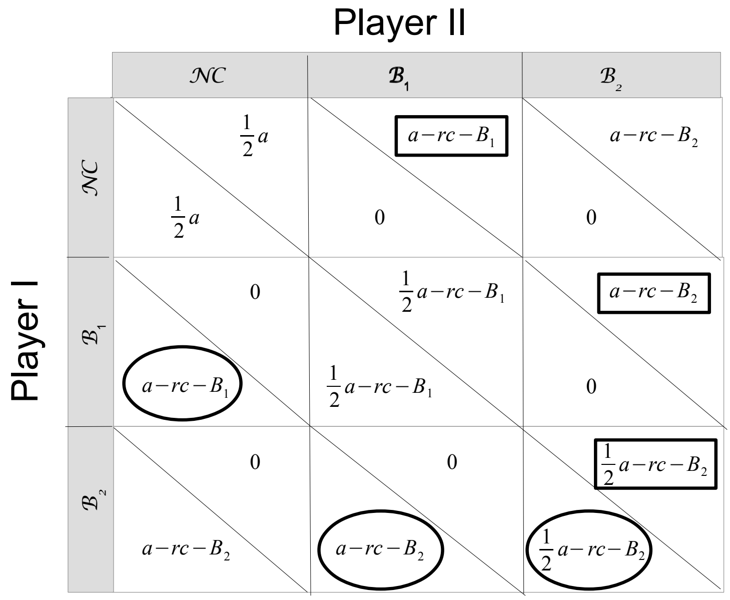

Figure 5. The revised corruption game – all the best reply functions.

It is perhaps reasonable that this problem has received less attention within sports, as the uncertainty of outcome[15] is normally assumed positive for sports demand. Then, adding doping, making the outcome of a competition less sure, may actually be viewed as advantageous[16]. However, in the event setting, it is obvious that an event host of less quality is not preferable from the arranger's point of view as it most certainly will have negative impact on demand. Consequently, the "order of the ranking list" has more meaning regarding events.

Luckily, as we presently have been able to show the great similarities between corruption and doping, we can investigate the allocation problem in events directly from the existing results. In [7], this is done by introducing a probability $p \neq \frac{1}{2}$ and the game theoretical consequences are relatively easy to judge. We will limit our analysis to the simplest case – i.e., not look at bribing as a decision variable. Figure 7 sums up how this can be done.

In Figure 7, we look at a quality dominant host. This means that one of the potential event arrangers is clearly better from the demand point of view. It has better facilities, weather, location, more local interest for the sport/event, and so on. As a consequence, it wins with certainty if the competition is fair. That is if either none (or both) applies a corruptive strategy, or (alternatively) if the best host (Player I in Figure 7) is corrupt alone. This is achieved by setting p to 1 as

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[15]See for instance [17] for a closer explanation of this concept.

[16]The uncertainty of outcome increases.

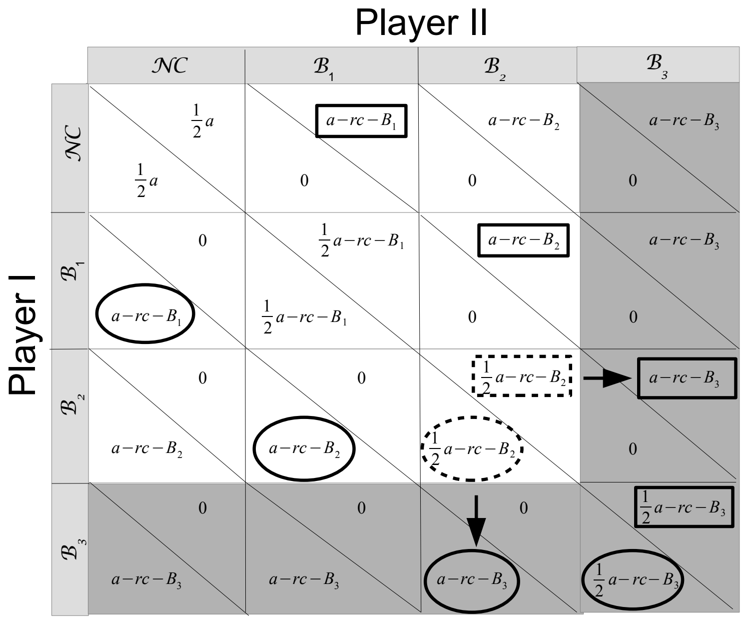

Figure 6. The revised corruption game – adding another bribe.

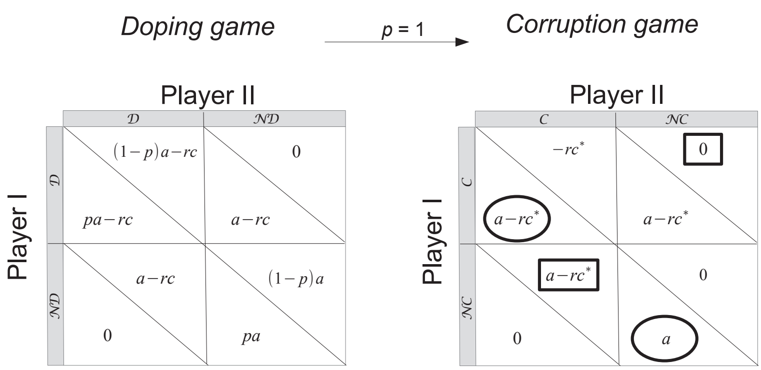

Figure 7. A corruption game were Player I is "better" than Player II.

indicated in the figure. Furthermore, by previous assumptions, $a, rc^*, a - rc^* > 0$, the best replies as indicated in the figure are the outcome.

These best replies indicate a single unique NE in mixed strategies. Hence, this situation is different from the previous one analysed in Subsection 3.1. Now, corruption is not (necessarily) everybody's strategy. A further analysis is straightforward. From [7], the single unique NE, using the notation in [7], can be expressed as[17]:

$$\{\pi_1^*, \pi_2^*\} = \left\{ \frac{pa - rc^*}{a(2p-1)}, \frac{a(p-1) + rc^*}{a(2p-1)} \right\}. \tag{3.11}$$

Utilizing the assumption of $p = 1$ in (3.11) gives,

$$\{\pi_1^*, \pi_2^*\} = \left\{ 1 - \frac{rc^*}{a}, \frac{rc^*}{a} \right\}. \tag{3.12}$$

Reintroducing the bribe B from equation (3.3), (3.12) can be expressed:

$$\{\pi_1^*, \pi_2^*\} = \left\{ 1 - \frac{rc + B}{a}, \frac{rc + B}{a} \right\}. \tag{3.13}$$

In the discussion leading to equations (3.4) and (3.5), we argued that $a \gg B$ and $rc \approx 0$. As a consequence, the limiting result of (3.13) must be:

$$\{\pi_1^*, \pi_2^*\} = \{1, 0\}.$$

That is, the best host chooses a corruption strategy while the slightly unfit host plays clean. This may seem as a "nicer" equilibrium solution – less corruption. However, be aware of the meaning of this. The only reason why the complete corruption observed in previous models disappears here is that the less qualified host understands that everybody uses corruption and if the opponent actually is a better choice for hosting the event, it is no point for him/her to take the extra expected costs of revelation $-rc$. On the other hand, the allocation problem (best host gets the event) is solved, but unfortunately, the best host is still corrupt. This is – by the way – in (reasonable) accordance to results in [12], although through a different modelling framework.

4. Discussion, conclusions and suggestions for further research

An obvious, but still interesting, conclusion is the simple fact that the economics of the doping models can easily be transferred to corruption models. This conversion process is exemplified in this paper and it indicates the similarity between competitive corruption and doping. Hence, our results can be used to transfer knowledge from, say, multi-player doping [8] to multi-player corruption games with relative ease. This is an obvious candidate for further research.

Although our focus in this article has been on corruption related to localization of sports events, it should not be difficult to see possible transfers to other corruption types as well – the most obvious candidate perhaps being corruption in public services.

The results indicate – which is perhaps not surprising – that corruption is no easier to fight than doping. The fact that the introduction of a bribe 'player-decision-variable' in the game leads to NEs with the highest possible bribe being the Nash equilibrium or game prediction, indicates this. In short, we could say: *Not only is everybody corrupt, everybody is maximally corrupt.* Transparency International [19] reports for instance that 80% of African and Middle East respondents report that corruption has increased (61%) or remained the same (19%). Unfortunately, such an unpleasant development could be expected given our model results.

[17] π_1^* and π_2^* are the NE mixed strategy probabilities of choosing either $\mathcal{C}$ or $\mathcal{NC}$.

Another feature is the strength of the results. Assume now, although we argued strongly for the opposite in Subsections 3.1 and 3.2, that the following inequality holds:

$$B_2 - B_1 > \frac{1}{2}a. \tag{4.1}$$

If this is the case, the mechanism securing a unique corruption NE is broken; as indicated in Figure 8.

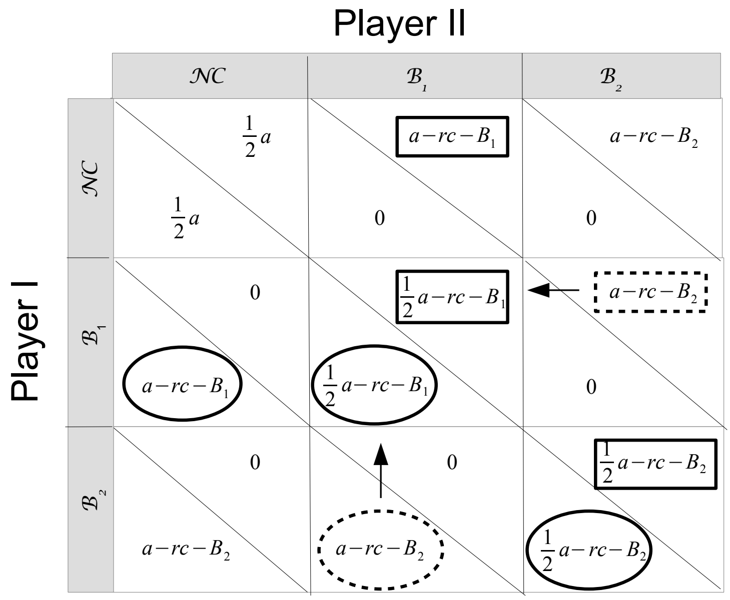

Figure 8. The consequence of assuming that $B_2 - B_1 > \frac{1}{2}a$ holds.

As long as $B_1 + rc < \frac{1}{2}a$, the no-corruption NE – $\{\mathcal{NC}, \mathcal{NC}\}$ – is not feasible[18]. Now, as indicated by Figure 8[19], the game is changed from a situation with a unique maximal corruption NE, to a game with two pure strategy NE's; $\{B_1, B_1\}$ and $\{B_2, B_2\}$. Of course, this argument also holds in the generalized situation with a finite set of Bs or in the continuous case. Hence, we achieve – in the continuous case – a game with an infinite number of pure NE's but with all of them being of a corruptive type. Of course, this game will also contain an infinite set of mixed strategy NE's, but this is not a point which need not be pursued here.

The point ought to be simple. Even with a highly unlikely parameter combination as described by inequality (4.1), the game still predicts total corruption – everybody is still corrupt. However, with the difference now that we do not know the magnitude of corruption. Note that this game perhaps might be named

[18]This is clearly possible as $B_2 - 2B_1 > rc$ is obtainable.

[19]Observe stapled boxes and ellipses as well as arrows in Figure 8.

a "Stag-Hunt$_{-1}$" game. A Stag Hunt game has all diagonal elements as NE's. This game has all but one diagonal element (the no-corruption case) as pure strategy Nash equilibria.

An obvious candidate for extended research is the player composition of the game. We assume that only potential hosts are players, and overlook (consciously) the fact that the event owner[20] is an active player in real world games of this type. In the real world, the process of assigning a host for a big event is clearly a far more complicated gaming situation than the simple complete information one-shot games we have discussed. The event owner defines (to a large extent) the basic rules for the "competition" which will assign the winning host, but this process will involve far more than a single decision on corruptness or not. In fact, corruptive actions may typically involve more than one decision and may certainly involve more actions by the host owner. In practice, host owners will often stage pre-qualification rounds, where a larger number of potential hosts engage early, followed up by a process decreasing the number of hosts gradually to a smaller number. Clearly, such a process is composed of sequential as well as simultaneous moves in a dynamic setting. Furthermore, the initial assumption of information completeness is surely a too strict assumption. Neither potential event hosts nor event owners know necessarily who they play against. In game theoretic terms; incomplete information. Still, even with all these model shortcomings, we believe our simple model framework provides interesting and valuable information related to understanding competitive corruption games.

Finally, even if we argue that corruption is at least as difficult as doping to overcome, the three basic parameters of doping control work here as well. Increasing sanctions (c) (and in practice making them implementable), increasing the probability of revealing corruption (r) and, perhaps most importantly, decreasing the value of corruption (a) are the three actions that do work. Interestingly, the last one, has been applied in sports in the recent years. The development of decreasing event values, especially be splitting them between individual countries are interesting. Three of the five last Euro tournaments have been hosted by two countries; Euro 2000 (Belgium/Holland), Euro 2008 (Austria/Switzerland) and Euro 2012 (Poland/Ukraine). It may very well be that the urge to fight corruption was not very high on the agenda when UEFA made this splitting decision. Our research does however indicate strongly that these decisions are also good for anti-corruption.

Furthermore, our discussion in Subsection 3.1 included some simplifications related to a and B[21]. The fact that a, among other revenues, could contain governmental subsidies is relevant. Several authors have pointed out that governmental subsidies differ substantially across countries. According to [14] and [1], this is particularly true for events taking place in the US. If it is so that US event hosts receive substantially less governmental subsidies than (say) European hosts, our arguments on a above could lead to less corruption problems for US events. Obviously, this is a somewhat speculative conclusion, perhaps a research question needing further (empirical) analysis.

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[20]IOC or FIFA is an obvious candidate for such a player position.

[21]See footnotes 8) and 9)

Additionally, as pointed out in [15] and [10], a certain part of B may be labelled "moral scruples". That is, the bribery action is "more costly" for some than others. Hence, our fixed B may differ across different potential hosts based on moral; for instance, being different in countries with different corruption cultures. Obviously, this is an enhancement to our simple models, something that should be possible to include, but also that stress the complexity of the matter.

Still, even with all the model shortcomings discussed in this section, we believe that our simple model framework provides interesting and valuable information related to improved understanding of competitive corruption games. We further believe that our modelling approach utilizing a gradually increasing economics of doping literature, may be helpful in further attempts, both in improved understanding, and maybe even solution to this alarming problem for global sport.

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