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Nobody's Innocent – The Role of Customers in the Doping Dilemma

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Abstract

To which extent high performances in professional sports are based on the use of illicit substances or other doping practices is extremely difficult to measure empirically. Game-theoretical approaches predict strong incentives to dope based on the interaction among athletes (prisoner's dilemma) or the interaction between some control organization and the athletes (inspection game). The role of stakeholders such as customers, sponsors, and the media is either ignored or only informally discussed. One might think that customers who are ready to withdraw their support after a doping scandal, would reduce the incentives to dope. We explicitly model the strategic interaction of such customers with athletes and organizers and strongly refute this (optimistic) conjecture. Customers even trigger doping by putting a threat on the organizers not to conduct serious doping tests. However, we show that this result can be altered by a change in the information structure. If transparency about doping tests is established, then there is a doping-free equilibrium. This has practical implications for the design of anti-doping policies, as well as for other situations of fraudulent activities.

Keywords: inspection game, doping, professional sports, scandals, cheating

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1 Introduction

When fraudulent activities are detected in some organization, the customers have to make a decision. Either they continue the relationship with this organization or they boycott it. Behaving in the latter way, i.e. reacting to scandals with a withdrawal of support, can be expected to reduce the extent of fraudulent activities (since the potential loss increases). As we will show in this paper, however, the effect might just go into the opposite direction: Critical customers who withdraw support after a scandal unintendedly trigger fraudulent activities. This conclusion is formally derived from a game-theoretic model which extends the standard inspection game by an additional player.[1] We carefully analyze and discuss this model focusing on the example of doping in professional sports.

Motivation Sport events, such as the Olympic Games, have grown to a size of substantial economic importance. Thereby the use of performance-enhancing drugs (doping) is considered as a risk for the sports industry. There are at least three reasons why it is socially desirable to reduce the extent of doping (cf. Preston and Szymanski, 2003). First, as it is well known, the use of performance-enhancing drugs can lead to serious health problems for the athletes. Second, athletes often serve as role models. Thus, a doped athlete is neither in the best interest of parents nor would she give the right image for a sponsoring company. Closely linked to that point is the third argument: An important character of sport is that it becomes uninteresting if athletes systematically violate the rules.[2] Even if most doping substances were legalized, there need to be some rules that define a discipline and systematic violations of these rules are undesirable. Thus, it is not surprising that even the United Nations and the European Commission are highly interested in anti-doping policies. The most important scientific questions on doping concern (i) the actual extent of doping – whether the use of performance-enhancing drugs is an exceptional practice of some delinquent athletes or a common practice – and they concern (ii) instruments to reduce the extent of doping.

Empirical studies about doping are rare because it is very hard to collect data of a high quality. Those few studies that try to assess the extent of doping empirically, make estimations that often strongly exceed the public perception (Pitsch et al., 2007; Striegel et al., 2010; Pitsch and Emrich, 2011).[3] Theoretical approaches to the doping issue have acknowledged that decisions to dope are not independent of decisions of other actors such as other athletes or control agencies. Game theory provides tools to analyze such situations of strategic interaction. The primary focus is thereby given to the interaction between athletes. This is often modeled as a prisoner's dilemma, where to dope is the dominant strategy (Breivik, 1992; Haugen, 2004).[4] Extending this approach, game theory is also used to analyze the interaction between athletes and an organization which decides upon conducting doping tests. This is usually modeled as an inspection game

[1]Inspection games are discussed by Dresher (1962), Maschler (1967), Tsebelis (1989), and Avenhaus et al. (2002), among others.

[2]As a survey on the Olympic Games shows, spectators, fans etc. want to see records and high performances but only under compliance of the rules (Messing and Müller, 1996).

[3]E.g. Striegel et al. (2010) found an eight times higher number of drug abuse than it is officially confirmed.

[4]Exceptions to the prisoner's dilemma occur if athletes can be sure to be detected when doped or when athletes have values or norms that exclude doping as a real alternative (Bird and Wagner, 1997; Eber, 2008).

(Berentsen et al., 2008; Kirstein, 2012). In an inspection game there is no pure strategy Nash equilibrium because athletes want to dope without being detected, while the control organization tries to detect doping without testing clean athletes. Thus, mixed strategy equilibria are used to predict the extent of doping in dependence of the benefits and costs.

Our Contribution We build on the previous game-theoretic work on doping but take the analysis one level further by introducing *customers* as an additional player into the game. Customers are highly important because they finally make professional sports economically viable. Consider a sports event from which customers turn away their interest. This event does not only suffer of less ticket and merchandise revenues, it will also become less attractive for media companies who report from the event and for companies who sponsor the event. In sum, this implies a substantial loss for the organizers of the sports event as well as for the athletes. We have seen a similar scenario in the recent history of the Tour de France, the world's most famous cycling race. Studying this case suggests that the large number of doping scandals has had an important role in reducing the support of stakeholders. For many other disciplines and events, this scenario – withdrawal of stakeholder support because of doping – has not happened. However, it seems to be always present as a threat.[5] Despite their essential role, previous studies (to the best of our knowledge) have not included customers as a player in a game-theoretic approach to doping. This paper closes this gap and explicitly analyzes the *role of customers* for the incentives to dope.

In our model customers support a sports event as long as there is no doping scandal. After a scandal we assume that customers would withdraw their support (and contrast this case from non-critical customers who always keep supporting). One might conjecture that the behavior of critical customers induces incentives for organizers and athletes to avoid doping since this increases the costs of doping for both athletes and organizers. However, our analysis reveals that the opposite is true: Under mild assumptions the unique outcome of the game is that athletes dope, while organizers make insuffcient effort to test them. Because our assumptions are very parsimonious, this result is robust against many changes in the specification of utility. The intuition is simply that customers who can withdraw their support constitute a threat to the organizers such that they avoid uncovering (the full extent of) doping.

We then investigate how to change the structure of the game in order to support a doping-free equilibrium. It turns out that an establishing transparency is sufficient for this purpose: If customers can observe whether there were serious doping tests, even if they turned out to be negative, then there is a doping-free equilibrium. However, this equilibrium is not unique – there is still an equilibrium involving doping. To rule out all doping equilibria it would be necessary to change the preferences of the customers (not only their information structure): They should prefer to withdraw their support not only after a doping scandal, but also after the suspicion of doping, i.e. they should insist that strong efforts to detect and punish dopers are made. We discuss the real world predictions of this model and the practical implications of its results for currently debated anti-doping policies.

[5]Empirical evidence on the Olympic Games shows that a majority of customers indeed considers doping as a threat (Messing and Müller, 1996; Messing et al., 2008).

Related Literature There is already a rich body of game-theoretic literature on doping incentives. One category of models focuses on (symmetric or asymmetric) games between athletes. The second category analyzes the strategic interaction between athletes and control institutions. Our model differs from both of these categories by integrating customers as an additional type of player. This is not an alternative, but rather an extension of what has been studied previously.

For the first category, pioneer work stems from Breivik (1992) who studies several two-player games between athletes. A typical conceptualization of the strategic interaction is the prisoner's dilemma game, where to dope is the dominant strategy (see also Haugen, 2004). An athlete only plays "no doping" if preferences of players are different (e.g. because of fairness considerations) (Breivik, 1992). Eber and Thépot (1999) also examine a 2×2 game between athletes. The payoffs are assumed to depend on the prizes, the number of events during the season, the probability of being caught, and perceived costs. For some parameters the payoffs are as in a prisoner's dilemma. Similarly, Bird and Wagner (1997) consider doping as a common pool resource dilemma.

An alternative way was proposed by Berentsen (2002) who introduces a two-player game in which two athletes have unequal probabilities to win (based on their physical abilities). Berentsen (2002) presents this asymmetric game in a world where doping would not be punished or else according to a punishment scheme resembling the official punishments of the International Olympic Committee (IOC). He finds a mixed-strategy equilibrium in which the favored player is more likely to dope. Berentsen and Lengwiler (2004) also use a bimatrix game to study the interaction among unequally talented athletes. Depending on the parameter values, they find different equilibria which are stable under replicator dynamics. Interestingly, Berentsen and Lengwiler (2004) find that increasing the punishments for using performance-enhancing drugs might increase the extent of doping in some cases. Finally, Kräkel (2007) studies two heterogeneous athletes in a tournament game. Determinants of a doping-free equilibrium were analyzed because it could be assumed that such an equilibrium leads to high social welfare.

In the second category of models, for the interaction between athletes and some control organization, often an inspection game is considered.[6] In an inspection game an inspectee has to decide whether to comply to or deviate from a norm, while an inspector can choose between inspecting or not inspecting the action.[7] Kirstein (2012) investigates an inspection game where the detection technology is not free of errors. The possibility of two types of errors leads to additional perfect Bayesian equilibria. Berentsen et al. (2008) extend an inspection game by a "whistleblowing" stage, in which the loser is asked whether the winner has doped or not. They compare Bayesian equilibria in games with and without this stage. Under whistleblowing they find a reduction of doping, while inspection costs are reduced. Eber (2002) compares the credibility of the anti-doping agency with the credibility of monetary policies. Within his model athletes form rational expectations about the effort of authorities to prevent doping which leads to a credibility problem (Eber, 2002). Similarly, Maennig (2002) uses a model which describes illicit behavior to analyze how officials or athletes behave if they are corrupt or doped.

[6]The fact that in the inspection game there is only one athlete does not mean that the ideas from the strategic interaction between athletes are neglected. In particular, it is assumed that under no controls athletes prefer to dope, which is based on considerations of competition among athletes.

[7]For general information on inspection games we refer the reader to Tsebelis (1989) and Avenhaus et al. (2002).

Especially for doping Maennig (2002) points out that costs of being punished are smaller than the expected benefits from doping. Pitsch et al. (2010) use a similar model to analyze the decisions of dealers and consumers in national doping markets considering different European anti-doping laws. They identify two types of athletes: consistent (or: unconditional) non-dopers and calculating dopers. Finally, Preston and Szymanski (2003) discuss the asymmetric information problem in commercial sports. They argue that a lack of enforcement and punishment leads to a low detection rate for cheating athletes.

If we consider the evolution of doping games as (1) models of strategic interaction between athletes and (2) models of strategic interaction between athletes and some control organization, then our contribution is to add a third level: (3) a model of strategic interaction between athletes, control organization, and customers. Our model is thereby kept very simple and is, in fact, simpler to analyze than many of the previous models. This is due to the fact that most of the works report on comparative statics (e.g. how mixed equilibrium strategies are affected by a change in payoffs), while we obtain a pure strategy Nash equilibrium that is robust against small parameter changes. Before we introduce the model – a game including customers –, let us briefly examine some empirical evidence on the role of customers concerning doping.

Some Evidence on the Importance of Customers Customers of a sports event do not only expect high performances from the athletes but also their compliance to the rules. During the Olympic Games in Barcelona 1992, for example, 91% of 475 interviewed spectators answered that they want to see high performances at the Olympic Games, but a majority of them (58%) considers doping as a *threat* to the Games (Messing and Müller, 1996). For the Olympic Games of Sydney 2000 and Athens 2004 the number of people who agrees that doping is a threat has even increased to 69% and 82% (Messing et al., 2008). This view is not restricted to spectators, but it is also predominantly shared by athletes, students of sports science, and media representatives (Tröger, 2006). But what is the actual "threat" that starts out from doping in sports? Probably this scenario can be best studied in an event, for which it is known that doping is widespread – such as the world's most famous cycling tour, the Tour de France.

The recent exposure of the doping affair concerning the seven-times Tour de France winner (Lance Armstrong) is just one very spectacular case in a long list of disclosures. In 1998 a whole cycling team (Festina) was excluded from the Tour de France after a large amount of performance-enhancing drugs was found in a team car. In the 2006 Tour de France, an affair centered on a physician (Eufemiano Fuentes) led to the expulsion of several participants and some days after the Tour de France 2006, it was detected that the winner (Floyd Landis) was positively tested on performance-enhancing drugs. One year after, the German public-sector TV channel quit the live-broadcast of that actual Tour de France when a German cyclist (Patrik Sinkewitz) was convicted on doping. Although this TV channel reported from the Tour de France again in the years 2008 until 2011, they finally quit in 2012. The reason for that was a sharp decline in the audience ratings.[8] Not only TV channels, also sponsors reacted with exit. For example, the cycling team-sponsor Phonak quit, after their team leader (Floyd Landis) was convicted of doping, and a German cycling team-sponsor (Gerolsteiner) quit after two German cy-

[8]While the market share amounted to 13 percent in year 2008, there was a decline to approximately 9 percent in 2009. The first reaction of the TV channels was a reduction of airtime.

clists (Stefan Schumacher, Bernhard Kohl) were found guilty. Thus, the recent history of cycling demonstrates that the reaction to the disclosures of systematic doping practices is the *withdrawal of support* from several stakeholders. This is true for media companies, sponsors, and – last but not least – customers. It is a notable fact that there are customers who still support the Tour de France despite (or maybe even because of) the doping scandals. However, it seems undeniable that the organizers of the event have suffered substantial losses due to the withdrawal of support of many customers, sponsors and media companies.

Similar scenarios of withdrawal of support have not happened in most of the other disciplines. As the recent Olympic Games in London show, the interest in sports and, particularly, in track and field athletics is huge. This does not mean that track and field athletics is free of doping. For example, the US sprinter Justin Gatlin who sprinted to his personal best in London has a background on doping delicti.[9]

This case is not that exceptional: among 64 world class sprinters on the 100 meters track Dilger and Tolsdorf (2004) found that 16, i.e. 25%, have been convicted on doping somewhen in the period from 1997 until 2002. It seems that, despite such cases, the public perception in athletics is that most of the athletes do not use performance-enhancing substances.[10] For example, in the year 1988 the most prominent 100 meters track star Ben Johnson was convicted on doping, while during the next Olympic Games (in Barcelona 1992) only every fourth or fifth spectator (22%) agreed that doping and manipulation are determining factors of the Olympic performances (Messing and Müller, 1996). The public perception of clean sport seems crucial for customers and other stakeholders to keep their support. Concerning the Tour de France, most of the TV spectators (89%) in a survey assumed that doping is a common practice in cycling.[11] This seems to be a crucial difference to most of the other disciplines and events, such as professional Tennis or Football, where doping is rarely a topic at all. However, the threat of customers withdrawing their support, is always of substantial size in professional sports. For example, in Germany the entrance fees for sport events amounted to 4 billion euros in 2010. Moreover, 5.5 billion euros were spent on promotion, sponsoring and media rights. Roughly, every third German enterprise supports sport.[12] In other countries including the United States the revenues of professional sports are even higher.[13] Thus, customers and other stakeholders are making professional sports events economically viable. Their critical role is the potential withdrawal of support. This is exactly the aspect of customers that is

[9] He was first convicted in 2001 and was suspended for one year. In 2006, Gaitlin was found guilty on doping again and had to expect a ban for the entire career, but only received a four year sentence after some collaboration with the national doping agency of the United States (USADA).

[10] Although many experts do not agree to this view, e.g. the German sport-sociologist and honorary president of the German athletics association (DLV), Helmut Digel, argues that doping is and was a huge problem in professional sports in Germany. The interview conducted by a German newspaper can be found at http://www.faz.net/aktuell/sport/sportpolitik/doping/helmut-digel-alle-wussten-vom-betrug-im-westen-11966739.html (last access: December 1st, 2012).

[11] These figures are reported by a German newspaper and can be found at http://www.zeit.de/online/2007/28/tour-de-france-medienkritik (last access: December 1st, 2012).

[12] cf. Federal Ministry of Economics and Technology, monthly report, February, 2012.

[13] In 2010 the National Football League (NFL) had revenues about 7.8 billion US dollars, the Major League Baseball (MLB) earned 6.8 billion US dollar, the National Basketball Association (NBA) earned 4.0 billion US dollars, and the National Hockey League (NHL) earned 3 billions US dollars. A major part from these revenues is realized by TV rights, e.g. the NFL receives 3.1 billions US dollars from the four biggest Networks (CBS, ESPN, Fox and NBC) per Season.

incorporated in our model.

The remainder of the paper is organized as follows: In Section 2 we present the model. Section 3 establishes the main results, thereby characterizing the doping equilibrium. Section 4 studies a variation of the model, which admits a doping-free equilibrium. In Section 5 we conclude.

2 Model

Considering benefits from professional sports, there is a large set of stakeholders: sports associations, team sponsors, event organizers, event sponsors, media, spectators, anti-doping agencies, doctors, politicians, etc. In our model we restrict attention to three types of players: Athletes, Organizers, and Customers. Athletes can decide between doping and staying clean, whereas doping is defined as the use of illicit substances or methods.[14]

The binary decision to dope or not to dope is a simplification of a set of decisions which might also be considered as gradual. The simplification can be justified by at least two reasons. First, it is often unambiguous whether an athlete uses illicit substances or not. Second, there is a subjective interpretation of whether the athlete considers that he/she cheats or not.

In our model Organizers represent those actors who decide whether to conduct serious doping tests or not. Thus, testing stands for systematically attempting to detect and punish doped Athletes. An Organizer in that sense is the world anti-doping agency WADA.[15] In several disciplines, the national anti-doping agencies (NADAs) have a major role in organizing doping tests of their athletes. In other disciplines, the sports associations or the event organizers are the key players in organizing systematic doping tests.[16] Consequently, Organizers in our model represent anti-doping agencies, as well as organizers of sports events and sports associations. Indeed, anti-doping agencies are not independent of theses organizations (Eber, 2002; Preston and Szymanski, 2003); and with respect to the decision we study here, they have similar interests.

Customers can decide upon staying a supporter or to withdraw support, e.g. not to continue watching an event on TV, not to further buy merchandise products, or to quit a membership in a club of supporters. Besides spectators, we could also subsume sponsors and the media (who broadcast or report about the sport events) under the term Customers. A withdrawal of each of these three actors can trigger the withdrawal of the two others. Sport events cannot survive without sponsors, withdrawal of the media restricts the access of the customers, and finally sport is only attractive for sponsors as long as there are customers. To make the arguments as clear as possible we focus on one representative customer and we also study only one representative organizer and one representative athlete (such that the strategic interaction between athletes is only presented in a highly reduced form). The extension to multiple players of a type would not qualitatively affect the results, but it would affect the ease of illustration. Therefore,

[14]The definition of doping is itself an issue that is worth a discourse (Eber, 2006).

[15]The WADA is an international institution founded in 1999 in Lausanne. Its main task is the world-wide coordination of anti-doping activities such as detection, deterrence and prevention. Moreover, the WADA coordinates doping tests with national anti-doping agencies (NADAs).

[16]For a richer description of the institutional setting see Emrich and Pierdzioch (2012).

we interpret the behavior of a representative player as the behavior of the Athletes, the Organizers, and the Customers (in plural).

The timing of the players' actions is as illustrated in Figure 1. First, Athletes decide on doping, then Organizers decide on testing, and finally Customers decide upon staying. The information set of the Organizers indicates that they do not observe the action of Athletes. Thus, the moves of Athletes and Organizers can also be considered as being simultaneously. In our model testing means that a doped Athlete is detected and punished.[17] If the history in this first stage is $(Dope, Test)$ we call it a "scandal." All other histories, i.e. $(Dope, Notest)$, $(Clean, Test)$, $(Clean, Notest)$, are no scandal. Since doping tests and their outcomes are not transparent to the public, Customers cannot distinguish between the three possible histories if there was no scandal.[18] This is captured by the information set consisting of three nodes. As Figure 1 shows, this game has eight potential outcomes, which we label in the following way: d-t-s, d-t-l, d-n-s, d-n-l and c-t-s, c-t-l, c-n-s, c-n-l as also illustrated in Figure 1.

While Athletes and Organizers have two strategies each $\{Dope, Clean\}$, respectively $\{Test, Notest\}$, Customers can choose between two actions in two information sets, which yields four strategies. We denote them by $\{SS, SL, LS, LL\}$, where, for instance, LS stands for action *Leave* in the first information set (after a scandal) and action *Stay* in the second information set (after no scandal).

3 Equilibrium Analysis

To analyze the model we employ the notion of subgame perfect Nash equilibrium (SPNE). In contrast to other doping games, there is no need to consider mixed strategies. We have not yet not specified the players' utility functions or preferences. We will introduce such assumptions step-by-step to clarify that mild assumptions are sufficient for some results (equilibrium), while stronger assumptions are needed for others (inefficiency). Moreover, we do not specify cardinal utility levels, i.e. absolute payoffs, because this is not in line with a stepwise procedure and it would force us to specify many assumptions that are not at all necessary. The advantage of such a parsimonious approach is that eventually derived results are robust against changes of specification details.

3.1 Existence of a Doping Equilibrium

We are most interested in the kind of Customers who withdraw their support after a scandal but not otherwise. This idea is covered by assumption A1 which makes mild assumptions on the preferences of all the players.

[17]The assumption that the test technology is free of mistakes and the assumption that any positively tested athlete is really punished is not realistic, but it rather introduces a bias in direction of avoiding doping. If we still find that Athletes dope in equilibrium, this seems a stronger result than without these assumptions. Kirstein (2012) studies a model where doping tests are not free of errors.

[18]The fact that sometimes sport events publicly announce the number of tests they have carried through does not contradict this assumption. Still, Customers do not know whether the Athletes have been seriously and systematically tested.

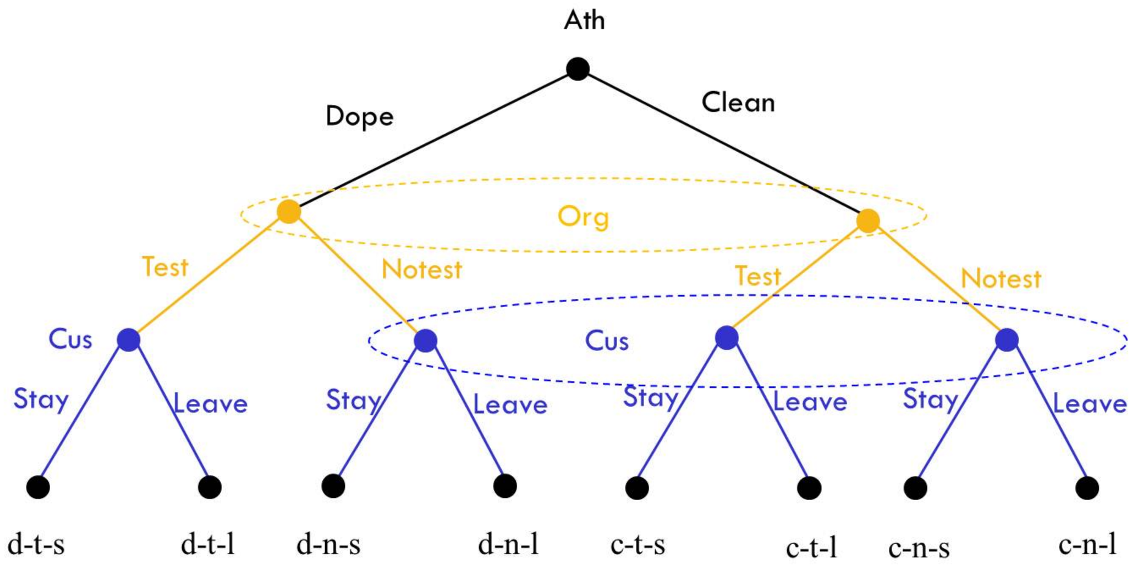

Figure 1: Structure of the game.

Assumption 1 (mild)**.** *For the players' preferences we assume the following:*

Ath: d-n-s $\succ^{Ath}$ c-n-s, i.e. Athletes prefer to dope if not tested; and c-t-s $\succ^{Ath}$ d-t-l, i.e. Athletes prefer to be clean and tested, while Customers stay, over being doped and tested, while Customers leave.

Org: d-n-s $\succ^{Org}$ d-t-l, i.e. a scandal combined with the loss of Customers is worse for the Organizers than undetected doping where Customers stay; and c-t-s $\succ^{Org}$ c-n-l, i.e. testing clean Athletes with Customers support is better for the Organizers than not testing clean Athletes when Customers leave.

Cus: d-t-l $\succ^{Cus}$ d-t-s, i.e. Customers prefer to withdraw support after a scandal; and d-n-s $\succ^{Cus}$ d-n-l, c-t-s $\succ^{Cus}$ c-t-l, and c-n-s $\succ^{Cus}$ c-n-l, i.e. Customers prefer to stay if there is no scandal.

The assumptions A1 are easy to justify. The assumption that Athletes dope if there are no tests follows from the standard assumption in the literature that the benefits of doping exceed the costs even if there are tests (e.g. Maennig, 2002).[19] Organizers might existentially depend on Customers' support such that they would probably prefer any outcome where Customers stay (i.e. d-t-s, d-n-s, c-t-s, and c-n-s) over any outcome where support is withdrawn (i.e. d-t-l, d-n-l, c-t-l, and c-n-l). This also means that testing is not too expensive in the sense that the withdrawal of customer support is worse than conducting tests. This assumption need not be satisfied for sport events that do not belong to professional sports. The preference of the Customers to leave after a scandal

[19]This interaction between several Athletes is often modeled as a prisoner's dilemma. There the dominant strategy is to dope, as we assume this behavior here for the case of no tests and one representative Athlete. In reality, there are also Athletes who are unconditional non-dopers (Pitsch et al., 2010). Their (trivial) behavior is not studied within our model.

means that they are bothered by doping scandals, rather than enjoying them.[20] Finally, Customers' preferences to stay if there was no scandal reflects the general interest in sports based on the view that Customers are unable to distinguish between undetected doping and clean sport even ex post. That is, their payoff of staying a supporter does not depend on whether d-n-s, c-t-s, or c-n-s is reached because they cannot distinguish between them. And similarly, their payoff of withdrawing their support would not depend on whether outcome d-n-l, c-t-l, or c-n-l is reached.[21] Given A1 a customer will stay a supporter if and only if there was no scandal – the behavior under scrutiny. The following proposition shows that outcome d-n-s – i.e. Athletes dope, Organizers do not test, and Customers stay supporters – is an equilibrium outcome.

Proposition 1 (doping equilibrium)**.** *Under Assumptions A1* $s^* := (Dope, Notest, LS)$ *is a SPNE.*

Proof. The only proper subgame of our game starts at node "scandal" $(Dope, Test)$. L is a Nash equilibrium (NE) in this trivial subgame. The second subgame is the game itself. Suppose Customers play LS in this game.

For the decisions of the Athletes and the Organizers LS induces the following matrix (1).

Org

		Test	Notest
Ath	Dope	d-t-l	**d-n-s**
	Clean	c-t-s	c-n-s

(1)

Now, it can be immediately observed that by applying A1, Athletes dope and Organizers do not test are mutual best responses since d-n-s $\succ^{Ath}$ c-n-s and d-n-s $\succ^{Org}$ d-t-l. Moreover, LS is a best response to $(Dope, Notest)$ because by A1 it holds that d-n-s $\succ^{Cus}$ d-n-l. □

The intuition for Proposition 1 becomes apparent when contrasting the result with the standard inspection game. In an inspection game an inspectee has to decide whether to comply or deviate from a norm, while an inspector can choose between inspecting or not inspecting the action. To embed this standard game into our notation we would consider the Athlete as the inspectee, the Organizer as the inspector and for the Customers which are standardly excluded, we would assume constant behavior. That is, our model differs from the standard inspection game only in that Customers sometimes withdraw support, while standardly Customers always stay supporter or, alternatively, they never support such that we would get the matrix

[20]In reality there might be Customers who enjoy (doping) scandals. We will consider such customers and, equivalently, uncritical customers, who always stay supporters, as a benchmark later on. However, we study a more critical kind of Customers here.

[21]A similar interpretation holds if we consider sponsors and media companies in the role of the Customers. Moreover, there is a second interpretation of this assumption for these actors. It might be that they are able to distinguish ex post between different outcomes, but do not strongly care about doping as long as it is not officially detected.

	Org		
		Test	Notest
Ath	Dope	d-t-s	d-n-s
	Clean	c-t-s	c-n-s

(2)

respectively the same matrix where in each outcome -s is replaced by -l.

The standard assumptions made in the inspection game concern only the Athletes and the Organizers and are collected in A2.[22]

Assumption 2 (inspection)**.** *In the inspection game the following assumptions are made on the preferences of Athletes and Organizers:*

Ath: *c-t-s* $\succ^{Ath}$ *d-t-s and c-t-l* $\succ^{Ath}$ *d-t-l, i.e. Athletes prefer not to dope if there are tests; and d-n-s* $\succ^{Ath}$ *c-n-s and d-n-l* $\succ^{Ath}$ *c-n-l, i.e. Athletes prefer to dope if there are no tests.*

Org: *d-t-s* $\succ^{Org}$ *d-n-s and d-t-l* $\succ^{Org}$ *d-n-l, i.e. Organizers prefer to test the Athletes if they are doped; and c-n-s* $\succ^{Org}$ *c-t-s and c-n-l* $\succ^{Org}$ *c-t-l, i.e. Organizers prefer not to test if Athletes are clean.*

The Assumptions A2 are partially redundant with assumptions A1, but further specify that Athletes prefer not to dope if tested and that Organizers prefer to test if and only if Athletes are doped. This reflects that Organizers are willing to detect doping, while testing is costly. In the inspection game (i.e. our model but with Customers who have preferences such that they always support) best response dynamics would always follow the cycle d-t-s $\hookrightarrow$ c-t-s $\hookrightarrow$ c-n-s $\hookrightarrow$ d-n-s $\hookrightarrow$ d-t-s $\hookrightarrow$ ..., i.e. counter-clockwise deviations in Matrix (2). This is the classic observation in the inspection game that there is no pure strategy Nash equilibrium.

This is different in our model, which is also an extended inspection game, but Customers leave after a scandal. In our model there is a pure strategy Nash equilibrium as shown in Proposition 1. The reason can be seen from a comparison between Matrix (2) and Matrix (1): Replacing d-t-s by d-t-l in the first matrix entry breaks the cycle of deviations when outcome d-n-s is reached because d-n-s $\succ^{Org}$ d-t-l, while d-t-s $\succ^{Org}$ d-n-s. In words, Customers who leave after a scandal establish a threat to the Organizers such that they prefer not to detect doped athletes, even if they would have done so in case that the Customers were uncritical (i.e. in case when the Customers would always stay as in the inspection game). Thus, the explanation for our qualitatively new result is that the introduction of (critical) Customers undermines the Organizers' incentives to uncover (the full extent of) doping because Organizers anticipate that they would suffer losses in the case of scandals. As a consequence athletes are not seriously tested and therefore decide to dope.[23]

This result is not due to other explanatory factors since we assume that the doping technology is free of errors, testing can be almost costless, the benefits of doping need not

[22]Usually, the inspection game is represented by numerical payoffs. This implies additional assumptions to the ones collected here. However, those additional assumptions are neither consensual in the literature, nor are they necessary for the results (because we are not looking for mixed strategy Nash equilibria).

[23]The practical implications of this observation are discussed in Section 3.3.

be high, and the disutility of being detected can be huge. Importantly, our argument is not that doped athletes produce higher performances which creates utility for the customers, although this idea would not alter the result.

3.2 Uniqueness of the Doping Equilibrium

We have so far not discussed whether there are other equilibria. Proposition 2 excludes this by use of the inspection game assumptions A2.

Proposition 2 (Uniqueness)**.** *Suppose Assumptions A1 and A2 hold. Then* $s^* = (Dope, Notest, LS)$ *is the unique SPNE.*

Proof of Proposition 2. $s^* = (Dope, Notest, LS)$ is a SPNE by Proposition 1. We show uniqueness of s^* by excluding all other strategy profiles from being an equilibrium. In the subgame that starts with the scandal, Customers choose leave in equilibrium (by A1). Thus, there are no SPNE where Customers play SS or SL. Given Customers play LL, there is no mutual best response for Organizers and Athletes because this is an inspection game situation (A2). Thus, only the four strategy profiles with Customers choosing LS remain. A1 excludes $(Dope, Test, SL)$ by d-t-l $\succ^{Cus}$ d-t-s and $(Clean, Test, SL)$ by c-t-s $\succ^{Cus}$ c-t-l from being an equilibrium. Finally, $(Clean, Test, LS)$ is not an equilibrium because c-n-s $\succ^{Org}$ c-t-s (A2). □

This result shows that the mild Assumptions A1 and the standard Assumptions A2 are powerful enough to rule out any equilibrium besides the previously found doping equilibrium. Thus, the introduction of Customers to the inspection game accentuates the extent of doping. While the mixed strategy equilibrium of the inspection game has the interpretation that only a fraction of Athletes dope, our pure strategy equilibrium predicts that all athletes (who are calculating dopers) dope. Let us now briefly discuss the interpretation and implications of this result.

3.3 Discussion of the Doping Equilibrium

We have so far established that the unique equilibrium outcome is d-n-s – i.e. Athletes dope, Organizers do not test, and Customers stay supporters. The real world prediction of our simple model is thus that the number of dopers is large, while the probability of a doped athlete to be caught and punished is close to zero. The real extent of doping within professional sports is hard to assess and thus remains highly controversial. Theoretically, there are strong incentives to use performance-enhancing drugs. In particular, if our second prediction holds – that the probability of being detected and punished is small.[24] The explanation that our model provides for doping is that organizers do not want to uncover the full extent of doping because they anticipate that they would suffer losses in the case of scandals.[25]

[24] In the absence of serious controls, athletes are in the classic (prisoner's) dilemma because they either can get a competitive advantage by doping or they have to assume that their rivals are doped (cf., e.g., Breivik, 1992).

[25] This line of reasoning supports the opinions of certain critical experts – e.g. the physician Frank Sörgel explicitly claims that sports associations and politics look away to preserve the sport's reputation and avoid potential financial losses (http://www.stern.de/sport/anti-doping-gesetz-initiieren-1920962.html, last access: December 1st, 2012) – without being a theory of conspiracy.

Our argument that Organizers lack the incentives for serious doping tests is in line with Eber (2002) who constitutes that Organizers have a low effort bias, which becomes stronger the more the authorities weight the economic stakes of professional sport.[26] Eber (2002) argues that Organizers should be "infinitely doping averse" and that even if they attempt to seriously detect and punish, they face a credibility problem. One way to increase the public credibility of anti-doping activities is to detect doping cases but very few of them. Indeed, we have not included the idea that the conviction of a few athletes enhances the credibility of clean sport. We have focused on the main effect, which is that the conviction of many athletes undermines the credibility of a sports event or even of a whole discipline. Importantly, we are not arguing that Organizers are unwilling to fight against doping, but simply that they have strong incentives not to fully uncover doping activities.

Our prediction that Organizers do not seriously test is also empirically difficult to assess. However, there are several pieces of evidence that support this view. For example, consider the anti-doping instrument called world anti-doping code (WADC). This is an international regulatory system that specifies test procedures, and lists of forbidden substances, and accredits doping labs. (The WADC is an instrument of the world anti-doping agency WADA and we assume for the moment that the WADA is free of incentives issues in the fight of doping.) Implementing the WADC in some discipline would contribute to establishing a strict anti-doping regime. As it turns out, however, the problem of the WADC is the lack of compliance on the part of the international sports associations (Emrich and Pierdzioch, 2012). For example, the following prominent sports associations are reported to refuse the WADC: the International Football Association (FIFA), the International Tennis Federation (ITF), and the International Cycling Association (UCI) (Emrich and Pierdzioch, 2012).[27] Another indication that there need not be serious doping tests although many efforts in the fight against doping are claimed is the charter formulated December 2-3, 2012, by a current movement called "change cycling now." The movement consists of sports journalists, former cycling officials, as well as of former cyclists, including a Tour de France winner. The charter strongly requests that the organization responsible for doping tests becomes independent and thus indirectly accuses the current institution as not being so. The charter expresses this as a principle to create doping-free cycling in the future: "The responsibility for deciding who is tested, when they are tested, and what drugs they are tested for, must reside in an independent entity that is beyond the control of the UCI."[28] Thus, even in cycling, where there is a long list of detected dopers, it seems that the probability of being detected when doped is not that high. We argue that in any discipline there are incentives to put insufficient effort into the detection of dopers. In the light of our results, the few spectacular cases of convicted dopers are not delinquent exceptions (bad apples), but rather unlucky cheaters or scapegoats.

Let us now return to our model and discuss efficiency.

[26]Of course, there are also other reasons, why detected doping leads to losses. For example, a national sports association might have an interest that athletes from its country are successful in international competition.

[27]The WADA does not have effective instruments to punish organizations that do not comply.

[28]The full charter can be found at http://www.changecyclingnow.org/wp-content/uploads/2012/12/Charter-of-the-Willing.pdf (last access: December 19, 2012).

3.4 Pareto Efficiency

Proposition 2 shows that the unique equilibrium outcome is d-n-s, which means that doping is prevalent. Whether this is a socially desirable outcome is not uncontroversial in the literature (Savulescu et al., 2004). Let us discuss the assumptions that decide upon efficiency. In our model the following assumption assures that d-n-s is indeed inefficient in the strong sense of being Pareto dominated.

Assumption 3 (controversial)**.** *For the preferences of the three players we assume the following:*

Ath: *c-t-s* $\succ^{Ath}$ *d-n-s* $\succ^{Ath}$ *d-t-s, i.e. Athletes prefer being tested and clean over being not tested when doped over being tested and doped.*

Org: *c-t-s* $\succ^{Org}$ *d-n-s, i.e. Organizers prefer the testing of clean Athletes over not testing doped Athletes.*

Cus: *c-t-s* $\succeq^{Cus}$ *d-n-s, i.e. Customers weakly prefer tested clean Athletes over not tested doped Athletes.*

Note that Assumptions A1, A2, and A3 are mutually consistent (i.e. there is at least one complete and transitive preference ordering for each player on all the outcomes such that the three assumptions are satisfied). The Assumptions A3 are plausible, but arguably much more controversial than A1 and A2. Athletes might dislike doping tests even if they are clean, because they have to be constantly available. However, we assume that Athletes are better off by being tested and clean than being doped, e.g. because doping would seriously affect their health. Organizers might have high costs of conducting doping tests and they might benefit from the performance of doped Athletes such that we had d-n-s $\succ^{Org}$ c-t-s. However, we take the view of benevolent Organizers who prefer to detect doped Athletes (as long as Customers stay) such that the relation is just the opposite. Finally, for Customers we keep the view that they cannot distinguish between the outcomes that do not include a scandal. Thus, d-n-s $\sim^{Cus}$ c-t-s $\sim^{Cus}$ c-n-s.

Clearly, under Assumptions A3, outcome d-n-s is Pareto dominated by outcome c-t-s. Thus, the unique equilibrium outcome in our model is not Pareto efficient. Outcome c-t-s, however is not Pareto dominated by any other outcome as established by Proposition 3.

Proposition 3 (Pareto Efficiency)**.** *Suppose Assumptions A1 and A3 hold. Then outcome d-n-s is not Pareto efficient, while outcome c-t-s is.*

Proof. The implication that d-n-s is Pareto dominated by c-t-s is immediate from A3.

To establish that c-t-s is Pareto efficient, let us show that for any other outcome d-t-s, d-n-s,..., c-t-l, c-n-l there is at least one player who strictly prefers outcome c-t-s. From A3 we get: c-t-s $\succ^{Ath}$ d-n-s $\succ^{Ath}$ d-t-s. A3 and A1 imply that c-t-s $\succ^{Ath}$ d-n-s $\succ^{Ath}$ c-n-s. From A1 we get: c-t-s $\succ^{Ath}$ d-t-l. From A1 we get: c-t-s $\succ^{Cus}$ d-n-s $\succ^{Cus}$ d-n-l. From A1 we get: c-t-s $\succ^{Ath}$ c-t-l. Finally, from A1 we get: c-t-s $\succ^{Org}$ c-n-l. □

In this section we have shown that we are indeed in a social dilemma situation. The unique equilibrium outcome, which involves doping, is Pareto dominated by a doping-free outcome. The next question is how the institutions can be changed such that the Pareto

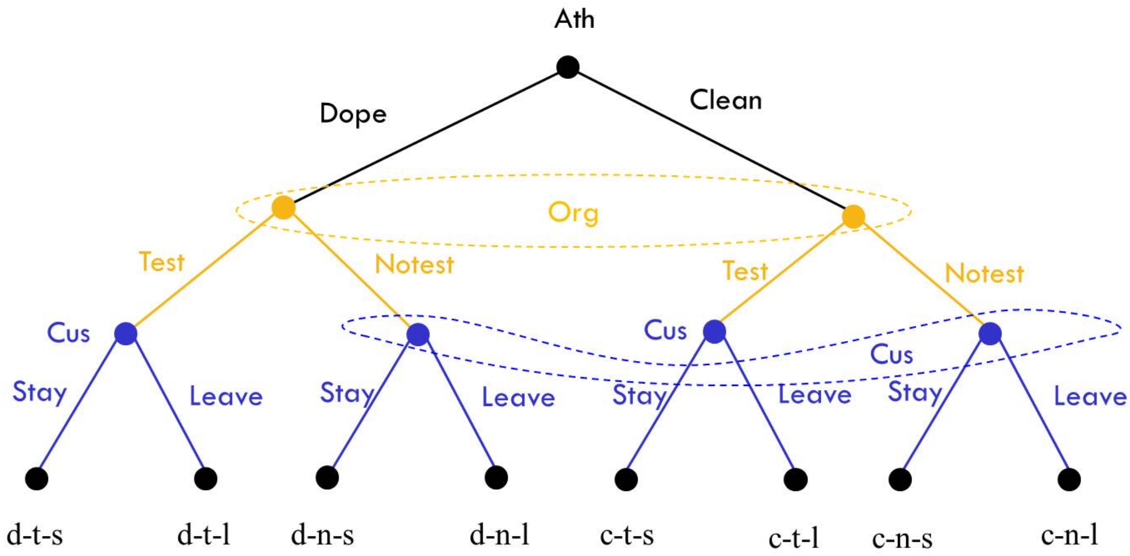

Figure 2: Structure of the game with well-informed Customers.

efficient outcome c-t-s becomes an equilibrium outcome. If the controversial assumption A3 is not accepted, then the doping equilibrium need not be Pareto dominated. Still, however, it is of high interest to find conditions for a doping-free equilibrium.

4 Inducing a Doping-free Equilibrium

We first establish the results, then we discuss current policy suggestions in the light of the model.

4.1 Change of Customers' Information Structure

In order to induce an outcome without doping, we change the information structure in the game. In particular, we let the Customers be also informed about doping tests that turned out to be negative. Consider the extensive game tree illustrated in Figure 2. As before, Organizers decide on testing the Athletes without observing whether there was doping or not. The Customers then decide upon staying a supporter or leaving. The information they have for this decision now consists of three information sets: one is after a scandal $(Dope, Test)$, one after a negative test $(Clean, Test)$, and one after no test, which consists of two histories $(Dope, Notest)$ and $(Clean, Notest)$. This yields eight strategies for the Customers, which we denote by $\{SSS, SSL, SLS, SLL, LSS, LSL, LLS, LLL\}$, such that the first letter stands for the action after a scandal, the second letter for the action after a negative test, and the third letter for the action if there were no tests.

In the game with the coarse information structure (studied in the former section), under Assumptions A1 and A2 the unique equilibrium outcome involved doping. The following proposition shows that with finer information structure there is a doping-free equilibrium, as well.

Proposition 4 (doping-free equilibrium)**.** *Under Assumptions A1 and A2 there are two SPNE in the game with finer information structure:* $\hat{s} := (Clean, Test, LSL)$ *and* $s^{**} := (Dope, Notest, LSS)$*.*

Proof. The game has two proper subgames: one starts at node $(Dope, Test)$ and one starts at node $(Clean, Test)$, cf. Figure 2. In both subgames only Customers act and by assumption A1 they will choose *Leave* in the first one and *Stay* in the second one. Thus, in each SPNE the Customers' strategy is either LSL or LSS. The following matrices show the decisions of Organizers and Athletes given that Customers choose LSL (Matrix 3) or LSS (Matrix 4):

Org

Ath		Test	Notest
	Dope	d-t-l	d-n-l
	Clean	**c-t-s**	c-n-l

(3)

Org

Ath		Test	Notest
	Dope	d-t-l	**d-n-s**
	Clean	c-t-s	c-n-s

(4)

Matrix 3 leads to mutual best replies $(Clean, Test)$. LSL is also a best reply to $(Clean, Test)$ because c-t-s $\succ^{Cus}$ c-t-l by A1 such that $\hat{s}$ is a SPNE. There are no other equilibria with LSL because A2 yields deviations from outcomes d-n-l and c-n-l, while d-t-l is not a candidate because, again, c-t-s $\succ^{Ath}$ d-t-l by A1.

Matrix 4 leads to mutual best replies $(Dope, Notest)$ (as already shown in proof of Proposition 2). LSS is also a best reply to $(Dope, Notest)$ because d-n-s $\succ^{Cus}$ d-n-l by A1. There are no other equilibria with LSS because A2 yields deviations from outcomes c-t-s and c-n-s, while d-t-l is not a candidate because c-t-s $\succ^{Ath}$ d-t-l by A1. □

Proposition 4 shows that a change in the information structure in our model is sufficient to obtain a doping-free equilibrium. *Thus, the social dilemma can be overcome by establishing transparency.* However, this result comes with (at least) two caveats. First, the doping-free equilibrium involves suboptimal behavior outside the equilibrium path. (Indeed, after no test, the equilibrium strategy of the customers *LS***L** implies to leave, although this is not in line with Assumption A1. Subgame perfectness simply does not rule out this aspect.) Second, there is still another equilibrium which involves doping. To solve these two issues at once, we would need different preferences of the Customers.

4.2 Change of Customers' Preferences

Let us now assume preferences for the Customers that induce uniqueness of a doping-free equilibrium, even if these assumptions might be counterfactual. Suppose that d-n-l $\succ^{Cus}$ d-n-s and c-n-l $\succ^{Cus}$ c-n-s, i.e. Customers preferred to withdraw their support if there are no doping tests. This is in contradiction to Assumptions A1. Let us change A1 to A1' such that these two orderings have changed, while all other binary comparisons are left unchanged. This change of preference reflects that Customers are now more skeptical about doping practices and therefore now insists on the proof of clean sports in order to stay a supporter. The change in preferences is strong enough to rule out all doping equilibria as the following proposition shows.

Proposition 5 (Counterfactual)**.** *Under Assumptions A1' and A2* $\hat{s} = (Clean, Test, LSL)$ *is the unique SPNE in the game with well-informed Customers.*

Proof. The proof of this proposition is fully analogous to the first and second part of the proof of Proposition 4 because no assumption of A1' is used that does not coincide with the assumptions in A1. That is, we can restrict attention to two strategies of the Customers LSL and LSS, while for LSL, cf. Matrix 3, we find the mutual best response as $(Clean, Test)$ such that $(Clean, Test, LSL)$ is a SPNE. For the case of LSS, cf. Matrix 4, now the difference between A1' and A1 becomes relevant. Matrix 4, again, leads to best replies $(Dope, Notest)$. However, LSS is not a best reply to $(Dope, Notest)$ because d-n-l $\succ^{Cus}$ d-n-s by A1'. Again, there are no other equilibria with LSS because A2 yields deviations from outcomes c-t-s and c-n-s, while d-t-l is not a candidate because c-t-s $\succ^{Ath}$ d-t-l by A1. □

As the proposition shows, with Customers who only stay after clean sport has been proven, there is only a doping-free equilibrium. Moreover, there is no more issue of suboptimal behavior outside the equilibrium path because the Customers' threat to leave after no tests is now credible. It thus not only takes a better information level for the Customers but also a change in preferences: they would have to insist on doping tests in order to induce incentives for a doping-free sport.

4.3 Implications for Anti-Doping Policies

In the literature on doping incentives various approaches are suggested to solve the doping issue. Many of them concern the change of incentives on part of the athletes. On one hand it is suggested to change the punishments or to increase the fines for being doped (e.g. Haugen, 2004). In the light of our model, however, this approach is not effective since in equilibrium athletes are not tested and thus do not get punished. On the other hand the suggestion is to decrease the benefits of doping, e.g. by reducing the prize spread between different ranks or by reducing the number of competitions (Eber and Thépot, 1999). But also decreasing the benefits of doping only affects the behavior of athletes if it succeeds in making doping less attractive than not doping, (i.e. the payoff of doping must be reduced to such an extent that the ordinal preference that we assume in the model switches direction). As long as the probability of being caught is small, this seems to be at least questionable.

Thus, for Athletes which are calculating dopers any anti-doping instrument has to make sure that the probability that doping is punished is sufficiently high. In this paper we have identified the lack of the Organizers' incentives to really implement such a regime. A rather radical solution to these misguided incentives is to replace the actors that are responsible for doping tests. Indeed, it is currently debated in several countries (among them Germany) whether to establish a legislation that makes the state and its body responsible for the prosecution of dopers.[29] In some states, e.g. Belgium, this is already implemented. In principle, the proposed shift of responsibility is a solution to the lack of

[29]The discussion caught new fire with the recent case of Lance Armstrong.

control since the police and the courts do not have the conflict of interest that NADAs and sports associations have. However, this approach is only fruitful if it is practically possible to fully circumvent the Organizers, i.e. if the collaboration of sports associations and NADAs is not crucial for the prosecution of doped athletes.

In this section, we have elaborated on a different approach to fight doping. We show how Customers can contribute to doping-free sports if they are sufficiently well-informed. In particular, we require information about doping tests which admits Customers to condition their support for the sports event on the presence of doping tests (as illustrated in Figure 2). Whether or not Customers really insist on doping tests, then determines the extent of doping in equilibrium (Proposition 4 and 5). Thus, a direct implication of our model is that *transparency* about the doping tests and their outcomes should be established.

This requirement is not satisfied in professional sports today. Most of the data that is publicly available only contains cases of detected doping but not information about the extent of testing. For example, the Internet Anti-Doping Database created by Norwegian sports journalist Trond Husø contains more than 5000 cases, but mostly of detected dopers. In the absence of doping scandals, this does not allow Customers to discriminate between clean sports and undetected doping (such as illustrated in Figure 1).

One type of actors who is in principle capable of establishing transparency are sports associations who we study as Organizers in our model. However, as argued above, such organizations lack incentives to do so. As Dilger and Tolsdorf (2004) and Striegel et al. (2010) even assume their lack of compliance is one reason why data on doping is so limited. In order to achieve more transparency, the WADA could open the access to their database called ADAMS. ADAMS was introduced to simplify the organization and realization of doping tests.[30] Currently only certain actors of the immediate sports environment are allowed to use ADAMS. Opening the access to ADAMS seems to be a cheap way to establish transparency, while such a policy might involve several new issues, including the violation of privacy rights. Moreover, it can be difficult or costly to understand and interpret the data for Customers. A much simpler suggestion is that the WADA makes public to which extent sports associations and NADAs comply to their fight against doping. This could be a simple rating which gives Customers a clear signal about which disciplines and events are credible in their fight against doping. Of course, this requires independence on part of the WADA, which is also doubted (Eber, 2002; Preston and Szymanski, 2003), but, in principle, we conclude that there should be an independent rating or certifying agency that officially measures to which extent certain sports events have implemented an anti-doping regime. Whether or not doping prevails in the future is then in the hand of the Customers.

[30] ADAMS has four main tasks: First, athletes are required to enter their actual wherabouts and other users will be informed about actual infringements against reporting standards (Athlete's Wherabouts). Second, it is also possible to manage medical exceptional permissions (Therapeutic Use Exemptions Management). Third, ADAMS informs about doping tests, infringements, and sentences (Information Clearing House). Finally, ADAMS is supposed to ease the scheduling of doping tests and the preparation of doping profiles (Doping Control Platform).

5 Concluding Remarks

In this paper we have extended the inspection game (cf., e.g., Avenhaus et al., 2002) by a third player: customers, who can withdraw their support. As it is shown in the application of doping in professional sports, the behavior of critical customers accentuates the fraudulent behavior.[31] Customers who are ready to leave after a doping scandal, undermine the organizers' incentives to test athletes on performance-enhancing drugs and to convict them on doping. As a consequence, athletes have stronger incentives to dope although this need not be in the best interest of any of the three types of players. Our analysis substantially strengthens the argument already outlined by Eber (2002) who comes to the following conclusion: The institution responsible for doping controls "may have some temptations to slacken its antidoping effort when confronted with doping affairs to preserve the economic value of the shows (e.g., the Olympic Games organized by the IOC [International Olympic Committee]). Knowing that, athletes may rationally not believe in strong antidoping policies and may then continue to choose high levels of doping." Our analysis of incentives suggests that the few spectacular cases of convicted dopers are not delinquent exceptions, but rather unlucky cheaters or scapegoats, because the probability of being detected when doped is low (cf. Preston and Szymanski, 2003). To elaborate on potential solutions for the doping dilemma, we show that a change in the information structure in our model is sufficient to obtain a doping-free equilibrium (Proposition 4). The crucial change is to establish transparency in the sense that customers know whether there were negative tests or there were no serious tests (cf. Figure 2 versus Figure 1). This allows customers and other stakeholders to condition their support on the presence of serious anti-doping tests. Practically, the required transparency could be established by a certificate or rating that shows which sports events have established a strict anti-doping regime.

However, our model is not restricted to doping and professional sports. When fraudulent activities are detected in some organization, there is a loss of reputation and critical customers may react with a boycott. There are not few contexts, where the agent that is able to detect the potential fraudulent activities is also affected by such a scandal. For example, there were scandals involving well-known textile manufacturers (Nike) and computer designers (Apple) where it turned out (or was claimed) that certain suppliers made use of child labor. More recently, it was revealed that European parcel companies (e.g. GLS) regularly collaborate with suppliers whose working conditions for employees violate several standards. Consider thus a company in the role of the Organizer, who has business relations with another firm (Athlete) that does potentially not comply to certain ethical standards. Detecting norm violations would also undermine the reputation of the company itself. Customers who react with a boycott substantially increase the loss of the company and thereby undermine its incentives to uncover (potential) scandals.[32] When the company (Organizer) prefers not to investigate potential fraud, the number

[31]Other counter-intuitive results of the inspection game are already known (Holler, 1993; Andreozzi, 2004; Friehe, 2008). They concern the indifference of the mixed strategy Nash equilibrium, which implies that a change of payoffs for one player does not affect the equilibrium behavior of this player, but only its opponent's. Maximin strategies are used to address this issue (cf. Aumann and Maschler, 1972; Holler, 1990).

[32]There is empirical evidence on a similar issue in the context of juridical judgments: An increase in the defined punishment, e.g. from prison sentence to capital punishment, can lead to a reduction of the number of convictions.

of fraudulent activities might even increase. As our model shows, this outcome can be altered if customers are informed about control activities of all companies by some independent institution. Thus, transparency is necessary in order to overcome this type of social dilemma.

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