

The Economics of Corruption in Sports - The Special Case of Doping

Eugen Dimant and Christian Deutscher

The Economics of Corruption in Sports - The Special Case of Doping

Eugen Dimant* and Christian Deutscher†

Abstract

Corruption in general and doping in particular are ubiquitous in both amateur and professional sports and have taken the character of a systemic threat. In creating unfair advantages, doping distorts the level playing field in sporting competition. With higher stakes involved, such distortions create negative externalities not only on the individual level (e.g. lasting health damages) but also frictions on the aggregate level (e.g. loss of media interest) and erode the principle of sports. In this paper, we provide a comprehensive literature overview of the individual drivers to dope, the concomitant detrimental effects and respective countermeasures. In explaining the athletes motivation to use performance enhancing drugs, we enrich the discussion by adapting insights from behavioral economics. These insights help to understand such an athletes decision beyond a clear-cut rationale but rather as a product of the interaction with the underlying environment. We stress that in order to ensure clean sports and fair competition, more sophisticated measurement methods have to be evolved and the respective data made publicly available in order to facilitate more extensive studies in the future. So far, the lack of data is alarming, especially in the area of elite sports where the stakes are high and doping has a substantial influence.

JEL-Code: D73, K42, L83

Keywords: Sports, Doping, Corruption, Countermeasures, Survey

*Corresponding author. University of Paderborn, Department of Economics, Center for International Economics. Germany. Ph.: +49-5251-60-1682, fax: +49-5251-60- 1679, e-mail: eugen.dimant@wiwi.upb.de, and Edmond J. Safra Center for Ethics, Harvard University, USA

†Department of Sports Science, University of Bielefeld

1 Introduction

“SPORT BRINGS PEOPLE TOGETHER: IT IS NOT ONLY ABOUT WINNING AND LOSING, BUT ALSO ABOUT A COMMON INTEREST OR A COMMON LOVE OF SPORT. SPORT IS NOT AN EXCLUSIVE AREA. IT IS NOT ONLY FOR PROFESSIONALS, SPORT IS FOR EVERYBODY. IT GIVES EVERYBODY FROM DIFFERENT BACKGROUNDS, GENERATIONS AND ABILITIES A REAL SENSE OF BELONGING AND A PERSONAL FULFILLMENT.”

12th Anti-Corruption Conference, Guatemala, 2006

Corruption is not a new phenomenon, but rather a persistent feature of human societies. In one form or another, corruption has always existed. Over the last years, politics increasingly tried to implement sophisticated regulations and constitutional reforms to defend their political institutions and systems against corruption, being fully aware of the possible long-lasting and detrimental effects corruption might impose on economy and society. Its credit belongs to the scholars and the media, who unflinchingly put this topic into the limelight of the peoples attention. There is a remarkably increased awareness that fighting corruption is fundamental to mitigating the wide-ranging set of accompanied negative externalities corruption. Among these, research points at an increase of income disparities and poverty, discontinuous economic development, squeeze out of foreign direct investments, emigration of high-skilled citizen (brain drain) and the like (See Nowak, 2001; Gupta, Davoodi & Terme, 2002; Aidt, 2009; Dimant, Krieger & Meierrieks, 2013. For a general discussion see Jain, 2001 and Dimant, 2014).

Unsurprisingly, corruption also occurs in various forms and in pretty much any area of sports. Here, embezzlement, match fixing, transfer of players or any kind of dilution of results are corresponding examples (see Maennig, 2008). Especially with professional sports attracting not only a lot of interest (estimations range from 800 million to 1.2 billion active sportspersons worldwide but also huge amounts of money might create a tremendous societal and economic burden. The general figures relating to the stakes in sports are overly impressive. For example, Bures (2008) argues that an estimated EUR 2.5 billion were spent on advertising in connection with the 2006 FIFA World cup. The sports industry at large generates on average between 2.5 and 3.5 of the GDP of countries. Involvement of money always gives rise to the attempts of biasing the expected outcome to ones own advantage, likely by using performance-enhancing substances. An athletes incentives are shaped not only by the (expected) inflow of prize money but also by the ascending prestige that is intertwined with ones pursue of self-fulfillment. Such incentives give rise to crossing legal boundaries in order to create a cutting edge.

As corruption in its various forms soaks through the entire sports system, it distorts honesty, fair play and trust for the game. The increasing amount of money inherent in this system makes this industry vulnerable to corruption (Schenk, 2009). It is almost impossible to reveal whether a particular player takes a backseat on purpose and thus complies with a stipulated and undisclosed agreement or whether he is just having a bad day. Outcomes in sports heavily depend on the effort that the sportsman is investing and which are likely to be under-mined once extra money comes into play. Sadly, these things can be found in any imaginable area of sports (Bures, 2008).

In professional sports, doping is a ubiquitous problem. Recent cases of doping in athletic sports, e.g. the exposure of Asafa Powell, Tyson Gay, Veronica Campbell-Brown and Sherone Simpson, or the revelation of past and current doping cases in cycling trigger public perception that sports is vastly interpenetrated with performance-enhancing drugs. Scholars from the Humboldt University found that doping has been a systemic issue in West Germany since the 1970s. Government funds were used to subsidize research on performance-enhancing studies. In official terms at least, the studies aimed at testing whether or not certain drugs were performance enhancing. However, when promising effects were discovered, these products seemingly found their way into the sports circles quite quickly. Further investigations indicate that Germany experienced a systemic and systematic problem with doping. In a self-determining way, sport physicians took control over the use of doping of any kind, sometimes even (at least it is claimed officially) without the athletes knowledge (see Spiegel Online, 2013; Ahrens, 2013). By and large, the general practices in East Germany are no exception. In 1991, coaches conceded that steroids propelled the success of East German women swimming teams over a period of two decades during the so-called Golden Period between the late 1960s and the late 1980s. The East German women swimming teams excelled in nearly every contest during this period, culminating in crushing the competition by winning 10 out of 14 gold medals and setting eight world records at the first world swimming championship in 1973 (Janofsky, 1991). Another striking example is former sprint superstar Ben Johnson, who was responsible for what was later called the “dirtiest race in history” when he humiliated his opponents in the 100 meter sprint final of the 1988 Olympic Games. Recently, he claimed that “as a youngster like me, that’s what I was told by my coach, that everybody on my level was doing it. So for me to be on a level playing field, I would have to join in, so to speak, so I said, ‘Why not?’” (Pilon, 2013).

So far, research has been fairly silent on the economics of doping, particularly trying to include insights from behavioral economics that allow to gain the athletes decision making process. It will be the aim of this paper to disentangle some of the effects decisively

affecting the individuals inclination towards doping, with a focus on the behavioral perspective. Among other things, our main contribution is a state-of-the-art overview of the sports corruption literature with a particular focus on doping and the integration of behavioral theories helping to explain the athletes inclination towards using performance enhancing drugs that go beyond clear-cut rational decision making processes.

In this paper, we shed light on a particular case of corruption: doping. By inducing frictions to the system through the creation of unwarranted disadvantages, doping imposes negative externalities on third parties by distorting the level playing field of fair competition and weakens the public trust in the institutions involved. Following this reasoning, doping shares fundamental features with general corruption, as doping generates personal gains to the detriment of others (see Maennig, 2002. For a general discussion of the various definitions of corruption see Dimant, 2014). We make the case that, although doping has an introversive purpose, its negative impacts go beyond the individual level and rather impose detrimental outcomes on the aggregate.

This paper is organized as follows: in Section 2 we briefly discuss the main aspects and history of corruption as well as the detrimental effects of doping on the individual and aggregate level. In Section 3, we discuss the rational and behavioral approaches explaining the individual decision-making process with respect to dope. In Section 4, we discuss the characteristics and detriments of corruption in sports and offer possible countermeasures. We conclude in Section 5.

2 Corruption in Sports An Overview

2.1 History and Magnitude

Given the increasingly high stakes, the manipulation of fair competition has far reaching adverse effects on sports nowadays. Allowing for betting on sports results and the like, and thus being embedded into a multibillion-dollar financial environment, small frictions in performance enhancement can have tremendous pecuniary impacts. Bures (2008) argues that there is some consent that American sports in the aggregate, football and tennis in particular, “face the greatest burden because opportunities for fixing to be lucrative exist across a wide range of competitions.”

People lean towards the belief that corruption in sports has only just become a problem. Cases of general corruption in sports, like that of the former soccer referee Robert Hoyzer or the former professional basketball referee Tim Donaghy, the Italians soccer betting scandal or the case of Lance Armstrong are medially hyped and thus bias our

perceptions. A wide range of corruption cases in modern sports have been encountered over the time, which are comprehensively covered in Maennig, 2008. Even academics found interest in providing prove for corruption in sports (for NCAA Basketball see Wolfers, 2006, for Sumo Wrestling see Duggan & Levitt, 2002). However, in some cases excessive media attention leads to perverted outcomes. The cases of the two successful (doped) cyclists Lance Armstrong and Jan Ullrich (Jan Ullrich represents the German counterpart to Lance Armstrong. Although not even near the (bygone) status of Lance Armstrong, Jan Ullrich is listed as the most successful German cyclist according to www.cyclinghalloffame.com) are exemplary for such a disparity. On the one hand, after denying doping for many years, Armstrong has finally been caught doping in 2012. Promoting his personal story and his book aggressively on TV and in press yielded him some odd form of sympathy. Ullrich, on the other hand, who was also convicted of doping in 2012, is a resented castaway (Ahrens, 2014).

The increasing commercialization and the medial appearance gave rise to the misleading belief that corruption in general and doping in particular are problems of modern times. The first documented case of corruption dates back to the ancient Olympic Games in 388 BC when a fighter bribed three of his competitors (Maenning, 2005). “There are also records of an early case of corruption in sporting management and administration. In 12 B.C. Damonikos of Elis, father of the Olympic wrestler Polyktor, attempted to bribe Sosandors, in order for him to persuade his son of the same name to concede victory in the Olympic wrestling competition to Polyktor. In sum however, a mere handful of cases of corruption in the ancient Olympic Games, held over a period of about a thousand years, are documented” (Maenning, 2008). Competing in the earliest days of modern Olympics starting in 1896, athletes resorted to injections of strychnine, tinctures of cocaine and the use of alcohol to achieve an edge. In the ancient days, athletes also ate raw bull testicles to boost their performance (Kelland, 2012). While, over time, the perception changes with respect to what is considered to be unlawfully performance enhancing, eating testicles is not (yet) banned in professional sports.

With increasing stakes, corruption in sports has become an immanent problem. The majority of people involved, directly or indirectly, suffer greatly from the consequences. It is needless to say that there are also ethical costs involved as it is responsible for creating an environment that is not conducive for aspiring young athletes. Looking at the above expressed ideas, corruption is inefficient on both the individual and aggregate level (Maenning, 2005). For the purpose of our approach, corruption in sports will be defined as any form of competitive distortion caused by any type of action considered illegal, unfair or unethical based on common international regulations and confinements,

as for example issued by the IOC in the Olympic charter. Or, put differently, as denoted by Maennig (2008):

“[Corruption in sports is understood as] behaviour by athletes who refrain from achieving the levels of performance normally required in the sport in question to win the competition and instead intentionally permit others to win, or behaviour by sporting officials who consciously perform their allocated tasks in a manner at variance with the objectives and moral values of the relevant club, association, competitive sports in general and/or society at large, because they receive or expect pecuniary or non-pecuniary advantage for them-selves.”

It has soaked through the entire spectrum of sports and poses detrimental effects. It is alarming that we don't have data of sufficient quality to draw sophisticated inferences about the spread of doping (ab)use in sports. Some have even gone so far to argue that no reliable estimate of the prevalence of doping in elite sports has been published so far (Sottas, Robinson, Fischetto, Doll, Alonso & Saugy, 2011). A few exceptions should be mentioned. Exemplarily, Sottas et al. (2011) use a comprehensive data set of 7,289 blood samples collected during international athletic competitions since the International Association of Athletics Federations (IAAF) has incepted a comprehensive blood-testing program back in 2001. Their results indicate that on average 14% of the tested athletes used blood doping. The data also suggests a strong heterogeneity of doping among athletes, ranging between 1% to 48% for sub samples stratified according to nationality, sex and typo of sport (endurance vs non-endurance).

In addition, Tokish et al. (2004) report that one to three million athletes in the United States use anabolic steroids with annual black market sales exceeding \$100 million. The study also indicates that up to 5% of 10th graders in the United States have experimented with human growth hormones. What is more, in 2013 a group of German scholars evaluated in a triathlon-doping-study 2,997 tri-athletes who participated in various German Ironman races. The results are worrisome: 13% admitted to physical doping (e.g. Steroids, EPO, Human Growth Hormone), 15% admitted to cognitive doping (e.g. Antidepressants, Beta Blockers, Modafinil, Methylphenidate), and 10% admitted to both physical and cognitive doping (Dietz, Ulrich, Dalaker, Striegel, Fanke, Lieb & Simon, 2013). While their numbers indicate that as many as 1 in 7 athletes used performance enhancing drugs, these numbers did not include professional athletes but only recreational ironman tri-athletes. It is conceivable that this is a lower-bound result given that professional athletes face higher incentives and have the required skill levels to boost their performance at a margin that makes the difference between mediocrity and superstar. We will return to this argument shortly at a later point.

2.2 Detrimental Effects of Doping

In this section we discuss a range of adverse effects associated with the (mis-)use of doping in competitive sports from both an individual and aggregate perspective. Such a subdivision is necessary since doping imposes different negative externalities at the individual level (mainly a health perspective) and aggregate level (mainly a cost perspective).

2.3 The Individual Perspective

Unarguably, doping represents a massive problem in sports, which by this definition is also a form of corruption as it distorts the underlying principles of fair and competitive contests. Many forms of sport have heavily suffered from doping, consequently leading to a depletion in interest for this kind of sports on the customers side. According to Preston and Szymanski (2003), there are four basic reasons for why doping can be harmful to sports in general and athletes in particular:

- I. It damages the health of athletes.
- II. It gives doped athletes an unfair advantage.
- III. It undermines interest in the sport.
- IV. It undermines the reputation of a sport.

With respect to the athletes health damages, the effects are manifold. The U.S. Anti-Doping Agency (USADA) lists a number of effects associated with performance enhancing drugs (PEDs) on their website (www.usada.org). Treating these substances as dangerous drugs, they claim that “PEDs have the ability or potential to drastically alter the human body and biological functions, including the ability to considerably improve athletic performance in certain instances.” For their purpose, the USADA subdivides the PEDs into 11 categories, which are, among others, Anabolic Agents (including Testosterone), Stimulants, Narcotics, Cannabinoids (Marijuana), Beta Blockers, Blood doping and Human Growth Hormone. The negative effects are substantial and vary for different age groups and genders. The side effects range from liver damage and impotence to generally higher risks for strokes and committing suicide.

An increased awareness raised by multiple deaths in sports back in the 1960s yielded a ban of using stimulants and narcotics in competitions in 1967. From then on, the number of banned substances and practices has been growing steadily and eventually gave rise to an official characterization of doping and a list of banned substances by World Anti-Doping Agency (WADA) in 2004. However, such awareness might be biased in the sense that a higher number of doping cases does not necessarily indicate an outbreak in

the usage of doping, but might rather reflect an increase in the institutions effectiveness in unveiling the usage of PEDs going hand in hand with the technological advancement. Given its hazy nature, a supposedly large dark figure of doping cases is extant. Consequently, the side effects associated with the intake of doping are widely unexplored due to a lack of meaningful long-term studies. This issue is even more pronounced when accounting for the wide appropriation of black market substances in wrong doses and with unknown and hazardous constituents (Kohler, Thevis, Schnzer & Pschel, 2008).

2.4 The Aggregate Perspective

Doping not only imposes detrimental effects on the individual level but also at the aggregate. Athletes generally act as role models and thus bear ample responsibility. Being ex-posed for using PEDs not only smears the athletes reputation and questions the legitimacy of their achievements, but also taints the sports clean slate. Once an athletes reputation is smeared, the loss of trust might translate into the fans distrust in institutions and weakening their effectiveness and trustworthiness. For example, this can happen via triggering extensive (and economically inefficient) infrastructural investments in the attempt to rebuild the peoples trust (Lessig, 2013). As we will elaborate at a later point, such an intertwined reputation system might lead to a perverted equilibrium in which clean athletes are unable to signal their fair sportsmanship (meaning their refusal to dope) and thus might start doping not because of their individual inclination but based on a pure utility maximizing calculus. Simply put, if everyone believes that the sport is infected and everyone dopes anyway, even the clean athletes might start taking PEDs to level the playing field due to their inability to send a credible signal of being clean. Consequently, the whole sport might accelerate into deviant behavior that is conditional on both other athletes deviant behavior and the (false) public perception. From a cost perspective, performing doping tests entail enormous annual costs to society. Referring to official information from the World Anti-Doping Agency (WADA), Maennig (2014) estimates the costs in 2013 to range between \$229 million and \$500 million in order to cover 270,000 doping tests. Given the testing results, every exposed case of violation against the rules costs about \$70,000. For an assumed sensitivity of doping tests of about 40% (Hermann & Henneberg, 2013) combined with a very short window of detectability implies a) high social costs in attempts to convict athletes who dope and despite these high costs b) a residual uncertainty remains with respect to detecting offenders. In an attempt to detect doping at a higher rate, increasing testing frequencies and improved testing methods are feasible measures. And even if the costs for testing decline as a result of improved testing methods, some fixed costs remain. Testing will continuously be in

need of high organizational effort, as the surveillance of athletes is very intense. First, they have to report their whereabouts to be available for testing procedures. Second, as performance enhancement will not remain at its status quo there is a need for expanded testing procedure, which is again costly (Hanstad & Loland, 2009).

In addition, the repetitive occurrence of doping has the power to see a sport lose its credibility. The best-known case is professional cycling. Continually uncovering a former and/or current professional cyclist achieved their performance due to the misuse of performance enhancing drugs. During the period of 1940-2013, more than 600 riders were detected to be cheating (www.cycling4fans.com). In 2007 media attention peaked and led the German Telekom to terminate the sponsorship of its T-Mobile-Team. Television audiences declined in most European countries (Dilger, Frick & Tolsdorf, 2007) and one year later German television stations abandoned their broadcasting of the Tour de France as a reaction to doping information being published. Both decisions affected professional cycling directly as revenues decreased. The inability to absorb the following decline in revenues even led to the cancellation of the Tour of Germany from 2009 until now. As both sponsors and broadcasters display the demand for sports studies it has been revealed that spectators hold a zero tolerance policy towards doping (see Solberg, Hanstad & Thoring, 2010; Engelberg, Moston & Skinner, 2012)). Repeated violations of the rule can result into a decline of the whole sector, potentially being negative external effects on those who were not involved with doping in the first place (Overbye, Knudsen & Pfinster, 2013).

3 Decision to Dope: Explaining Behavior

In what follows, we will shed light on an athletes decision-making process to engage in doping from various perspectives. For one, the individual approach will serve as a starting point to explain deviant behavior. The purpose of this approach is to highlight the athletes decision as the result of (bounded) rational assessments. The aggregate approach on the other hand highlights that individual decision-making is subject to the peer groups decisions and reputation mechanisms, consequently being correlative with the surrounding social environment.

3.1 The Individual Perspective

Monetary and non-monetary incentives play a decisive role in an athletes calculus to even consider the intake of performance enhancing drugs that are both harmful and risky with respect to future consequences. Sufficiently high incentives might serve as a

trigger to over-step boundaries. Research confirms the existence of such incentive effects for e.g. Golf (see Ehrenberg & Bognanno, 1990; Ehrenberg & Bognanno, 1990). At the same time, evaluating relative performance makes sporting contests prone to sabotaging behavior (see Garicano & Palacios-Huerta, 2005; Deutscher, Frick, Grtler & Prinz, 2013) and potentially doping (Krkkel, 2007). It is thus important to analyze the driving factors of an athletes decision to go down this dangerous path. We do so by providing both purely rational and behavioral perspectives that are conducive to the understanding of doping behavior.

3.2 A Rational Approach

If anything, corruption in sports has widely been discussed from a delineative perspective in the literature of sports economics. While the ultimate practice is well understood, the underlying motivations and decision-making processes heavily lack a behavioral perspective. In what follows, we will seminal contributions that help to understand individual decision making to dope from a rational perspective.

In their seminal work, Becker and Murphy (1988) develop a general theory of rational addiction that can easily be adapted to explain individual doping decisions. Hereby, addiction might be the result of either a physical or a social dependency (e.g. ones need to achieve recognition and approval). Approaching this topic from a rational perspective, they argue that rational addiction implies the presence of an active calculus that would consistently maximize utility over time. Their theoretical results suggest that even strong addictions are driven by rational decisions and involve a forward-looking maximization of stable preferences. These restrictions have been eased in subsequent research involving quasi-hyperbolic preferences, leading to an addicts time inconsistent decisions. For a discussion see Gruber & Kszegi, 2001). Hereby, individuals with high discount rates for future events and thus a high preference for the present are more likely to become addicted. From an athletes perspective, the expectation of a short-run gain in the form of winning con-tests and prize-money might facilitate the use of doping. This is propelled by the circumstance that an athletes time window to seriously participate in competitive sports is vastly limited, thus making high discounting of future events even more likely.

Using a similar approach, Maennig (2008) explicitly models the individuals decision to engage in crime in a rational risk-assessment style. He transforms Beckers (1968) general model of crime exertion into the context of corruption in sports and argues that athletes are able to carry out proper risk assessments in order to weigh their expected benefits against the expected costs. This neoclassical approach can also be used to shed light on the athletes decision whether or not to dope. Maennig constitutes the following

to hold:

$$E(U_i^n) = (1 - p_i) * [U_i * (p_i Y_i - DC_i - POC_i) + p_j * NPB_i - NOC_i] \\ + p_i * [U_i * (-F_i - DC_i - POC_i) - LR_i - NOC_i]$$

Here, $E(U_i^n)$ denotes the net utility of the corrupt behavior, p_i represents the probability that the perpetrator is convicted, while p_j represents the probability of the successful corruption. So, the expression in the brackets after $(1 - p_i)$ is the net utility for the perpetrator in case he is not convicted while the expression after p_i is the net utility in case he is convicted. In the first case, the athlete's utility is increased by the pecuniary income he gets (Y_i), and by the non-pecuniary utility (NPB_i), e.g. reputation or honors. However, some costs have to be taken into consideration, such as the direct costs of preparation including the costs of avoiding detection (DC_i), by the pecuniary opportunity costs (POC_i), and the non-pecuniary opportunity costs (NOC_i). The second addend bears the costs of the financial penalty (F_i) which can also include losses from further competitions or jobs and the loss of reputation (LR_i). Put differently, an individual will strictly prefer to behave in an illegitimate way if the following holds:

$$E(U_i^n) > NPC_i$$

In line with this cost-benefit perspective, it is important (and yet insufficiently discussed in academic literature) to analyze the impact of rising stakes on the probability of using PEDs. In the more recent past, one can observe a substantial increase in absolute wage disparity for both team and individual sports. While US Major Leagues cap salaries by introducing salary floors and roofs, superstars who are able to draw in endorsement money often exceeding their regular salary (see Dilger & Tolsdorf, 2014). Endorsement contracts value increases as companies are able to market athletes worldwide. Asserting an increase of rewards especially towards the top performers lets one assume the presence of incentive effects to dope. Marginal returns to improvement are especially high towards the top positions. For an elite athlete being close to or at the top of his antagonists or an athlete being close to making the cut for becoming a professional, the jump in general income and prize money development incentives to engage in illegal performance enhancement are even higher compared to an athlete at the bottom of the field or an amateur. Prize money development to be observed throughout the last two decades increased marginal returns to improved performance (and hence doping) especially for top athletes competing for the highest rewards. As empirical evidence is

rare, at best survey results and anecdotal evidence indicate the percentage of dopers to increase with the level of competition they compete at (Pitsch & Emrich, 2012).

Although evidence is still lacking, under these circumstances it is reasonable to assume that such monetary incentives will have a strong impact on injured athletes to dope in order to abridge ones injury lay-off. Existing data suggest that, on average, professional NBA players who suffer from severe injuries lose 30 percent of their value (which is determined by the athletes performance on the field) in the long-term. The magnitude of this detrimental effect on a players value is positively correlated with the players age (Silver, 2014). Along these lines, we argue that the incentives strength in manipulating an athletes decision whether or not to take performance enhancing drugs is a function of his own age that most likely exhibits a U-shape characteristic. The reasoning goes as follows: a competitive athlete in his young years has both the physical conditions and sufficient upward leeway to allow for a skill boost large enough to create an edge that makes the difference between mediocrity and superstar. Under these circumstances, the expected monetary and non-monetary benefits might very well outweigh the risks accompanied by taking PEDs. While this advantage vanishes with the athlete getting older, this flattening off is substituted and the initial decline is likely to be overcompensated by what is known as the endgame effect at the end of his active career. Here, existing punishment mechanisms like being exempted from participating in tournaments have no credible sanctioning effect on an old athlete who is close to his retirement. In Section IV, we highlight measures that have the potential to mitigate individual incentives to dope and also deal with the endgame effect. For these theoretical arguments to be strengthened, one would need cross-sectional data of a quality that is higher than what is currently available. However, using an unbalanced panel of 64 world-class sprinters, Dilger and Tolsdorf (2005) provide at least some evidence for the existence of the endgame effect. The dataset entails 3,024 different 100m races for the period 1997-2002. The results suggest that doped athletes are significantly older (about 3 years) than their clean tested opponents.

Although the rational incentives to engage in doping in the first place has become clear, it is not set in stone that such behavior will persist over time and create an undesirable equilibrium in which doping soaks through the entire system. For this, a game theoretic approach might be helpful. Bchel et al. (forthcoming) provide such a perspective to corruption in sports in general and doping in particular. Shedding light on the sport athletes dilemma, this approach allows studying the respective course of action as a result of conflict of interest between par-ties, known preferences but unknown actual intentions. So far, existing game theoretic approaches have been highlighting doping

decisions either from the perspective of the competitors or from the perspective of both competitors and organizers. However, no effort has been carried out to introduce a third party, which makes sports a multibillion industry in the first place: the customer. This being the main achievement of Bchel et al. (forthcoming), some of the implications of their model should be highlighted.

Simply put, athletes are in a situation of the prisoners dilemma type. Both of them would be better off not engaging in doping in the first place. But as nobody can trust the other, both end up taking drugs in order to enhance their chances to win (at least in the one-shot consideration without allowing for trust and reputation to build up). In analyzing the strategic interaction between athletes, doping is commonly found to represent a dominant strategy, even though it might not be in the best interest of the athletes (see Breivik, 1992; Haugen, 2004). An extension to this approach is the so-called inspection game, in which the relationship between athletes and organizations in charge for doping tests is modeled (Berentsen, 2002; Kirstein, 2014). In an inspection game, there is no Nash equilibrium in pure strategies but rather mixed equilibria, as both parties long for different outcomes: the athlete, who wants to dope without being actually detected, and the control organization, who wants to detect only doped athletes without having to test also the clean athletes.

Extending the existing approaches, Bchel et al. (forthcoming) introduce the customer as an additional player to the game. The underlying motivation is straight forward as customers play a decisive role in making sports profitable. Once customers lose interest, professional sports might experience a downfall, especially in monetary terms (e.g. cycling). In this vein, the possible threat of customers turning away from sports is included into the athletes decision making sphere. Here, the basic assumption is a trigger strategy on the side of the customers: they provide support for sports until a doping scandal occurs, which will then lead to the withdrawal of support. Under mild assumptions, the unique equilibrium is that athletes dope while organizers underinvest in testing them. The reasoning is that the customers threat to withdraw their support leads to a situation where the organizers rather tolerate (uncovered) doping rather than running the risk of losing support due to discovered cases of doping. Undoubtedly, this result is not in the best interest of any party involved.

To sum up, the athletes opportunity costs of not being able to earn (prize) money, his increasing loss of value as he advances in age and being exposed to a prisoners type of dilemma work into the same direction and serve as an incentive to take performance enhancing drugs. As evidence suggests, the combination of these incentives is strong enough to outweigh the disincentives of punishment.

3.3 A Behavioral Approach

In this section, we will shed light on individual doping decisions that are driven by behavioral aspects beyond clear-cut rational decision-making. Consequently, some well-known behavioral approaches that are conducive to understanding doping decisions will be discussed.

Bounded rationality, which refers to an individual's cognitive limitation due to the presence of depletive resources unleash peculiar behavioral patterns. "Two features of the brain provide foundations for behavior and decision-making. One is its limited information processing capacity. Humans are purposeful but bounded. They are generally not irrational or random in behavior. [...] The second is modularity different brain components have some ability to affect behavior independently of other modules" (Schmid, 2004). The human brain relies on fundamental patterns, simplifying and accelerating processing, often leading to more intuitive decisions, to which people frequently refer to as gut feeling. By any means, humans simultaneously and sequentially implement various techniques: they make mental accounts, organize choices in a lexicographical style, and enforce selective perception and the like. As a result, choices are pondered less deliberatively, potentially inducing inadvertent behavior.

As research indicates, self-control is an integral part of continuous decision making processes, allowing for more deliberate assessments of each situation and facilitating the individual's capability to resist temptations. Self-control is treated "as the capacity of one 'more rational' self to override the decisions of a more impulsive one (or several)" (Achtziger, Alós-Ferrer & Wagner, 2011). The underlying idea is that resources needed to exhibit self-control are the same that are used for controlling and restraining thoughts and impulses, persisting cognitive tasks and the like. As is evidently true, these resources are limited, being used for one task only leaves a reduced (if at all) amount of self-control for subsequent tasks. Using up cognitive resources necessary for self-control induces a state of ego depletion. Consequently, in a state of ego depletion, self-control is less pronounced, leading to more automatic and thus less deliberate and less rational decisions. Along these lines, it is reasonable to assume that being exposed to constant physical and psychical pressure, certain physiological conditions resulting from, in particular, ego depletion, lower the athlete's self-control and consequently the intrinsic threshold to withstand doping. Consequently, athletes who are exposed to extensive physical and psychical strain are more prone to the abuse of performance enhancing drugs.

From a crime perspective, a lack of self-control is perceived to be the driving factor behind deviant behavior (see Hirschi & Gottfredson, 1990; Muraven, Pogarsky & Shmueli, 2006). However, for self-control to be effective, sufficient mental resources are

needed. At short sight, these resources are finite and once they are depleted, the decision maker gives in and resorts to using heuristics rather than a deliberative cost-benefit analysis. Lab experiments indicate that ego depletion sustainably taxes self-control resources, leading to more automatic and less conscious decisions (Achtziger, Alós-Ferrer & Wagner, 2011).

In a sports context this could mean that if the athlete engages in tasks that eat up cognitive resources needed for self-control, subsequent decisions are taken less appraisingly, possibly leading to more inconsiderate outcomes, e.g. in the form of heuristics. One can easily imagine that professional athletes who are consistently under physical and psychological pressure of various kinds (frequent and intense workout, strict nutritional protocols, restraints and constrictions of various kinds), quite frequently deplete their resources, which might influence their intrinsic inclination towards taking performance-enhancing substances. Experimental evidence points to the idea that impairing cognitive resources leading to ego depletion has a substantial and a prolonging effect on changes in behavior and shows an intensifying character as more decisions are made (Id., see also Vohs, Baumeister, Schmeichel, Twenge, Nelson & Tice, 2008). The decision to dope might thus be driven by the circumstances of resource depletion rather than by a critical individual assessment of costs and risks on the one side and benefits on the other side.

In such a mental state, an individual resorts to the use of heuristics. One particular heuristic approach that is involved in the individual decision-making process is “win-stay, lose-shift” and is closely connected to habits and standard operating procedures. This concept is particularly helpful to explain why athletes might stick to their previous choice to dope. Such a strategy explains the evolution of certain behavioral patterns and can, in particular, be easily applied to any type of repeated decision problems. In more detail, once a decision in favor of doping was made, as long as the outcome of the last round was a success, the player will stick to his previous decision. For our purposes, the outcome of the last round may be represented by the outcome of last blood test or contest, the player is the athlete and the decision sphere is denoted by the athletes decision whether or not to dope in a previous contest. This behavior is evolution-ary stable and might induce a state of consistent drug abuse as long as athletes are not caught.

Consequently, one could agree with the reasoning that in a cognitive state of ego-depletion athletes resort to doping more often and with less containment (interestingly, this aspect has been fairly unnoticeably been touched upon in the seminal work of Becker and Murphy (1988). They state that “the level of [...] temporary stressful events that stimulate the demand for addictive goods [...] also affect the likelihood of becoming addicted.” This in fact is more restrictive than our line of argument, since we argue

professional athletes have to deal with stressful events not only from time to time but on a constant basis, thus substantiating our claim even more.) It might be disappointing but hardly surprising that professional athletes merely focus on their competitive goals rather than frequently engaging in appraising deliberations. In some cases, doping and other kinds of corruption in sports might serve the purpose. While most likely the detrimental effects are underestimated, athletes can live up to their own and external expectations, before eventually being convicted to misbehave.

3.4 The Aggregate Perspective

3.4.1 Spill-Over Effects and Social Contagion

In this part, focus lies on the role of conditionality in the individuals decision-making process with respect to using PEDs. This approach represents a combination of imitating and following other peoples behavior on the basis of complying with possible existing norms. As will be argued, this approach suggests that an individuals decision to engage in doping might be the result of spill-over effects resulting from the peers doping decision that are observed by the individual.

Research indicates that crime has severe contagion effects. Along these lines, individuals are more inclined towards deviant behavior if people around them behave in an unethical way (Glaeser, Saverdote & Scheinkman, 1996). Within the context of sports, one might think of a cycling team, where the initial usage of doping might inflame a straw fire. Theory suggests that individuals are likely to engage in herding behavior by following the (bad) example of the peers. Anecdotal and empirical evidence suggests the existence of contagious behavior in diverse contexts such as smoking at school, drug and alcohol use, co-offending behavior and general acts of crime (see Baumann & Ennet, 1996; Vitaro, Tremblay, Kerr, Pagani & Bukowski, 1997; Reiss, 1988; Alexander, Piazza, Mekos & Valente, 2001; Andrews, Tildesley, Hopy & Li, 2002). Moreover, Falk and Fischbacher (2002) find support for reciprocal preferences as a source of social interaction, Gino et al. (2009) argue that contagion in unethical behavior is driven by group-differentiation, Zafar (2011) finds that both learning about the descriptive norm and image-related concerns play a role in the choices of the subjects, and Dimant (2014a) provides evidence that the magnitude of contagion is subject to the individuals social proximity to the peers and that the adaptation of bad behavior is fundamentally different from the adaptation of good behavior (for a comprehensive literature overview see Dimant, 2014b). In the context of sports, Ichniowski and Preston (2014) find evidence for the existence of peer effects and spillovers of skill among soccer players. Although

research is still silent on this, it is reasonable to assume that such findings are not only context dependent but also translate to the sports context. Especially in team sport, spillover effects are likely to appear within members of the same team. Anecdotal evidence from Jamaica indicates that extensive institutional corruption of the anti-doping regime is also conducive to the spillover of systematic doping across different forms of sport (Bond, 2013).

In addition, one might account for the fact that money represents a positional good, indicating that the value derived from it also depends on the peers behavior. Consequently, both the striving for a higher social status and recognition by the peers scale up the subjective importance of money, eventually representing a decisive factor for an athlete to overstep bounds. In this context, Kirchgssner (2014) argues that “the fear of losing ones current standard of living (consumption) might be one reason for engaging in risky activities like corruption”, which he also refers to as the catching up with the Joneses motive. Evidently, peer groups exhibit a traceable impact on individual behavior. In the context of sports, when being exposed ones peers deviant behavior such as doping, even an intrinsically motivated honest person might be inclined to conform to the (perceived) social norms in order to not be the odd one out. In retrospective, this seems to be a true observation for cycling. More often, not only single professionals were convicted of doping but it was also found to be institutionalized among the teams, exerting extensive pressure (both with respect to performance and social belonging) on those who dont comply.

3.4.2 Threat of Reputation Loss

Reputation is an essential and immanent feature of everyday life. In a social context, reputation determines the own trustworthiness and once undermined it is hard to rehabilitate into society. As discussed by Maennig (2006), already in ancient history, reputation played a decisive role in sports. “In the ancient Olympics, the corrupt athletes were heavily punished by financial means. Each of them had to pay for the construction of zanes (column of shame), which was then placed directly at the entrance of the Olympic Stadium. These columns cost a fortune because they were made of the best materials and manufactured by the best artisans.” Not only the monetary loss but also the negative impact of the loss of face represented a deterrent factor.

Along these lines, the impact of possible reputation loss might deter individuals to dope in the first place. However, an individuals reputation depends not only on ones own behavior but also on the behavior of peers and predated group comporment. For this, we apply the results derived by the seminal work of Tirole (1996) on the role of

reputation on doping decisions. He was among the first to not only incorporate the possibility of reputation recovery once lost due to misbehavior, but also to highlight the interdependencies between individual and collective reputation.

In this context, the impact of joint dynamics of individual and collective reputations on the persistence of corruption is studied. It is assumed that individual incentives are affected by the individuals past behavior (which is commonly observed by outsiders in a noisy matter) and the groups past behavior, thus introducing reputation effects. Hereby, an intergenerational dependency of past members behavior and possible reputation loss on current members decision vectors is modelled. In the context of sports, such an approach allows light to be shed on how past group members decision of e.g. a cycling team impact a current team members decision with respect to whether or not to dope. One of the main results is that under particular conditions, current members of a group are locked-in into deviant behavior as a result of past group members deviant behavior. Here, the groups reputation has been damaged in the past and engaging in deviant behavior in the present becomes the best response. The mechanism works as follows:

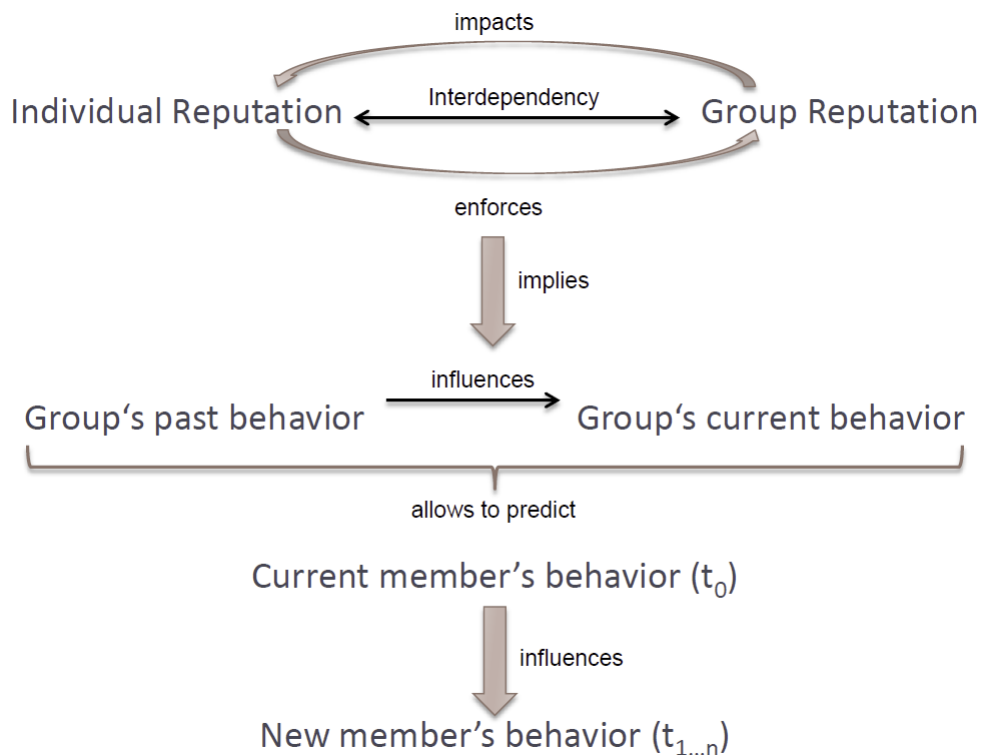


Figure 1: Interdependency of information and behavior on reputation (own illustration)

New group members may suffer from past deviant behavior of the elders in consequence of damaged reputation which implies that such interdependency might lead

to both short-and long-run steady state corruption-traps. While the loss of reputation functions as a threat to the individual and thus should represent a deterrent factor, once reputation is smeared by the other group members, a short-run and long-run corruption steady-state might be reached in which it is not worthwhile to remain faithful and abstain from using PEDs. In consequence, using this approach one can easily comprehend that not only the individuals inclination towards misbehavior is of importance but also the composition of the close environment.

4 Countermeasures to Fight Doping

The comprehensive mitigation of the illegal taking of doping requires a multifaceted approach. Various leverage points are conceivable. From a classical cost-benefit perspective, raising the (expected) costs for doping might do the trick, which in return can be expected to (c.p.) reduce the incentives for such deviant behavior in the first place. This can be implemented via both pecuniary penalty in form of fees and an extended ban from the federation or any form of competition events of corrupt athletes. The possible loss of reputation represents a strong cost-driving factor. If the media sticks together and carries out extensive media coverage, the concomitant costs would rise significantly.

One feasible approach is to extend the (randomized) testing of professional athletes for PEDs. In particular, given that athletes depending on their skill level and age exhibit different incentives to dope, such results could give rise to more selective additional testing (for example, athletes who just rehabilitated from a severe injury). Preston and Szymanski (2003) argue that although randomized testing would increase the chance of exposing doped athletes and thus increase the (expected) costs as well, most professional US sports managed to reach agreements through the player unions putting a ban on randomized testing. Partly, the concomitant costs can be internalized via reinforcing incentives for self-reporting, blowing the whistle and asymmetric punishment (see Basu, Basu & Cordella, 2014; Maennig, 2014). While increasing the fines to reach an incentive-compatible level to deter athletes from using PEDs might seem to represent a feasible approach in general, excessive fines like the ones imposed on Petar Korda might not bring about the desired outcome (in fact, Petar Korda was not only banned from competition but also had to repay the prize money he won. He never actually paid the money back. See Maennig, 2014).

Another potential approach would aim at reducing expected benefits. As argued before, extensive doping is extremely lucrative in professional sports due to high stakes, which in turn facilitate rent-seeking behavior on the side of the athletes. Reducing the

rents involved in sports could be achieved by, for example, lowering the prize money for the athletes or reducing the athletes base income. On the one hand, reducing benefits of sporting events and the like would clearly reduce the incentive to engage in deviant behavior as it would (c.p.) deteriorate the relationship between expected costs and expected benefits. On the other hand, reducing benefits could potentially harm the whole industry as the peoples excitement and involvement in sports might peak off significantly. Along these lines, adjusting the disparity in the athletes incomes represents another regulating screw. The design of professional sporting contests and the resulting income inequality potentially incentivize doping, especially amongst top athletes. Following theoretical considerations by Lazear and Rosen (1981), sporting contests are decided upon the relative performance by the athletes. Hence marginal differences in performance can determine the outcome of the contest. Rosen (1981) states that a small number of people earn enormous amounts of money in the field they engage in. Thus, marginal differences in talent result in large income differences, which lead to the result that marginal differences in sporting performance cause not so marginal differences in revenues generated by the contestants.

Further attempts to fight the doping issue involve harsher measures such as temporarily excluding the tainted sports disciplines from the Olympic program, banning the television broadcast or shifting the cost burden to official institutions of the respective sport (Maennig, 2014). In accordance with the deferred compensation model developed by Lazear (1979), Maennig (2002) proposes a mechanism according to which professional athletes would deposit part of their prize money into a fund. This money will be safely stored and paid out after they retire if, in retrospective, they remained clean over the course of their sports career. This in fact might counterbalance the athletes incentive to dope induced by the earlier discussed endgame effect. However, it remains questionable whether athletes are willing to take the real loss in income brought about by deferring payments to the future. Since athletes (just as regular people as well) discount future income and thus prefer consumption now over consumption later, such an approach might distort incentives. In the short term, this is especially true for athletes who are active at the time of the introduction of such measures due to a shift in their reference point. Having been used to a system where they were in charge of their whole prize money, giving up this prestige might provoke broad rejection. However, in the medium and long term and especially for young (amateur) athletes, such a one-time cut can be expected to cause a less pronounced rejection.

Unarguably, doping in sport imposes various pronounced negative effects on society and economy, impacting individuals, teams and entire sports equally and thus is worth

the fight. Maennig (2006) argues that one case of corruption alone can cause significant social marginal damage, since in general it may result not only in a considerable loss of image for the perpetrator, but also for the sporting discipline as a whole and even for sport in general, and may not necessarily stop at the borders of the individual country involved. From an institutional perspective, one can only hope that the transpired doping cases trigger the formation of more sophisticated official bodies taking the issue of doping more seriously than until now. The inception of the World Anti-Doping Agency (WADA) in 1999, the publication of the World Anti-Doping Code in 2003 and the agreement of the UNESCO Convention against Doping in Sport in 2005 represent landmarks (Boulihan, 2014).

However, the effectiveness of countermeasures to fight corruption in sports in general and rambling doping in particular is mediated by the corruption inherent to the institutions itself. Such corruption potentially dissuades institutions from their initial purpose and consequently sands the wheels of the implemented efforts to successfully and sustainably fight corruption. One striking example is the International Federation of Association Football (FIFA). For decades, FIFA has been on and off involved in corruption scandals with respect to vote buying, awarding of contracts and the World Cup bids. Representing the main governing body of international soccer, one would expect such an institution to take the clearing up of corruption more seriously than it has been the case so far. In fact, FIFAs Investigatory Chamber of the FIFA Ethics Committee (FEC) seems to be negligent of shedding light on existing deficiencies and instead defers the publication of the final report dealing with the investigation of the latest corruption issues related to the allegedly corrupt World Cup bids of 2018 (Russia) and 2022 (Qatar) (see The Telegraph, 2014). Under such circumstances institutions fail to fulfill their duties and in turn contribute to breeding systemic corruption. With high stakes on the line, such an economy of influence is serving the interests of a few at the expense of the many. Unsurprisingly, the fight against corruption of any kind in sports cannot be successful as long as the underlying institutions suffer from the same disease. More steps have to be undertaken to ensure clean sports and fair competition, such as creating truly independent governing institutions that are prevented from pursuing their own interests or those of a minority of stakeholders.

5 Final Remarks

As has been exhaustively argued throughout this paper, corruption in sports is highly relevant and persistently existing in pretty much any area of professional sports. Fixing

matches, bribing officials, using performance-enhancing substances and the like are substantially impeding sports. Having shed light on general characteristics of corruption in sports, the focus of this paper was to bring together economic theories from both the rational and behavioral sphere to analyze the athletes inclination towards doping. The implications suggest that both approaches are useful in explaining doping decisions and that athletes are driven by a complex bundles of cost-benefit calculations, incentives, reputation concerns, spill-over effects and social contagion and the like.

Existing research is still relatively quiet on many issues with respect to the sports problem with corruption in general and doping in particular. Consequently, the institutions in charge have trouble to implement the right mix of rules and leeway to allow for a clean and competitive sport. One fundamental problem is the lack of good data. Given the excessively high monetary and non-monetary stakes involved in (professional) sports, such a deficiency is worrisome. Official bodies and institutions should procure that the seizure of a clean sport is taken as seriously and as professionally as the sport disciplines themselves. After all, both on the individual and aggregate level, no one benefits from infested disciplines in the long run.

References

- Achtziger, A., Alós-Ferrer, C., & Wagner, A. (2011). Social Preferences and Self-Control. Working Paper: 5.
- Ahrens, P. (2014). Lance Armstrong im US-Fernsehen: Perfekt vermarkteter Betrug. Spiegel Online, August 20, 2014, <http://www.spiegel.de/sport/sonst/lance-armstrong-doping-luegen-beichte-a-987105.html>.
- Ahrens, P. (2013). Doping bei Spitzensportlern: Die Spritze hat mich fertiggemacht. Spiegel Online, August 5, 2013, <http://www.spiegel.de/sport/sonst/doping-in-westdeutschland-kolbe-dressel-und-die-anderen-a-914818.html>.
- Aidt, T. (2009). Corruption, Institutions, and Economic Development. *Oxford Review of Economic Policy*, 25, 271-91
- Alexander, C., Piazza, M., Mekos, D., & Valente, T. (2001). Peers, Schools, and Adolescent Cigarette Smoking. *Journal of Adolescent Health*, 29, 22-3.
- Andrews, J., Tildesley, E., Hops, H., & Li, F. (2002). The Influence of Peers on Young Adult Substance Use. *Health Psychology*, 21, 349-57.
- Basu, K., Basu, K., & Cordella, T. (2014). Asymmetric Punishment as an Instrument of Corruption Control. The World Bank: Policy Research Working Paper 6933.
- Baumann, K. & Ennett, S. (1996). On the Importance of Peer Influence for Adolescent Drug Use: Commonly Neglected Considerations. *Addiction*, 91, 185-98.
- Becker, G. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy*, 76, 169-217.
- Becker, G., & Murphy, K. (1988). A Theory of Rational Addiction. *Journal of Political Economy*, 96, 675-700.
- Berentsen, A. (2002). The Economics of doping. *European Journal of Political Economy*, 18, 109-27.

Bond, D. (2013). Jamaica Doping Scandals Tip Of Iceberg, Says Senior Drug Tester. BBC, November 11, 2013, <http://www.bbc.com/sport/0/athletics/24900565>.

Breivik, G. (1992). Doping Games: A Game Theoretical Exploration of Doping. *International Review for the Sociology of Sport*, 27, 235-53.

Bchel, B., Emrich, E., & Pohlkamp, S. (2014). Nobodys Innocent: The Role of Customers in the Doping Dilemma. *Journal of Sports Economics*, forthcoming.

Bures, R. (2008). Why Sport is not Immune to Corruption. Transparency International: Work-ing Paper.

www.cyclinghalloffame.com

Deutscher, C., Frick, B., Grtler, O., & Prinz, J. (2013). Sabotage in Tournaments with Heter-ogeneous Contestants: Empirical Evidence from the Soccer Pitch. *The Scandinavian Journal of Economics*, 115, 1138-57.

Dietz, P., Ulrich, R., Dalaker, R., Striegel, H., Franke, A., Lieb, K., & Simon, P. (2013). Associations between Physical and Cognitive Doping A Cross-Sectional Study in 2,997 Triathletes. *PLoS ONE* 8:11.

Dilger, A., Frick, B., & Tolsdorf, F. (2007). Are Athletes Doped? Some Theoretical Arguments and Empirical Evidence. *Contemporary Economic Policy*, 25, 604-15.

Dilger, A., & Tolsdorf, F. (2005). Karriereverluste und Doping von 100 m-Lufern. *Modellgesttzte Personalentscheidungen*, 8, 103-17.

Dimant, E. (2014a). The Nature of Corruption An Interdisciplinary Perspective, Center for International Economics: Working Paper Series No. 2014-06.

Dimant, E. (2014b). Contagion Effects in Crime and the Role of Social Proximity An Experimental Approach. Mimeo.

Dimant, E., Krieger, T., & D. Meierrieks (2013). The Effect of Corruption on Migration, 1985-2000, *Applied Economics Letters*, 20, 1270-74.

- Duggan, M., & Levitt, S. (2002). Winning Isn't Everything: Corruption in Sumo Wrestling. *The American Economic Review*, 92, 1594-1605.
- Ehrenberg, R., & Bognanno, M. (1990). Do Tournaments have Incentive Effects?. *Journal of Political Economy*, 98, 1307-24.
- Ehrenberg, R., & Bognanno, M. (1990). The Incentive Effects of Tournaments Revisited: Evidence from the European PGA Tour. *Industrial and Labor Relations Review*, 43, 74-88.
- Engelberg, T., Moston, S., & Skinner, J. (2012). Public Perception of Sport Anti-Doping Policy in Australia. *Drugs: Education, Prevention & Policy*, 19, 84-7.
- Falk, A., & Fischbacher, U. (2002). Crime in the lab-detecting social interaction. *European Economic Review*, 46, 859-69.
- Forbes (2014). The Worlds Highest-Paid Athletes. *Forbes*, September 10, 2014, <http://www.forbes.com/athletes/list>.
- Garicano, L., & Palacios-Huerta, I. (2005). Sabotage in Tournaments: Making the Beautiful Game a Bit Less Beautiful. London School of Economics: Discussion Paper.
- Gino, F., Ayal, S., & Ariely, D. (2009). Contagion and Differentiation in Unethical Behavior. *Psychological Science*, 20, 393-98.
- Glaeser, E., Sacerdote, B., & Scheinkman, J. (1996). Crime and Social Interactions. *Quarterly Journal of Economics*, 111, 507-48.
- Gruber, J., & Kszegi, B. (2001). Is Addiction Rational? Theory and Evidence. *Quarterly Journal of Economics*, 116, 1261-1303.
- Gupta, S., Davoodi, H., & Alonso-Terme, R. (2002). Does corruption affect income inequality and poverty?. *Economics of Governance*, 3, 23-45.
- Hanstad, D., & Loland, S. (2009). Elite Athletes Duty to Provide Information on their

- Whereabouts: Justifiable Anti-Doping Work or an Indefensible Surveillance Regime?.
Euro-pean Journal of Sport Science 9:1.
- Haugen, K. (2004). The Performance-Enhancing Drug Game. *Journal of Sports Economics*, 5, 67-86.
- Hermann, A., & Henneberg, M. (2013). *Anti-Doping Systems in Sports are Doomed to Fail: A Probability and Cost Analysis*. University of Adelaide.
- Hirschi, T., & Gottfredson, M. (1990). *A General Theory of Crime*. Stanford University Press.
- Houlihan, B. (2009). Achieving compliance in international anti-doping policy: An analysis of the 2009 World Anti-Doping Code. *Sport Management Review*, 17, 265-76.
- Ichniowski, C., & Preston, A. (2014). Do Star Performers Produce More Stars? Peer Effects and Learning in Elite Teams. NBER Working Paper No. 20478.
- Innes, R. (1999). Remediation and Self-Reporting in Optimal Law Enforcement. *Journal of Public Economics*, 72, 379-93.
- Jain, A. (2001). Corruption: a review. *Journal of economic surveys*, 15(1), 71-121.
- Janofsky, M. (1991). Olympics; Coaches Concede That Steroids Fueled East Germanys Success in Swimming. *The New York Times*, December 3. <http://www.nytimes.com/1991/12/03/sports/olympics-coaches-concede-that-steroids-fueled-east-germany-s-success-in-swimming.html>.
- Kelland, K. (2012). Ancient Dopers got their Kicks from Raw Testicles. Reuters, August 1, 2012, <http://www.reuters.com/article/2012/08/01/us-oly-doping-history-day-idUSBRE8700YC20120801>.
- Kirchgssner, G. (2014). On Self-Interest and Greed. Center for Research Economics, Management and the Arts: Working Paper No. 2014-12, 11.
- Kirstein, R. (2014). Doping, the Inspection Game, and Bayesian Enforcement. *Journal*

- of Sports Economics, 15, 385-409.
- Kohler, M., Thevis, M., & Schnzer, W. and Pschel, K. (2008). Gesundheitsschden und Todesfle durch Doping. *Rechtsmedizin*, 18, 177-82.
- Krkel, M. (2007). Doping and Cheating in Contest-Like Situations. *IZA Discussion Papers* No. 2059.
- Lazear, E. (1979). Why Is There Mandatory Retirement?. *Journal of Political Economy*, 87, 1261-84.
- Lazear, E., & Rosen, S. (1981). Rank-Order Tournaments as Optimum Labor Contracts. *The Journal of Political Economy*, 89, 841-64.
- Lessig, L. (2013). Institutional Corruption Defined. *Journal of Law, Medicine and Ethics*, 41, 3.
- Maennig, W. (2014). Inefficiency of the Anti-Doping System: Cost Reduction Proposals. *Substance Use & Misuse*, 49, 1201-05.
- Maennig, W. (2008). Corruption in International Sports and How it May be Combatted. *International Association of Sports Economists: Working Paper Series* No. 08-13.
- Maennig, W. (2006). Corruption. In: Andreff, W. and Szymanski, S. (eds) *Handbook on the Economics of Sport* (Edward Elgar, 2006).
- Maennig, W. (2005). Corruption in International Sports and Sport Management: Forms, Tendencies, Extent and Countermeasures. *European Sport Management Quarterly*, 5, 187-225.
- Maennig, W. (2002). On the Economics of Doping and Corruption in International Sports. *Journal of Sports Economics*, 3, 61-89.
- Muraven, M., Pogarsky, G., & Shmueli, D. (2006). Self-control Depletion and the General Theory of Crime. *Journal of Quantitative Criminology*, 22, 263-77.

- Nowak, R. (1996). Corruption and transition economies. *Science*, 48, 321-35
- Overbye, M., Knudsen, M., & Pfister, G. (2013). To Dope or not to Dope: Elite Athletes Perceptions of Doping Deterrents and Incentives. *Performance Enhancement & Health*, 2, 119-34.
- Pilon, M. (2013). Sprinter in 1988 Olympic Scandal Deplores Doping. *The New York Times*, September 4. http://www.nytimes.com/2013/09/05/sports/ben-johnson-sprinter-in-1988-scandal-denounces-doping.html?_r=2&.
- Pitsch, W., & Emrich, W. (2012). The Frequency of Doping in Elite Sport: Results of a Replication Study. *International Review for the Sociology of Sport* 47: 559-80.
- Preston, I., & Szymanski, S. (2003). Cheating in Contests. *Oxford Review of Economic Policy* 19:4: 612-24.
- Reiss, A. (1988). Co-Offending and Criminal Careers. *Crime and Justice* 10: 117-70.
- Rosen, S. (1981). The Economics of Superstars. *The American Economic Review*: 845-58.
- Schenk, S. (2009). Corruption and Sport: Building Integrity and Preventing Abuses. Transparency International: Working Paper.
- Schmid, A. (2004). Conflict and Cooperation Institutional and Behavioral Economics. Blackwell Publishing, 28.
- Silver, N. (2014). What Happens to Injured NBA Stars Like Paul George?. <http://fivethirtyeight.com/features/what-happens-to-injured-nba-stars-like-paul-george/>.
- Solberg, H., Hanstad, D., & Thoring, T. (2010). Doping in Elite Sport Do the Fans Care? Public Opinion on the Consequences of Doping Scandals. *International Journal of Sports Marketing & Sponsorship* 11:3: 185-99.
- Sottas, P.-E., Robinson, N., Fischetto, G., Doll, G., Alonso, J., & Saugy, M. (2011).

- Prevalence of Blood Doping in Samples Collected from Elite Track and Field Athletes. *Clinical Chemistry* 57:5: 762-69.
- Spiegel Online (2013). Humboldt-Universität: Studie enthält systematisches Doping in der BRD. <http://www.spiegel.de/sport/sonst/studie-der-humboldt-universitaet-systematisches-doping-in-der-brd-a-914597.html>
- The Telegraph (2014). Pressure grows on FIFA to publicise its report into possible World Cup bid corruption. <http://www.telegraph.co.uk/sport/football/world-cup/11118834/Pressure-grows-on-Fifa-to-publicise-its-report-into-possible-World-Cup-bid-corruption.html>.
- Tirole, J. (1996) A Theory of Collective Reputations (with Applications to the Persistence of Corruption and to Firm Quality). *The Review of Economic Studies*, 63, 1-22.
- Tokish, J., Kocher, M., & Hawkins, R. (2004). Ergogenic Aids: A Review of Basic Science, Performance Side Effects, and Status in Sports. *The American Journal of Sports Medicine* 32:6:1543-53.
- Vitaro, F., Tremblay, R., Kerr, M., Pagani, L., & Bukowski, W. (1997). Disruptiveness, Friends Characteristics, and Delinquency in Early Adolescence: A Test of Two Competing Models of Development. *Child Development* 68:4: 676-89.
- Vohs, K., Baumeister, R., Schmeichel, B., Twenge, J., Nelson, N., & Tice, D. (2008). Making Choices Impairs Subsequent Self-Control: A Limited-Resource Account of Decision Making, Self-Regulation, and Active Initiative. *Journal of Personality and Social Psychology* 94:5: 883-98.
- Wolfers, J. (2006). Point Shaving: Corruption in NCAA Basketball. *The American Economic Review* 96:2: 270-83.
- Zafar, B. (2011). An Experimental Investigation of Why Individuals Conform. *European Economic Review* 55: 774-98.