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Money Matters: The Effects of Cost in the Doping Game Between Athletes, Organizations and Customers

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Abstract

A major challenge in modern sports is maintaining the integrity of the competition. Ever since sports became a major fixture in media and gathered passionate fandoms, the stakes for winning have increased dramatically. Fierce competition has encouraged athletes to achieve every possible edge, with some resorting to illicit substances. As a result, drug testing has become a common practice in the industry. By analyzing and altering parameters of testing cost and the customer's attention to testing, I will try to develop a future where doping is minimal.

Keywords: low case, comma, paper template, abstract, keywords, introduction

1. Introduction

A man in a yellow jersey blazed past the roaring crowd on his bicycle, mouth agape and victory etched into his face. His bright complexion dazzled under the warm Paris sun as fans from all over the world had their eyes glued to grainy TV screens. These triumphs cemented the cyclist's name in the cycling Hall of Fame, bringing him recognition and financial freedom. Little did the world know that this American hero who battled cancer could not battle the urge to dope on the big stage. Seemingly overnight, the cyclist was stripped of his countless achievements. This was the case of Lance Armstrong, who confessed to taking banned substances in 7 Tour de France tournaments. In fact, the U.S. Anti-Doping Agency alleged that 80% of Tour de France medalists from 1996 to 2010 also doped.[1] To this day, doping lingers as a prevalent issue that drastically undermines the integrity of this sport.

This systematic violation plagues many sports, which are a cultural fixture and a pastime beloved by many. Worldwide athletic events are amplified by the roar of stadium crowds and passionate fans. Despite many highly visible sporting scandals in top tier events like Tour de France, sports fans have seemingly remained loyal in their viewership.

Some previous research has modeled the interactions between athletes as a prisoner's dilemma, where it is optimal for both athletes to dope.[2] Other research has emphasized the role of customers and their impact on athletes' decision to dope. This model was extrapolated to interactions between athletes and organizations. In one paper published in the *Journal of Sports Economics*, the authors referred to these additional agents as "customers", a term that encompasses big media companies, sponsors, and viewers who keep sporting events afloat. Customers are crucial to this model because the withdrawal of customer support deems a sports organization obsolete. I will elaborate on testing costs and their implications for the doping scheme, modeling the consequences of fluctuations in the doping cost. Since testing more frequently is not feasible when frequent top-level testing may cost $40,000 dollars for each athlete, I will analyze other possible solutions to minimize doping.

I will be extending the model of "Nobody's Innocent" (a model discussed in the next section of this paper) by presenting an organization of transparency, where customers care about the presence of testing. By changing the parameter quantified as customer reluctance to view sports events without testing, I will be reflecting upon the impact testing-conscious customers will have on the equilibrium.

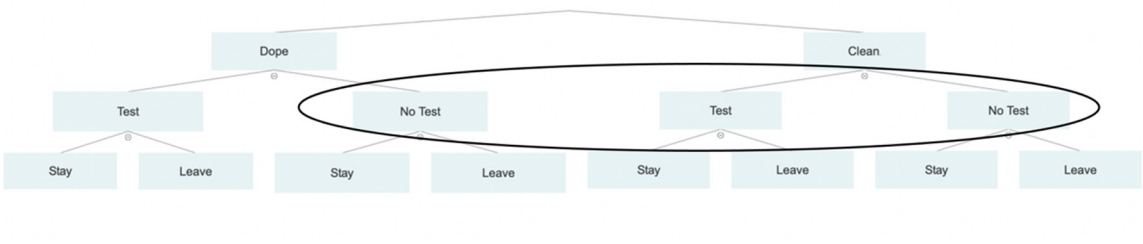
In the second section of my paper, I will be dedicating my literary review to explaining a preexisting game that focuses on the role of a third player (customers) and their interactions with the athletes and the organizations. In the third section, I will be introducing the assumptions and the characteristics of the game which I created where I invoke the variable of cost. In the fourth section, I will solve my model and introduce its real work implications. In the fifth section, I will address the possible limitations of my model. In the sixth section, I will extend my model

based on its limitations by adjusting the transparency of my model and the preference of customers to leave non-tested games. In the seventh section, I will discuss real-world doping solutions based on my doping-free models. The eighth section will serve as my conclusion.

A article formulated by Buechel, Emrich and Pohlkamp named "Nobody's Innocent" utilizes a model to describe the strategic interactions between the tournament organizer, players, and customers. In this model, players first decide whether to dope or stay clean. Unaware of this decision, organizations decide whether to test. Afterwards, audiences decide whether a sporting event has involved a scandal. A scandal occurs when an organization tests a doping player.

One may assume that athletes will always choose to dope over staying clean when organizations do not test. Since doping gives athletes a competitive edge, this assumption is reasonable. The authors of "Nobody's Innocent" assume that organizations want to retain their customers, because customers sustain the sports ecosystem and fund large-scale sports competitions. Finally, it is assumed that customers prefer to leave after a scandal. Though this assumption does not apply to every fan, the proposed model specifically aimed to focus on fans that are conscious of doping and hate to see a dirty sport.

Although the consensus may be that audiences should demonstrate that the integrity of the sport matters to them by leaving when there is a scandal, this model suggests that this scenario will instead induce an equilibrium in which organizers stop testing to avoid scandals. Therefore, players choose to dope.



d-t-s	d-t-s	d-t-s	d-t-s	d-t-s	d-t-s	d-t-s	d-t-s
2	1	7	6	8	3	5	4
8	4	5	1	6	2	7	3
1	2	3	2	3	2	3	2

Figure 1.

The unique Nash Equilibrium (a scenario in which no player will be willing to change their decision for higher payoffs) of this model is D-N-S (Dope-Notest-Stay). Audience members have four strategies: SS, SL, LS and LL, in which the first letter denotes their decision in response to a scandal and the second letter denotes their decisions in the absence of scandals. The customer's payoff is the highest when they leave under a scandal and stay when there are no scandals. Thence, their dominant strategy becomes LS. We could create one payoff matrix for this dominant strategy (Fig. 2). According to the payoff matrix, the Nash Equilibrium is to dope and not test.

	Test	No Test
Dope	1,4	7,5
Clean	8,6	5,7

Figure 2.

If audiences do not actively request testing transparency, organizations prefer to hide whether athletes are doping. This equilibrium can only be broken when the total payoffs lost when the audience leaves outweigh the external costs of testing for each player.

Nevertheless, this model ignores the flimsy testing methods used by most testing agencies. The time frame during which organizations can detect an illicit drug is miniscule. The infamous case of Lance Armstrong in the Tour de Frame happened not because no drug tests were administered, but because all previous testing failed to detect illicit

substances.[3] Sometimes athletes maintain their reputations amongst sporting fans if positive tests are only found after the event. Even worse, bans on competitive play for athletes can come after their retirement, which drastically decreases the negative consequences of being caught doping.

Not all sporting fans will fully commit to reducing their support after a scandal. If the reduction is insignificant to the grand profit, organizations will not try to actively avoid scandals by not testing their athletes.

The investigator analyzes the works of Nobody's Innocent and predicsts that the decrease of testing costs will aquire a non-doping equilibrium which is the desired outcome for sports leagues and competitions.

2. Game Theoretic Model

Referencing the findings of the Nobody's Innocent game, I have created a sequential game including players, organizations, and customers. The athletes go first, deciding whether to take substances or stay clean. The organizations go second, deciding whether or not to test. Finally, the customer goes third and decides whether to stay or leave based on whether a scandal occurs or not. A scandal denotes when the athlete dopes and the organization tests. In all other cases denoted by no scandal, the customer will not be able to differentiate between dope-notest, clean-notest and clean-test. I will be denoting the decisions of each player through these letters:

d=dope

c=clean

t=test

n=notest

s=stay

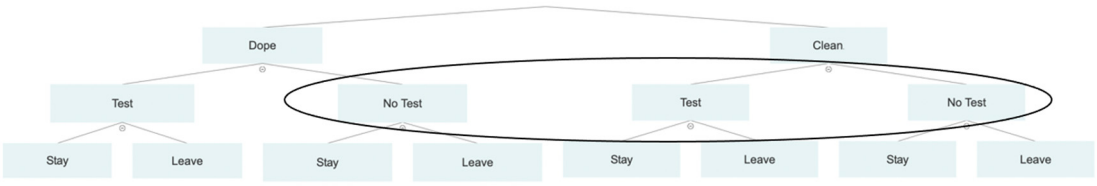
l=leave

The decisions made consecutively will be denoted with the three letters: the first one denoting the decision of the athlete, the second one denoting the decision of the organization, and the third one denoting the decision of the customers. For instance, a situation in which the athletes dope, the organization tests, and a customer stays will be presented as dns.

Assumptions:

The athletes we have considered for our model are exclusively star athletes with massive fanbases, since more anonymous athletes garner negligible attention and have less influence on the viewer counts of large-scale sporting events. This model analyzes the impacts of doping in large-scale sporting events.

A reasonable assumption to make will be that athletes prefer to dope if they are not tested. Even though, in the real world, health deficits could draw the athlete away from doping, the competitive edge, and the financial incentive of winning outweighs the others in this model. Since winning large events like the Tour de France can bring massive honor and even financial freedom, winning unconditionally is often an athlete's top priority. The massive payoffs for winning off doping can be seen through the classic prisoner's dilemma interpretation of doping in sports, where all athletes will be incentivized to dope (if not tested of course). For instance, the payoffs of athletes in dns is much smaller than the payoffs of cns.



dts	dtl	dns	dnl	cts	ctl	cns	cnl
2	1	7	6	8	3	5	4
10-c	6-c	5	1	8-c	4-c	7	3
1	2	3	2	3	2	3	2

Figure 3.

In the organizer's case, their main incentive is achieve financial gains by attracting customer support; therefore, they prefer customers stay even if doping is not detected, than for customers to leave when doping is detected. Most organizers focus on financial gain rather than the integrity of their sporting events. They tend to turn a blind eye to scandals if it helps them attract viewership.

In the case of customers, we will assume that they leave after learning that an athlete dopes. This may not always be the case for either real-life viewers or sponsors. some fans enjoy the constant controversy. Similarly, some brands profit from the brand awareness created by doping scandals, as was the case with watchmaker Festina after the Tour de France scandal in 1998. Although this assumption does not reflect impact on viewership counts after doping scandals from top tournaments like the Tour de France, it helps give an idea of the results of an audience who cares about integrity and desires a clean sport.

3. Results

Building upon the work of previous papers, I will be incorporating the financial cost into the equation. By including an additional cost metric called C into the model, we can test the effects of financial cost on the doping Nash Equilibrium.

Figure 4 shows the results when C is greater than one: the doping equilibrium remains under the state of D-N-LS, since it is much more affordable to hide doping incidents from the public. This result mirrors the case presented in Nobody's Innocent, in which organizations seek to hide the fact that certain athletes are doping by not testing. The additional costs of testing further deter the organizations from testing.

	Test	No Test
Dope	1,6-C	7,5
Clean	8,8-C	5,7

Figure 4.

When c=1, the following table shows that the organizations can choose whether to test or not, as the relative payoffs are the same. The Nash Equilibrium does not exist, as organizations can freely choose between test and no-test. In the real world, organizations have equal chances to both test and to not test. Therefore, it may become a case of cat and mouse, where athletes will try to make the best decision on whether to dope or to stay clean based on their predictions, since the organizations are equally probable to make either decision.

	Test	No Test
Dope	1,6-C	7,5
Clean	8,8-C	5,7

Figure 5.

Figure 5 highlights the Nash Equilibrium when C is smaller than one. When testing cost decreases to this extent, the only Nash Equilibrium is C-T-SL.

	Test	No Test
Dope	1,6-C	7,5
Clean	8,8-C	5,7

Figure 6.

If testing costs decrease to an extent that C becomes bigger than one, a non-doping equilibrium will be achieved. This outcome suggests that the process of eradicating doping is merely an arms race between dopers and the testers.

This model assumes that organizations never release information regarding whether they test to their audience. However, considering top tier athletes competing in top level competitions, it is more likely that organizations will reveal this information to most of their customers. The extension covers an alternate situation in which the customers have the full information set and know whether an organization has tested its players.

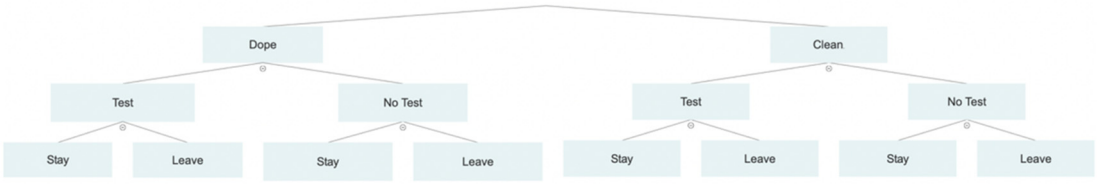
The model assumes that most general tests have an accuracy of more than 50%, meaning that they are reliable. The reality, though, is that although most testing is certainly accurate to this extent, the timing of the test may

compromise its accuracy. Drugs taken in the off season are very difficult to detect. According to the World Anti-Doping Agency (WADA), only 1 to 2 percent of blood and urine samples every year come back positive.[4] In contrast, an anonymous survey completed by the *Journal of Sports Medicine* tells a different story: the results portray that up to 57 percent of athletes admitted using performance-enhancing drugs.

Extension under Transparency:

This model does not fully reflect the perspective of the audience. In fact, it neglects how testing is revealed to the public for most top tier sporting organizations. Large-scale sporting events like the Tokyo Olympics and the Tour de France are supported by an international testing agency which offers in-competition and out-of-competition testing. The rather open model of this agency proposes that perhaps customers, in general, do know whether testing is conducted. Therefore, we altered the information node into three information sets. As seen in the model, test-dope, as always, is its own information set. Test-clean is set apart from no test because customers know that testing took place. On the other hand, notest-dope and notest-clean contribute to one information set as customers do not know whether players truly doped or not when they are not tested.

The payoffs for the customers will also be adjusted to present a more holistic perspective. The last model assumed that audience members cared about and reprimanded doping by leaving the sport after a scandal. The new model will assume that audience members genuinely care about the presence of testing and may leave competitions simply out of fear that some athletes might be doping when organizations do not test. I will present this parameter as A, denoting the attention that customers give to the presence or absence of testing.



dts	dtl	dns	dnl	dcts	ctl	cns	cnl
2	1	7	6	8	3	5	4
8	4	5	1	6	2	7	3
1	2	3	2+A	3	2	3	2+A

Figure 7.

As the parameter of A increases in the model, customers will have greater affinity for the tested games. Now the customer has three strategies—their actions under a test-dope, test-clean and no tests—denoted through three consecutive letters, each representing each of their decisions under these circumstances. For instance, SLS means the customer stays under test-dope, leaves under test-clean, and stays when there are no tests. The dominant strategy of the customers will be altered as under A. Although their first two strategies under dope-test and clean-test will not change, customers will prefer to leave games that are not tested when A increases. When A reaches 1, there will be no difference in the payoff of the customer between when they stay and when they leave. When A is bigger than one, customers will prefer to leave when organizations do not test their players and drastically reduce organization payoffs due to the lack of massive support. A being less than one will give us the benchmark case of a Nash equilibrium in Dope, No-test, Stay. When A is greater than one, customers will leave under any competition that lacks tests. Therefore, those customers' dominant strategy will be LSL. The following payoff matrix (Fig. 8) can be deduced from those strategies.

	Test	No Test
Dope	1,4	6,1
Clean	8,6	4,3

Figure 8.

According to this model, if customers withdraw support in response to both scandals (dope-test) and the lack of

testing, an equilibrium will be established in test-clean-stay. In this best-case scenario, not only will the sport be clean, it will also retain its audiences. Through this lens, the withdrawal of support when organizations do not test actively encourages organizations to test. Meanwhile, the withdrawal of support only when a player has been doping will simply encourage organizations to avoid testing.

When the customer leaves whenever organizations do not test, organizations prefer to have customers and so will strictly enforce testing on the athletes. Although this scenario may seem plausible for the larger sports organizations around the world, we have to keep in mind that the scnario ignores smaller organizations, where continuous testing may not be as sustainable. To alleviate some of the economic strains of constant testing, I have created a list of plans for the future.

Transparency has certainly assisted the progression towards a non-doping equilibrium with non-profit organizations like the International Testing Agency (ITA) actively offering assistance to sports organizations in need.

One enhancement that could decrease testing costs and increase the awareness of doping incidents may be whistleblowing. Creating an environment in which sporting figures are encouraged to report their teammates who dope could pose a great benefit to testing agencies. In the famous Lance Armstrong case, many of his American teammates reported to know that he was doping beforehand, including George Hincapie, Tyler Hamilton and Floyd Landis (some of whom who doped themselves).[5] If issues could be reported before the major tests even occur, the prominence of doping amongst athletes could be changed from its core. Yet to increase the incentive to whistleblow, anonymity or physical protection is a must. Two employees who whisltleblew in the Russian Anti-Doping Agency were immediately concerned for their physical safety after they leaked information about a state-run doping system. They ended up fleeing their home country.[6] In order to ensure the safety of whistleblowers, the first step is to create a sophisticated and anonymous platform through which players could report incidents. Examples of this stem from the 2014 Olympics, which involved an integrity and compliance hotline. Other instances of this include the online whistleblowing portal managed by FIFA.[7]

Alternatively, organizations themselves could help activate player responsibility. Raising awareness of the implications of doping could help players realize the detrimental effects of doping on the sport. For example, a sport that associates itself with routine corruption can lose the trust of viewers. Education has the potential to facilitate good practice, as shown by the National Integrity of Sports Unit, which explains the socioeconomic repercussions that such a breach of vital sports regulations can have.

The massive sports fandoms and sports media often hold or perpetuate many misconceptions about doping. Many media companies, sponsors, and viewers admire an athlete who ignores all consequences in an attempt to win an extremely prestigious sports competition. Some even take joy from watching highly competitive biking races that are fueled by illicit substances. The mere prevalence of doping by so many star athletes in prominent sports like cycling normalizes this act. The increase of the attention that customers have towards whether a game have been tested and played fairly can help disincentivize athletes from doping and motivate organizations to test. Afterall, the loss of support from audience members and sponsors could largely sway the athletes from doping. Yet it's still hard to request for tougher punishments when testing are still so unreliable. When athletes are only getting detected at the far ends of their careers, an effective punishment could be hard to impose. This point goes back to the main parametric which we tried to alter for our economic model, cost of testing. When testing technology improves and decreases in cost, reliably punishing the doping athletes will become drastically easier.

4. Results

Throughout this paper, I have analyzed the findings of the "Nobody's Innocent" paper and the incorporation of the customer into those findings. Through their model, I was able to extend and add the parametric of cost where I found out that once cost is reduced to smaller than one, a non-doping equilibrium will be acquired where the audience will continue to embrace the sport they love, and the organizations will continue testing. Nevertheless, most testing agencies can make transparent the activities they've conducted in major sports leagues. Therefore, I adapted my model to account not only for the transparency of the test, but the customer's level of concern over whether games are tested. By incentivizing customers to leave when the games are not tested and possibly unfair, organizations will be pushed to always test their games to stop customers from leaving.

Incorporating the findings of these two models, we learn that important preqrequisites for eliminating testing include a viewer base that cares about the integrity of the sport and a lower cost of testing. In contemporary sports, countless non-profit testing agencies specifically dedicate themselves to eliminate doping in the sports scene. The arms race between the development of doping technology and testing technology is likely to continue. However, customers could force the hand of the sports organizations by specifically demonstrating that they will not watch

the games that are not tested,

There is no perfect solution to drug testing in the Olympics. The findings of the model can assist the path of technological development in testing technologies as it can drastically lead organizations and athletes into a doping free sport. Nevertheless, my models have shown that the reduction of cost, and presence of customers who care that drug testing takes place could massively encourage organizations and players to conduct more testing on prospective athletes. Most scenarios are quite multi-faceted. In some cases, showing disregard for a sporting event when a scandal occurs can cause organizations to actively hide sandals. In others, it is better to actively fight for tested events in which all athletes are drug-free. While the continuous battle against doping in competitive sports may not completely eradiate these substances, the steps laid out in this paper could alleviate doping and guide the model toward a non doping equilibrium.

5. Discussion

Transparency has certainly assisted the progression towards a non-doping equilibrium with non-profit organizations like the International Testing Agency (ITA) actively offering assistance to sports organizations in need.

One enhancement that could decrease testing costs and increase the awareness of doping incidents may be whistleblowing. Creating an environment in which sporting figures are encouraged to report their teammates who dope could pose a great benefit to testing agencies. In the famous Lance Armstrong case, many of his American teammates reported to know that he was doping beforehand, including George Hincapie, Tyler Hamilton and Floyd Landis (some of whom who doped themselves).[5] If issues could be reported before the major tests even occur, the prominence of doping amongst athletes could be changed from its core. Yet to increase the incentive to whistleblow, anonymity or physical protection is a must. Two employees who whisltleblew in the Russian Anti-Doping Agency were immediately concerned for their physical safety after they leaked information about a state-run doping system. They ended up fleeing their home country.[6] In order to ensure the safety of whistleblowers, the first step is to create a sophisticated and anonymous platform through which players could report incidents. Examples of this stem from the 2014 Olympics, which involved an integrity and compliance hotline. Other instances of this include the online whistleblowing portal managed by FIFA.[7]

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The massive sports fandoms and sports media often hold or perpetuate many misconceptions about doping. Many media companies, sponsors, and viewers admire an athlete who ignores all consequences in an attempt to win an extremely prestigious sports competition. Some even take joy from watching highly competitive biking races that are fueled by illicit substances. The mere prevalence of doping by so many star athletes in prominent sports like cycling normalizes this act. The increase of the attention that customers have towards whether a game have been tested and played fairly can help disincentivize athletes from doping and motivate organizations to test. Afterall, the loss of support from audience members and sponsors could largely sway the athletes from doping. Yet it's still hard to request for tougher punishments when testing are still so unreliable. When athletes are only getting detected at the far ends of their careers, an effective punishment could be hard to impose. This point goes back to the main parametric which we tried to alter for our economic model, cost of testing. When testing technology improves and decreases in cost, reliably punishing the doping athletes will become drastically easier.

References

Breivik, G. (1987). The doping dilemma. Some game theoretical and philosophical considerations. *Sportwissenschaft, 17*, 83-94. https://doi.org/10.1177/101269029202700303

Breivik, G. (1992). Doping games: A game theoretical exploration of doping. *International Review for the Sociology of Sport, 27*, 235–253.

Buechel, B., Emrich, E., & Pohlkamp, S. (2016). Nobody's Innocent: The Role of Customers in the Doping Dilemma. *Journal of Sports Economics, 17*(8), 767–789. https://doi.org/10.1177/1527002514551475

Maennig, W. (2014). Inefficiency of the Anti-Doping System: Cost Reduction Proposals. *Substance use & misuse, 49*, 1201-1205. https://doi.org/10.3109/10826084.2014.912065

Notes

Note 1. Lance Armstrong's doping scandal and it's relationship with the doping scene in Tour De France is reported by Wilson (2013). Its implications. He refrenced the United States Anti-Doping Agency's report on Armstrong.

Note 2. Reports on the nature of this prisoner's dilemma could be displayed through the paper of Breivik (1987) where he published a paper where both players would dope even when they will both individually get more utility if they both stay clean. This depicts the natural inentive and the onstant drive to win from the athletes.

Note 3. Evidence published by LiveScience displayed the various methods that Lance Armstrong utilized to evade the illicit drug tests that were conducted in a suprising frequency when he was competing in Tour de France. Such methods included Erythropoietetin which raised red blood cells to boost the ability for muscles to carry oxygen. Testing methods could not find a sufficient way to differentiate this hormone with its natural counterpart.

Note 4. Referencing the World Anti Doping Agency, the number of blood and urine samples coming back positive is minimal. The massive deviance with the general consensus of the athletes portray the possible ineffectiveness of the tests.

Note 5. Insider references all the athletes that testified against Lance Armstrong. One of their teammates have claimed that they all have decided to stop perpetrating the fraudulene activities of Lance Armstrong.

Note 6. A report by the New York Times portrays the Stepanova family who exposed the scandalous state-sponsored doping program across Russia.

Note 7. Fifa's reporting system is web-based, allowing respoinsible personnel part of the sporting industry to report to official website of FIFA when match irregularities are spotted.