Sport, Doping, and Politics

Nikita Bukhanchenko[1,2] and Dmitry Dagaev[1]

[1]HSE University

[2]New Economic School

1 Introduction

This research in progress aims to identify the factors that affect the incumbent's choice to intervene into the National Anti-Doping Agency's (NADA) work, striving to hide the fact of doping usage by the domestic athletes. We investigate how the degree of intervention affects the contest in terms of win probabilities and the total consumption of doping.

In order to address these questions, we build up a game-theoretical model that incorporates strategic interaction of the following agents: two athletes — domestic and foreign, – domestic NADA, and the incumbent. Both athletes simultaneously and independently from each other make their decision about the amount of doping they use. The NADA chooses whether to check athletes for doping intensely, or not. The incumbent chooses degree of intervention into the NADA's routine in order to decrease the intensity of doping tests for the domestic athlete. Ceteris paribus, both athletes want to decrease the amount of doping they consume and increase their chances of winning the contest. NADA cares about low doping consumption but at the same time NADA is vulnerable to corruption. Incumbent wants to increase the chances of winning for the domestic athlete by spending on NADA as little money as possible.

We show that under some general assumptions it is beneficial for the incumbent to intervene into the NADA's work. Moreover, it appears that the choice of non-intervention does not depend on the prize of athletes.

Despite the fact that doping is becoming a popular topic in sports economics literature, to the best of our knowledge, there are no papers that explore the role of local authorities and build bridges between sport, doping, and politics. Furthermore, in most of the existing

papers the usage of doping is considered as a direct decision of an athlete and/or her team. Our model allows to understand, why athletes are prone to use illegal substances in a different way, through political intervention in a sport competition.

2 The Model

We model a competition between two homogeneous athletes 1 and 2 for the prize valued at $V > 0$. The competition is organized on the home field of athlete 1. Strategic players in the model are two athletes, the National Anti-Doping Agency (NADA), and the incumbent. NADA and incumbent represent the country of athlete 1.

1. **Athletes**. Athlete i independently from the opponent chooses D_i — amount of the doping he would like to consume before the competition ($i = 1, 2$). Doping consumption is costly but it increases the chances to win the competition: the probability $p_i = p_i(D_1, D_2)$ that athlete i wins is defined as

$$p_i(D_1, D_2) = \begin{cases} \frac{D_i}{D_1+D_2}, & \text{if } D_1 + D_2 > 0 \\ \frac{1}{2}, & \text{if } D_1 + D_2 = 0 \end{cases} \tag{1}$$

   After the competition, athletes are get tested for doping. If an athlete is caught, he is disqualified.

2. **National Anti-Doping Agency**. NADA is responsible for testing the athletes for the doping. It strategically chooses the testing technology that differ in quality. NADA can differentiate the athletes and apply different testing technologies to different athletes. Technology Q_q is characterized by the probability of doping detection, or, alternatively, the probability $\widehat{q}$ of doping non-detection, where

$$\widehat{q}(D, q) = \begin{cases} 1, & \text{if } D = 0 \\ q, & \text{if } D > 0 \end{cases} \tag{2}$$

   and $q \in [q_0, 1]$ is a constant. Here $q_0 \in (0, 1)$ is the technology constraint corresponding to the best detection technology. Assume that NADA chooses technology Q_{q_i} for testing athlete i.

3. **Incumbent**. Incumbent can intervene into the NADA's work. Assume that by choosing the level of intervention a, incumbent shifts the NADA's utility by increasing the

importance of a win of home athlete 1. The costs of intervention $c(a)$ is a monotonic increasing function of a. Incumbent's intervention can be revealed by the World Anti-Doping Agency (WADA) with probability

$$\widehat{r}(a) = \begin{cases} 0, & \text{if } a = 0 \\ r, & \text{if } a > 0 \end{cases} \tag{3}$$

where $r \in (0, 1)$ is a constant.

Denote by $P_1(D_1, D_2, q_1, q_2)$ the probability that athlete 1 wins the competition, he is not tested positive for the doping, and WADA does not reveal the incumbent's intervention. Denote by $P_2(D_1, D_2, q_1, q_2)$ the probability that athlete 2 wins the competition and he is not tested positive for the doping.

Define the payoff functions. Athlete i maximizes

$$V \cdot P_i(D_1, D_2, q_1, q_2) - D_i. \tag{4}$$

Incumbent maximizes his utility

$$u_I(D_1, D_2, q_1, q_2, a) = P_1(D_1, D_2, q_1, q_2) - c(a). \tag{5}$$

Utility function of NADA is given by

$$u_{NADA}(D_1, D_2, q_1, q_2, a) = aP_1(D_1, D_2, q_1, q_2) - D_1 - D_2. \tag{6}$$

Without incumbent's intervention ($a = 0$), NADA cares about the absense of the doping. Higher vaules of a increase the weight of the politically motivated win of the home athlete.