

Illinois Wesleyan University

From the Selected Works of Michael Seeborg

2010

Inferring Drug Use from Productivity Trends in Track and Field

Michael C. Seeborg, *Illinois Wesleyan University*
Allison Fisher



Available at: https://works.bepress.com/michael_seeborg/17/

Inferring Drug Use from Productivity Trends in Track and Field

By Michael C. Seeborg and Allison Fisher

Record breaking performances in track and field events have long been of public interest and have even been the focus of an econometric analysis by Munasinghe, et. al. (JPE, 2001). Breaking a world record or winning medals at the Olympics can bring fame and high economic returns. However, the difference between superstar status and also-ran status can be a fraction of a second in running events and only millimeters in field events such as the long jump and shot put. This suggests that elite athletes have a strong incentive to create marginal improvements in performance by taking illegal performance-enhancing drugs if the probability of apprehension is low. The relationship between breaking rules and the probability of apprehension is an idea which is now widely accepted in the economic literature on crime pioneered by Becker (JPE, 1968).

Our study identified a period from 1962 through 1990 when anabolic steroids were readily available and anti-doping enforcement was lax. We hypothesize that performances of elite track and field athletes should be significantly above trend during these years across all event groups. After 1990, anti-doping enforcement became much more effective and coordinated and a number of well-known athletes were stripped of medals and World records. Thus, since the risk of apprehension had increased, we expect performance to fall below trend after 1990.

To explore the performance of elite track and field athletes over time we collected the top 10 season best performances in six events (100 m, 400 m, 5000 m, mile run, shot put, and long jump) for every year from 1949 through 2007. Next, we ran basic trend regressions (robust standard errors) of the natural log of several measures of performance (top performance for season, average of top 10 season performances, and median for top 10 seasonal performances) and saved the residuals which are defined as actual performance minus the trend predictions.

Since the results of this analysis were consistent across all events, we illustrate with a single event, the shot put. A simple trend regression for the natural log of season's best shot put distance from 1949 through 2007 showed a positive and significant trend with the model explaining a substantial amount variation in season 2 best performance ($R=0.68$). As expected, the residuals show a pattern of auto correlation that is consistent with our steroid story. The actual season best distances were below trend (negative residuals) in 12 of the 13 years from 1949 through 1961. Then the pattern changed abruptly during the heavy steroid use period from 1962 through 1990 when actual shot put distances were above trend in 27 out of 29 years (positive residuals). In the post-1990 period of effective testing and coordinated antidoping efforts, the pattern again reverses with actual season best shot put distances falling short of trend every year (negative residuals). We found similar patterns for the other five events. We also found that the basic pattern held regardless of which of the three measures of performance were used.

To overcome the conceptual difficulty that event performances are measured in different units (e.g., seconds for sprinters, meters for shot putters) a dummy variable was defined that allowed us to pool performance data across all six events and increase our sample size from 59 to 354 observations (six events times 49 years). The dummy variable indicates whether the actual event performance was above the trend performance estimated for that event. A marginal effects probit model with robust standard errors is run to predict the probability of having a better than predicted performance as a function of three variables: whether the year was an Olympic year; whether the year was in the unrestricted steroid use period (1962-90); and whether the year was in the coordinated effective testing period (1991-2007). The reference time period was 1949 through 1961. The results provide strong support for our expectation of a much higher likelihood of better than predicted performance during the heavy-drug-use period (1962-90) and a much lower likelihood of better than predicted performance during the period of rigorous anti-drug enforcement (1991-2007).

If effective enforcement of anti-doping rules continues, above trend performances are unlikely to occur with the same frequency as during the period of unrestrained anabolic steroid use. Fortunately for fans, outstanding performances, like Usain Bolt's 100 m sprints in 2008 and 2009, will occasionally occur and world records will occasionally fall. However, when they do we can be more certain that those records and season best performances are the result of non-drug related determinates of production, such as training, coaching, shoe quality, track and field conditions, and the innate ability of athletes.