Foreword

This year's Gijon conference on sports economics focused on econometrics and quantitative analysis of sports outcomes. Given the ready availability of large (massive) quantities of high-quality data that are true measurements of their theoretical counterparts, it is to be expected that econometrics would occupy a large part of the literature on the analysis of sports. That literature has traditionally built on four central themes:

- Competitive balance
- Labor relations
- Attendance and demand, price and income elasticities
- Economic impact of sport on the economic community.

Each of these has been explored in a vast theoretical and applied literature. Correspondingly, each occupies a section in this volume.

The quantitative analyses in that tradition have tended to rely on some familiar econometric methods, primarily linear regression methods and dynamic linear models including applications of panel data methods. However, recent studies have also begun to move into less traditional areas, such as discrete choice modeling (for example, for attempting to measure streaks as in basketball and tennis), multinomial choice (for analyzing outcomes of horse races) and stochastic frontier models (for analysis of player performance). This introduction to the conference notes the four traditional foci of research, and briefly touches on a few of these innovations.

COMPETITIVE BALANCE

Team and league owners and player union representatives are concerned with two major issues when they meet – salaries and the distribution of revenues, and competitive balance. The various leagues and organizations have had different degrees of success in achieving these objectives. The roles of incentives and incentive compatibility are large in these areas. The history of organized sports is punctuated with labor problems and strikes, walkouts and lockouts. In 2011, the National Football League

(US) was able to avoid a strike that would have truncated the 2011–12 season by forging a new player agreement. At the time of writing, the National Basketball Association (NBA) is still working on a solution. In their detailed analysis of the problem of competitive balance, writers disagree on the success of league attempts to achieve competitive balance. Revenue sharing is a device used in several sports to attempt to achieve that end. Whether revenue sharing, at the 'back end' of the revenue generation chain should improve results in the competitiveness at the front end is debatable. In one of the centrepieces of this literature, Szymanski and Kesenne (2004) find a counterintuitive result that revenue sharing leads to lower, not higher, investment in talent, and ultimately works in the wrong direction. Nonetheless, sports leagues have relied heavily on revenue sharing to attempt to further competitive balance. The UK, Brazil and other countries also use a system of promotion and relegation within the vertical divisions of football competition to reward success and penalize the lack of it.

Ultimately, the objective of competitive balance is team value. In the US, Major League Baseball and the National Football League (NFL) have had different degrees of success in sharing revenues, with the latter being much more successful. Recent numbers on team valuations (see www.forbes.com) are telling: the striking feature of these data is not the levels of the team valuations – the NFL is clearly more successful overall – but the variances of the two series (Table 1). The NFL, which is much more aggressive about revenue sharing appears to be much more successful in equating team values. As the analysts at *Forbes Magazine* (the source of these data) note, however, the overall level of NFL team valuations has fallen in 2010/11 for the first time since they began tracking team values in 1998.

ATTENDANCE MODELS, DEMAND AND PRICING

Dozens of authors have analyzed attendance and price and income elasticities for sporting events. García and Rodríguez (2009) provide an extensive survey of demand studies for sporting events. A recurrent theme in this literature is the pricing conundrum. Analysts perenially find estimates of the price elasticity between −1 and 0. The implication would be that local monopolies are pricing suboptimally in the inelastic region of the demand curve, in contradiction to what basic theory would predict. Various theories have been advanced for the finding, some based on the econometric methods and others based on the underlying theory of the model. For the first of these, some authors have suggested that 'fan loyalty' (lagged

Table 1 2010 team values

Rank	NBA team	Current value ($MIL)	Rank	NFL team	Current value ($MIL)
1	New York Yankees	1500	1	Dallas Cowboys	1650
2	New York Mets	912	2	Washington Redskins	1550
3	Boston Red Sox	833	3	New England Patriots	1361
4	Los Angels Dodgers	722	4	New York Giants	1183
5	Chicago Cubs	700	5	Yew York Jets	1170
6	Los Angeles Angels of Anaheim	509	6	Houston Texans	1150
7	Philadelphia Phillies	496	7	Philadelphia Eagles	1123
8	St Louis Cardinals	486	8	Tampa Bay Buccaneers	1085
9	San Francisco Giants	471	9	Chicago Bears	1082
10	Chicago White Sox	450	10	Denver Broncos	1081
11	Atlanta Braves	446	11	Baltimore Ravens	1079
12	Houston Astros	445	12	Carolina Panthers	1049
13	Seattle Mariners	426	13	Cleveland Browns	1032
14	Washington Nationals	406	14	Kansas City Chiefs	1027
15	Texas Rangers	405	15	Indianapolis Colts	1025
16	San Diego Padres	401	16	Pittsburgh Steelers	1020
17	Baltimore Orioles	400	17	Green Bay Packers	1019
18	Cleveland Indians	399	18	Miami Dolphins	1015
19	Arizona Diamondbacks	390	19	Tennessee Titans	1000
20	Colorado Rockies	373	20	Seattle Seahawks	994

Source: www.forbes.com.

variables) will improve the models, while others rely on more elaborate models, such as the Tobit framework as opposed to linear regression.

The analysis of fan demand for tickets is a pursuit in its own right. It can also provide input for further analyses. For example, one of the key ingredients of many studies is the extent to which team success translates to demand for tickets. This, in turn provides grist for analysis of the success of major player acquisitions. The case of Alex Rodriguez provides an intriguing example. When the Texas Rangers hired him with an eye-popping 10-year contract in 2000, it was believed that his presence on the team could be expected to produce eight more wins per year. The analytic challenge at this point is to translate eight more wins per year into a broader measure of success. An attendance model of the form

$$Attendance_{it} = \alpha_i + \beta_1 Wins_{it} + \beta_2 Wins_{i,t-1} + \beta_3 Attendance_{i,t-1} + \ldots + \varepsilon_{it}$$

incorporates the relevant effects and the aforementioned fan loyalty effect. In this model, the impact of additional wins on equilibrium attendance is $\partial E[Equilibrium\ Attendance]/\partial Wins = (\beta_1 + \beta_2 /(1 - \beta_3)$. No reasonable values of the model parameters produces the roughly 100 000 fans per win per year for 10 consecutive years that would have been necessary to justify economically the roughly \$16 000 000 per year that this acquisition cost the team.

This analysis leaves the pricing conundrum to be considered. Two possibilities have been proposed. In a widely cited study, Marburger (1997) argued that teams should be treated as multiproduct firms – seats in the stands are only one of several products they sell. In this setting, the optimal price vector for the firm could well involve pricing one of the several products in the inelastic region of the demand curve. This model is clearly at work in the pricing of movie tickets at theaters, where the main driver of profits is the concession stand, not the film.

A second possibility noted by Roger Noll in his study in this volume (Chapter 7), is a major specification problem. The face value of a ticket to a sporting event (or any other entertainment event) does not represent the true price of the event. The buyer invests often large amounts of time getting to, at and returning from the event. Any reasonable value of the buyer's time will multiply the cost of the event from the buyer's perspective. Since the elasticity is $\partial \ln Q/\partial \ln P$, the denominator is greatly overestimated if the calculation is done with ticket prices without regard to the value of time. For an example, the value −.57 is reported in Lee and Miller (2006) for baseball tickets. We suppose this represents the elasticity at a base price of \$20 increasing to \$25. For a baseball game that involves three hours in the stadium and an hour of transportation in each direction, if

time is valued at $10 per hour, the $5 increase in the ticket represents only a 7 percent change in the ticket price, not a 25 percent increase. This translates into an elasticity estimate of (25%/7%)′(−.57) or −2.04. The upshot is that measured elasticities may well be measuring the wrong price, and the direction of the error is against the conundrum.

THE HOT HAND AND PROBABILITY MODELING

The search for a 'hot hand' is another area that has attracted some attention in sports. A model that embodies the hypothesis in various forms is one in which outcomes are autocorrelated. The psychology of the perception of a hot hand in basketball was examined by Gilovich et al. (1985). In spite of their negative finding, authors have continued to search for autocorrelation in sequences of ouctomes. The notion has been incorporated in models of basketball, tennis outcomes by Franc et al. (2001) and, recently, in gambling by Rabin and Vayanos (2010). Results are mixed for performance sports as just noted, and likewise for using multinomial discrete choice modeling for handicapping horse races by Bolton and Chapman (2008).

STOCHASTIC FRONTIER MODELING

We note, finally, the availability of rich, accurate data sets on sports performance provides a natural laboratory for modeling in the frontier framework. Koop (2002, 2004) has applied the stochastic frontier model to several performance measures in baseball. In another contribution to this conference, Lee (2011) has used the approach to study baseball success more broadly.

CONCLUSION

The study of sports in the economy presents a rich arena for application of sharply focused micro economics, macroeconomics and econometrics to team and individual outcomes. This conference volume offers a survey of recent analyses that continues the tradition of empirical and theoretical analysis of the economics and econometrics of sports.

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