TOURNAMENT PERFORMANCE AND "AGENCY" PROBLEMS: AN EMPIRICAL INVESTIGATION OF "MARCH MADNESS"

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ABSTRACT

Tournaments have long been used as a resource allocation device. Regardless of the margin of victory, a tournament's champion is typically rewarded far more handsomely than are its losers. For this reason, a tournament can generally be expected to elicit spectacular levels of performance from a group of competitors; performances in professional golf tournaments are an example. Surprisingly, the analysis in this paper indicates the existence of **no** significant relationship between the rewards and performances of participants in the NCAA basketball tournament. To explain this finding we allude to the classic principal-agent problem.

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According to Webster's Third New International Dictionary, the word tournament is derived from the Old French verb "torneier" meaning "to engage in mounted combat." It further defines tournament as "a knightly sport originating in the middle ages in which mounted armored combatants armed usually with blunted lances or swords and divided into two parties engage one another to exhibit their skill, prowess, and courage and to win a prize or favor bestowed by the lady of the tournament chosen for the occasion."

At their inception tournaments were meant to be, and were in fact, public spectacles. Sharp distinctions were made between combatants with only marginal differences in skill and prowess; winning or losing translated into life (as a "champion") or death. In general, tournaments heighten the reward associated with being "the best," and can thus be seen as a way of inducing people to provide their best efforts in a given task.

Many economic events have a zero-sum component that parallels a tournament. Not surprisingly, there is an extensive theoretical literature in economics on tournaments,[1] and empirical work has begun to emerge. Ehrenberg and Bognanno (1990) provided the first non-experimental test;[2] they found that higher expected returns provided golfers with performance enhancing "incentive effects" in professional tournament play. But are incentive effects present in other tournament settings?

In this paper we test for the existence of incentive effects in a tournament between teams of amateur athletes--the 1990 NCAA men's basketball tournament. While one would expect schools with the prospect of greater rewards to devote more resources (in the form of better coaches and facilities) to obtaining tournament success, we wondered whether teams of amateur athletes would

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[1]See, for example, Green and Stokey (1983), Carmichael (1983), Malcomson (1984), Rosen (1986), and Lazear (1989).

[2]Subsequent empirical studies include: Brian Becker and Mark Huselid (1992); Richard Lambert, David Larcker, and Keith Weigelt (1993); and Charles Knoeber and Walter Thurman (1994). These studies support Ehrenberg and Bognanno's results.

respond to tournament incentives in the same manner as did professional golfers.[3]

I. "March Madness:" Do Differential Returns Matter?

The National Collegiate Athletic Association (NCAA) Men's Basketball Tournament takes place annually in March; consequently, the media has dubbed it "March Madness." To be invited, a team must either: 1) secure an "automatic" bid (by becoming a conference champion); or 2) be granted a discretionary "at large" bid (by award from the NCAA selection committee).

Prior to 1991, tournament prizes filtered through participant schools' athletic conferences according to idiosyncratic conference rules, producing diverse monetary rewards.[4] For example, in the Metro Athletic Conference all team winnings belonged to the winning team's school, while in the Pacific Ten Conference only ten cents per dollar won were received by the winning team's school.

Although the prizes provide a diverse set of monetary incentives to universities, NCAA players are amateurs. Prizes trickle down through athletic conferences, to schools, and finally to athletic departments, but not to the players. Because the institutional arrangements in the NCAA tournament differ from those found in "professional" tournaments, it provides a unique opportunity to test for incentive effects in an alternative setting.

Empirical Model

Aside from this dichotomous dependent variable W (W=1 if the team wins and W=0 otherwise) our estimating equation is analogous to Ehrenberg and Bognanno's:

$$W = a_0 + a_1(SPLIT) + \mathbf{a_2}\cdot\mathbf{X} + \mathbf{a_3}\cdot\mathbf{Y} + v. \qquad (1)$$

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[3]The fact that schools in the tournament are non-profit institutions does not invalidate this proposition. No one makes the point better than Paul Heyne (1991): "Even Mother Teresa does better with more money (p. 5)."

[4] If the team is an "independent" (does not belong to any conference), then the money went directly to the school. In 1991, the NCAA established new rules for distributing the prize money that took the discretionary power away from the conferences and all but eliminated differential payoffs. A summary of these rules can be obtained from the authors. These changes are largely consistent the view of the NCAA as a cartel; for analysis on this, see Koch (1983).

Above, SPLIT is the proportion of the prize distributed by conference rules to the team's university. Table 1 lists SPLIT for schools participating in tournament for the first round and the second round (which also applies to the third round).[5] Because the incentive to win the first round is the additional amount received by being in the second round, the SPLIT from the second round is the appropriate measure for estimation of equation (1) for the tournament's first round.[6] Control variables are represented in the vector **X**; $\mathbf{a_2}$ is a coefficient vector. Team ability proxies are represented in the vector **Y**; $\mathbf{a_3}$ is a coefficient vector. Finally, v is a random error.

The control variables in **X** are: 1) ENROLL, the student enrollment, to control for possible differences in team funding levels;[7] 2) DIS, the distance between the teams' home town and the tournament site, to control a "home crowd advantage;"[8] and 3) PUB, a dummy variable equalling one if the represented school is a public institution and zero otherwise.[9] The variables in **Y** are: 1)

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[5]Sigelman and Bookheimer (1983) found that alumni contributions to athletic programs were positively correlated with football program success. They found no such correlation for basketball program success.

[6]Similarly, the third round split (which is the same as the second round split) is the appropriate measure for estimation of equation (1) for the second round. We are indebted to an anonymous referee for recognizing this point. In Table 1 we also list the first round SPLIT. This was for completeness and as a curiosity. We, like an anonymous referee, found it curious that the ACC had lowered SPLIT in the second round.

[7]It would have been better to have included the amount of dollars allocated to university basketball programs. While it may be possible to obtain data on institutions' athletic budgets, an accurate measure of spending on basketball would be difficult to isolate. Further, such items as trainers, and building and travel expenses are sometimes found in other university budgets. In the absence of accurate data on the full costs of basketball programs, we used enrollment data as our proxy. Theoretically one would expect a larger funding base to imply enhanced success; the predicted sign for the ENROLL coefficient is positive.

[8]Because each team was allocated fewer than 400 tickets, a large percentage of the tickets available were offered to the general public. These tickets could obviously have been obtained more easily (legally and through underground markets) by those living closer to the tournament site. Furthermore, teams that had fewer time and altitude changes should also have had an advantage. For these reasons, there always seems to be a rash of complaints when a team like Indiana University gets to play in Indianapolis.

[9]A large subdiscipline in economics is devoted to the analysis of public versus private institutions. The broad upshot of the "public choice" literature is that resources will generally be allocated more efficiently in private than in public institutions. This is the force behind one of

RANK, the teams' pre-tournament ranks found in USA Today, as a proxy for the teams' overall abilities;[10] and 2) GAME, the number of games played by teams during the season, as a proxy of ability enhancing game experience.[11]

The Data

Data on game outcomes (W), team rankings (RANK), and other team performance variables were obtained from the Chicago Tribune and USA Today. Institutional data on schools (ENROLL and PUB) were found in the 1990 World Almanac, and traveling distances (DIS) were found in the Rand McNally Standard Highway Mileage Guide. Data on the conference rules for splitting winnings (SPLIT) were obtained through personal communication with the athletic directors and conference presidents of all schools in the tournament.[12]

Empirical Findings

Logit estimation of equation (1) for the tournament's first round produced the results in Table 2. The coefficient on RANK, our proxy for team ability, is significant and has the expected sign.[13]

Milton Friedman's favorite quips: "Nobody spends somebody else's money as carefully as he spends his own." The "public choice" prediction is for the PUB coefficient to be negative.

[10]The rankings data are the computerized ratings compiled by Jeff Sagarin and published in USA Today. They take into account such factors as won/loss percentage and strength of schedule.

[11]The GAMES variable ranged from 28 to 34 games. We included this variable because we thought it reasonable to think that *ceteris paribus* an extra 6 games of experience might have some impact in terms of either 1) experience; or 2) the potential for injury. As the direction of these two effects oppose each other, we had no *a priori* expectation for the sign of this variable.

[12]Data on SPLIT for the 1990 season came at a high cost. Because SPLIT cannot be presumed to be constant in years prior to 1990, analysis of the NCAA tournament in years prior to 1990 was not conducted. An anonymous referee pointed out that conference sharing rules for years immediately prior to 1990 could have had an important on the resources devoted to recruiting the players who participated in the 1990 tournament. We agree, but, given the difficulties in obtaining SPLIT, we were not able to conduct a test of the referee's hypothesis.

[13] RANK equals one for the best team in the tournament and increases in magnitude as team quality decreases.

Also significant are the coefficients for GAME, PUB, and ENROLL.[14] The coefficients for two of the variables in Table 2, DIS and SPLIT, are insignificant. The insignificance of the SPLIT coefficient indicates that expected[15] increased monetary payoffs (from making the second round) did not provide performance enhancing incentive effects for teams in the NCAA tournament.[16]

The results of logit estimation of equation (1) for the tournament's second round are reproduced in Table 3. As in the NCAA tournament's first round, there is no evidence of the presence of performance enhancing incentive effects in the second round; SPLIT's coefficient is insignificant in the tournament's second round.[17]

Unlike the results for the first-round, the coefficients for RANK, GAME, PUB, and ENROLL for the second-round are insignificant. Our suspicion is that their insignificance is idiosyncratic to this round of this particular tournament.[18] Because of the wholesale insignificance of independent variables in the second round, an additional estimation of equation (1) is performed

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[14]The signs of ENROLL and PUB are in line with their theoretically predicted signs. See footnote 6 and footnote 8 for explanations of the predicted signs of these coefficients.

The significant, positive sign on the coefficient for GAMES might lead one to speculate that this variable might actually be measuring the strength of the team. The correlation of -.07 between RANK and GAME suggests otherwise.

[15]Recall that SPLIT here is the second-round value.

[16]Ehrenberg and Bognanno examined the relationship between the **dollar** value of an improvement in rank, adjusted in several ways, as their measure of the expected return to effort. Our measure, SPLIT, is a percentage. Following the suggestion of an anonymous referee, we ran the equation replacing SPLIT with SPLIT multiplied by the monetary prize. This change was inconsequential to our findings and the results are not reported in this paper.

[17]As an anonymous referee noted, it is interesting that, although insignificant, the signs on the estimated coefficients for SPLIT change from Table 1 to Table 2. The sign change in no way weakens our case, and if anything is supportive of the hypothesis that SPLIT doesn't provide incentive effects.

[18]To get a feel for what was going on in this round consider that: 1) the higher ranked team won only 7 of 16 games; 2) the largest school won only 8 out of 16 games; and 3) the public school team won fifty percent of the games played against private schools.

on data pooled from the first and second rounds.[19]

The results of this pooled estimation appear in Table 4. The results in Table 4 are consistent with those found in Table 2. The significance levels for the coefficients of RANK, GAME, PUB, and ENROLL in Table 4 are only marginally lower than those in Table 2. Consistent with the results in Table 2 and Table 3, SPLIT's coefficient is also insignificant in Table 4. In conclusion, no evidence suggesting the existence of incentive effects was found in our analysis of either pooled or un-pooled data.[20]

II. Discussion: Why Differential Returns Didn't Matter

Although the absence of incentive effects may seem surprising, they can be explained in the context of the classic "principal-agent" problem.[21] Universities (the "principals") are faced with the problem of motivating coaches and players (the "agents") to perform well in the tournament. Although monetary incentives can be used to induce coaches to conform with the universities' goals, players cannot receive monetary payoffs.[22] Or, to put it in the language of Alchian and Demsetz (1972), players are not the residual claimants of the tournament's revenues.

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[19]We are indebted to an anonymous referee for suggesting that we run equation (1) on the pooled sample. This seems appropriate because: 1) first and second round games were in the same location so that DIS was unchanged; and 2) SPLIT for the second and third round were the same.

[20]In estimations of equation (1) not reported we found SPLIT insignificant for: 1) the pooled post-first-round tournament; 2) the pooled post-second-round tournament. The significance levels of the other explanatory variables in these runs were similar to those in Table 3.

[21]This problem is a classic topic in the literature of economics. The problem is easily described in the context of a business owner who hires a worker to perform some task. The owner is the "principal," and the worker is the "agent." The owner's problem is to choose a compensation scheme that provides the worker with incentives to perform the task in the manner that best suits the owner's objectives (net of costs). The owner's solution will vary with such situational variables as: his ability to observe the worker's effort; his ability to observe the quality of the worker's output; the worker's employment alternatives; and the risk preferences of the owner and the worker. For an excellent textbook discussion of this topic see: Hal R. Varian (1992), pp. 441-469.

[22]It has been pointed out to us that monetary payoffs do not lead to conformity of coaches in all occasions. These monetary incentives might plausibly cause coaches to incur recruiting violations that do not reflect the universities' goals.

Consequently, the flow of tournament revenues exerts no influence toward bringing the idiosyncratic goals of the players and universities into conformity. Although the prime goal of each university is to win games and advance in the tournament, players may focus too much on individual goals. Consider, for example, a player who is trying to improve his status in the National Basketball Association draft by showcasing his individual (rather than team) skills. Such a player may inadvertently lower the probability that his team will advance in the tournament.[23]

III. Conclusion

In an important way, the reward structures of the NCAA basketball tournament and of professional golf tournaments are strikingly different. The distribution of rewards in the NCAA tournament leaves substantial room for principal-agent conflict; the distribution in professional golf tournaments leaves little room for such conflict. From the principal-agent perspective, one would expect "incentive effects" to be present in professional golf tournaments, but one should not be surprised by their absence in the NCAA men's basketball tournament.

Tournaments, and their attendant reward structures, can be used to elicit spectacular performances **only when** the goals of principals and agents are induced into conformity. When rewards cannot be assigned so as to induce conformity, even the existence of differential rewards among principals may have little impact on agents' tournament performances.

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[23]Or, as another example, a player whose draft position is both high and secure might reasonably be more concerned about staying injury free than about his team's advancement in the NCAA tournament. There is little question, as one referee pointed out, that a few select players enhance **their** value via NCAA tournament visibility. But the degree to which the value of such individual visibility translates into team success remains an open question. This issue prompted a second referee to suggest that future research include investigating whether stars' statistics improve significantly in NCAA tournament play.

Table 1
Percentage Split Received By
Participant Teams in the 1990
NCAA Men's (First and Second Rounds)

Conference	Split[24]: 1st Round	Split: 2nd, 3rd Rounds
Atlantic Coast	1.00	.70
Metro	1.00	1.00
Independents	1.00	1.00
Big West	.66	.66
Southeastern	.60	.60
Western Athletic	.55	.55
Colonial	.51	.51
Big East	.50	.50
Metro Atlantic	.50	.80
Mid American	.50	.50
Big Ten	.50	.50
Sun Belt	.50	.50
Atlantic Ten	.50	.50
Southwestern	.48	.48
West Coast	.40	.90
Northeastern	.40	.40
Midwest City	.40	.40
North Atlantic	.36	.36
Missouri Valley	.33	.33
Trans-American	.30	.30
Ivy League	.30	.30
Southland	.25	.25
Southwestern	.20	.30
Southern	.20	.20
Mid Continent	.20	.20
East Coast	.20	.20
Ohio Valley	.16	.16
Big Eight	.125	.125
Pacific Ten	.10	.10
Big Sky	.10	.10

[24] **Split is fraction of NCAA prize money that the participant team's school may keep in the various athletic conferences.**

Table 2
Logit Estimation of Equation (1)
First Round 1990 NCAA
Men's Basketball Tournament

Dependent Variable = W
Number of Observations = 64

Independent Variable	Estimated Coefficient	T-Statistic	Two Tail Significance
Constant	-13.416	-1.754	0.085
RANK	- 0.043	-2.578	0.013*
ENROLL	0.087	2.154	0.036*
DIS	0.0001	0.293	0.771
SPLIT[a]	- 0.003	-0.167	0.868
PUB	- 2.119	-2.084	0.042*
GAME	0.502	1.991	0.051**

*Significant at the 5% level
**Significant at the 10% level
Log Likelihood = -26.413
[a]SPLIT is second-round value (see the discussion on p. 6)

Table 3
Logit Estimation of Equation (1)
Second Round 1990 NCAA
Men's Basketball Tournament

Dependent Variable = W
Number of Observations = 32

Independent Variable	Estimated Coefficient	T-Statistic	Two Tail Significance
Constant	-6.525	-0.801	0.430
RANK	-0.011	-0.504	0.618
ENROLL	0.004	0.098	0.923
DIS	-0.0004	-0.658	0.516
SPLIT[b]	0.012	0.669	0.510
PUB	0.245	0.229	0.821
GAME	0.207	0.804	0.429

Log Likelihood = -20.628
[b]SPLIT is third-round value (see the discussion on p. 6)

Table 4
Logit Estimation of Equation (1)
First and Second Round (Pooled Sample) 1990 NCAA Men's Basketball Tournament

Dependent Variable = W
Number of Observations = 96

Independent Variable	Estimated Coefficient	T-Statistic	Two Tail Significance
Constant	- 9.352	- 1.799	0.075**
RANK	- 0.028	- 2.595	0.011*
ENROLL	0.052	1.945	0.055**
DIS	0.000	- 0.001	0.999
SPLIT	0.005	0.444	0.658
PUB	- 1.168	- 1.741	0.085**
GAME	0.330	1.973	0.052**

***Significant at the 5% level**
****Significant at the 10% level**
Log Likelihood = -51.922

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