Crime on the Court

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This paper addresses the question, What happens to the arrest rate when the number of law enforcers increases? One implication of the analysis is that arrest statistics are a poor instrumental variable for judging the quality of law enforcement. Increasing the number of police can increase or decrease the number of arrests. An increased probability of arrest induces fewer criminal acts; hence the ambiguity. Because of this result, we apply the theory in the setting of college basketball. We find a large reduction, 34 percent, in the number of fouls committed during a basketball game when the number of referees increases from two to three. Additional empirical evidence is presented which suggests that this elastic supply of basketball crime is due to more competent officiating and cleaner play.

I warne you wel, it is no childes pley. [GEOFFREY CHAUCER, *Canterbury Tales*]

I. Introduction

The economic approach to crime (Becker 1968; Tullock 1971; Barro 1973; Ehrlich 1973, 1975; Becker and Landes 1974; Becker and Stigler 1974) develops the concept of a market for criminal activities. The supply of crime is a function of the costs and benefits of illegal activities and individual risk preference. The demand for crime derives from the free-lunch theorem—not all crime is worth preventing. In

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this paper we employ these demand and supply functions to discuss the impact of the number of law enforcers on the arrest rate.

Our interest centers on the impact that a small change in the number of enforcers has on the number of arrests. Does a greater number of policemen lead to more or fewer arrests, other things equal?[1] To address this question we develop a theory that models the behavior of enforcers and criminals simultaneously. We motivate the discussion of the theory with an example from the world of sports. Our question in this context is, What is the impact of the addition of a third official in college basketball on the number of fouls called per game? Sports provide an economic laboratory with a history of accurate reporting of events. This is unlike most criminal data, which are generally held to be subject to various types of reporting error. We thus apply our theory in Section III by using the complete history (1954–83) of the Atlantic Coast Conference (ACC) basketball tournament. Employing data on fouls per game and controlling for a variety of ceteris paribus conditions (players' ability and experience, rule changes, attendance, and so forth), we find a statistically important *negative* association between the number of officials and the number of fouls called per game. Since this result can be due to several effects at work in our model, we present evidence in Section IV that the negative relation is due to better officiating and cleaner play. Concluding remarks are offered in Section V.

II. A Theory of Law Enforcement

In any given time period the probability that a criminal will commit a crime is a function of the expected costs and benefits of crime. The expected cost of crime is the probability of arrest and conviction times the fine associated with conviction; the expected benefit of crime is the probability of not being detected times the rewards of illegal behavior.

Formally,

$$P_C = P(D, F, B), \tag{1}$$

where $D = 1 - (1 - P_{A|C})^N$. P_C is the probability of criminal activity; D is the probability of detection and conviction given that a crime has been committed; $P_{A|C}$ is the probability that any one policeman will

[1] Swimmer (1974) addresses this problem in the context of seven different crimes. However, as he notes, there are several problems with his data. In particular, there are nonnormal errors in the reporting of crime statistics across cities and income groups by the offended person, and there is also nonnormality in the errors of police reports about crime statistics. We attempt to avoid such problems by applying our model to a data set that does not suffer from these problems.

make an arrest given that a crime has been committed; F is the fine; N is the number of police; and B is the benefit of criminal activity. We assume that P_C decreases with an increase in D, an increase in F, and a reduction in B.[2]

The police can make an arrest whether or not a crime has been committed, and vice versa. Hence, we write

$$P_{A|C} = A(N) \tag{2}$$

and

$$P_{A|G} = G(N), \tag{3}$$

where $P_{A|C}$ and N are defined as above and $P_{A|G}$ is the probability of a false arrest. The signs of A_N and G_N are both ambiguous.

In the general case of N policemen, the probability of an arrest is

$$P_A = 1 - P_C(1 - P_{A|C})^N - (1 - P_C)(1 - P_{A|G})^N. \tag{4}$$

Inserting the behavior of the actors into (4) yields

$$P_A = 1 - P(D, F, B)[1 - A(N)]^N - [1 - P(D, F, B)][1 - G(N)]^N, \tag{5}$$

with $D = 1 - [1 - A(N)]^N$, which is a reduced-form demand and supply theory of criminal activity.

We illustrate one comparative static result of the model, which addresses the central theme of the paper. Namely, the derivative of (5) with respect to N predicts the change in the number of arrests for an increase in the number of police, ceteris paribus. This derivative is:

$$\begin{aligned}\frac{\partial P_A}{\partial N} = {} & P_D D_N[(1 - G)^N - (1 - A)^N] + NPA_N(1 - A)^{N-1} \\ & + N(1 - P)G_N(1 - G)^{N-1} \\ & - P[(1 - A)^N \ln (1 - A)] \\ & - (1 - P)[(1 - G)^N \ln (1 - G)],\end{aligned} \tag{6}$$

where $D_N = NA_N(1 - A)^{N-1} - [\ln (1 - A)](1 - A)^N$.

We cannot predict the sign of (6). Increasing N increases the number of policemen who might detect a crime or make a false arrest (the last two terms are positive), but it changes the probability that each will do so (the second and third terms are ambiguous). A fortiori, criminal behavior adjusts to changes in the probability of arrest, the

[2] The individual's preference toward risk is crucial in mapping D, F, and B into P_C. For our purposes, however, the degree of risk aversion is not important. Whatever it is, we assume it is constant. Moreover, we interpret the fine associated with detected crime to mean any sanction, including incarceration.

first term in (6). Even if we could sign the impact of N on police behavior—for example, that more police means better detection and more arrests—the response of criminals would be to commit fewer crimes, and the total effect remains ambiguous.[3] Even if more police reduces the probability that any one policeman will catch a criminal, the larger number of police might lead to an increased probability of detection as N increases. Consequently, it is not possible to say a priori whether more police is associated with more or fewer arrests.[4] Since the sign of $\partial P_A / \partial N$ cannot be determined logically, we seek an empirical estimate of its sign in the next section.

III. An Application to College Basketball

Our theory does not predict a sign for (6), that is, for what happens to the arrest rate when the number of police increases. To the extent that rules violations in basketball are analogous to criminal behavior, a data source is available that allows us to estimate the sign of (6) and to draw inferences about the impact of N on A and G. We recognize that the typical sanction meted to a basketball player who violates the rules is not the same thing as incarceration. However, many of the sanctions imposed for rules violations are parallel to putting someone in jail. For example, a player with five fouls goes out of the game. Two technical fouls on a coach lead to his ejection from the game. Strictly speaking, monetary fines are not imposed for rules violations (although they are in an opportunity cost sense). Rather, possession of the ball or a free throw is given to the other team. There is an empirical symmetry between basketball rules violations and crime, which means that an estimate of equation (6) in a basketball economy may be useful in predicting its sign in general.

In 1978, an experiment began in college basketball. The number of officials in the Atlantic Coast Conference (ACC) was increased from two to three per game. This change allows us to estimate the impact of

[3] Indeed, the first and second terms in (6) are probably of opposite sign. If A_N is positive, D_N is also positive, and the first term in (6) is negative ($A > G$). If increasing the size of the police force increases the individual policeman's probability of arrest (and if $A > G$), criminals respond by committing fewer crimes. The reverse is possible although not logically required.

[4] By similar argument it is also impossible to predict the impact of police competency on the number of arrests. Highly trained and experienced police forces may be associated with low arrest statistics. Moreover, in a profit-maximizing setting no owner would willingly bear the extra cost of adding an enforcer, such as shoplifting detectives in a department store, unless the crime rate would decrease. But as we have just noted, this does not imply more arrests. Decreases in the commission of crime do not necessarily reduce the arrest rate because more false arrests could be forthcoming as the number of police increases. The problem is compounded in nonproprietary settings because crime minimization may not be the objective function.

more enforcers on the arrest rate, which is the number of personal fouls committed by each team in a game. Our data base consists of the history of the ACC tournament.[5] Beginning with the 1979 tournament, there were three officials assigned to each game. Prior to 1979, there were two. For most of the games we can identify the officials by name. In addition to the change in the number of officials, there have been other rule changes. In 1983, a 30-second shot clock and a 3-point shot from 19 feet were in effect. Starting in 1973, the first six fouls committed by either team in a half resulted in the other team gaining possession of the ball. Prior to 1973, a single free throw was taken by the fouled player. Beginning in 1963, an offensive foul cost a possession; prior to 1963, a fouled defensive player was awarded a free throw.

To estimate the sign of $\partial P_A/\partial N$, we also need to control for changes in F and B, the costs and benefits of fouling. We estimated the number of fouls called on the winning and losing team in each game as a function of the other team's field goal and free throw accuracy in the game, FGPCT and FREEPCT; the total score of the game, SCORE; the year of the tournament, TIME; the difference in the height of the winning and losing team, HITEDIFF; the difference in the experience of the winning and losing team measured by the number of lettermen, PLAYEXP; the difference in coaching experience measured by the number of years as coach at the respective schools, EXP; attendance at the game, ATTEND; and the experience of the referees as measured by the average number of ACC tournament games officiated by the crew, OFFEXP. SHOOT and CHARGE control for the two rule changes discussed above. SHOOT is one for years when all fouls were awarded a free throw and zero for years when the first six fouls were penalized by loss of possession. CHARGE is zero for years when an offensive foul cost the offending team possession and one for years when it cost a free throw. OFFICIAL controls for the number of referees calling the game; it takes the value 2 or 3. We anticipate that SCORE controls for the 1983 rule changes. An appendix that gives our data and information about their derivation is available from the authors. The data were obtained from Barrier (1981) and various editions of the *Atlantic Coast Conference Basketball Yearbook.*

[5] The ACC holds its basketball tournament each March at the end of regular season play. Generally there have been eight member schools, although from 1972 to 1979 there were only seven schools. The University of North Carolina team did not participate in the 1961 tournament because it was guilty of a rule violation (playing an ineligible player). The teams are seeded according to regular season records, and the tournament is a single-elimination event. This means that eight teams yield a seven-game tournament and seven teams a six-game tournament. The first tournament was played in 1954, and we have data on the 1983 tournament. We are missing data for 1955 and 1962, and hence we have a total of 201 games in our data set.

TABLE 1

Regression Results—Basketball Fouls

	Parameter Estimate	Standard Error	t-Ratio	Prob > $\|t\|$
	Number of Fouls Committed by Winner (F-ratio = 14.90; R^2 = .5471)			
INTERCEPT	−4,709.49	602.680559	−7.8142	.0001
TIME	2.426270	.308124	7.8743	.0001
SCORE	.104337	.022676	4.6012	.0001
FREEPCT	−12.721683	4.687295	−2.7141	.0074
FGPCT	−14.601949	8.443828	−1.7293	.0858
SHOOT	11.107982	2.999642	3.7031	.0003
OFFICIAL	−21.059024	2.631219	−8.0035	.0001
HITEDIFF	.724399	.408193	1.7746	.0780
EXP	.238277	.085598	2.7837	.0061
PLAYEXP	−.398640	.247292	−1.6120	.1091
OFFEXP	−.428517	.152126	−2.8169	.0055
ATTEND	−.000145	.000397	−.3652	.7155
CHARGE	14.461917	3.670531	3.9400	.0001
	Number of Fouls Committed by Loser (F-ratio = 10.67; R^2 = .4639)			
INTERCEPT	−3,458.62	531.447697	−6.5079	.0001
TIME	1.778320	.271717	6.5447	.0001
SCORE	.124287	.023660	5.2531	.0001
FREEPCT	−3.950536	5.439805	−.7262	.4688
FGPCT	−22.704364	9.475005	−2.3962	.0178
SHOOT	9.922577	2.620516	3.7865	.0002
OFFICIAL	−13.784749	2.332086	−5.9109	.0001
HITEDIFF	−.138335	.358248	−.3861	.6999
EXP	.124235	.075083	1.6546	.1001
PLAYEXP	−.145511	.214533	−.6783	.4987
OFFEXP	−.280478	.134300	−2.0884	.0385
ATTEND	.000232	.000353	.6577	.5118
CHARGE	9.881283	3.360302	2.9406	.0038

The results of estimating this model by ordinary least squares are reported in table 1. In both the winner's and the loser's equation, OFFICIAL has a negative and statistically significant coefficient.[6] The magnitude of the coefficient suggests that adding the third official reduced the number of fouls called per game by about 17. Over the

[6] We estimated the winner's and the loser's foul equation by the method of seemingly unrelated regressions. The results are comparable to those reported in table 1. Deleting the experience variables or ATTEND does not alter the results. We tested for equality of the OFFICIAL coefficients across the winner's and loser's equation in each of these specifications. In every case the impact of the third official is larger (more negative) on the winner than the loser. In the specification in table 1 the F-statistic is 4.28, which is significant at the 5 percent level. In the other two specifications, deleting the experience variables and deleting the experience variables plus ATTEND, the test suggests equality.

whole period, 1954–83, there were on average 52.2 fouls called per game. Hence, the effect of adding the third official was substantial—a 50 percent increase in the number of enforcers was associated with a 34 percent reduction in the number of arrests.

The other results in table 1 are consistent with rational behavior on the part of the participants. The time trend has been to increase the number of fouls called by about two per game per year. SCORE, as a proxy for speed and action on the court, is positively associated with more fouls per game; more action begets more fouls although the direction of effect could be the opposite. Each 10 points scored is associated with about one more foul. The better either team shoots, as proxied by FREEPCT and FGPCT, the less it is fouled. On average a 1 percentage point increase in free throw accuracy by one team is associated with about eight fewer fouls per game by the opponent. The greater the difference between the heights of the two teams, the more fouls per game. The more disparate is the experience of the two coaches in a given game, the more fouls are called. The opposite is true for players' experience. Referees' experience has a negative and significant coefficient. Attendance is a proxy for the importance of the outcome of the game.[7] The two rule changes, SHOOT and CHARGE, both have strong positive signs of about the same magnitude. This is interpreted to mean that players and coaches would rather give their opponents a free throw than possession of the ball.[8]

IV. Two versus Three Officials

The negative relationship between arrests and the number of enforcers in the case of basketball can be due to two things. More referees are associated with either fewer false arrests, fewer criminal acts, or both. If the probability of a false arrest decreases with N, it is likely that the probability of a good arrest increases. Although it is not logically required that these two effects be of opposite sign, intuition suggests they are as an empirical matter. In addition, if the probability of arrest increases with the number of police, we expect that the probability of detection also increases. Consequently, we contend that the response of criminals to an increase in N will be to commit fewer

[7] Attendance is a poor proxy for the importance of the game for at least two reasons. We do not know ticket prices, and we cannot measure the extent of the television audience or revenues. Face value of tournament tickets is not very relevant since the schools employ two-part pricing schemes to allocate tournament tickets. We were unable to obtain a time series of these pricing schemes by schools.

[8] We tried several other control variables. These include whether there was an overtime, the halftime score, the difference in the final score, the difference in the halftime score, and the total number of field goals attempted per game. None of these variables are statistically important, nor did their inclusion affect the other results.

crimes. Therefore, if the number of false arrests decreases with N, the negative sign on (6) must be due to two things—fewer false arrests and less crime committed. On the other hand, if the evidence indicates that the number of false arrests increases with N, the negative relationship must be due to fewer good arrests, a negative marginal product for the third official, or more referee shirking.

Upsets

Quantifying the number of false arrests is not an easy task. Therefore, we first attempt to sign G_N indirectly by examining the time series of upsets in ACC tournament competition. We argue that the fewer mistakes made by officials, the more likely the better team will win the game. Specifically, official error (Type I or Type II) increases the variance of the outcome of the game and decreases the probability that the better team will win. Assume that the number of officials is mean preserving with respect to the scoring of each team but that official error increases the variance of each team's scoring. It follows that the mass of probability that the expected loser will win must increase. We define an upset as a tournament game in which a lower-seeded team defeats a higher-seeded team. Tournament seeds are based on regular season records against conference opponents. If the quality of officiating increases with N, going from two to three officials reduces the number of upsets, and vice versa.

Consider the following model. The probability of an upset is a function of the costs and benefits of winning, the technical abilities of the teams, and luck. For example, young teams (in our data teams with few lettermen) may acquire relatively more basketball capital over a season than old teams. This implies that a young team will lose relatively more of its early conference games and enter the tournament with a low seed. By the end of the season the difference between the abilities of the old and the young team will have decreased. This will increase the probability of an upset, ceteris paribus. A similar human capital argument can be advanced for coaches. PLAYEXP and EXP control for the difference in player and coaching experience. To control for changes in the costs and benefits of winning, we also entered TIME, SCORE, SHOOT, and CHARGE. Finally, we included a variable, NCAA, which controls for changes in the rules for advancing to postseason play. Prior to 1975, only the winner of the ACC tournament advanced to the National Collegiate Athletic Association tournament. From 1975 to 1979, the tournament winner and one other team could advance. Since 1980, 4.25 teams have advanced on average. These rule changes reduce the incentive of the top-seeded teams to win the tournament; they are already assured a

TABLE 2

REGRESSION COEFFICIENTS—UPSET MODEL

OLS ESTIMATES (F-Ratio = 3.35; R^2 = .1310)

	Parameter Estimate	Standard Error	t-Ratio	Prob > $\|t\|$
INTERCEPT	−23.566823	27.882899	−.8452	.3991
TIME	.012449	.014161	.8790	.3806
SCORE	−.000456	.001149	−.3975	.6915
EXP	−.011492	.004219	−2.7236	.0071
PLAYEXP	−.037984	.011627	−3.2670	.0013
SHOOT	.032936	.141496	.2328	.8162
CHARGE	.195689	.157978	1.2387	.2171
OFFICIAL	−.355691	.192095	−1.8516	.0657
NCAA	.083083	.076524	1.0857	.2791

LOGISTIC REGRESSION ESTIMATES (MODEL χ^2 = 24.50, df = 8)

	Parameter Estimate	Standard Error	χ^2 Statistic	Prob > χ^2
INTERCEPT	−130.31612147	166.51167003	.61	.4338
TIME	.06808087	.08443313	.65	.4201
SCORE	−.00235112	.00658561	.13	.7211
EXP	−.06130248	.02484204	6.09	.0136
PLAYEXP	−.21896673	.07135558	9.42	.0022
SHOOT	.42417153	.86915017	.24	.6255
CHARGE	1.04057746	.94075572	1.22	.2687
OFFICIAL	−2.81048966	1.67979328	2.80	.0943
NCAA	.76486641	.67016956	1.30	.2537

place in the NCAA tournament based on their regular season performance.

We report ordinary least squares and logistic regressions of the upset model in table 2, including OFFICIAL. The change from two to three officials is associated with a reduced probability of upsets, and the result is statistically significant at the 10 percent level.[9] We interpret this result to mean that the quality of officiating increased with the advent of three officials. That is, three officials reduced the variance in the outcome of tournament games, which implies that the quality of officiating increased with three referees. In turn this sug-

[9] The other results in the upset model are consistent with economic behavior. For example, the NCAA rule changes decreased the incentive of top-seeded teams to win the tournament. Alternative specifications, e.g., deleting changes in the rules of play or including the experience of officials, do not affect the results. It may be true that differences in player and coach experience and ability do not perfectly control for the expected closeness of the game. For example, it would be nice to have betting odds or some other measure of pregame point spreads, but we were unable to locate such data for our time series.

gests that the negative sign of $\partial P_A/\partial N$ is due to fewer false arrests and reduced fouling.[10]

Crime and Output

Transfers, including transfers due to crime, are associated with redistributive competition. Individuals compete to capture transfers and to resist having their wealth taken away. In other words, real resources are consumed in the transfer process. What is the implication of this argument for crime and output? As Tullock (1967, p. 231) says, "A successful bank robbery will inspire potential thieves to greater efforts, lead to the installation of improved protective equipment in other banks, and perhaps result in the hiring of additional policemen." This means that economies with high crime rates will be associated with low real production, ceteris paribus.

In basketball terms, Tullock's point can be put this way. Fouling but not being caught in the act will induce players to foul and to practice avoiding fouls or techniques to draw the attention of officials when they are fouled, and may lead to the addition of more referees. Such behavior reduces scoring because spending time in this way decreases a player's ability to perform other basketball feats such as scoring. For this reason we argue that expected errors in officiating induce players to learn and perform skills that *reduce* scoring. We can use this argument to estimate the signs of G_N and A_N. If the addition of the third official is associated with more scoring on the basketball court, we have another piece of evidence that three officials led to a lower crime rate in terms of the number of fouls actually committed during a game. If three officials are associated with less scoring output, we would infer that the basketball crime rate actually rose in the three-

[10] This result squares with the reasons given for the move to three referees by basketball intellectuals. For example, Professor Edward Steitz of Springfield College, Secretary-Editor of *NCAA Basketball Rules*, made such a case for three officials in a phone conversation with us. For an introduction to the art of officiating, including a technical discussion of two vs. three officials, see Bunn (1968, pp. 177–247). Alternative explanations for the move to the third official include attempts to improve the enforcement of rules other than fouling and the potential for wealth redistribution. The wealth redistribution argument will not stand empirical scrutiny on several grounds. The regular season and tournament winning percentages across schools during the two and three official era appear to be normally distributed. In addition, only two schools voted against the change to three officials. Finally, given that sports is an income-inelastic good in the quality dimension, we expect sports entrepreneurs to add officials and other monitoring technology over time as a means of reducing official error and nonproductive behavior by players. We note that during the drafting of the final version of this paper, the United States Football League announced that it will employ instant replays to reduce officials' errors in the 1984 season.

official era. A positive association between officials and output would imply that the crime rate declined.

In a purely technical sense, output on a basketball court is the score of each team. This does not mean that the economic output of a basketball game is the score. Winning the game may be paramount to the fans. As a wise coach once observed, an ugly win is better than a pretty loss. Nonetheless, we believe that economic output and technical output are monotone transformations of each other.[11]

We can estimate the impact of more officials on scoring output in a basketball economy. Consider the following model of the winner's and the loser's score. TIME controls for trend. SHOOT and CHARGE control for rule changes. HITEDIFF, PLAYEXP, and EXP control for differences in players' and coaches' ability and experience across the two teams in a given game. FREEPCT and FGPCT control for game-specific performance of players. FOULS represents a form of victim compensation for detected crime. The more a team is fouled, the more victim compensation it receives in the form of possession of the ball or free throws and the higher its score on average. OFFICIAL is used to determine whether there is more or less real output with more police.

Table 3 reports ordinary least squares estimates of the model. The results are not sensitive to model specification.[12] The coefficient on OFFICIAL is positive in both equations, but it is only statistically significant in the winner's equation. There is therefore some reason to believe that three officials are associated with increased scoring output on the court. Further evidence on this point can be gained from the results on officials' experience. The coefficient on this variable is positive and significant in both equations. More experienced officials are associated with higher scores, presumably because they call a better game. More referee learning means better refereeing, better refereeing means fewer fouls committed, and fewer fouls committed means more real output. This is additional evidence that more basketball officials reduces the number of fouls committed and the number of bad calls.

[11] One casual piece of evidence to support this contention is the prevalence of shot clocks in professional basketball. We also observe the emergence of a shot clock in college basketball as the scoring in games declined due to the increasing number of teams that resorted to stall-like play on offense. Viewed in this way, slowdown basketball, such as the four corners, is simply an extreme investment of basketball talent in a wasteful way.

[12] We also estimated the output model and the foul model simultaneously where each team's score and fouls are endogenous using the method of three-stage least squares. The estimates were not substantially different from the ordinary least squares estimates reported in tables 1 and 3.

TABLE 3

REGRESSION COEFFICIENTS: OUTPUT MODEL

	Parameter Estimate	Standard Error	t-Ratio	Prob > $\|t\|$
	Winner's Score (F-ratio = 11.63; R^2 = .4853)			
INTERCEPT	3,010.916	1,023.48	2.9418	.0038
TIME	−1.540839	.524111	−2.9399	.0038
OPPONENT'S FOULS	.713351	.130790	5.4542	.0001
CHARGE	.610939	5.984444	.1021	.9188
SHOOT	−10.106034	4.648230	−2.1742	.0313
OFFICIAL	7.286445	4.485530	1.6244	.1064
HITEDIFF	1.027700	.619922	1.6578	.0995
EXP	.037159	.132085	.2813	.7789
PLAYEXP	.205872	.371958	.5535	.5808
ATTEND	−.000745	.000607	−1.2263	.2221
OFFEXP	.539729	.231331	2.3331	.0210
FREEPCT	22.587973	9.298198	2.4293	.0163
FGPCT	126.528813	13.920502	9.0894	.0001
	Loser's Score (F-ratio = 4.64; R^2 = .2734)			
INTERCEPT	2,569.971	1,095.331	2.3463	.0203
TIME	−1.293030	.561771	−2.3017	.0227
OPPONENT'S FOULS	.524618	.120858	4.3408	.0001
CHARGE	−1.912368	6.038176	−.3167	.7519
SHOOT	−14.397993	4.787349	−3.0075	.0031
OFFICIAL	2.023766	4.921747	.4112	.6815
HITEDIFF	−.397539	.648689	−.6128	.5409
EXP	−.137062	.138543	−.9893	.3241
PLAYEXP	−.222621	.392002	−.5679	.5710
ATTEND	−.000392	.000625	−.6270	.5316
OFFEXP	.405802	.242835	1.6711	.0968
FREEPCT	22.806112	7.402350	3.0809	.0025
FGPCT	45.123960	13.307594	3.3908	.0009

V. Conclusion

We present a model of criminal and police behavior where the behavior of each is endogenous. One important result of the model is that the arrest rate may be a misleading statistic when attempting to evaluate the quality and quantity of law enforcement. The mass of the sports evidence suggests that increasing the size of the police force reduces the arrest rate and increases the quality of law enforcement. No policy implications follow from this result, however. Increasing the size of the police force is not free, and we are not prepared to argue that such changes would be cost effective in practice. We can note, however, that the supply of crime in our data is relatively elastic. We find that a 50 percent increase in the number of officials is associated with a 34 percent reduction in arrests. Our other evidence suggests that the crime rate went down even more than this. We find that referee competency went up with the move to three officials and that the number of fouls called went down. So the crime rate must have decreased by more than 34 percent. This implies an elastic response by criminals to changes in the probability of being arrested.

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