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The Demand for Student-Athlete Labor and the Supply of Violations in the NCAA

Jill S. Harris

THE DEMAND FOR STUDENT-ATHLETE LABOR AND THE SUPPLY OF VIOLATIONS IN THE NCAA

JILL S. HARRIS*

I. INTRODUCTION

Though many students and college sports fans tend to reject the notion, most economists agree: the NCAA is an incidental cartel. This paper examines two of the more fascinating features of cartels: the necessity of agreements to earn monopsony rents and the tendency to cheat on the agreements. Although it might be traditional to observe the NCAA's behavior from the point of view of standard neoclassical optimizing models (i.e., the NCAA is a firm producing sports entertainment from a set of inputs in such a way as to maximize profits), following Becker[1] and Ehrlich,[2] another framework for observation incorporates theories of criminal behavior.[3] Within this framework, violations are committed to maximize winning percentages (and economic rents) from increased cartel profits. In this way, a supply of violations is generated in addition to a supply of output. This paper develops a theoretical framework for the supply of violations in the NCAA and the demand for student-athlete (S/A) labor. It utilizes a reciprocal demand model to illustrate the willingness of NCAA member schools to exchange rules violations for high-quality S/A labor.[4]

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* Assistant Professor (Visiting) at Pomona College, where she currently teaches Economics of Crime, Economics of Sport, Industrial Organization, and Principles of Microeconomics. She earned her Ph.D. from Oklahoma State University after graduating from the University of California Riverside with an MA in Financial Economics.

1. Gary S. Becker, *Crime and Punishment: An Economic Approach*, 76 J. POL. ECON. 169, 169–217 (1968).

2. Isaac Ehrlich, *Participation in Illegitimate Activities: A Theoretical and Empirical Investigation*, 81 J. POL. ECON. 521, 521–65 (1973).

3. Both Becker and Ehrlich adopted a "rational" approach to crime in their models. These models emphasize the benefits and costs of both legal and illegal activities. *Id.* at 559–61; Becker, *supra* note 1, at 207.

4. This approach uses an adapted version of John Stuart Mill's reciprocal demand model (as interpreted graphically by Edgeworth and Marshall). *See* JOHN STUART MILL, PRINCIPLES OF POLITICAL ECONOMY: WITH SOME OF THEIR APPLICATIONS TO SOCIAL PHILOSOPHY 593 (Sir William

II. LITERATURE

The NCAA is a monopsonist in the input market and colludes in the output market. A sizeable literature on the self-monitoring behavior of cartels helps frame the current approach. Koch defined the input market in an athletic environment quite clearly when he recognized the power the NCAA developed to legislate, execute, and maintain judicial functions over member schools.[5] All of the above behavior was typical of any cartel according to Koch.[6] He describes the member college as a firm, describes games played between it and rival teams as output, and considers the university a multiproduct firm with differentiated products.[7] The inputs used in the process are partial monopoly owners of talent who sell their labor to partial monopsonists. Accordingly, it is the availability of alternatives to non-athletic activities that creates negotiating power for the S/A. This power enables him or her to earn positive rent.

Kahn explored cartel behavior and amateurism in college sports.[8] He concludes, "[C]ollege sports programs . . . extract rents from revenue-producing athletes by limiting their pay and requiring [amateur status]."[9] A variety of legal challenges to amateurism have failed—most notably the recent decision by the National Labor Relations Board to not rule on the National College Players Association petition to unionize on behalf of Northwestern University football players.[10] Estimates of marginal revenue

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Ashley ed., Augustus M. Kelley Publishers 1973) (1909). Mill's model was applied to international trade. He explains:

> But all trade, either between nations or individuals, is an interchange of commodities, in which the things that they respectively have to sell constitute also their means of purchase: the supply brought by the one constitutes his demand for what is brought by the other. So that supply and demand are but another expression for reciprocal demand: and to say that value will adjust itself so as to equalize demand with supply, is in fact to say that it will adjust itself so as to equalize the demand on one side with the demand on the other.

Id.

5. James V. Koch, *The Economics of "Big-Time" Intercollegiate Athletics*, 52 SOC. SCI. Q. 248, 248 (1971).

6. *Id.* at 249.

7. *Id.* at 250.

8. Lawrence M. Kahn, *Markets: Cartel Behavior and Amateurism in College Sports*, 21 J. ECON. PERSP. 209, 209–26 (2007).

9. *Id.* at 224.

10. Football players, led by Kain Colter, sought to be recognized as employees of Northwestern University. They petitioned the National Labor Relations Board for the right to unionize and collectively bargain. Tom Farrey, *Kain Colter Starts Union Movement*, ESPN (Jan. 28, 2014), http://espn.go.com/espn/otl/story/_/id/10363430/outside-lines-northwestern-wildcats-football-players-trying-join-labor-union. On August 17, 2015, the National Labor Relations Board declined to rule on

products of draft-quality athletes compared to actual compensation of S/A labor shows how the NCAA uses its cartel power to pay top performers less than their market values. These results were suggested by Fleisher, Goff, Shughart & Tollison.[11] The monopsony rents earned by the cartel are sizeable. Estimates made by Brown[12] and Brown & Jewell[13] range from $500,000 to $1,000,000.[14]

The NCAA exhibits so many "classic" cartel characteristics it is essentially a textbook case. Leeds & von Allmen use the NCAA as an example of a buying cartel in their intermediate theory text.[15] Fleisher, Goff & Tollison point out the NCAA is subject to lumpy entry conditions.[16] This creates a unique first mover problem (high start-up costs for the first school to break away from the cartel). Output monitoring by the cartel is described in Stigler,[17] Fleisher et al.,[18] and Fleisher, Goff & Tollison.[19] Within the NCAA, the monitoring takes place with imperfect information; self-enforcement models with imperfect information were introduced by Spence[20] and Green & Porter[21] and updated by Tedeschi.[22] These models consider cartels in a repeated games context with homogeneous (as in Green & Porter) and differentiated (as in Tedeschi) outputs.[23] Since cartel members cannot observe the moves of others perfectly, the optimal cartel

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the petition. Nw. Univ., 362 N.L.R.B. No. 167, 204 L.R.R.M. (BNA) 1001, 1088, 2015 WL 4882656, at *7 (Aug. 17, 2015).

11. Arthur A. Fleisher III, Brian L. Goff, William F. Shughart II & Robert D. Tollison, *Crime or Punishment? Enforcement of the NCAA Football Cartel*, *in* SPORTOMETRICS 153, 154 (Brian L. Goff & Robert D. Tollison eds., 1st ed. 1990).

12. Robert W. Brown, *An Estimate of the Rent Generated by a Premium College Football Player*, 31 ECON. INQUIRY 671, 671–84 (1993).

13. Robert W. Brown & R. Todd Jewell, *Measuring Marginal Revenue Product in College Athletics: Updated Estimates*, *in* ECONOMICS OF COLLEGE SPORTS 153, 153–62 (John Fizel & Rodney Fort eds., 2004); Robert W. Brown & R. Todd Jewell, *The Marginal Revenue Product of a Women's College Basketball Player*, 45 INDUS. REL. 96, 96–101 (2006).

14. Brown & Jewell, *Measuring Marginal Revenue Product in College Athletics: Updated Estimates*, *supra* note 13, at 96, 154 (citing Brown, *supra* note 12, at 679–81; Robert W. Brown, *Measuring Cartel Rents in the College Basketball Player Recruitment Market*, 26 APPLIED ECON. 27, 32 (1994)).

15. MICHAEL A. LEEDS & PETER VON ALLMEN, THE ECONOMICS OF SPORTS 385–87 (5th ed. 2014).

16. ARTHUR A. FLEISHER III, BRIAN L. GOFF & ROBERT D. TOLLISON, THE NATIONAL COLLEGIATE ATHLETIC ASSOCIATION: A STUDY IN CARTEL BEHAVIOR 123–32 (1992).

17. George J. Stigler, *A Theory of Oligopoly*, 72 J. POL. ECON. 44, 46 (1964).

18. Fleisher, Goff, Shughart & Tollison, *supra* note 11, at 157–62.

19. FLEISHER, GOFF & TOLLISON, *supra* note 16, at 100–22.

20. Michael Spence, *Tacit Co-Ordination and Imperfect Information*, 11 CAN. J. ECON. 490, 490–505 (1978).

21. Edward J. Green & Robert H. Porter, *Noncooperative Collusion Under Imperfect Price Information*, 52 ECONOMETRICA 87, 87–100 (1984).

22. Piero Tedeschi, *Cartels with Homogeneous and Differentiated Products and Imperfect Monitoring*, 35 INT'L ECON. REV. 635, 635–56 (1994).

23. Green & Porter, *supra* note 21, at 91; Tedeschi, *supra* note 22, at 643–47.

equilibrium cannot be maintained. Humphreys & Ruseski developed a model of optimal "whistle-blowing" behavior in a self-monitoring cartel.[24] This approach takes a basic model of tacit coordination and imperfect information by Spence and makes it dynamic with reaction lags.[25] Without some sort of self-monitoring and enforcement, these models tell us the cartel will not survive in the long run.[26]

If cheating on the cartel agreement is discovered, enforcement actions are taken. These actions affect the competitive balance of the organization. Depken & Wilson report the greater the level of enforcement in a conference, the better the competitive balance.[27] However, they also find that as punishments increase in severity, competitive balance erodes.[28] Using only observable variables available to all cartel members, Humphreys & Ruseski predict instances of cheating detection and punishment with reasonable success.[29] Their approach reinforces earlier findings and suggests the stability of the cartel is important to its members.[30]

Scholarship linking the behavior of the NCAA with the influence of the economics of crime is less prominent in the literature. The papers in this area stem primarily from the work of Becker and Ehrlich. Becker argues that scarcity causes rational economic agents to weigh the costs and benefits of legal and illegal behavior.[31] He imagines a supply of offenses function that is heavily influenced by the probabilities of arrest and conviction, the expected punishment, and returns to other legal activities.[32] Ehrlich also develops a supply of offenses function using a state preference approach in a one period uncertainty model.[33] He suggests the opportunities available in legitimate activities are important for the would-be offender.[34] Becker and Ehrlich present us with the rational crime model. Both authors suggest crime and legal activities are not mutually exclusive; an optimal activity mix exists.[35] This approach has been quite influential in the broad literature on criminal justice and has

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24. *See* Brad R. Humphreys & Jane E. Ruseski, *Monitoring Cartel Behavior and Stability: Evidence from NCAA Football*, 75 S. ECON. J. 720, 720–35 (2009).

25. *Id.* at 722, 724; *see* Spence, *supra* note 20.

26. *See* Humphreys & Ruseski, *supra* note 24, at 733.

27. Craig A. Depken II & Dennis P. Wilson, *NCAA Enforcement and Competitive Balance in College Football*, 72 S. ECON. J. 826, 843 (2006).

28. *Id.*

29. Humphreys & Ruseski, *supra* note 24, at 734.

30. *See id.* at 733–34.

31. Becker, *supra* note 1, at 207–09.

32. *Id.* at 207.

33. Ehrlich, *supra* note 2, at 533–37.

34. *Id.* at 559–60.

35. Becker, *supra* note 1, at 209; Ehrlich, *supra* note 2, at 523–24.

simultaneously shaped policy.[36] Using this rational crime approach, McCormick & Tollison study enforcement effects on crime.[37] Employing data from professional basketball, they find the supply of fouls is sensitive to the number of referees on the court.[38] More enforcement results in less crime.[39] Since enforcement is not costless, efficiency requires that efforts to reduce criminality should involve evaluation of both the benefits and costs of crime reduction.

This investigation of NCAA behavior is influenced most by the economics of crime literature. Cheating on NCAA amateurism rules can be modeled as a rational choice. Detection and punishment of cartel cheating, thus, become necessary functions of the NCAA.

III. THEORETICAL MODEL

The production of sports entertainment (and winning percentages) requires S/A, other labor inputs, and the facilities and equipment associated with athletic competition. The standard approach witnesses the firm making input decisions based on marginal benefits and marginal costs of employing the resource. Let ρ represent winning percentages, R represent rents, and $L_{s/a}$ represent student-athlete labor. To maximize winning percentages, ρ, schools will compare the marginal revenue product (MRP) of S/A with the wage they must pay S/A. Specifically, the MRP of the S/A is the increase in the win/loss record (the marginal product of S/A, $\delta\rho/\delta L_{s/a}$) multiplied by the increase in rents from the increase in the winning percentage ($\delta R/\delta\rho$). Thus, MRP S/A = $(\delta\rho/\delta L_{s/a})*(\delta R/\delta\rho)$.

In the absence of NCAA restrictions, schools will hire S/A so long as the MRP exceeds or is equal to the wage. The higher the wage, the smaller the quantity of high-quality S/A demanded and vice versa. This relationship is depicted in Figure 1 panel (a). It should be emphasized that the wage schools pay for S/A represents the legal payment as set forth in the NCAA Manual. NCAA rules reduce the payment to w_1 and the cartel captures rents equal to the shaded area in panel (a) Figure 1.

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36. Becker, *supra* note 1, has over thirteen thousand citations according to Google Scholar. Moreover, the rational crime model has inspired contemporary policy makers to rethink the criminal justice process. *See, e.g.*, Anne Milgram, *Why Smart Statistics Are the Key to Fighting Crime*, TED (Oct. 2013), http://www.ted.com/talks/anne_milgram_why_smart_statistics_are_the_key_to_fighting_crime.

37. Robert E. McCormick & Robert D. Tollison, *Crime on the Court*, 92 J. POL. ECON. 223, 223–35 (1984).

38. *Id.* at 229–30.

39. *See id.* at 232–34.

In the same way, the schools will hire other labor inputs (coaches, trainers, etc.) so long as the MRP of each of these inputs exceeds or is equal to their respective prices. If the markets for these other labor inputs are competitive, these resources are obtained through price competition, and no exploitation occurs. Since NCAA rules prohibit schools from using price competition to attract S/A, schools resort to non-price competition. In addition to the NCAA-sanctioned recruiting tools and offers (campus visits, scholarships, facilities, etc.), schools may also resort to non-sanctioned offers, which are recruiting violations. These violations become part of the demand for S/A labor.

Formally, the S/A demand function can be expressed as: DL = DL (GRANT, P_{other}, V, ρ)(1) where GRANT is the NCAA-sanctioned wage, P_{other} is the price of other inputs, ρ is the school's winning percentage in the sport, and V are NCAA violations. This input demand function is analogous to the conditional input-demand function found in the neoclassical theory of the firm. The demand is a function of input prices and the level of output. As a neoclassical input demand function, we can expect the demand for higher quality S/A labor to exhibit the usual characteristics. The demand will be an inverse function of the input's own price, i.e., $\delta DL/\delta GRANT < 0$. That is, as the value of the legal payment to athletes increases, the gap between it and the MRP declines. Therefore, the potential rent declines. With less rent available at the margin, the additional benefit from using one more unit of high-quality S/A labor diminishes. Thus, DL decreases as GRANT increases; there is an inverse relation between quality S/A labor demanded and price. Moreover, since violations are covert means of recruiting S/A, the demand will be inversely related to violations, of $\delta DL/\delta V < 0$. The violations committed add to the total price of quality S/A labor, making it more expensive to obtain. It is useful to consider GRANT as the explicit cost of S/A labor and V as the implicit cost. As the number of violations increases, then, the units of high-quality S/A labor demanded decreases. The cross-price effects will be indeterminate, depending on whether the other inputs are substitutes or complements. Finally, the demand for S/A labor will be an increasing function of the output (winning percentages) so that $\delta DL/\delta\rho$ is positive.

The input demand function described above is simultaneously a production function for the school. Since NCAA rules fix the number of athletes teams may use, fierce competition for better quality athletes arises. Recruiting agents, acting on behalf of schools (specifically their athletic interests), supply violations and other inputs (such as facilities, past win/loss records, and a basic scholarship) to recruit more talented athletes. Therefore, just as the production of sports entertainment creates a derived demand for quality S/A, the demand for S/A creates a willingness to supply, or produce, violations.

As mentioned, this treatment of the supply and demand for violations is rooted in the economics of crime literature.[40] In the pursuit of better win/loss records and the higher rents that success produces, schools have an incentive to cheat on the NCAA-sanctioned wage. By cheating and offering star S/A cash or in-kind benefits exceeding the NCAA-defined legal maximum, the schools can obtain more talented athletes and increase their winning percentages and their economic rent. Thus, the demand for S/A translates into a supply of violations as illustrated in panel (b) of Figure 1.

An adaptation of John Stuart Mill's reciprocal demand model is useful for illustrating this reciprocal relationship between demand and supply. First, consider panel (a) in Figure 2. The vertical axis represents varying qualities of S/A labor (with poorer quality labor near the origin and higher quality away from the origin). The horizontal axis represents quantities of violations (V). The line OU indicates an athletic department's willingness, ceteris paribus, to exchange NCAA rules violations for star athletes. Other things equal, we can expect schools to commit more violations for more star athletes, i.e., OU will be upward sloping. Moreover, neoclassical theory would predict a declining marginal willingness to cheat because the marginal product of S/A labor is subject to diminishing returns. This behavior creates an increasing slope of OU. The line OP in Figure 2(b) indicates the terms of trade; it is the number of violations required to acquire a given quality of star athletes. The flatter this line, the more expensive S/A labor is in terms of violations. As the slope of OP increases, more star-quality S/A labor can be acquired for any given number of violations. Take, for example, the amount of labor L0 s/a. To acquire this amount of labor, a school must commit V, V', or V" violations as the terms of trade move from OP, to OP', or to OP."

The willingness-to-cheat curve, OU, can be used to derive a demand for S/A labor. Additionally, a supply of violations curve can be derived from the same set of curves. The school will select a combination of violations and S/A labor based on the terms of trade. The equilibrium combination will be at the intersection of OU and OP. Taking all alternative terms-of-trade (price) lines and finding the OP/OU intersections produce two sets of data: (1) a collection of price/labor quantity data, and (2) a collection of price/violations data. This information can be translated to the conventional format found in panels (a) and (b) of Figure 3.

The relative price of quality S/A labor in terms of violations is on the vertical axis of panel (a) in Figure 3 while the quality of S/A labor is on the horizontal axis. The prices p, p', and p" from Figure 2 panel (b) are transferred to the vertical axis in Figure 3(a). For each of these prices, the quality of labor

40. A more traditional model might view the demand for cheating as emanating from the firm (i.e., cheating is just another input the firm demands to produce its output).

demanded is shown by the demand for S/A labor curves, DL. Now, for each point on the curve DL, there are a corresponding number of violations produced to secure the desired quality of S/A labor. Figure 3(b) illustrates the supply of violations function generated from the demand for quality S/A labor. The demand function in panel (a) is equivalent to the supply of violations in Figure 3(b).

The key to this simultaneous relationship is the effect the NCAA cartel has on the behavior of the school and its agents in the production of sports entertainment. Because of the NCAA cartel, the school acts as a monopsonist in the labor market; this behavior is captured in the demand for S/A labor. At the same time, the very existence of the cartel creates economic incentives for the schools to cheat on the sanctioned wage; this behavior is captured by the supply of violations. Thus, producing sports entertainment involves engaging in a labor market that can, at the same time, be interpreted as a violations market. Consequently, the behavior of the schools can be studied from either perspective.

Focusing on the violations market, the supply of violations defines the general willingness of schools to break NCAA rules. The economics of crime literature indicates the willingness to break rules (or laws) will be influenced by the costs and benefits of cheating. As the benefits of higher winning percentages rise, the willingness to cheat will also increase. A higher marginal product of S/A labor will also increase the willingness to break rules as will increased monopsony power. This latter influence reflects the higher marginal rents available from exploitation of S/A labor. Sports with greater monopsony power (i.e., football and basketball) have the potential to earn higher rents from cheating. The potential costs of cheating (i.e., forsaken television revenues) will deter violations as they increase. Following the economics of crime literature, what matters are the expected costs: the penalty multiplied by the probability of punishment. Therefore, a supply of violations function can be formally presented as Vs = Vs (Pv, MKT, FINE, PROB, GRANT) (2), where Vs is the quantity of violations supplied; Pv is the price of violations; FINE is the cost of cheating (the NCAA-imposed sanctions); MKT is the degree of monopsony power; PROB represents the probability of being caught and punished; and GRANT represents the legally sanctioned wage the school must pay the S/A. From the preceding discussion, we would expect the following relations: $\delta Vs/\delta Pv > 0$, $\delta Vs/\delta MKT > 0$, $\delta Vs/\delta FINE < 0$, $\delta Vs/\delta PROB < 0$, and $\delta Vs/\delta GRANT < 0$.

The price of violations, Pv, represents the marginal rent the school gains from cheating (the distance between the demand curve and w1 in panel (a) of Figure 1). The gains from cheating are reflected by the marginal rent available to the team from supplying violations. Therefore, the higher Pv is, the greater is the supply of violations and vice versa. Similarly, as monopsony power increases, the potential economic rents increase. For this reason, the supply of violations also increases with increased market power. Higher marginal costs of cheating discourage violations. Increases in the probability of punishment and/or sanctions will reduce the supply of violations.

On the input side, S/A are viewed as utility maximizers, where utility is a function of income. The decision to supply labor can be viewed as a portfolio allocation problem, where the objective is to maximize: $U = U(Yl, Yi)$ and where utility, U, is a function of Yl, income earned from the selection of a college sports program, and Yi, income earned from alternative employment opportunities. Neoclassical economic theory assumes the relationships between these variables are such that $\delta U/\delta Yl > 0$, $\delta^2 U/\delta(Yl)^2 < 0$, $\delta U/\delta Yi > 0$, and $\delta^2 U/\delta(Yi)^2 < 0$. The income defined by Yl includes sanctioned offers and the extra benefits from illegal offers. This utility maximization process results in a supply of labor function (implicit in this approach is the assumption S/A realize there are a limited number of positions per program and a large pool of applicants; it is the utility maximization of the most talented S/A that is captured here). Traditionally, the S/A will supply sports labor so long as she or he receives an in-kind (legal) or cash payment (illegal) in excess of her or his opportunity cost. Because the supply of labor depends in part upon the extra benefits from illegal offers, it follows the demand for violations (by S/A) is derived from the supply of labor decision.

The relationship can be depicted as before using the reciprocal demand model. Figure 4 shows the S/A side of the trade-offs illustrated in Figure 3. In Figure 4, panel (a), the vertical and horizontal axes remain labeled as in Figure 3(a). Focusing on the supply of S/A labor and demand for violations, it is evident the flatter the line OA, the greater is the number of violations demanded to secure a given amount of S/A labor. Also, for increasing quantities of labor along a given willingness-to-cheat curve, the quantity of violations demanded increases. Thus, in Figure 4(b), a supply of S/A labor function is shown as S_L and it is simultaneously equal to the demand for violations function, Dv, in Figure 4(c). This demand for violations will exhibit the usual characteristics of neoclassical demand theory and the economics of crime literature.

Formally, the demand for violations is defined as: $Vd = Vd\ (Pv, GRANT, PROB)$(3) where Pv is the price of violations, as described above; GRANT is the basic grant (legal offer) provided to athletes; and PROB is the probability of losing collegiate eligibility for violating NCAA rules. Based on neoclassical demand theory and the economics of crime literature, we can expect: $\delta Vd/\delta Pv < 0$, $\delta Vd/\delta GRANT < 0$,and $\delta Vd/\delta PROB < 0$.

The willingness of S/A to violate NCAA rules will be inversely related to the NCAA-sanctioned benefits and the probability of being punished. The product of these two variables represents the expected costs of crime.

There is a relationship, then, between the price of violations and the willingness of schools to cheat. As the price of violations rises, the schools' willingness to cheat increases as well. This is because the reward to the schools is rising. The divergence between the MRP and the official wage is the result of monopsony power. The greater the market power of the schools, the fewer the alternatives left to the S/A and, ceteris paribus, the less willing S/A will be to cheat. Therefore, for larger deviations between MRP and the sanctioned wage, the S/A will require fewer violations. Accordingly, for smaller marginal rents, more violations are demanded. For larger marginal rents, fewer violations are demanded.

S/A are utility maximizers and schools are rent maximizers. The behavior of both participants can be described by the standard neoclassical theory of optimization. From this activity, the traditional input demand and labor supply functions are derived. The input demand and labor supply functions imply a supply of and demand for violations.

Consider Figure 5, which brings Figures 2 through Figure 4 together in one set of graphs. The curve OU in panel (a) defines the willingness to cheat in athletic programs. The OU curve, as noted above, can be used to define both a demand for S/A labor curve and a supply of NCAA violations curve as illustrated in panels (b) and (c). The OA curve in panel (a) shows the S/A willingness to trade S/A for violations. This curve can be used to derive a S/A labor supply and a demand for violations, which are illustrated in panels (b) and (c) respectively. The results of this process are two markets clearing simultaneously. It is the intersection of the two willingness-to-cheat curves, which provides equilibria in the two markets. With the simultaneous nature of the two markets established, estimation of only one of the markets is necessary for analysis. Thus, the following model deals exclusively with the violations market.

IV. EMPIRICAL MODEL

The empirical model consists of three endogenous variables and four exogenous variables: the quantity of violations supplied, Vs, the quantity of violations demanded, Vd, and the price of violations, Pv, and the costs of sanctions, FINE, the degree of market power exercised by the NCAA schools, MKT, the potential loss to S/A of NCAA sanctions, GRANT, and the probability of being punished, PROB. The data includes 928 school violations observations from the period 1983–94.[41] Observations for Vi are taken from

41. In 1994, the NCAA enforcement regime experienced a dramatic change. Mandatory penalties for violations were eliminated and the organization switched to a "self-reporting" process for

the NCAA's Enforcement Summary of Division I Schools. Average annual professional salary data for each of the three sports serves as a proxy for S/A MRP while disaggregated scholarship expense data is used for the NCAA-sanctioned wage. It is expected that Pv will be positively related to Vs and negatively related to Vd.

The cost of sanctions, FINE, is measured as the marginal increase or decrease in television revenues earned by each school lagged one year. The method adopted follows that used in Fleisher, et al. It is expected that schools coming off of a losing season will be more likely to cheat, suggesting an inverse relationship between FINE and Vs. The market power variable, MKT, is captured by a ratio of graduation rates. A value for the ratio greater than one signals relatively more monopsony power while values less than one signal relatively less monopsony power. The relationship between MKT and Vs is expected to be positive. The potential sanction faced by S/A, GRANT, is the average net present value of the basic grant multiplied by the number of S/A for each sport. Finally, the probability of punishment, PROB, is estimated from the NCAA data on enforcement. A ratio of punishments to estimated violations (weighted by the change in winning percentage from the previous year) serves as a proxy for this effect. Table 1 lists the variables employed in the model and their definitions. Table 2 reports summary statistics on the data set.

The original sample included the observations from NCAA Division I-A football, basketball, and baseball teams from the Atlantic Coast, Big East, Big West, Big Ten, and (then) Big 8 conferences. Aggregating across sports may assume some type of administrative-level complicity that is unrealistic. Yet, anecdotal evidence suggests that—although decisions may not be made jointly between the Athletic Director and the Administration—each agent certainly benefits from more success versus less success of athletic endeavors. Consider the very recent case of the collaboration between ESPN and the University of Louisville. A variety of news reports detail increased enrollments, a wider cross-section of student applications, and increased donations.[42] Assuming linearity in the parameters, the model takes the form

$$Vs = a_{01} + a_{11}Pv + b_{11}MKT + b_{21}FINE + b_{31}PROB + b_{41}e_1$$
$$Vd = a_{02} + a_{12}Pv + b_{52}PROB + b_{62}GRANT + e_2$$

infractions. Due to this regime change and the football conference realignments that occurred in the late 1990s, this study examines a period of relative stability in NCAA structure and enforcement routines.

42. *See, e.g.*, Steve Eder, Richard Sandomir & James Andrew Miller, *At Louisville, Athletic Boom Is Rooted in ESPN Partnership*, N.Y. TIMES (Aug. 25, 2013), http://www.nytimes.com/2013/08/26/sports/at-louisville-an-athletic-boom-made-for-and-by-tv.html?hpw&_r=1.

$$Vs - Vd = 0$$

where Vs is the probability of supplying violations; Vd is the probability of demanding violations; a_{ii} are the coefficients for the endogenous variables; b_{ii} are the coefficients for the exogenous variables in each equation; and e_1 and e_2 are random error terms. Due to the simultaneous system and the censored data, a nonlinear maximum likelihood estimation process (simultaneous Probit) was used. Table 3 summarizes the results from this model.

Of interest in Table 3 is the significance of the coefficients on PRICE, PROB, and GRANT in the supply equation, V_s. PRICE and PROB have positive signs on their coefficients. The sign on FINE is negative as expected but FINE is not significant in this sample. This could be due to the fact that the expected punishment is effectively zero for most programs. Although it is highly likely the data simply did not capture the impact properly, there is anecdotal evidence suggesting penalties are typically not high enough to change the behavior of cheating programs.[43] A composite "penalty" variable was estimated as well (taking PROB multiplied by FINE); the coefficient was equally insignificant. GRANT is significant and of the expected sign. Results for FINE do not support the proposition that punishment deters crime in the NCAA. The sign on MKT is negative and the effect is not significant.

How meaningful are the estimated relationships in an economic sense? One way to think about the impact of these relationships is to consider a one standard deviation increase in the exogenous variable and observe the resulting change on the dependent variable. For example, if there is a one standard deviation in PRICE, what happens to the supply of violations, Vs? Table 4 shows these impacts. Clearly, for this sample, GRANT is most important in determining the overall level of violations, and PROB is not meaningful in an economic sense.

For Vd, all the estimated coefficients are significant. The economic impact of these estimated relationships are also listed in Table 4 with similar magnitudes. On the demand side, the positive sign on PRICE is somewhat curious. In the model, violations are supplied by schools and demanded by S/A. If violations are a "normal" good, we expect an inverse relationship between price and quantity demanded. These results suggest S/A actually increase the violations demanded as the price increases. Upon further reflection, this result may not be peculiar given the way price is measured. The negative sign on GRANT tells us that students desire fewer violations the larger the grant-in-aid

43. Indeed, Oklahoma State University coach, Mike Gundy, said, in January 2015, the $8,500 fine from their violations case had zero impact on their program. Bill Haisten, *OSU's Mike Gundy Reacts to NCAA Penalty: 'We Should Be Doing Cartwheels'*, TULSA WORLD (Apr. 29, 2015), http://www.tulsaworld.com/sportsextra/osusportsextra/osu-s-mike-gundy-reacts-to-ncaa-penalty-we-should/article_b9c34222-f267-56d1-aa73-7284018354d1.html.

offer is, other things the same. Since PRICE is being measured as monopsony rent (using grant-in-aid in the calculation), there is likely an endogeneity issue with the demand specification. Still, the empirical model of supply and demand suggests a “virtual” market for violations exists. Put differently, the demand for S/A labor generates a supply of violations by member schools and the supply of S/A labor generates a demand for violations by the S/A themselves.

In this market for violations, schools are first-movers. As members of the NCAA cartel, they have the most to gain from cheating on amateurism rules and offering illegal incentives to S/A. In order to investigate the robustness of the model on the supply side, a hybrid supply of violations was estimated using a Probit model with the addition of two interaction variables, PWRBB and PWRBK. These interaction terms were formed by multiplying the MKT variable by a dummy variable equal to 1 when a violation was recorded for a baseball program (PWRBB), and 0 otherwise, and a dummy variable equal to 1 when a violation was recorded for a basketball program (PWRBK), and 0 otherwise.[44] These results are summarized in Table 5. All the signs and magnitudes are robust to this model specification. The additions of the interaction terms seem to aid in identifying the influence of relative market power on the supply of violations. Other things the same, basketball programs “cheat” twice as often as baseball programs—a result the theoretical framework predicts.

V. Discussion and Conclusion

The results suggest a “virtual” market for violations exists. The supply of violations is directly related to price and relative market power of the sports involved and inversely related to the basic grant-in-aid. The demand for violations is inversely related to the basic grant-in-aid. Recently, the Power Five conferences (ACC, Big 12, Big Ten, Pac-12 and SEC) voted to allow payment of additional stipends to close the gap on cost of attendance. This creates a natural experiment of sorts; the model here predicts that increased stipend should result in a decrease in violations, ceteris paribus. Time will tell if this modest change to NCAA rules alters the behavior of cartel members and S/A.

Since the supply of violations is equivalent to a demand for quality S/A, a simple change of labels allows for investigation of the “twin” parallel market (i.e., the demand for quality S/A labor). Varying degrees of monopsony power affect the amount of cheating with the NCAA, thus information regarding the balance of market power within the cartel could lead to increased awareness of

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44. The ratio of graduation rates used to measure the relative monopsony power, MKT, alone may be too noisy a signal.

potential violators. For example, if a particular program appears to consistently attract top quality S/A, economic rents to the school should increase. These rents will show up in the form of larger facilities, larger staffs and, of course, higher salaries. The NCAA's enforcement team could create an index of "rents" earned and monitor the index for changes beyond some threshold level to signal potential recruiting violations.

The reciprocal nature of the supply and demand for violations opens the door to another set of conversations about NCAA amateurism rules. Because the supply of violations determinants can be reinterpreted as demand for S/A labor determinants, those interested in changing labor market conditions could find these results useful. For example, if the Northwestern players do eventually succeed in forming a players union, how will the demand for S/A labor be affected? Will cheating on NCAA rules increase if S/A are unionized? In addition, there are clear benefits of estimating a market-clearing price or illegal offer in the violations market. This information could be used to calibrate penalties for infractions, develop better enforcement tactics, and potentially predict the optimal amount of future grants-in-aid.

Cartels are (theoretically) unstable. There is an opportunity cost involved in the detection and deterrence of cheating. With better proxies for PROB, FINE, and MKT effects, a "forecast" for violations could be produced and a type of pro forma analysis for the NCAA would be possible. Better information about cartel member behavior can only improve competitive balance and cartel stability. By integrating the influence of the economics of crime models and the existing economics of sport and industrial organization studies of cartel behavior, this research contributes a new theoretical framework for studying the NCAA and other cartels—particularly those with monopoly power in the output market and monopsony power in the input market.

Table 1 Variable Names & Definitions

PRICE	S/A MRP – sanctioned wage is the natural log of (Avg. professional salary – avg. scholarship)
V	Qualitative variable equal to 1 if violation with enforced sanction occurred 0 otherwise
MKT	Ratio of general population graduation rate to S/A graduation rate
PROB	Ratio of punishments to estimated violations (weighted by change in winning percentage from prior year)
GRANT	The natural log of the average net present value of the basic scholarship multiplied by the number S/A for each sport (scaled)
FINE	Marginal increase or decrease in TV revenues earned by school lagged one year

Table 2 Summary Statistics

Variable	Mean	Min	Max	Std. Dev.
PRICE	4.49	1.22	8.32	1.94
V	0.05	0	1	0.22
MKT	0.702	0.0	1.68	0.34
PROB	0.023	0.003	0.343	0.024
GRANT	3.402	1.914	4.762	0.839
FINE	-0.048	-9.35	9.104	2.005

Data sources include: NCAA Enforcement Summary, NCAA News, College Football U.S.A., Chronicle of Higher Education, World Almanac, NCAA Annual Reports and the Athletic Departments of various DI schools. N=928

Table 3 Z stats are reported in parentheses. * =10%, **=5% ***=1% significance

Variable	Equation Vs	Equation Vd
Constant	-1.037	-1.232
	(-2.625)***	(-4.064)***
PRICE	0.108	0.096
	(1.807)*	(1.648)*
GRANT	-0.300	-0.273
	(-2.077)**	(-2.014)**
PROB	3.001	2.95
	(1.788)*	(1.777)*
MKT	-0.239	Not a rhs variable
	(-1.092)	
FINE	-0.003	Not a rhs variable
	(-0.086)	

Results from Simultaneous Probit model N=928

Table 4 Impact of 1 standard deviation increase in significant variables Supply of Violations (Vs), (Vd)

	(Vs)	(Vd)
PRICE	0.210	0.186
GRANT	-0.252	0.229
PROB	-0.018	-0.071

N=928

Table 5 Estimated models Supply of Violations,Vs, and Demand for Violations, Vd, Z or t stats are reported in parenthesis 10%=* 5%=** 1%=***

(1) Variable	(2)Vs Hybrid-	(3)Vs Probit	(4)Vd Probit
PRICE	0.121 (1.891)*	0.108 (1.807)*	0.096 (1.648)*
MKT	n/a	-0.239 (-1.092)	Not a rhs variable
FINE	-0.002 (-0.05)	-0.003 (-0.086)	Not a rhs variable
PROB	3.063 (1.819)*	3.001 (1.788)*	2.95 (1.777)*
GRANT	-0.369 (-1.883)*	-0.300 (2.077)**	-0.273 (-2.014)**
PWRBB	0.728 (1.840)*	n/a	n/a
PWRBK	1.447 (2.379)**		

Results from Probit model of a "hybrid" supply expression with baseball and basketball dummy variables are presented in Column (2). Columns (3) and (4) are the original Probit results from Table 3 for comparison. Additional information about the results is available from the author by request.

Figure 1
The production of sports entertainment requires the use of S/A labor. The demand for this labor, Ds/a gives rise to the production of Violations, Vs

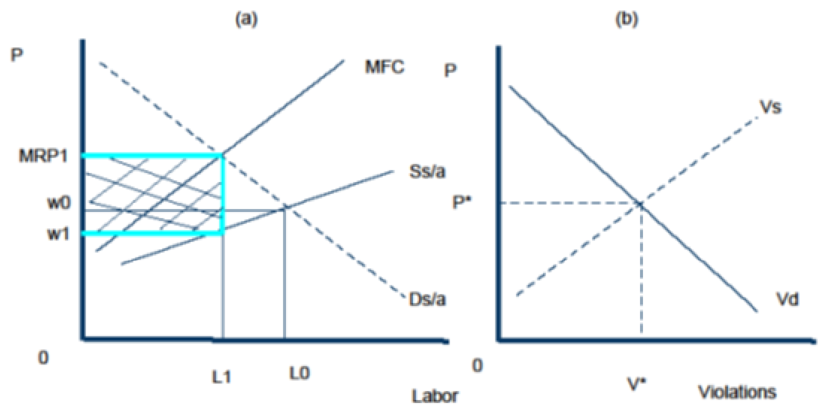

Figure 2

The offer curve, OU, illustrates the willingness of a school to offer violations to secure better quality S/A. The rays, OP, OP', OP" reflect the terms of trade between quality and violations.

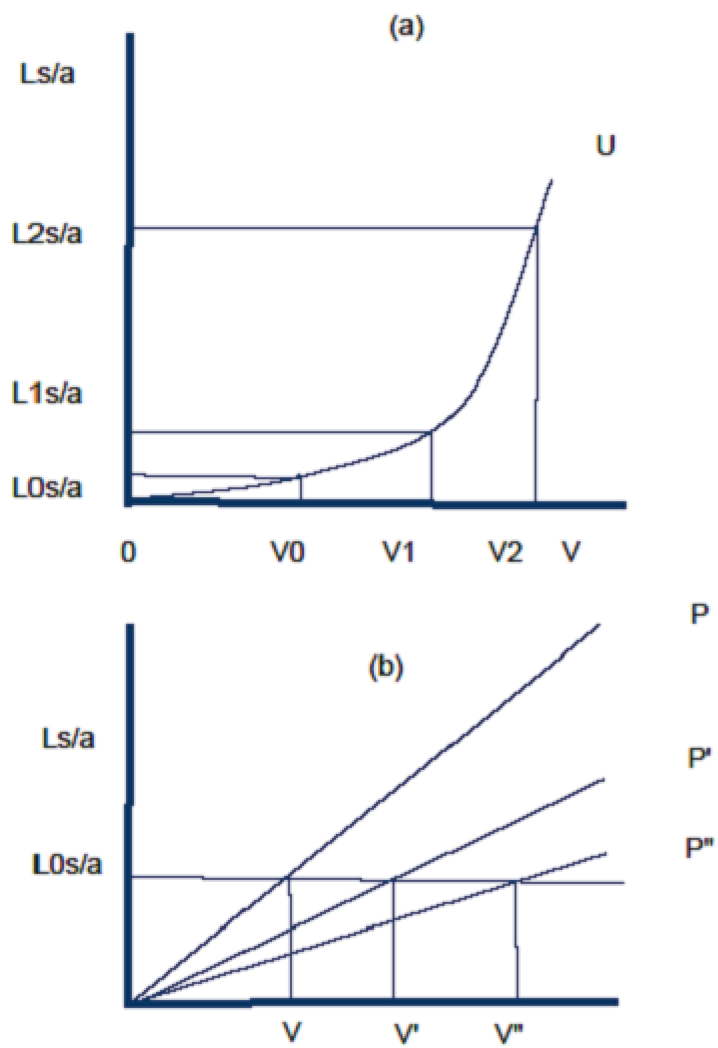

Figure 3
The demand for S/A labor results in the supply of violations.

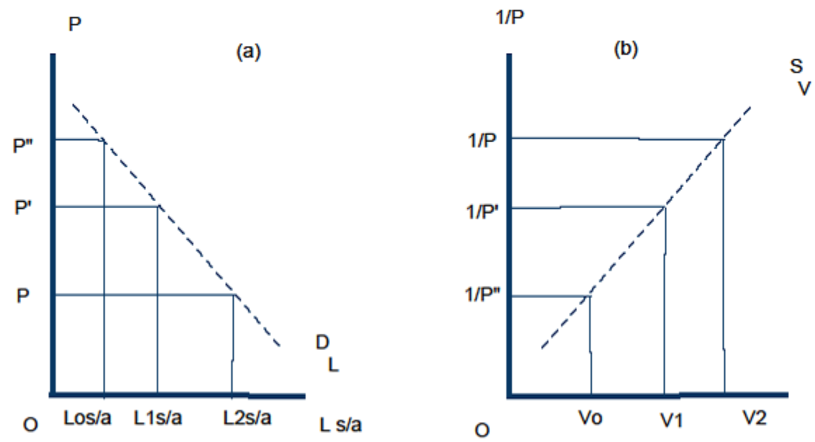

Figure 4

The offer curve, OA, reflects the willingness of a S/A to exchange labor for violations. As the offer curve rotates to the right, more violations are required to secure the same amount of quality labor.

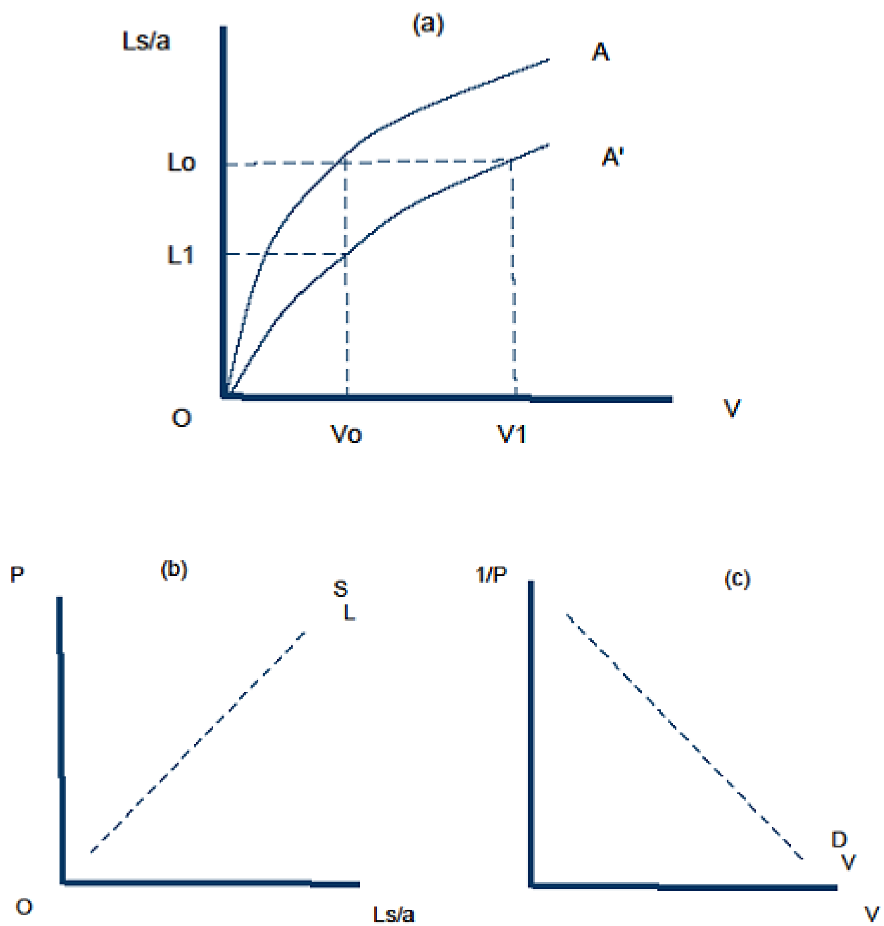

Figure 5
The intersection of the offer curves, OU and OA, defines an equilibrium in both the labor and violations market.