

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

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Abstract

The National Collegiate Athletic Association (NCAA) acts as a cartel with monopsony power in the market for student-athletes. This paper models the demand for student-athlete labor using a reciprocal demand model. The reciprocal demand translates into a supply of violations (or cheating) on the NCAA cartel agreement. A theoretical foundation for this simultaneous system is created and an empirical model is estimated using a maximum likelihood estimator on violations data from Division IA basketball, baseball, and football programs from 5 conferences. Results suggest market power is significant in explaining some of the variation in the supply of violations. Since detecting and deterring cheating is costly, information about the supply of violations is useful.

JEL Classifications: D43, L13, J42

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Though many students and college sports fans tend to reject the notion, most sports economists agree: the NCAA is a cartel. Cartels are interesting for a variety of reasons. This paper examines two of the more fascinating features of cartels: the necessity for agreements to retain extra 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), another framework for observation incorporates theories of criminal behavior following Becker (1968). Within this framework, the choice variables are different. Instead of modeling the firm's decision as choosing output to maximize profit, violations are chosen to maximize winning percentages (and economic rents) from the increased shares of cartel profits. In this way, a supply of violations is generated in lieu of 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 Mill-Edgeworth-Marshall reciprocal demand model to illustrate the willingness of NCAA member schools to exchange rules violations for high-quality S/A labor. An empirical model is developed from the theoretical framework and a supply of violations function is estimated. Contributions from this research include:

- the joining of two distinct threads of scholarship--the economics of sport and the economics of crime--together with industrial organization and cartel theory;
- the introduction of the reciprocal nature of the supply of violations and the demand for S/A labor which can be generalized to the supply of cheating (or offenses) and the demand for high-quality inputs more broadly in other

organizational contexts;

- The identification of monopsony power as a significant determinant of the supply of violations, or cheating, within the NCAA specifically and other cartels potentially.

A rapidly growing literature exploring the economics of sport together with contributions from the economics of crime and industrial organization influence this paper. The economics of sport literature can be usefully split between input market analysis and output market analysis. Since the NCAA acts as a monopsonist in the input market and colludes in the output market, the last few decades provide a number of papers on the NCAA and its behavior. Koch (1971) 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. All of the above behavior was typical of any cartel according to Koch. He describes the member college as a firm, games played between it and rival teams as output, and considers the university a multiproduct firm with differentiated products. 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 S/A. This power enables him or her to earn positive rent.

Kahn (2007) explored cartel behavior and amateurism in college sports. He concludes college programs extract rents from revenue-producing S/A by limiting their pay and requiring amateur status. Estimates of the exploitation of top-tier college athletes have been made by Brown and Jewell (2004 and 2006) and Brown (1993). Estimates of marginal revenue products of draft-quality athletes compared to actual compensation of S/A shows how the NCAA uses its

cartel power to pay top performers less than their market values. These results were suggested by Fleisher, Goff, and Tollison (1992) and Zimbalist (1999).

The NCAA exhibits so many “classic” cartel characteristics it is literally a textbook case. Browning and Browning (1989) use the NCAA as an example of a buying cartel in their intermediate theory text. Carlton and Perloff (1990) describe four factors that aid in the detection of cheating in a cartel and they--together with Fleisher, Goff, and Tollison (1992)--point out the NCAA is subject to lumpy entry conditions. This creates a unique first mover problem (high start-up costs for the firm school to break away from the cartel). Monitoring of the cartel agreement has been studied by Humphreys and Ruseski (2009). They develop a dynamic model under incomplete information and recognition lags to explain the self-monitoring behavior in the NCAA football cartel.

Less prominent in the literature surrounding the NCAA’s behavior is scholarship linking the behavior of the NCAA with the influence of the economics of crime. Becker (1968) wrote the seminal piece in this area. Through a basic optimization approach, Becker develops a supply of offenses function with marginal cost of cheating, the probability of arrest and conviction, and the marginal benefit of cheating. Together with Landes (1974) Becker argues the applied principle of scarcity causes rational economic agents to weigh the costs and benefits of legal and illegal behavior. Erlich (1973) also develops a supply of offenses function via a one-period uncertainty model. His model differs in the explanatory variables from Becker’s approach and shows that crime and legal activities are not mutually exclusive; an optimal activity mix exists.

This paper is influenced most heavily by the economics of crime literature. Cheating--whether on a midterm, on the basketball court, or on NCAA recruiting rules--can be modeled as a rational choice. The ability to detect and deter cheating becomes useful for teachers, referees, and cartels alike.

II. Method

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 won/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, $MRP_{S/A} = (\delta R/\delta\rho) * (\delta\rho/\delta L_{s/a})$.

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 is the quantity of high-quality S/A demanded and vice versa. This relationship is depicted in Figure 1 panel (a). It should be emphasized 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.

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 will 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. Generically, the latter are recruiting violations. These unsanctioned offers then become part of the demand for S/A labor. Formally, the S/A demand function can be expressed as:

$DL = DL(\text{GRANT}, P_{\text{other}}, V, \rho)$, 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., $\delta DL / \delta \text{GRANT} < 0$. 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 won/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. A more typical approach 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). While the latter is more traditional, the former reflects the influence of criminal behavior models acknowledged in the introduction. In the pursuit of better won/loss records and the higher rents 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 (as interpreted graphically by Edgeworth and Marshall) 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 since 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 L_0 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, a la Mill/Marshall, will be at the intersection of OU and OP . Taking all alternative terms-of-trade (price) lines and finding the OP/OU intersections produces 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 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 which 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 (forsaken television revenues, etc) 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:

$$V_s = V_s(P_v, \text{MKT}, \text{FINE}, \text{PROB}, \text{GRANT})$$

Where V_s is the quantity of violations supplied; P_v 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:

$$\delta V_s / \delta P_v > 0,$$

$$\delta V_s / \delta \text{MKT} > 0$$

$$\delta V_s / \delta \text{FINE} < 0 \text{ and}$$

$$\delta V_s / \delta \text{PROB} < 0$$

$$\delta V_s / \delta \text{GRANT} < 0$$

The price of violations, P_v , represents the marginal rent the school gains from cheating (the distance between the demand curve and w_1 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 P_v 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: $U = U(Y_1, Y_i)$ where utility, U , is a function of Y_1 , income earned from the selection of a college sports program, and Y_i , income earned from alternative employment opportunities. Neoclassical economic theory assumes the relationships between these variables are such that $\delta U / \delta Y_1 > 0$, $\delta^2 U / \delta (Y_1)^2 < 0$, $\delta U / \delta Y_i > 0$, and $\delta^2 U / \delta (Y_i)^2 < 0$. The income defined by Y_1 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. Since 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 Mill-Edgeworth-Marshall 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, D_v 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:

$$V_d = V_d(P_v, \text{GRANT}, \text{PROB})$$

where P_v 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:

$$\delta V_d / \delta P_v < 0,$$

$$\delta V_d / \delta \text{GRANT} < 0,$$

$$\text{and } \delta V_d / \delta \text{PROB} < 0.$$

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. The relationship between the willingness to cheat and the price of violations is somewhat convoluted, since the price of violations is defined in terms of the benefit to the school (the difference between the marginal revenue product of S/A and the payments to S/A) of violating NCAA regulations.

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 school 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, in a Mill-Edgeworth-Marshall framework, 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. The applied model will deal solely with the violations market. Once supply and demand functions for violations are estimated, hypothesis tests can be performed. The results of these tests can be extended to in the input market.

III. Data and Empirical Model

The empirical model consists of three endogenous variables and four exogenous variables: the quantity of violations supplied, V_s , the quantity of violations demanded, V_d , and the price of violations, P_v , 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.

There are 928 observations across 7 variables in the sample data. Observations for V_i , are taken from 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 P_v will be positively related to V_s and negatively related to V_d .

The cost of sanctions, FINE, is measured as the marginal increase or decrease in television revenues earned by each school lagged on year. The method adopted follows that used in Fleisher, et al. (1992). It is expected schools coming off of a losing season will be more likely to cheat suggesting an inverse relationship between FINE and V_s . 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 V_s 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 Div IA football, basketball, and baseball teams from the Atlantic Coast, Big East, Big West, Big 10, and (then) Big 8 conferences. The initial data set spans the time period from 1983-1991. The data is older; however, this period is a relatively stable one in terms of NCAA enforcement procedures and football conference compositions. Incorporating more recent observations could very well improve the analysis, but modeling the structural breaks properly could be the subject of an entirely different paper! For this reason, an older but stable sample period was selected. 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.¹ In light of the complimentary nature of these agents and in order to capture the variation in degree of monopsony power, the initial sample is aggregated.

Assuming linearity in the parameters, the model takes the form:

$$V_S = a_{01} + a_{11}P_V + b_{11}MKT - b_{21}FINE - b_{31}PROB + b_{41}e_1$$

$$V_D = a_{02} + a_{12}P_V - b_{52}PROB - b_{62}GRANT + e_2$$

$$V_S - V_D = 0$$

where V_S is the probability of supplying violations, V_D is the probability of demanding violations, a_{ii} are the coefficients for the endogenous variables and b_{ii} are the coefficients for the

¹ See <http://insiderlouisville.com/news/2013/08/26/nytimes-features-louisville-sports/> for one example

exogenous variables in each equation, and e_i 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 is positive as expected confirming, but PROB is positive also. It is suspected since FINE is not significant in this sample that the expected punishment is effectively zero for most programs. This could potentially explain the sign. 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. 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. The sign on MKT is negative and the effect is not significant. For, V_d , all the estimated coefficients are significant, but PRICE is positive and so is sign on PROB. At best, the combined results weakly support the notion of a demand and supply of violations. In fact, the results are more indicative of a supply relationship than a demand relationship. In order to test the robustness of the results 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 formed by multiplying the MKT variable by a Dummy variable =1 when a violation was recorded for a baseball program, 0 otherwise and the same for basketball). Next, an inverse supply of violations was estimated (PRICE as the dependent variable and V on the right hand side) using a Panel Weighted Least Squares estimator for comparison. These results are summarized in Table 4.

The WLS estimator of the inverse V_s produces the strongest results in terms of explanatory power (R-squared .878) and estimated coefficients on 5 of the 7 variables significant at the 1% level. FINE and PROB are not significant in this specification; however, as discussed

above, they are likely too small to make a difference in the sample. By comparison, the simultaneous and hybrid probit models are quite weak. Humphreys and Ruseski (2009) and others acknowledge the very small number of observed violations in NCAA enforcement data. With only 47 violations across this sample period, the 1s observed are dwarfed in number by the 0s which dampens any predictive ability of this model as currently specified.

Still, even with a relatively mixed bag of empirical results, the WLS model seems to support the central thesis of a supply of violations (a positive and significant relationship between PRICE and V) with relative market power influencing this relationship (the coefficient on PWRBK is twice as large as PWRBB). Given these findings, additional work on the supply parameters is warranted.

III. Extensions and Conclusions

The results seem to suggest a “market” for violations exists. The supply of violations is directly related to a price and monopsony power. Since the supply of violations is equivalent to a demand for quality S/A, a simple change of labels allows investigation of the intuitive parallel market (the demand for quality S/A labor). Since varying degrees of monopsony power affect the amount of cheating with the NCAA, information regarding the balance of market power within the cartel could lead to increased awareness of potential violators. For example, if a particular program appears to consistently attract top quality S/A by flexing its market power, economic rents to the school should increase. 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. In addition, the model could be adapted to any other monopsonistic industry (health care for example).

Another useful application of this research is the establishment of the reciprocal nature of

supply and demand violations. Since the supply of violations determinants can be reinterpreted as demand for S/A labor determinants, interesting questions regarding the demand for S/A labor can be explored. The benefits of estimating a market-clearing price or illegal offer within the market for violations could lead to better policy decisions for the NCAA with respect to S/A grants and enforcement trends. By introducing the criminal behavior perspective, an alternative approach to traditional labor market analysis is developed as well.

Recently, the increased availability of Geographic Information Systems (GIS) has made it easier for economists to explore spatial patterns and relationships theoretically and empirically. There is terrific potential for additional research on the supply of violations and the demand for S/A labor with the addition of GIS (updating the powerful research of geographers of sport like John F. Rooney, Jr., for example). One extension of the model could include a spatial variable to estimate the impact of distances on cheating (within conferences and across conferences).

Cartels are (theoretically) unstable. There is an opportunity cost involved in the detection and deterrence of cheating. One application of this research could result in the development of a “forecast” for violations based on market power and pricing of violations. By updating the sample data and finding better proxies for the PROB, FINE, and MKT effects, it could be possible to conduct a type of *pro forma* analysis for the NCAA. Would it be valuable to predict which schools are most likely to cheat? Considering the reciprocal demand for S/A labor, can a market-clearing price, or illegal offer, be determined? What are the implications of a change in the degree of monopsony in the various professional sports? For example, if the leagues vertically integrate into the NCAA input markets, will cheating increase or decrease? 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
PWRBB PWRBK	Interactive variables = MKT multiplied by dummy = 1 when V occurred in the sport 0 otherwise (BB = baseball, BK = basketball)

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

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

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

Predictions ratio for Model =1.0

Akaike Criterion 376.79

Table 4 Z or t stats are reported in parenthesis 10%=* 5%=** 1%=***

Variable	Vs Hybrid-- Probit	Vs (Inverse)-- WLS	Vs – Probit	Vd Probit
PRICE	0.121 (1.891)*	n/a	0.108 (1.807)*	0.096 (1.648)*
MKT	-1.112 (-2.601)***	2.00 (18.33)***	-0.239 (-1.092)	Not a rhs variable
FINE	-0.002 (-0.05)	0.001(0.004)	-0.003 (-0.086)	Not a rhs variable
PROB	3.063 (1.819)*	0.508 (0.453)	3.001 (1.788)*	2.95 (1.777)*
GRANT	-0.369 (-1.883)*	2.69 (51.16)***	-0.300 (2.077)**	-0.273 (-2.014)**
V	n/a	0.353(3.745)***	n/a	n/a
PWRBB	0.728 (1.840)*	-0.97 (-9.45)***	n/a	n/a
PWRBK	1.447 (2.379)**	-2.89(-19.77)***		

Predictions ratio = 1 R-squared .878 Predictions ratio = 1

Akaike Criterion 373.99

Akaike Criterion 376.79

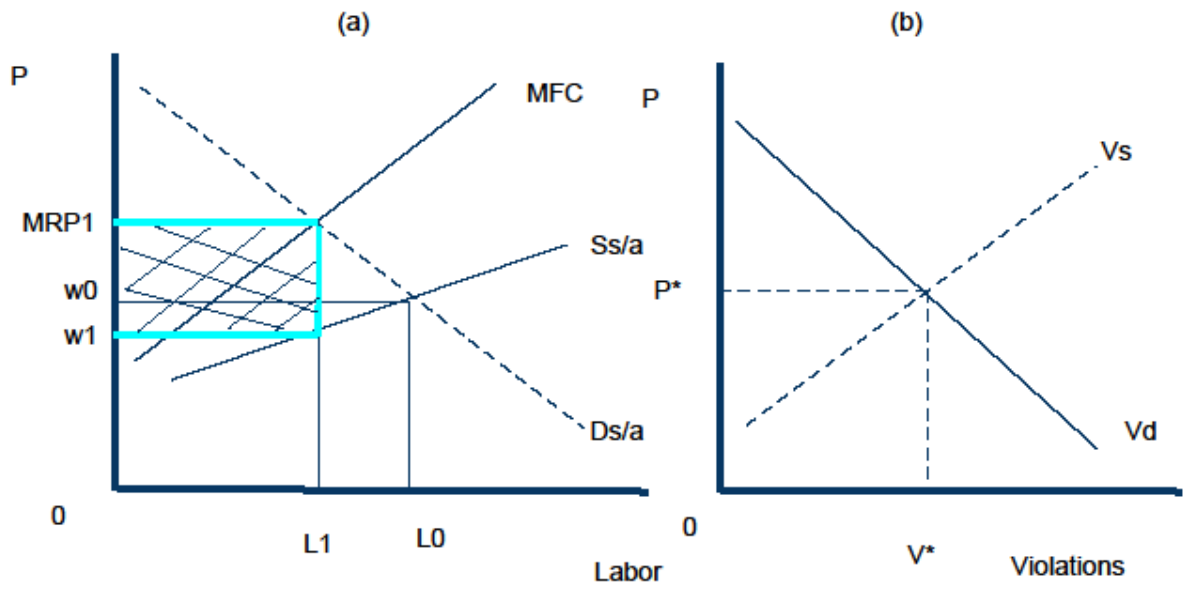


Figure 1
 The production of sports entertainment requires the use of S/A labor. The demand for this labor, Ds/a gives rise to the production of Violations, Vs

Figure 2

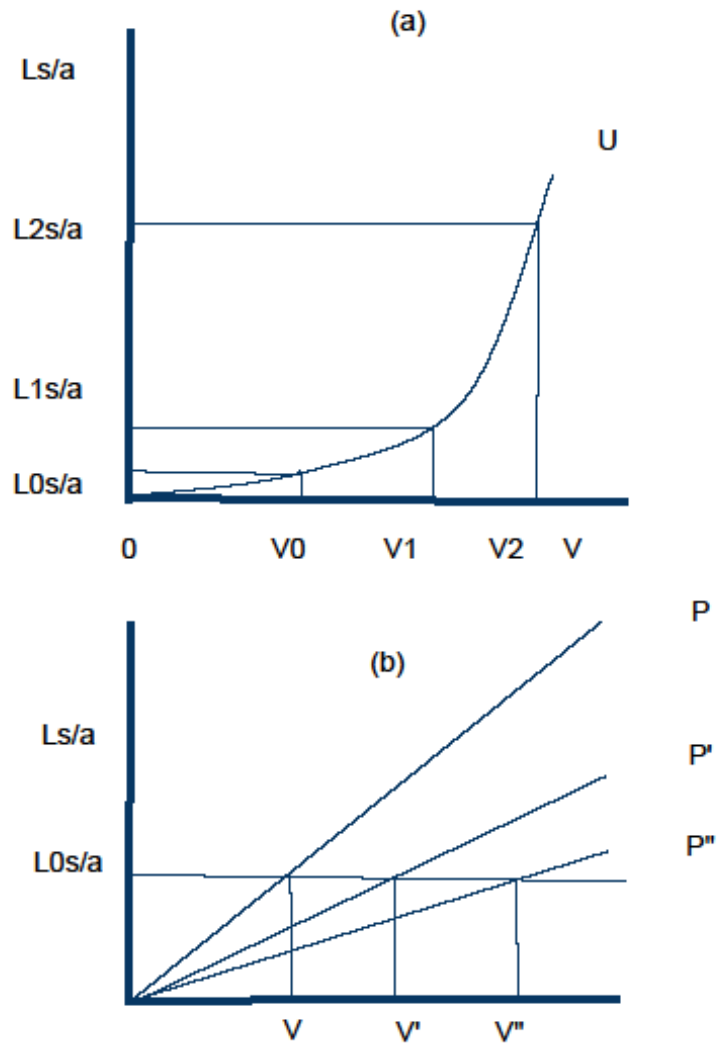


Figure 2 The offer curve, OU, illustrates the willingness of a school to offer violations to secure better quality S/A. The rays, OP, OP', OP'' reflect the terms of trade between quality and violations.

Figure 3

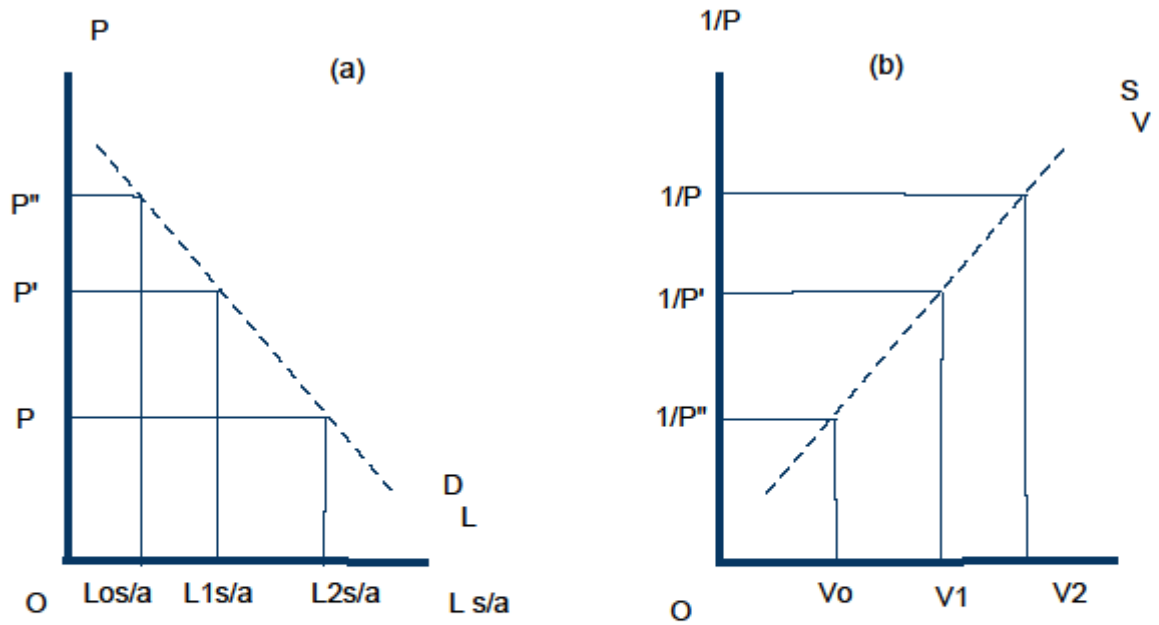


Figure 3
The demand for S/A labor results in the supply of violations.

Figure 4

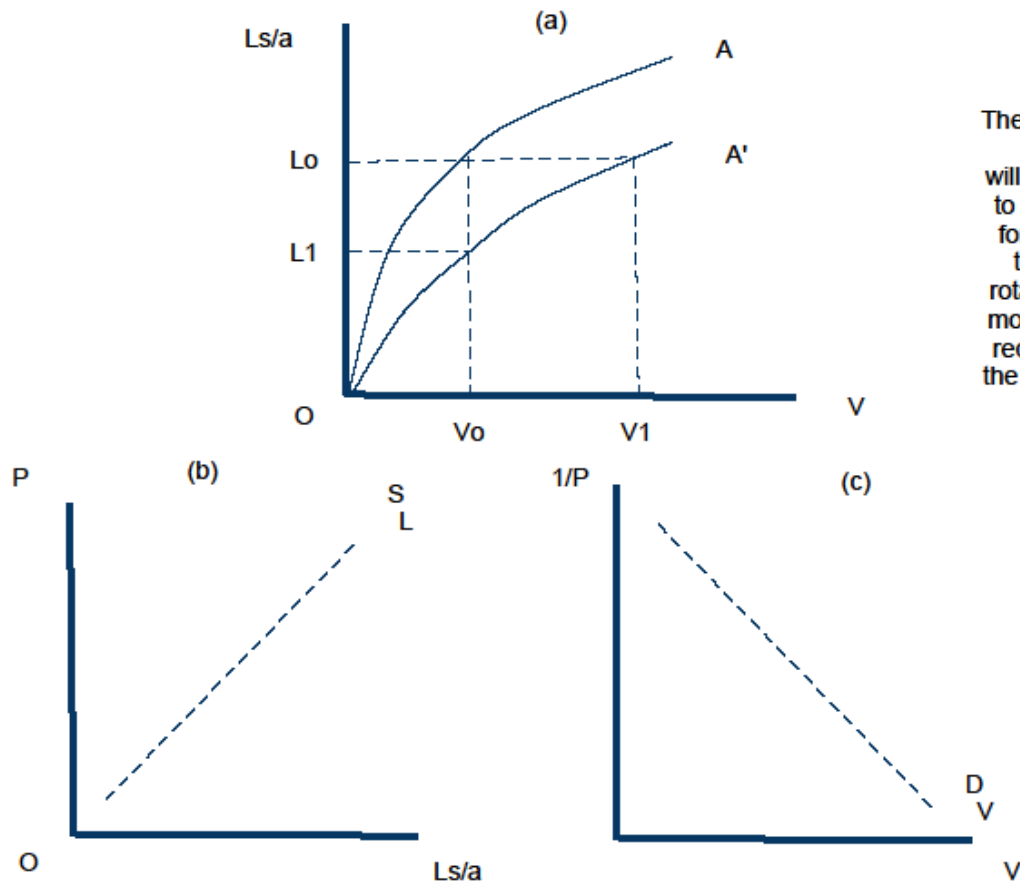


Figure 4
The offer curve, OA , reflects the willingness of a S/A to exchange labor for violations. As the offer curve rotates to the right, more violations are required to secure the same amount of quality labor.

Figure 5

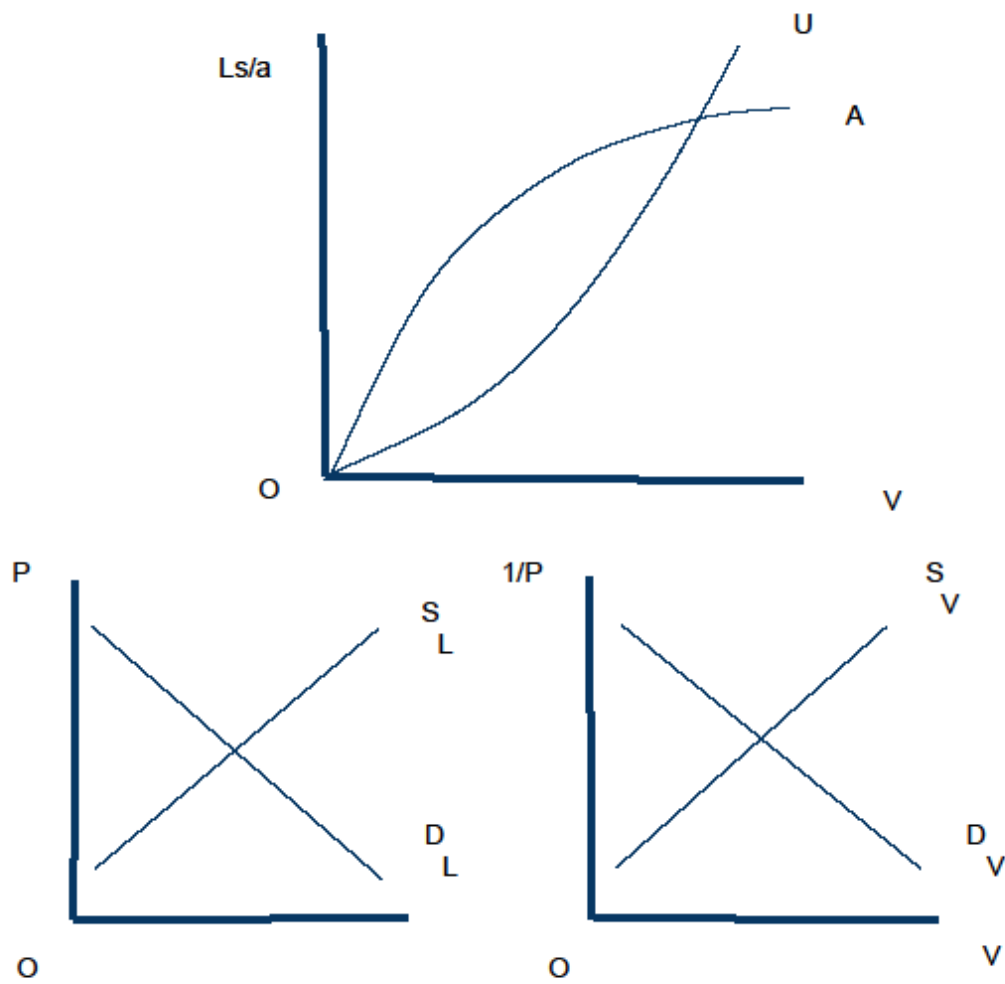


Figure 5
The intersection
of the offer
curves, OU and
 OA , defines an
equilibrium in
both the labor
and violations
market.

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