

**THE END OF COLLUSION?:**  
**Competition after Justice and the Ivy League Settle**

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**Abstract:** Under the December 1993 settlement between the Ivy League and MIT and the Department of Justice on price-fixing charges, the schools were able to continue much of their behavior in coordinating financial aid awards. Rather than disbanding the cartel, the settlement changed the rules by which the cartel operated.

I empirically analyze whether the settlement had any impact on pricing, earnings from tuition, and financial aid outcomes. I find that after the settlement, the average market price to non-needy students, to needy students, and tuition revenue earned per student all rise. Schools that adopt need-only financial aid policies raise the price to non-needy students and earn even more tuition revenue per student relative to schools that award merit-based aid. However, they decrease the price charged to needy students, so that after the settlement they charge a lower needy price than do schools that award merit aid. Those schools that cooperatively implemented their need-only financial aid policy before the lawsuit do not price any differently than other types of schools after the settlement, except that the price charged to meritorious students rises dramatically. In general, financial aid awards became more generous – at all schools, more students receive scholarship aid, regardless of the basis for the award, and more scholarship aid is spent per student. It appears that the settlement increased price competition for some students at the expense of other students; schools seem to have become more aggressive in utilizing price discrimination.

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In December 1993, MIT and the Department of Justice reached an out of court settlement in a case in which Justice accused the Ivy League and MIT of conspiring to restrain trade through horizontal price-fixing in violation of the Sherman Antitrust Act. Briefly, the Ivy League and MIT adopted what is termed the Overlap process for awarding financial aid. Member schools collectively adopted a policy of awarding financial aid only on the basis of need and of meeting each spring to jointly determine a student's family contribution towards college costs if the student was admitted to more than one of the Ivy Overlap schools; thus, financial aid recipients faced the same net price at all Ivy Overlap schools. Under the terms of the settlement, the schools can continue much of the contested behavior as long as they meet the full financial need of their students, who must be admitted on a need-blind basis. Two notable actions are disallowed: (1) the schools cannot agree on financial aid awards prospectively and (2) they cannot discuss or agree on the division of the financial aid package between grant (scholarship) aid and self-help aid.<sup>1</sup> Section II discusses the financial aid process and legal history in more detail.

I empirically examine the effects of the settlement on pricing, tuition earnings, and financial aid outcomes. Considering the history of cooperation and that much of the contested behavior is allowed under the settlement, one might hypothesize that behavior and outcomes have not changed. That is, the cartel may operate as efficiently as ever. On the other hand, the Ivy Overlap schools argued vehemently that ending the Overlap process would lead to an explosion in competition for the very best students at the expense of needy students. In that case, one would expect to see lower prices and more generous financial aid awards.

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<sup>1</sup> Self-help aid refers to subsidized loans and work-study aid.

Section III discusses the inferences that can be drawn from the theory regarding the effect of the settlement. Essentially, the settlement increased the ability of schools to deviate from the cooperative agreement without being detected. Thus, the benefit relative to the cost of cheating may have increased sufficiently to encourage deviation, in which case we would expect to see an increase in the degree of price competition between Overlap and other schools. Such an increase in competition should result in lower prices, lower tuition revenue earnings, and more generous financial aid awards. If the settlement was not sufficient to destabilize the cartel, then we would find that prices, tuition earnings, and financial aid outcomes would be unchanged.

Section IV motivates the empirical test. Reduced form equations for the price to non-needy students, to needy students, to meritorious students, and to financial aid recipients, tuition revenue earnings per student, financial aid availability, and financial aid expenditures are estimated.<sup>2</sup> I describe the sample and the data in section V.

I present the results in section VI, and conclude in section VII. The results indicate that the settlement had a complicated impact. Prices to non-needy students, to needy students, and the average across all students increased. Schools that adopted a need-only financial aid policy, including Overlap schools, eliminated the price charged to meritorious students relative to that charged by schools that award merit-based aid, suggesting that price competition for meritorious students increased. They also reduced their price to needy students below that charged by merit schools. At the same time they increased the price premium to non-needy students, and this price increase was sufficient to increase tuition revenue earnings per student. Financial aid awards in general became more available and more generous. However, financial aid in the form of scholarships was less available at need-only schools relative to at merit schools after the settlement. Need-only schools spend less on scholarship aid than do schools that offer merit-based aid, but that difference is unchanged by the settlement. Schools that coordinate their financial aid awards behave no differently than need-only schools in terms of financial aid availability and in terms of financial aid generosity. It appears that the settlement shifted price competition in favor of

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<sup>2</sup> I use the term “meritorious student” to refer to any student who would receive merit-based financial aid were it offered. Merit-based financial aid can be offered to reward some talent of the student (academics, music, art, athletics) or some other characteristic of the student (*e.g.*, belonging to a certain ethnic group or club).

some students at the expense of others. As such, the welfare effects are ambiguous.

## II. Brief Overview

In this section, I describe financial aid policies and the changes brought about by the lawsuit and subsequent legislation. I broadly group schools into three categories based on their financial aid policies: the Overlap schools, the independent need-only schools, and the (independent) merit schools. The Overlap schools cooperatively adopted a policy of awarding financial aid only on the basis of need and cooperatively determined the financial need of commonly admitted students.<sup>3</sup> Of the schools that adopt and implement their financial aid policies independently, some award financial aid only on the basis of need while others offer merit-based awards as well. The major facts and timing are presented in Figure 1.

Briefly, the Overlap process consists of the following. Members of each Overlap group would each determine the family contribution of each admitted student based on commonly agreed upon principles. The total financial aid package consisted of the difference between the school's student budget (tuition and fees, room and board, books and other expenses) and the family's contribution towards education. Each spring, the schools met to discuss the financial situation of any student for whom the schools' calculated family contribution differed by \$500 or more; Bamberger and Carlton (1999) report that initial disagreements arose in about ten to twenty percent of the cases. At the meetings, the schools would agree upon a common family contribution.

The appendix includes most of the consent decree signed by MIT in December 1993, which is also binding on the Ivy League schools. The final settlement allows colleges and universities to legally continue much of the originally contested behavior. In order to cooperate, schools must admit students on a need-blind basis; that is, the schools must decide whom to admit without regard to the applicant's financial status.<sup>4</sup> All of the charged schools and most if not all of the highly ranked schools adhere to this principle.<sup>5</sup> The second condition

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<sup>3</sup> The schools in each Overlap group are identified in Table 1 below.

<sup>4</sup> Schools may consider an applicant's financial status when admitting students from a waitlist.

<sup>5</sup> All of the schools had a need-blind admissions process before the settlement, and most also met the full need of admitted students. The National Association of College Admission Counselors reports that, in 1994, 91% of surveyed colleges and universities report that the institution is 100 percent need-blind until May 1, and 86% report that they are need-blind after May 1.

## Figure 1: Time Line

**Late 1950s.** The Overlap process for awarding financial aid begins. Members in the Overlap groups meet each spring to discuss prospective financial aid awards to commonly admitted applicants.

**May 1989.** The government investigation into financial aid practices becomes public.

**Spring 1991.** The last meetings of the Overlap groups occur.

**May 1991.** The Department of Justice formally charges the members of the Ivy League and MIT of violating the Sherman Antitrust Law by restraining trade with their financial aid policies. The Ivy League members immediately sign a consent decree; MIT proceeds to trial.

**July 1992.** The Higher Education Amendments of 1992 becomes law. It allows colleges and universities the right to cooperate in awarding financial aid without any “inference of unlawful contract, combination, or conspiracy” to be drawn. Schools are not allowed to discuss prospective financial aid awards to commonly admitted students. The provision expires on September 30, 1994.

**September 1992.** The District Court judge rules against MIT. The judge applies a (very) limited rule of reason standard; he briefly considers, and rejects, MIT’s claims that the financial aid policy had socially beneficial effects.

**September 1993.** The Appellate Court remands the case. The Appellate Court finds that the financial aid policy should be evaluated under a full Rule of Reason.

**December 1993.** MIT and the Department of Justice settle out of court. Both sides claim victory.

**October 1994.** The Improving America’s Schools Act of 1994 essentially legislates the provisions of the consent decree signed by MIT and the Department of Justice on a temporary basis, to expire September 30, 1997.

**September 1997.** The Need-Based Educational Aid Antitrust Protection Act of 1997 slightly amends the Improving America’s Schools Act of 1994, and extends the expiration date to September 30, 2001.

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requires that the schools meet the full financial need of matriculated students. The Overlap schools argued that at least part of the goal of the Overlap process was to allow the schools to achieve exactly this objective, so presumably the schools do not find these conditions objectionable.

Schools that meet the conditions described above can cooperate in formulating financial aid policies and methods of implementation. They can agree to award financial aid only on the basis of need. They may agree on the formulae used to calculate a student’s family contribution and they may jointly formulate financial aid forms. However, the settlement specifically allows schools to use their own judgment in determining a student’s family contribution and allows the schools to request and use information in addition to that requested on jointly authored financial aid forms. In other words, the schools can agree in principle on how to award financial aid, but they can also deviate from the agreement if they so desire.

The amount and type of information that can be exchanged changed significantly under the settlement. Before financial aid awards are made, schools may exchange financial

data for commonly admitted students; thus, all schools can make financial aid awards based on identical information. After financial aid awards are made, an independent third party may distribute summary information regarding financial aid awards. For each pair of schools, schools can be notified of the number of cross-admitted applicants who receive financial aid and the number of cross-admitted applicants “for whom the family contribution of one school exceeds the family contribution of the other school by at least (a) 20%, and (b) 50%, of the average family contribution” of all applicants who receive aid across all cooperating schools. Thus, participating schools would receive some information allowing them to identify participating schools that deviate substantially from agreed upon principles of financial aid. In addition, schools could be notified for each cooperating school the number of students whose family contribution and financial aid exceeded or fell short of the school’s student budget. The former would indicate that the school was deviating from awarding financial aid on the basis of need only and the latter would indicate that the school is not meeting the full financial need of its applicants.

Finally, the settlement limits the degree of cooperation. The schools cannot discuss or agree upon family contributions expected from individuals. However, the effect of not being able to *discuss* family contributions of individuals may not be large. First, schools are allowed to exchange financial information from applicants before financial aid awards are made. Thus, all schools could have exactly the same financial information for each individual. Second, the schools can jointly determine the formulae from which to calculate the family’s contribution to higher education costs. Therefore, in principle, there should be no differences in calculated family contributions, even if discussion of individual cases is not allowed. According to Bamberger and Carlton (1999), the disagreements that were discussed at the annual spring Overlap meetings occurred either because the schools had different financial information or because the schools had differential ability to analyze “complicated financial holdings.” Exchange of individual financial information through a third-party could solve the first problem, and jointly determining how to evaluate complicated financial holdings could solve the other. Thus, the amount of information exchange and cooperation in formulating policies allowed under the settlement may have made annual meetings redundant. On the other hand, since the settlement allows financial aid officers to use “professional judgment”

## Figure 2: Significant Terms of the Settlement

### Conditions for Cooperation:

Practice need-blind admissions.

Provide financial aid sufficient to meet the full need of all students.

### Extent of Cooperation:

Schools may jointly agree to award financial aid on the basis of need only.

Schools may jointly determine principles of need analysis, but they may not eliminate the professional judgment of individual financial aid officers.

Schools may jointly develop financial aid forms, but remain free to request additional data.

### Data Exchange:

Before financial aid awards are made, schools may exchange financial data on commonly admitted students.

After financial aid awards are made, an independent third party may disclose to the schools:

The number of commonly admitted students for whom the family contribution of one school exceeds to family contribution of the other school by at least 20% and 50% of the average family contribution of all students receiving aid.

The number of commonly admitted students for whom the family contribution plus financial aid award exceeded and fell short of the school's student budget.

### Prohibitions:

Schools may not discuss family contributions of individual students.

Schools may not discuss the mix of grants and self-help.

Schools may not discuss prospective tuition levels.

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in awarding financial aid, differences in expected family contribution can vary across schools.

In addition, cooperating schools may not discuss or agree on the form of financial aid, that is whether aid is in the form of grant aid or self-help aid. According to Bamberger and Carlton (1999), some Overlap schools agreed on the division of financial aid between grant aid and self-help, while other Overlap schools did not. It is therefore unclear how much of an influence this prohibition may have. Shortly after the lawsuit was brought, newspapers began reporting that competition in financial aid was becoming more intense,

but no evidence (or even anecdotes) was given. Beginning in January 1998, competition did heat up immensely, in both the methods used to determine a student's financial need and the form in which such need would be met. However, this increase in competition did not occur until over four years after the case was finally settled, and seems likely to have been triggered by something other than the lawsuit.<sup>6</sup>

During the course of the lawsuit, Congress passed several laws regarding the process of awarding financial aid. First, as part of the Higher Education Amendments of 1992 Act, Congress allowed schools to voluntarily agree with any other schools to award non-Federal financial aid only on the basis of need and to discuss and adopt a policy for determining a student's need. However, schools were specifically prohibited from discussing or coordinating on prospective financial aid to specific students. As part of the Improving America's Schools Act of 1994, Congress temporarily made it lawful under the antitrust laws for schools, so long as they admit students on a need-blind basis, to continue the behavior allowed under the previous law. In addition, the schools were allowed to exchange a variety of information through an independent third party. Essentially the law codified the provisions of the settlement reached by MIT and the Department of Justice.<sup>7</sup>

In sum, two main changes have occurred in light of the litigation. First, via the consent decree signed in December 1993 and the laws passed by Congress, the legal status of coordinating financial aid is rather certain. Behavior that the schools can undertake and the circumstances under which they can coordinate financial aid awards is specifically spelled out. Second, their ability to come to agreements and to police agreements has been reduced to some degree. While they can agree in principle on how to calculate financial aid awards, they cannot discuss actual awards. They can be notified by an independent third party if awards deviate substantially across schools, which allows for undetected smaller deviations. However, as far as anyone knows, the schools are not taking advantage of coordinating to the extent allowed legally. The settlement may have sufficiently loosened the structure of the cartel to lead to either its permanent breakdown or more deviations from the agreed cartel outcome. The question addressed in this paper is whether these changes in the cooperative

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<sup>6</sup> *The Economist* suggests that the explanation for the sudden increase in competition is the huge growth in endowments caused by the high returns of the stock market in the last several years.

<sup>7</sup> The relevant text of the law is included in the appendix.

financial aid process are sufficient to have changed the pricing and earnings behavior of the schools in question.

### III. Theoretical Discussion

While the objective of colleges and universities in cooperatively setting financial aid policy and awards is disputed, revealed preference arguments and standard cartel analysis can be used to make some inferences of the effect of the settlement between the Ivy League schools and the Department of Justice. Assume that decision-makers at Overlap schools attempt to maximize a utility function subject to a non-profit constraint; for the time being, I leave the arguments of the utility function unspecified.

As in a standard cartel, at each point in time, an Overlap school must decide whether or not to continue cooperating with rivals. In this case, the decision is whether to abide by or deviate from agreed upon principles for awarding financial aid. The gains from deviating can be represented as in a standard profit-maximizing setting, where the utility function,  $U$ , replaces the profit function.

$$\begin{aligned}
 V = & \left[ U |_{\text{deviate}} - U |_{\text{cooperate}} \right] \\
 & + \delta \Pr(\text{cheating detected}) \left[ U |_{\text{punishment}} - U |_{\text{cooperate}} \right] \\
 & + \delta \Pr(\text{cheating not detected}) V,
 \end{aligned}$$

where  $\delta = \frac{1}{1+r}$  is the discount rate. The value function can be re-written as

$$\begin{aligned}
 V = & \frac{1}{1 - \delta \Pr(\text{cheating not detected})} \left[ U |_{\text{deviate}} - U |_{\text{cooperate}} \right] \\
 & + \frac{\delta \Pr(\text{cheating detected})}{1 - \delta \Pr(\text{cheating not detected})} \left[ U |_{\text{punishment}} - U |_{\text{cooperate}} \right]. \quad (1)
 \end{aligned}$$

A school will deviate from the cooperative arrangement if  $V$  is positive, but will cooperate if  $V$  is zero or negative. If the non-profit constraints do not bind at the cartel optimum, the schools will formulate the cartel such that  $V = 0$  under the terms of the original cartel. If the non-profit constraints do bind, then  $V$  may be positive under the terms of the original cartel.

The impact of the settlement depends on how its terms affect the factors of  $V$ . It can be shown that  $V$  increases with an increase in the probability that cheating is not detected, declines with an increase in the probability that cheating is detected, increases with an increase in the utility derived when cheating, decreases with an increase in the utility derived from cooperating, and increases with an increase in the utility derived during the punishment phase.

Under the settlement, three possibilities may occur: (1)  $V$  may remain non-positive and the cartel continues functioning; (2)  $V$  may become positive and the cartel disintegrates; and (3) the cartel may restructure the agreement to ensure that  $V$  remains non-positive. Under the first possibility, we should see no change in pricing and financial aid outcomes. In this case the settlement is completely ineffective. Under the second possibility, we should see a move from the cooperative outcomes to non-cooperative outcomes. Under the third possibility, the schools have two methods by which to stabilize the agreement in light of the settlement. They can increase the duration of the punishment phase (see the discussion in Porter, 1983), increasing the loss that arises when a price war is triggered, or they can reduce the utility achieved under cooperation (see the discussion in Rotemberg and Saloner, 1986). In this case we should see some change in the price and financial aid outcomes.

In order to discuss what changes might arise, it becomes necessary to consider what the objective of cooperation was. Consider first the arguments of the member schools.<sup>8</sup> The primary goal given for the Overlap policy was to concentrate financial aid on needy students and to conserve financial aid; that is, financial aid monies were to be reallocated from non-needy, meritorious students to needy students. The schools argued that the Overlap process was necessary to achieve a need-blind admissions process in conjunction with a policy to meet the full financial need of admitted students. Finally, the Overlap schools argued that the effect of the Overlap process was socially beneficial. They argued that the Overlap process did not affect average tuition revenue earned per student, so that there was no anti-competitive impact, and that it enabled more needy students to attend Overlap colleges than otherwise would have been able to, increasing socioeconomic diversity at Overlap schools,

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<sup>8</sup> The stated goals of the Overlap schools are compiled from Carlton, Bamberger, and Epstein (1995), Bamberger and Carlton (1999), and from the district and appellate court rulings. Carlton served as an expert witness for MIT.

which they argued was socially beneficial.

Given these stated goals, what would be the expected effect of the change in the Overlap process? First, assume that the settlement was sufficient to lead to the end of collusion. Under the arguments made by the schools, since the Overlap process did not change tuition revenue earnings, they should likewise be unchanged by the end of Overlap. The schools' arguments also predict that, under the demise of the Overlap process, financial aid will be diverted to non-needy meritorious students away from needy students. This could result in two outcomes: less financial aid per needy student and/or fewer needy students receiving financial aid. That is, if Overlap is truly necessary for the Overlap schools to achieve their twin policies of need-blind admissions and meeting the full financial need of admitted students, one of these goals would no longer be achieved. Thus, the impact predicted by the Overlap members of the demise of Overlap is dismal: fewer needy students receive financial aid, and therefore are unable to attend the school of their choice. The shift of financial aid should also lead to an increase in the average price paid by needy students and a decline in the average price paid by meritorious students. Finally, consider the argument that the goal of the Overlap process was to conserve financial aid. This could be interpreted as implying that the amount of financial aid will increase with the demise of the Overlap process.

Now consider how the Overlap process might have been re-organized in such a way as to prevent cheating. If the re-organization was in the form of an increased punishment period, no observable change in prices and financial aid outcomes would obtain; the cartel would continue to operate in such a way that cheating was never optimal. On the other hand, the cartel may be re-organized in such a way as to reduce the utility achieved from cooperation to offset the increase in the probability that deviations will not be observed. Under the arguments of the schools, they increase utility by jointly shifting financial aid from non-needy, meritorious students to needy students. Thus, to reduce utility under cooperation, we should expect to see some financial aid going to meritorious students and less to needy students. Thus, we could observe a somewhat lower price to meritorious students and a higher price to needy students. In addition, we should see some evidence of more merit aid given. Again we should see no change in average tuition revenue earned per student.

Now consider the implications of two families of models that may describe the behav-

ior of non-profit firms; each of these models is consistent with the Department of Justice's claim that the goal was to reduce financial aid expenditures and therefore raise tuition revenue earnings. One framework nests profit-maximization and the other framework is based on constrained utility-maximization.

Carlson and Shepherd (1992) and Shepherd (1995) argue that the goal of elite universities and colleges is to maximize long-run prestige, and that an important method to achieve that objective is to maximize net revenues from undergraduate education. They also suggest that a secondary goal of decision-makers is to benefit faculty and administrators, for example through better facilities, leading to X-inefficiency. Because the long-run goal of the schools is to maximize prestige, admitting any student who could afford tuition, which would maximize short-run tuition revenues, could damage the prestige of the school and hence reduce long-run revenues. Thus, schools are interested in admitting students who contribute the most to long-run revenues, which will be a function of their tuition payments, future donations, and the value of the prestige they add to the school. Consider, then, a model where schools maximize long-run profits from tuition, the proceeds of which are then expended in some way favorable to decision-makers and in a manner to allow the school to maintain its non-profit status.

Without cooperation, students fall into three groups: non-needy, needy, and meritorious. Meritorious students are those who particularly contribute to the prestige of the school. Competition leads schools to reduce prices in order to attract students who will contribute to long-run value of the schools. In particular, prices would be reduced to meritorious students, in the form of larger financial aid awards, in order to attract these students. Under the Overlap policy, students are instead divided into only two groups: non-needy and needy. The price to meritorious students unambiguously rises under coordination. Meritorious students no longer benefit from price competition to attract them to a given schools. Presumably prices to needy students would also increase, as schools cooperatively set the price to needy students. Colluding in order to decrease price competition for better students would increase tuition earnings, since prices to meritorious and needy students would rise, contributing to decision-makers' ability to increase utility.

Alternatively, Netz (1999) models university decision-makers as maximizing utility

subject to a non-profit constraint. Utility is assumed to be a function of the quality of the school, similarly to Carlson and Shepherd, but also from offering opportunities to (enrolling) needy students, as argued by spokespersons for some of the Overlap schools.<sup>9</sup> Even though decision-makers wish to increase the number of qualified needy students at the school, reducing price competition for these students increases decision-makers' utility. Colluding reduces price competition for needy students, increasing resources that can be used to raise the quality of the school, which directly increases utility and also attracts students, including needy students, indirectly increasing utility. The impact of cooperation in setting prices to needy students in this model is to increase the prices paid by needy, meritorious, and non-needy students. The effect on tuition revenue is unclear, but likely to be positive.<sup>10</sup>

Both models suggest, if the terms of the settlement are sufficient to cause the breakdown of the cartel, that price competition for meritorious and needy students will increase, leading to lower prices for both types of students at Overlap schools. The increase in price competition by Overlap schools should lead to lower prices to meritorious and needy students at peer schools, regardless of their financial aid policies, as well. The increase in price competition may necessitate an increase in financial aid expenditures. The effect on the price to non-needy students is unclear. Under the model in Netz (1999), the reduction in prices to needy and meritorious students will reduce total resources available, thus reducing expenditures on quality and thus the price to non-needy students. On the other hand, if the administrators' utility increases in the well-being of non-needy students as well as of needy students, then under collusion the price to non-needy students would have been below the profit-maximizing level. Then the previously cooperating schools may choose to increase prices to non-needy students in order to increase resources available to reduce prices to needy students. In any event, under both models, price competition to meritorious and needy students should increase, leading to lower prices and more and higher financial aid awards.

Finally, one must consider that tacit collusion may be present in the market for higher

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<sup>9</sup> The model could be extended to allow school decision-makers to derive utility from perks such as nicer facilities. The implications of cooperation or competition in awarding financial aid are unchanged.

<sup>10</sup> Tuition revenue may fall depending on how the mix of needy and non-needy students changes; recall Simpson's paradox.

education. As discussed in Netz (1999), the Department of Education provides each school to which a student applies an estimate of the student’s financial need. Indeed, if the student receives any federal financial aid, including subsidized loans or work-study, the school cannot award the student a total financial aid package in excess of the Department of Education’s calculated financial need. Thus, even schools that do not cooperatively implement their financial aid policy may be able to achieve a non-competitive outcome given the focal point provided by the Department of Education. Netz (1999) finds empirical support for the idea that schools that independently adopt need-only financial aid policies charge a higher non-needy price, charge a higher price to financial aid recipients, and earn higher tuition revenues per student than do schools that offer merit-based aid. Schools that adopt an Overlap process increase prices and tuition revenue earnings even more. Thus, even if the settlement is sufficient to cause the breakdown of the cartel, instead of moving to the competitive outcome, the Overlap members may instead move to an outcome that is more competitive than that obtained under full collusion, but that is less competitive than the completely competitive outcome. That is, after the settlement Overlap members may act more similarly to independent need-only schools than to independent merit schools.

#### **IV. Empirical Set-Up and Methodology**

I now proceed to estimate reduced form equations for prices and financial aid outcomes. Four prices are considered. The first three prices measure out-of-pocket costs to students who pay full price, to students who receive a need-based scholarship, and to students who receive a merit-based scholarship. The fourth price considered is the average price paid by all students, or average tuition revenue earnings per student.

The analysis of the effect of the settlement on prices uses the following estimating equations:

$$P_{it} = \alpha + F_{it} \gamma + U_i \beta + D_{it} \delta + Q_{it} \xi + T_t \tau + \mu_i + \nu_{it},$$

where  $P_{it}$  represents the price charged by school  $i$  at time  $t$ . The  $F$  matrix represents variables which indicate the financial aid regime; the  $U$  matrix contains variables that may indicate differences in school types; the  $D$  matrix variables representing demand conditions;

the  $Q$  matrix factors that indicate the quality of the school;  $T$  is a trend variable;  $\mu_i$  a school-specific error term; and  $\nu_{it}$  a white noise error varying across schools and time.

Five financial aid regime variables are used, depending on the financial aid policy of the school and depending on the legal status. First, schools are divided according to whether they offer merit-based financial aid (the control group of schools); whether they adopt a need-only financial aid policy, regardless of whether they adopt and implement the policy cooperatively or independently (termed need-only schools); and finally whether the school cooperatively implements its need-only financial aid policy (termed Overlap schools).<sup>11</sup> Then consideration is given to the legal regime. I divide the sample into two periods: the period during which Overlap schools held annual meetings to jointly determine a student’s financial need (termed the “before” period) and the period during which no such meetings were held (termed the “after” period). The first financial aid variable included is a dummy variable equal to one if meetings were not held. This variable will indicate whether there was a change in the average price across all of the sample schools. Then four interaction dummies are included, which indicate: (1) schools that adopt a need-only financial aid policy during the years when meetings occurred; (2) the same set of schools during years when no meetings were held; and (3) and (4), schools that adopted an Overlap process during and after meetings were held. How the coefficients on the need-only and Overlap dummies change after the settlement is the question of interest. If the coefficients before and after are statistically significantly different (equal), then presumably the meetings have had (have not had) an effect on the price charged by need-only or Overlap schools relative to the control group of schools that offer merit-based aid.<sup>12</sup>

Two variables are included in the  $U$  matrix: indicator variables for liberal arts schools and for public schools. These variables are included to capture the fact that these types of schools may have different objective functions than other types of schools. It is expected

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<sup>11</sup> No school that offers merit-based financial aid cooperatively implements its financial aid policy.

<sup>12</sup> Alternative specifications were also considered. One divided time into three periods: before the investigation became public, after the final settlement, and the period in between. The idea was that any changes may not have occurred until after the final settlement, even though the meetings ended earlier. Between the investigation and the final settlement, schools may have behaved differently given the legal uncertainty under which they were operating. Another alternative used the same division discussed in the paper, but rather than a dummy variable indicating the period after the meetings ended included a variable indicating the number of years since the meetings ended. The idea was that the cartel may have sustained itself for some period of time before disintegrating. The specification in the paper seemed to fit the data the best.

that universities will behave differently than liberal arts schools, if for no other reason than a tendency for the former to emphasize the physical sciences over the liberal arts and research over teaching. Liberal arts schools are known for their small size and their excellent learning environment. This reputation may enable them to command a price premium. At the same time, these attributes also contribute to higher costs, which also suggests that prices would be higher. Thus, the coefficient on liberal arts schools is expected to be positive. Public schools are likewise expected to have different utility functions than private schools. In addition, state schools are typically legislatively limited in the amount of discretion they have over setting prices. Finally, public schools may represent a lower quality good, through larger classes, higher student-faculty ratios, limited space in required courses, *etc.* While variables measuring the quality of the school are included, they may not be sufficient to capture the full quality effect. Thus, the coefficient on the public dummy variable may pick up a quality effect and a public good/subsidy effect as well as any differences in utility-functions. All effects suggest a negative coefficient.

One variable is included to measure demand conditions, indicated by the  $D$  matrix. It is the weighted average real per capita state and national median income. The weight is the proportion of the student body that are state residents. It is expected that the higher per capita income, the higher is demand and the higher will be price. The variables in the  $Q$  matrix are designed to proxy for the quality of the institution. Quality of the school is measured with: the proportion of faculty members holding doctorates, the student-faculty, and the number of majors offered by the school. It is expected that the higher the quality of the school, the higher will be the price. Thus, the coefficients on the first and last quality variables are expected to be positive, while the coefficient on the student-faculty ratio is expected to be negative.

Finally I include a trend variable in all the price equations. It has long been observed that real education prices have been trending upwards for unknown reasons throughout the last two decades. This trend continues even after adjusting for increases in college costs of production (*e.g.*, faculty salaries), which have been increasing faster than the cost of inflation. Therefore, the trend variable is included to capture this unexplained trend without mistakenly attributing the trend to changes in the legal regime under which the schools can

coordinate financial aid awards.

Five financial aid variables are analyzed: the proportion of undergraduates who receive need-based scholarships; the proportion who receive merit-based scholarships; total scholarship aid per student (for need- or merit-based awards); total need-based scholarship aid allocated to freshmen, per student; and total merit-based scholarship aid allocated to freshmen, per student. The financial aid variables are expected to be determined by similar variables:

$$A_{it} = \alpha + F_i \gamma + T_i \beta + I_{it} \delta + R_{it} \xi + C_{it} \tau + \mu_i + \nu_{it},$$

where  $A$  indicates the financial aid variable,  $F$  the financial aid regime,  $T$  the type of school,  $I$  characteristics of students,  $R$  the resources of the school, and  $C$  the cost of attending the school. The financial aid regime variables ( $F$ ) are the same as those used in analyzing prices.

Three variables are used to indicate the type of school ( $T$ ): dummy variables indicating whether a school is a liberal arts school, whether it is public, and whether it has a religious affiliation. All three types of schools may be expected to have different strategies in awarding financial aid.

Several variables indicating student body characteristics are included, depending upon the type of aid that is being analyzed. One measure of need that is included is income is a variable that is the weighted average state and national median income, where the weight is the proportion of the student body that is in-state. In addition, a variable indicating the proportion of the student body that is African-American is included. While this is an exceedingly rough proxy, the idea is that the variable will indicate a larger proportion of the student body that is needy, given that the median household income of African-Americans is significantly below the median household income across all Americans. Income and the percentage of African-American students are included in the regressions explaining availability of need-based aid and the total amount of scholarship aid and the amount of need-based aid per student. The percentage of students who are African-American is also included in the equations related to merit aid. Merit aid includes all aid awarded on the basis of student characteristics other than need; such aid may be awarded in part to attract a more racially diverse student body.<sup>13</sup> In addition, the percentage of freshmen who are

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<sup>13</sup> Ideally, measures of other ethnicities would be included, but such data are available only for later years.

from the top ten percent of their high school graduating class is included in the merit aid equations.

Two variables indicating the resources of the school ( $R$ ) are included. The first gives total unrestricted non-tuition revenue per student available to the school. The more resources available to the school, the more generous it can be. However, it may not choose to spend the resources on financial aid. Thus, this variable is expected to be positive or insignificantly different than zero. The second gives total restricted scholarship expenditures per student. The more revenues that a school is restricted to spend on financial aid, the more generous should be financial aid. On the other hand, since funds are fungible, it may be that restricted funds simply displace discretionary funds, in which case there may be no statistically significant effect.

In addition, all equations include the school's comprehensive fee, which is the sum of tuition, mandatory fees, and room and board. One would expect that, conditional on the income and the characteristics of the student body, as the comprehensive fee increased, more students would qualify for financial aid and would qualify for higher amounts. Thus, I expect the coefficient on the comprehensive fee to be positive in all equations.

Finally, the fraction of the student body that is graduate students is included as a control variable for the total grant aid expenditures per student equation. These expenditure data are from the Department of Education surveys, and include grant aid expenditures on undergraduates and graduates. If the average grant aid received per graduate student is different than that received by undergraduates, the dependent variable will give a biased estimate of aid per undergraduate.<sup>14</sup>

To most efficiently use the information contained in the panel data, random effects are used. So long as the regressors are independent of both parts of the error term, the random effects estimator gives consistent, efficient estimates. A Hausman specification test can be used to test the assumption that the time-varying variables are independent of the school-specific error term. The results of this test is reported at the bottom of the results tables. For one of the price equations (non-needy price) and two of the financial aid equations (the

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<sup>14</sup> Similar controls are not necessary in the equations explaining grant aid by basis, since that data is from Peterson's and does not include expenditures on graduate students.

proportion of the student body that receives merit aid and total grant aid expenditures per student), the assumption is strongly rejected. Ultimately these equations will be estimated using the Hausman-Taylor technique, though the results currently reported are random effects results.

The Hausman-Taylor approach is an instrumental variables random effects estimator, where the instruments include the exogenous variables, deviations from the time-mean for the time-varying variables, and the time mean of the exogenous time-varying variables. The correlation between regressors and the unobserved school-specific (time-invariant) effects can be eliminated by removing the time-invariant component of the endogenous, time-varying, regressors. Thus, transforming the endogenous regressors into deviations from their time-means provide natural instruments. This ability to obtain instruments from “inside” the system is important in this application. No outside instruments that are correlated with the measured quality of the school but not correlated with the unobserved quality of the school, captured in the school-specific error, seem likely to exist.

## V. Data

The sample consists of the Overlap schools as well as a control group of schools that either do not offer merit-based aid and also do not participate in an Overlap process or that do offer non-need-based aid. Following Masten (1995), the sample consists of any school named as one of the top 25 national universities or the top 25 national liberal arts colleges from the annual *U.S. News and World Report* surveys on colleges in any year since 1981. The 67 schools included in the sample are listed in table 1, which categorizes the schools according to their financial aid policy. I categorize schools into independent need-only and merit-based depending on whether merit-based aid is not or is available in most of the years in the sample.<sup>15</sup> The sample covers 1981-82 through 1997-98; recall that the last spring meeting of the Overlap groups to jointly determine students’ family contributions occurred in spring of 1991.

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<sup>15</sup> Schools designated as need-only do not offer merit-based aid 80% of the time when coordinating meetings were held and do not offer merit-based aid 62% of the time after the meetings ended; schools that are designated as merit schools offer merit-based aid 98% and 100% of the time before and after the meetings ended, respectively; and Overlap schools did not offer merit-based aid 89% and 86% of the time before and after the meetings ended.

**Table 1: Sample of Schools<sup>1</sup>**

Ivy Overlap <sup>2</sup>	Pent./Sisters Overlap <sup>2</sup>	Independent Need-Only <sup>3</sup>	Merit-Based Aid <sup>3</sup>	
Brown	Amherst	Bates	Caltech	North Carolina
Columbia	Barnard	Colgate	Carleton	Northwestern
Cornell	Bowdoin	Hamilton	Carnegie-Mellon	Notre Dame
Dartmouth*	Bryn Mawr	Haverford	Centre College	Oberlin
Harvard	Colby	Lafayette	Chicago	Ocidental
MIT*	Middlebury	Notre Dame	Claremont McKenna	Rice
Princeton	Mt. Holyoke	Pomona	C. of the Holy Cross	Rochester
Pennsylvania	Smith	Reed	Colorado College	St. Olaf
Yale	Trinity	St. John's	Davidson	Swarthmore
	Tufts	Stanford	Duke	Texas at Austin
	Vassar		Earlham	UC Berkeley
	Wellesley		Emory	UCLA
	Wesleyan		Georgetown	Vanderbilt
	Williams		Grinnell	Virginia
			Illinois	Washington & Lee
			Johns Hopkins	Washington U
			Michigan	William & Mary
			Wisconsin	

\* Associate member of the Pentagonal/Sisters Overlap Group.

<sup>1</sup> Derived from *U.S. News and World Report* annual rankings of colleges and universities.

<sup>2</sup> As listed in *U.S. v. Brown University, et al.*, 1992.

<sup>3</sup> Derived from *Peterson's Guides*. See the text for details.

The primary data sources are Peterson's *College Money Handbook* and Peterson's *Guide to Competitive Colleges*. Additional financial data is from the Higher Education General Information Survey (HEGIS) and the Integrated Postsecondary Education Data System (IPEDS) institutional characteristics and finance surveys conducted annually by the National Center for Educational Statistics, Department of Education.<sup>16</sup> In addition, real (1990) US and state median incomes are compiled from the Statistical Abstract of the US (per capita income) and the Economic Report of the President (deflator). The Higher Education Price Index, which is used to deflate the educational financial data to 1990 real dollars, is from Research Associates of Washington.<sup>17</sup>

The dependent price variables are measured as follows. The price paid by non-needy

<sup>16</sup> For any variable available in multiple datasets, I verify that the data are consistent across the different sources.

<sup>17</sup> Educational financial data are deflated using the HEPI because higher education costs have increased more quickly than general inflation. Using a deflator based on the CPI does not change the results.

students is measured as a weighted average of in-state and out-of-state tuition plus mandatory fees, both of which are from Peterson's; this variable is called the non-needy price. The average price paid by needy students is measured as tuition plus mandatory fees less the average scholarship received by needy students, the latter reported by Peterson's; this variable is called the needy price. The average scholarship received by needy students includes awards for which the school chooses the recipient and uses funds under its control; it does not include the value of subsidized loans or the value of work-study awards (essentially, subsidized wages). The average price paid by meritorious students at schools that offer merit-based aid is measured as tuition and mandatory fees less the average merit-based scholarship. For schools that do not offer merit-based aid, the price paid by meritorious students is measured as the average of the non-needy and needy prices, weighted by the proportion of the undergraduates who receive need-based financial aid. This variable is called the meritorious price. The idea is that a meritorious student, defined as a student who would receive merit-based aid were it available, would pay a price at a need-only school based on need only. Finally, tuition revenue earned per student, called the average price, is given by tuition and fees less total grant aid administered by the school divided by the total number of students. Thus, the the prices give the family's out-of-pocket expense. That is, it only subtracts the average scholarship (grant) award, not the total value of subsidized loans and subsidized wages.

The dependent financial aid variables are measured as follows. The proportion of undergraduates who receive need-based and merit-based financial aid is calculated from Peterson's *College Money Handbook*. The *Handbook* reports the number of need-based and merit-based scholarships that are available; these numbers are divided by undergraduate enrollment. Total grant aid expenditures per student use expenditure data from the Department of Education and total enrollment data from Peterson's guides. Need-based financial aid expenditures per freshman and merit-based financial aid expenditures per freshman use the total dollar amount of need-based and merit-based scholarship aid awarded to freshmen and freshmen enrollment data from Peterson's *College Money Handbook*.

Two of the quality variables included in the price equations – the proportion of faculty with Ph.D.s and the student faculty ratio – come from Peterson's *Guide to Competitive Colleges*. The final quality variable – the number of majors – is from Peterson's *College Money*

**Table 2: Mean Prices and Tuition Earnings**  
(Standard Deviations in Parentheses)

	Overlap		Need-Only		Merit	
	Mtgs <sup>1</sup>	No Mtgs <sup>2</sup>	Mtgs <sup>1</sup>	No Mtgs <sup>2</sup>	Mtgs <sup>1</sup>	No Mtgs <sup>2</sup>
Non-Needy Price	\$13,035 <sup>*,†,‡</sup> (1,164)	\$16,197 <sup>†,‡</sup> (806)	\$12,082 <sup>*,‡</sup> (1,172)	\$15,403 <sup>‡</sup> (1,168)	\$8,804 <sup>*</sup> (3,978)	\$11,550 (4,852)
Needy Price	\$5,585 <sup>‡</sup> (1,419)	\$5,717 <sup>‡</sup> (1,208)	\$5,848 <sup>‡</sup> (1,126)	\$5,898 <sup>‡</sup> (1,597)	\$4,439 <sup>*</sup> (2,306)	\$5,312 (2,446)
Merit Price	\$8,630 <sup>*,‡</sup> (2,766)	\$11,100 <sup>†,‡</sup> (1,320)	\$8,753 <sup>‡</sup> (1,015)	\$8,984 <sup>‡</sup> (3,541)	\$5,492 <sup>*</sup> (3,674)	\$6,696 (4,429)
Average Price	\$9,823 <sup>*,†,‡</sup> (1,386)	\$11,237 <sup>†,‡</sup> (1,571)	\$8,941 <sup>*,‡</sup> (1,045)	\$10,406 <sup>‡</sup> (1,545)	\$5,947 <sup>*</sup> (3,175)	\$7,211 (3,459)

<sup>1</sup>1982-1983 through 1991-92.

<sup>2</sup>1992-1993 through 1997-98.

\*Statistically significantly different between time, for the same group of schools.

†Statistically significantly different from Need-Only schools.

‡Statistically significantly different from Merit schools.

*Handbook*. Whether the school is a liberal arts college or a university is given by *U.S. News and World Report* surveys. Whether a school is public is indicated by both Peterson's guides and by the Department of Education surveys. The proportion of the student body that is made up of graduate students is compiled from total and undergraduate enrollment data in Peterson's guides. Religious affiliation is from Peterson's *Guide to Competitive Colleges*, as is the proportion of the student body that is African-American. Income is the average of real state and real national median income, weighted by the proportion of the student body that is in-state. The proportion of the student body that is from the top ten percent of their high school class is from Peterson's *Guide to Competitive Colleges*.

The financial control variables are compiled from all the data sources. Total non-tuition and fee revenue per student is calculated using total current revenue and total tuition and fee revenue from the Department of Education and total enrollment is taken from Peterson's. Total restricted scholarship expenditures per student use revenue and expenditure data from the Department of Education and enrollment data from Peterson's. The comprehensive fee is from Peterson's.

Descriptive statistics regarding the price variables and the financial aid variables are provided in tables 2 and 3, respectively. The tables indicate means based on school type and

whether the Overlap schools were holding annual meetings or not. Statistically significant differences across school type and across time are indicated. Several patterns emerge. First, the real price paid by students who do not receive financial aid (the non-needy price) and tuition revenue earnings per student (the average price) increase for all three types of schools after the meetings end. The price increase is about 15% for need-only and Overlap schools, and is over 20% for schools that offer merit-based aid. The price charged to needy students increases for schools that offer merit-based aid, but is unchanged at the other types of schools. The price to meritorious students increases at Overlap schools and at merit schools, while the aid price rises only at need-only schools. All price variables both before and after the settlement are higher at Overlap and independent need-only schools than they are at schools that offer merit-based aid. Finally, the non-needy price and tuition earnings per student are higher at Overlap schools than at independent need-only schools before and after the settlement, though the premium is smaller after the settlement. Thus, in terms of the price variables, we see many prices increasing. In addition, we see continued differences across types of schools, though the differences narrow after the annual meetings end. It remains to be seen if the differences persist after controlling for differences in quality and for the general upwards trend in educational prices.

From table 3, we see that financial aid availability and expenditures have changed since the settlement. The availability of need-based aid has increased at all three types of schools by about 10%, and there is no difference in availability of need-based aid across the types of schools before or after the meetings ended. The similarity across types of schools would be expected if the income distribution of students is roughly the same at each school. The availability of merit-based aid has gone up substantially at merit schools and at need-only schools, though the availability at need-only schools is still quite small. Real grant aid expenditures per student – both in total and on a need or merit basis – have increased substantially at all types of schools; total real grant expenditures per student have increased by 33% at all three types of schools. Before and after the meetings ended, Overlap members and need-only schools spent statistically significantly more on total grant aid and on need-based grant aid than did merit schools. The difference remains the same before and after the settlements end. Thus, it appears that financial aid is more widely available and more

**Table 3: Mean Financial Aid Variables**

(Standard Deviations in Parentheses)

	Overlap		Need-Only		Merit	
	Mtgs <sup>1</sup>	No Mtgs <sup>2</sup>	Mtgs <sup>1</sup>	No Mtgs <sup>2</sup>	Mtgs <sup>1</sup>	No Mtgs <sup>2</sup>
% Undergraduates Receive Need Aid	37.95%* (6.23)	42.29% (7.78)	39.68%* (9.52)	42.20% (7.36)	38.50%* (16.53)	42.45% (17.01)
% Undergraduates Receive Merit Aid	0.02% <sup>‡</sup> (0.13)	0.04% <sup>‡,‡</sup> (0.24)	0.01% <sup>*,‡</sup> (0.11)	1.00% <sup>‡</sup> (2.82)	7.06%* (5.56)	12.54% (14.29)
Grant Aid/Student	\$3,552 <sup>*,‡</sup> (1,202)	\$4,714 <sup>‡</sup> (1,369)	\$3,477 <sup>*,‡</sup> (969)	\$4,640 <sup>‡</sup> (1,083)	\$3,015* (1,704)	\$4,067 (2,037)
Need Grant Aid/ Student	\$3,718 <sup>*,‡,‡</sup> (814)	\$5,016 <sup>‡,‡</sup> (992)	\$3,453 <sup>*,‡</sup> (1,022)	\$4,493 <sup>‡</sup> (973)	\$3,034* (1,801)	\$3,866 (2,145)
Merit Grant Aid/ Student	\$0 <sup>‡</sup> (0)	\$1 <sup>‡</sup> (2)	\$3 <sup>‡</sup> (23)	\$88 <sup>‡</sup> (293)	\$451* (346)	\$943 (698)

<sup>1</sup>1982-1983 through 1991-92.<sup>2</sup>1992-1993 through 1997-98.

\*Statistically significantly different between time, for the same group of schools.

<sup>†</sup>Statistically significantly different from Need-Only schools.<sup>‡</sup>Statistically significantly different from Merit schools.

generous after the settlement, but it does not appear that the relative differences between the types of schools changed.

Finally, table 4 presents descriptive statistics for the variables used in the regression analysis. Note that the discounted prices can be negative because financial aid awards are based not only on tuition and fees but also on room and board, books, travel and other living expenses. I now proceed to use regression analysis to examine the effect of the settlement on the price and financial aid variables.

## VI. Results

The regression results for the prices are presented in table 5.<sup>18</sup> The coefficients of primary interest are the first five which describe the financial aid regime. After controlling

<sup>18</sup> For now all results reported are based on a random effects estimator. Those equations for which the Hausman specification test statistic is significant will be re-estimated using the Hausman-Taylor technique. The Hausman-Taylor technique is a variation of instrumental variables that controls for correlation between regressors and the school-specific error term. Without the correction, the estimated coefficients and standard errors are biased and inconsistent. The results in Netz (1999) suggest that the effect of using the Hausman-Taylor technique will be minimal changes in coefficient values and increased significance levels compared to the random effects results.

**Table 4: Descriptive Statistics**

	Obs.	Mean	Std. Dev.	Minimum	Maximum
<b>Price Variables</b>					
Non-Needy Price*	670	\$13,296	\$3,619	\$1,155	\$17,975
Avg. Needy Price*	512	\$5,531	\$1,781	-\$338	\$13,575
Avg. Meritorious Price*	479	\$8,211	\$3,692	-\$3,183	\$16,241
Tuition Rev./Student*	546	\$9,047	\$2,820	\$339	\$15,133
<b>Financial Aid Variables</b>					
% Students Get Need Aid	614	41%	13	5%	72%
% Students Get Merit Aid	599	4%	8	0	70%
Grant Aid Exp./Student*	651	\$3,850	\$1,673	\$278	\$11,354
Need Grant Aid Exp./Student*	566	\$3,831	\$1,641	\$289	\$8,540
Merit Grant Aid Exp./Student*	202	\$117	\$327	0	\$2,340
<b>Control Variables</b>					
Liberal Arts	670	56%		0	1
Public	670	10%		0	1
Religiously Affiliated	651	15%		0	1
Income <sup>†</sup>	670	\$18,940	\$1,279	\$14,186	\$22,627
% Faculty w/Ph.D.	670	92%	8	43%	100%
Student-Faculty Ratio	670	10	3	3	23
Number of Majors Offered	670	57	32	2	183
% Freshmen Top 10 H.S. Grads	630	70%	20	23%	100%
% African-American	651	5%	23	0	13%
% Graduate students	651	22%	23	0	89%
Non-Tuition Revenue/Student*	650	\$30,194	17,079	\$2,323	\$153,424
Restricted Sch. Exp./Student*	650	\$1,592	1,006	\$96	\$5,565
Comprehensive Fee*	651	\$17,648	\$3,440	\$7,006	\$23,013

\*Deflated by the Higher Education Price Index to 1990 constant dollars.  
<sup>†</sup>In 1990 constant dollars.

for the general upward trend in real education prices, I find that the real price to students who don't receive any financial aid and to students who receive need-based aid have increased, as has tuition revenue earnings per student (the average price). There has been no statistically significant change in the price to meritorious students. Thus, it does not appear that, in the sample group of competitive schools, price competition for needy or meritorious students increased. Indeed, the price for needy students has increased. This is contrary to the implications of the economic models and the arguments of the Overlap members. All suggested that there would be increased competition for needy and meritorious students at a minimum. The increase in the price to non-needy students is consistent with the model

**Table 5: Prices and Tuition Earnings**  
(Standard errors in parentheses.)

	Non-Needy Price	Needy Price	Meritorious Price	Average Price
After Settlement	230.15* (118.27)	565.11** (223.03)	732.34 (465.89)	383.07** (168.82)
Need-only, Before	882.92*† (466.19)	3.98† (373.20)	1,866.75**† (895.45)	1,049.65*† (563.00)
Need-only, After	1,338.07*** (465.71)	-737.75* (380.31)	-144.10 (928.75)	1,466.98** (567.39)
Overlap, Before	1,053.13**‡ (470.17)	-428.98 (378.48)	-217.42‡ (908.95)	989.32* (568.39)
Overlap, After	726.15 (470.15)	-373.74 (386.52)	2,215.83** (948.54)	745.73 (573.11)
Liberal Arts	-209.19 (356.25)	-65.19 (308.87)	1,230.27 (746.86)	180.92 (439.59)
Public	-9,798.60*** (549.62)	-4,869.27*** (482.69)	-5,490.80*** (1168.09)	-6,309.18*** (699.02)
Income	-29.14 (67.91)	22.54* (11.61)	13.45 (25.60)	18.51* (10.49)
Trend	333.87*** (30.08)	5.08 (50.52)	149.89 (109.73)	86.97** (42.76)
% Faculty w/Ph.D.	5.45 (4.75)	15.85* (9.23)	-25.67 (20.62)	12.02* (7.07)
Student/Faculty	2.59 (12.11)	52.36** (25.00)	-134.06** (53.64)	40.20** (18.17)
Number of Majors	1.61 (3.04)	11.59*** (4.38)	16.79* (10.14)	3.17 (4.68)
Constant	9,660.25*** (1,163.71)	-839.32 (1,939.31)	5,667.28 (4,325.22)	2,414.24 (1,771.50)
Observations	670	512	479	546
Haus. Spec. Test	52.69***	4.99	0.60	1.52

\*\*\*,\*\*, \*Significant at 1%, 5%, and 10% level, respectively.

†The Need-only, Before and Need-only, After coefficients are statistically significantly different at the 10% level or better.

‡The Overlap, Before and Overlap, After coefficients are statistically significantly different at the 10% level or better.

in Netz (1999), if decision-maker utility is also a function of the well-being of non-needy students.

Of the remaining four financial aid variables, first consider the significance of the Overlap variables. The Overlap members were most directly affected by the settlement. If the Overlap variables are significant, then the Overlap schools set prices differently than do

need-only schools relative to the control group of merit schools.<sup>19</sup> Before the meetings ended, Overlap schools charged a non-needy price and a higher average price that was higher than even the need-only prices. These premiums disappeared after the meetings ended.<sup>20</sup> While no formal charges were brought, the Department of Justice did suspect that the Overlap members were exchanging information regarding tuition levels at the meetings.<sup>21</sup> If true, this may explain the decline in the premium. Thus, the settlement appears to have changed the competitive environment sufficiently to prevent the Overlap members from achieving higher prices than the need-only schools that implement their policy independently. After the meetings end, the only way in which the Overlap schools differ from the need-only schools is in the price charged the meritorious students. This price has increased substantially. While the need-only schools' meritorious price does not statistically (or economically) significantly differ from the price charged by the merit schools, for the Overlap schools the price is over \$2,000 higher. This too is quite surprising, both in light of the economic models and in light of the arguments made by the schools themselves. This is possibly explained if the schools that offer merit-based aid responded to the threat of an increase in price competition for meritorious students on the part of Overlap members. Thus, the merit schools may have reduced the price to meritorious students substantially, causing the difference between Overlap schools and merit schools to increase.

Now, consider the need-only coefficients. First, note that the before and after coefficients are statistically significantly different than each other in all regressions, as indicated by the dagger superscripts. That is, the end of the Overlap meetings appears to have substantially changed the prices charged by the need-only schools relative to the control group of merit schools. Two price differences increased: need-only schools charged a higher relative price to students who pay the full price and earned higher tuition revenues per student (a higher average price) after the meetings ended. Two prices decline, as is consistent with the theoretical implications. First, after the meetings end the need-only schools charge a

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<sup>19</sup> Recall that the need-only dummy variable is equal to one for both independent need-only schools and Overlap schools. Thus, the coefficient indicates a different outcome for schools with need-only financial aid policies, regardless of whether the policy is implemented cooperatively or independently.

<sup>20</sup> Though after the meetings ended the Overlap dummy is insignificant in the average price regression, it is also statistically significantly unchanged from the value before the meetings ended.

<sup>21</sup> One of the specifications of the settlement was that schools were prohibited from exchanging information regarding future tuition levels.

price to needy students that is over \$700 less than that charged by schools that award merit-based aid. Second, the price premium charged to meritorious students disappears. Thus, among need-only schools, competition does seem to have increased for needy and meritorious students.

The other variables in general perform as expected. When significant, an increase in income leads to a higher price. When statistically significant, the quality variables – the proportion of faculty with Ph.D.s, the student-faculty ratio, and the number of majors offered – generally have the expected sign. In other words, the higher the quality of the school, the higher the prices and revenues. The exception is the student-faculty ratio, which has a statistically significantly positive effect on the needy price and on the average price; this is contrary to expectations. Finally, it is strange that none of the quality variables are significant in the non-needy equation. One would expect the non-needy price to most strongly reflect quality, where other prices reflect characteristics of the students themselves. In all of the price equations, collinearity problems exist between the quality variables and the trend variable. Prices and quality variables are trending upwards over the entire time period. If the trend variable is omitted from the estimation, the coefficients on the “after settlement” indicator variable are much higher. That effect is almost certainly due to the secular upward trend in education prices, not due to changes brought about by the settlement. Thus, it is appropriate to include the trend variable, but such inclusion does reduce or eliminate the statistical significance of the quality variables.

The results for financial aid outcomes are presented in table 6. First, consider the Overlap variables. In neither time period and in no regression are they ever statistically significant. This suggests that, regardless of whether the Overlap schools engaged in annual meetings to jointly determine a student’s financial need, the Overlap schools behaved no differently in terms of the availability of financial aid nor in scholarship expenditures per student, compared to need-only schools that implement their financial aid policies independently.

All financial aid variables change after the settlement ends, and all changes are consistent with higher availability and higher levels of scholarship awards after controlling for the upward trend in the comprehensive fee. First, note that the proportion of students receiving

**Table 6: Financial Aid Outcomes**

(Standard errors in parentheses.)

	Get Need Aid	Get Merit Aid	Grant Aid/ Student	Need Grant Aid/Student	Merit Grant Aid/Student
After Settlement	3.07*** (0.86)	3.52*** (0.59)	540.82*** (63.54)	278.19*** (90.19)	132.58** (56.70)
Need-only, Before	-4.53 <sup>†</sup> (3.54)	-8.95*** <sup>†</sup> (2.56)	-530.21* (296.53)	-829.07*** (304.28)	-640.85*** (119.59)
Need-only, After	-6.98** (3.55)	-11.91*** (2.56)	-477.73* (297.51)	-819.17*** (309.08)	-702.71*** (125.22)
Overlap, Before	-2.80 (3.62)	0.40 (2.64)	-12.77 (301.93)	-252.66 <sup>‡</sup> (312.08)	-2.38 <sup>‡</sup> (113.95)
Overlap, After	-2.03 (3.60)	-0.37 (2.64)	-55.59 (301.07)	31.00 (315.49)	-78.16 (117.17)
Liberal Arts	6.50** (2.78)	0.47 (2.05)	-1532.35*** (264.15)	67.53 (244.55)	-144.93 (95.61)
Public	-15.28*** (4.86)	-2.80 (3.47)	-2,278.24*** (396.67)	-2,062.28*** (432.97)	-409.91** (183.50)
Religious	-4.41 (2.78)	3.22 (2.73)	-500.61** (222.19)	-585.66** (279.42)	80.83 (129.58)
Income	0.97* (0.50)		75.71** (36.14)	111.93** (55.81)	
% African-Am.	0.46 (1.94)	-0.14 (1.26)	317.82** (143.24)	173.13 (251.05)	13.61 (75.94)
Top 10 H.S. Class		0.35 (2.90)			2.42 (13.38)
% Graduate Students			-42.69*** (2.73)		
Unres. Rev./Student	2.24 (4.34)	0.05 (2.99)	1,583.16*** (345.89)	144.43 (458.29)	-20.13 (152.86)
Res. Sch./Student	2.04*** (0.54)	0.33 (0.39)	312.36*** (43.09)	225.70*** (59.56)	-12.98 (16.62)
Comp. Fee	0.34 (0.34)	0.04 (0.18)	146.55*** (24.15)	227.71*** (33.07)	3.98 (8.59)
Constant	12.88*** (7.83)	4.50 (4.00)	842.80 (599.01)	-2023.68** (866.60)	660.13*** (194.15)
Observations	611	579	648	195	616
Haus. Spec. Test	6.73	43.1***	50.06***	7.03	5.68

\*\*\*,\*\*, \*Significant at 1%, 5%, and 10% level, respectively.

<sup>†</sup>The Need-only, Before and Need-only, after coefficients are statistically significantly different at the 10% level or better.<sup>‡</sup>The Overlap, Before and Overlap, after coefficients are statistically significantly different at the 10% level or better.

financial aid – need- or merit-based – increase by over three percentage points at all types of schools after the meetings ended. In addition, grant aid expenditures per student – in total, need-based, and merit-based – increased after the meetings ended. Thus, the Overlap members’ prophecies of less aid available for needy students does not appear to have come true, in general. However, it does appear to have become less available at need-only schools. Before the meetings ended, need-only schools awarded need-based financial aid to almost five percentage points fewer students. After the meetings ended, that difference increased to almost seven percentage points. Thus, while the control group of schools increased the availability of need-based aid, the need-only schools decreased availability.

In terms of the amount of scholarship aid spent per student, need-based aid, merit-based aid, and total aid increased after the settlement. Both before and after the meetings ended, need-only schools spent less scholarship aid per student than did the merit schools. This is consistent with the argument of the Department of Justice that the goal of Overlap was to reduce financial aid expenditures, assuming that the need-only schools are engaging in tacit collusion.<sup>22</sup> The end of the cooperative meetings has not changed the aid gap; that is, the coefficient on the need-only dummy after the meetings end is not statistically significantly different than the coefficient while the meetings occurred.

Finally, consider the control variables. Public schools do not offer as much scholarship aid nor is it as widely available as at private schools; this should be expected, given public school resources. Religious schools also spend less on total grant aid and need-based grant aid, but do not spend a statistically significantly different amount on merit-based aid. The variable included to indicate the “merit” of the student body, the percentage of the freshmen class that is from the top ten percent of their high school class, is not significant, while the percentage of students that are African-American is only significant in terms of total grant aid spent per student. (Recall that the latter may also proxy for increased need amongst the student body.) Finally, consider the impact of school resources. As predicted, the more unrestricted, non-tuition revenue available to the school, the higher grant aid expenditures per student. In addition, the higher the restricted scholarship aid per student available to the school, the more students who receive a need-based scholarship and the more grant

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<sup>22</sup> The latter condition is necessary since the Overlap schools behave no differently than the need-only schools.

aid in total and on a need-basis is spent per student. Finally, the comprehensive fee is a statistically significant determinant of the amount of total grant aid and need-based grant aid per student, but does not affect the amount of merit-based aid per student nor the proportions of students receiving either type of aid. Thus, most of the expectations on the control variables hold.

## **VII. Conclusion**

The purpose of this paper is to analyze the impact of the settlement between the Ivy League and MIT with the Department of Justice on pricing and financial aid strategies. While the settlement allowed much of the contested behavior to continue, some limits were put on the ability of the schools to enforce collusion and on the ability of the schools to reduce competition in the form of the financial aid. Comparisons are made across schools that adopt different financial aid policies and across time. The results suggest that the settlement has lead to changes in both pricing and financial aid outcomes. While more students are receiving financial aid and more scholarship aid is being spent per student, prices have still risen on average after the legal proceedings led the schools to end their annual coordinating meetings.

## Appendix

### Settlement

In December 1993, the Department of Justice and MIT reached an out-of-court settlement that was in many ways more lenient than that signed by the Ivy League schools. The following standards of conduct<sup>23</sup> were included in the settlement.

#### “Standards of Conduct

1. Non-profit institutions of higher education may participate in the cooperative financial aid arrangements set forth below (“Participating Schools”), provided that they:
  - a) practice need-blind admissions; that is, admit all United States citizens to their undergraduate programs without regard to family financial circumstances, other than those admitted from a wait list; and
  - b) provide financial aid sufficient to meet the full need of all such students.
2. Participating Schools may agree to provide only need-based financial aid and to prohibit merit scholarships.
3. Participating Schools may *jointly* discuss and agree on principles of need analysis, but may not thereby eliminate all professional judgment on the part of individual financial aid officers.
4. *Before* financial aid awards are made, Participating Schools may exchange through a central computer facility data on commonly-admitted applicants regarding family and student assets, income, allowances against assets and income, number of family members, and the number of siblings in college. Each participating school may retrieve such data only once for each applicant.
5. *After* financial award letters are sent to students, each participating school may submit financial aid data to an independent third party for analysis. The independent third party shall tabulate and disclose the following to all Participating Schools:
  - a) For each pair of schools:
    - (1) the total number of cross-admitted applicants who receive financial aid; and
    - (2) the number of such cross-admitted applicants for whom the family contribution of one school exceeds the family contribution of the other school by at least (a) 20%, and (b) 50%, of the average family contribution of all aided applicants across all Participating Schools;
  - b) For each Participating School, the number of students, if any, for whom the sum of family contribution plus financial aid from all sources (1) exceeded, and (2) fell short of, the school’s student budget.

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<sup>23</sup> Emphases added.

6. Until the graduation of each admitted class, each Participating School shall maintain with respect to that class (a) all reports received from the independent third party, and (b) data consisting of the number of students offered financial aid and the number admitted from a waitlist.
7. Participating Schools may *jointly* develop uniform applications for collecting data from financial aid applicants, but each shall remain free to request and utilize additional or different data from its applicants.
8. Participating Schools may not discuss or agree upon family contributions to be expected from individual aid applicants.
9. Participating Schools may not discuss or agree upon the mix of grants and self-help to be awarded individual aid applicants.
10. Participating Schools may not agree upon or exchange prospective tuition or general faculty salary levels.”

**Improving America's Schools Act of 1994** (Public Law 103-382),  
as amended by the Need-Based Educational Aid Antitrust  
Protection Act of 1997 (Public Law 105-43)<sup>24</sup>

**Sec. 568. Application of the Antitrust Laws to Award of  
Need-Based Educational Aid.**

(a.) EXEMPTION – It shall not be unlawful under the antitrust laws for 2 or more institutions of higher education at which all students admitted are admitted on a need-blind basis, to agree or attempt to agree –

- (1) to award such students financial aid only on the basis of demonstrated financial need for such aid;
- (2) to use common principles of analysis for determining the need of such students for financial aid if the agreement to use such principles does not restrict financial aid officers at such institutions in their exercising independent professional judgment with respect to individual applicants for such financial aid;
- (3) to use a common aid application form for need-based financial aid for such students if the agreement to use such form does not restrict such institutions in their requesting from such students, or in their using, data in addition to the data requested on such form; or
- (4) to exchange through an independent third party, before awarding need-based financial aid to any of such students who is commonly admitted to the institutions of higher education involved, data submitted by the student so admitted, the student's family, or a financial institution on behalf of the student or the student's family relating to assets, liabilities, income, expenses, the number of family members, and the number of the student's siblings in college, if each of such institutions of higher education is permitted to retrieve such data only once with respect to the student;

(b.) LIMITATIONS – Subsection (a) shall not apply with respect to –

- (1) any financial aid or assistance authorized by the Higher Education Act of 1965 (20 U.S.C. 1001 et seq) ; or
- (2) any contract, combination, or conspiracy with respect to the amount or terms of any prospective financial aid award to a specific individual.

(c.) DEFINITIONS – For the purposes of this section

...

- (6) the term 'on a need-blind basis' means without regard to the financial circumstances of the student involved or the student's family;

...

(d.) EXPIRATION – Subsection (a) shall expire on September 30, 2001.

...

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<sup>24</sup> The amendments are minor. In particular, the word *temporary* is removed before the word exemption in subsection (a); the expiration date is changed from 1997 to 2001; and subsection (a) item (4) mildly restates the type of data that can be exchanged.

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