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Keywords
educational economics, student financial aid

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The increasing use by private colleges and universities of financial aid based on "merit", as opposed to based solely on financial need has caused many to raise concerns that this type of aid will go mainly to higher income students crowding out aid to lower income students. However, some analysts suggest that by attracting more "almost full-paying" students through the use of merit aid, institutions will have more financial resources that they can use to increase their financial aid to low-income students and thus their enrollment. Results using data from the College Board's *Annual Survey of Colleges* and other secondary data sources suggest that the increased use of merit aid is associated with a decrease in enrollment of low-income and minority students, particularly at more selective institutions. Additionally, this paper examines how institutions may be diverting financial resources to fund merit aid awards, such as through the increased use of part-time faculty, increases in tuition or fees, or smaller increases in faculty salaries. For middle and bottom tier colleges a merit aid policy is accompanied by an increase in tuition. Top tier colleges experience decreases in faculty salaries after the introduction of a merit aid policy, and bottom tier colleges see increases in salaries.

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I. Introduction

The adoption of a policy of awarding financial aid based on merit, as opposed to strictly need-based aid, has become markedly more popular at private colleges and universities over the last two decades. This increased use of merit aid by private colleges and universities has been a popular topic of discussion by educators, researchers and the press. Merit aid is often used by many private colleges and universities seeking to increase their enrollments of high test score students in order to boost the quality of their student bodies. It is well documented that test scores, such as SAT and ACT scores, are highly correlated with income and race. Many fear that merit based awards will go mainly to higher income and non-minority students, leading to a decrease in the enrollment of low-income students, as well as possibly students from under-represented minority groups. In a 2006 study, Heller estimates that greater than 60% of institutionally offered merit aid went to students with family incomes above the median, and 13% went to students from families earning greater than $125,000. If financial aid funds must be split between merit-based awards and need-based aid and many if not most of the merit-based awards are going to higher-income students, there will be fewer funds available to subsidize the costs of attendance for low-income students. This seems to be a reality for many financial aid offices - a 2003 study by the Lumina Foundation reports anecdotes from college administrators indicating that there is often a trade-off occurring between need and merit in financial aid decisions at some institutions.

However, it may be the case that the use of merit aid by private institutions does not have a negative impact on the enrollment of low-income students. Some argue that

merit aid can actually help to improve the financial situation of an institution by bringing in more "almost full-pay" students (Bowen et. al, 2005). In this case, on average the merit awards do go to higher income students, but they do not fully subsidize the cost of attendance and as enrollment goes up, net tuition revenues could go up as a result. This increased revenue could then be used to increase the quality of the institution and/or to increase need-based financial aid. The 2003 Lumina Foundation report shows that some colleges and universities report using merit aid as a tool to increase enrollment and fill their classes to capacity. A 2006 case study examining one such institution showed that following the introduction of merit aid there was an increase in tuition revenues as well as an increase in the representation of low-income students (Scannell, 2006).

There is also the concern that in order to provide merit aid, institutions might need to divert funds originally intended for other areas than just need-based aid, such as for increases in faculty salaries, or hiring of full-time faculty versus adjunct faculty. Colleges also might use increases in tuition or other fees such as room & board to cover the increase in spending on merit-based financial aid. Diverting funds in these ways may impact educational outcomes and direct costs to students, and therefore it is important to understand how the introduction of merit-aid programs can affect spending patterns at institutions.

This paper will help to shed light on these questions by first examining what factors influence an institution's decision to begin offering merit-based aid. The paper then continues by examining how the socio-economic and demographic composition of the student bodies at private four-year colleges and universities change following the introduction of a merit aid policy, and by investigating whether the use of merit aid is

successful in that its adoption is followed by increases in the quality of the student body and/or by enrolling larger classes. Lastly, this paper explores what other spending trade-offs institutions may be making in order to fund their merit awards.

Private colleges and universities respond to low growth in the median SAT scores of their freshmen classes as compared to their peer institutions by introducing a merit aid program. The results suggest that there is a decrease in the representation of low-income students after schools begin offering merit aid, and a redistribution of Black students from top schools to bottom ranked schools. However, the sizes of these effects are different for colleges of different initial quality. The use of merit aid is associated with modest gains in median SAT scores of the incoming class, particularly for middle tier colleges. In terms of changes in spending in other areas, the use of merit aid is associated with an increase in tuition for middle and bottom tier schools, and a slight decrease in associate and full professor salaries at top-tier schools. These results suggest that the use of merit-aid may lead to an increase in the under-representation of low-income and minority students at private four-year colleges and universities and that for some institutions funds may also be diverted to fund these scholarships which could result in negative impacts on student outcomes.

This paper proceeds as follows. Section II reviews the literature in the area and discusses in more detail the questions I will test. Section III contains descriptive statistics, followed by results in Section IV, and in Section V, I conclude.

II. Background

With the expansion in the use of merit-based financial aid, there has been an accompanying increase in research focused in this area. However, at this point most research has focused on state merit aid programs and specifically, the Georgia HOPE scholarship. This program was designed to increase enrollment of college-able students at colleges and universities in Georgia, and also to entice students to remain in state to pursue their post-secondary degrees. As a result, much of the research focusing on this program and other state programs like it, have examined the enrollment impacts, and how these effects are distributed across different sub-populations of students[1]. Singell and coauthors (2006) use Pell grant data to show that the introduction of the Georgia HOPE scholarship did lead to an increase in access to higher education for low-income students. However, in a 2000 paper, Dynarski shows that while the HOPE scholarship program was successful in its goal to increase enrollment, there was very little of an effect for low-income and Black students who often were not eligible for the award due to low test scores. A later paper examining similar merit aid programs in other states showed more favorable enrollment effects for Black and Hispanic students (Dynarski, 2003). Results of another study examining the response of four-year colleges and universities to the introduction of the Georgia HOPE scholarship show that institutions reacted by increasing tuition and other fees (Long, 2004). Although the Georgia HOPE scholarship, and other state programs like it, has very different goals, the results of these studies show that the impacts of merit-based aid may not be distributed evenly across income and race

[1] For other examples of work examining effects of the Georgia HOPE scholarship see Cornwell et al., 2006 and Cornwell & Mustard, 2005.

groups. These studies also provide evidence of one way in which institutions may respond to an increase in spending on aid – increases in tuition.

Research examining the effects of institutionally funded merit aid awards by four-year colleges and universities is much more limited, mostly due to the scarcity of data on institutional spending on merit aid. A 2006 paper by Ehrenberg, Zhang and Levin investigates how the use of institutionally funded National Merit Scholarships affects the enrollment of students that receive a Pell Grant. Their results show that institutions that fund National Merit Scholarships for their enrolled students that have earned them enroll fewer Pell Grant recipients, a proxy for the number of low-income students. Although this is a specific type of institutionally funded merit-based financial aid these results show that institutionally funded aid programs based on academic merit can lead to a crowd-out of lower-income students.

If the introduction of institutionally funded merit aid awards at private colleges and universities also leads to a reallocation of funds from other sources to financial aid, this may impact educational outcomes of students. One possible way this could happen is if colleges or universities increase the use of part-time or adjunct faculty for teaching in order to cut costs on faculty salaries which may negatively impact students' grades and persistence. Ehrenberg and Zhang (2005) find that colleges or universities that employ more adjunct professors have lower persistence rates of students into their second year. Students that are taught mostly by this type of professor that by definition does not have as strong of a tie to the college or university, and in some cases may be less qualified than a tenure-track professor, may not be as satisfied with their academic experience and therefore are less likely to persist into their second year. Using administrative data from

the public higher education system in Ohio, Bettinger and Long in a 2006 paper find similar evidence that taking more classes taught by adjunct professors is associated with lower persistence rates for students. However, they find that there also might be some positive impacts of adjunct professors in that they can increase the probability of taking future courses in the subject taught, particularly in fields such as engineering and education (Bettinger & Long, 2007).

Institutions may also cut back on spending on faculty salaries in order to help fund merit aid awards. Lower real faculty salaries, or smaller raises, could lead to an increase in turnover of high quality faculty who are already employed by the university (Ehrenberg et al., 1991). Additionally, these colleges and universities will likely find hiring of high quality new faculty to be difficult as outside options will now be more attractive. This could possibly lead to a decrease in faculty quality, which could in turn impact student outcomes. This paper will examine how student body characteristics, faculty salaries, tuition and fees levels, and percent of the faculty that are adjuncts are impacted by the use of institutionally offered merit aid. Additionally, I will investigate how the effect of merit aid on these outcomes may differ for colleges and universities of different quality levels. The results shed light on the perhaps unintended consequences of merit-based financial aid.

III. Data and Descriptive Statistics

To examine the choice to offer merit aid and to evaluate the effects of the use of merit-based financial aid by private colleges and universities, this paper uses data from the College Board's *Annual Survey of Colleges* for the years of 1987-2005. Each year the

College Board sends a survey to institutions that includes a set of questions regarding their financial aid practices. The survey specifically asks the institution to report if they award non-need based financial aid that is based on academic merit. This paper focuses on private four-year colleges and universities as public colleges and universities are more limited in their control over their funding sources and spending. I restrict the sample to private four-year colleges that report in the beginning of the sample period (1987) that they do not offer financial aid based on merit[2]. By doing this, I have defined the set of 133 private four-year schools that are "at-risk" of offering merit aid in order to compare characteristics before and after the addition of merit aid. A majority of private four-year colleges and universities were already offering merit aid when the data window opens in 1987 and as a result the remaining set of "at-risk" institutions is fairly small. However, as much of the concern regarding the effects of merit aid policies are focused on the institutions that have switched to merit aid in the last two decades, this sample should capture the population of interest. There are 40 schools that never begin offering aid and 93 schools that begin offering merit aid during the nineteen year time period. This paper follows these schools through the sample period, observing the year in which they begin offering aid. This information is used to define at each point in time how many years an institution has offered merit aid.

Data on student body characteristics, institutional characteristics and spending are merged in from a number of sources. The percentage of students receiving a Pell Grant is obtained from the Pell Grant Recipients data and is used to proxy for the percentage of low-income students at each institution in each year. The racial composition of each

[2] The sample of private four-year colleges and universities excludes post-secondary institutions specializing in the study of music or the arts, and religious seminaries.

college or university is derived from the *Integrated Postsecondary Education Data System* (IPEDS), a product of the National Center for Education Statistics (NCES). Measures of student body quality and application pool quality such as 75th percentile SAT scores and median SAT scores of incoming freshmen[3], number of applicants, admit rate and yield rate come from the College Board data set, as does the percent of enrolled freshmen from outside the U.S. Institutional costs and spending data, including tuition, room & board, and average salary by faculty rank, come from IPEDS. Finally, the percent of faculty employed part-time is derived from IPEDS data.

Figure 1 shows the percentage of private four-year colleges and universities in the sample offering merit-based financial aid for each year in the sample period, 1987-2005. The trends are also shown for each tier. Tiers are defined using median SAT scores of the student body at the start of the sample period to partition the complete sample of private four-year institutions into terciles.[4] By definition, no institutions in the sample were offering merit aid in 1987. There is a fairly steep and steady increase for the whole sample, and as a result, in 2005 about 70% of the colleges and universities in the sample have started offering merit aid. The bulk of this increase comes from schools in the bottom and middle tiers, as about 50% of the top-tier schools report offering merit aid in 2005, whereas over 90% of mid-tier schools offer merit aid in 2005. One of the main hypothesized motivations behind the use of merit-based financial aid is to attract more

[3] What is referred to as the median SAT score is actually calculated as the midpoint of the interquartile range.

[4] More specifically, the median SAT scores in 1987 of all private four-year colleges and universities reporting complete merit-aid data for the sample period, including those that offer merit for the entire period, were used to break the sample into terciles. Bottom tier schools have SAT scores below 1020, Middle Tier schools have SAT scores between 1020 and 1110, and Top Tier schools have SAT scores greater than or equal to 1110. All SAT scores prior to 1996 were re-centered using the crosswalk provided by the College Board. If SAT scores were missing in 1987, 1988 values were used if available, or if not, SATs were imputed using expenditures per student, urbanicity, % residential, and student body size.

high ability students to enroll at one's institution. Bottom and mid-tier schools have the most incentive to do this in order to move up in the hierarchy of private four-year colleges and universities by enrolling a higher quality student body. However, top-tier colleges may decide to begin offering merit aid as a way to stay competitive and to retain high-ability students as more and more colleges around them are trying to steal these students away. Figure 1 illustrates that there has been a strong movement by private four-year colleges and universities towards merit-based financial aid. When weighted by the size of the undergraduate student body, the trends look very similar, showing that there is not a specific pattern over time to the size of schools that have decided to begin offering merit aid.

Descriptive statistics for the outcome variables of interest are shown in Tables 1a and 1b. Mean values are reported for the beginning and end of the sample period, as is the percent change in each variable over the time period for the whole sample of schools and by tier. The percentage of students receiving Pell Grants has increased by 15% over the sample period. The majority of this increase has occurred in the mid-tier and bottom tier schools. Although there has been a fairly large increase in percent Pell over the time period, low-income students still make up a much smaller proportion of the upper-tier schools; only 14% of the student body at top tier schools as compared to almost 48% at bottom tier schools. The percentage of Hispanic students enrolled has grown significantly over time, and the bulk of this increase has occurred at mid-tier and top tier schools. Despite the increases, in 2005 Hispanic students made up only 5% of the student bodies at the schools in the sample. There is a very similar pattern for the increase in representation of Asian students. Although there has been very little increase

in the percentage of Black students enrolled at schools in the sample, there have been large percentage increases in the top two tiers. Black students are much more highly represented in the student bodies at bottom tier schools than at top tier schools, 31% in the bottom tier versus only 5 % in the top tier.

Applicant pools have increased quite a bit over the sample period, especially at bottom tier schools (over 100%). However they are still significantly larger at top tier schools. This is hardly surprising, as the top tier colleges are the most in demand by students, especially high ability students, and they are also on average larger schools with more slots for freshmen students. It may also be that this jump in applications for middle tier schools is partly driven by the increased use of the common application by these schools (Liu, et. al, 2007). Although the applicant pool has grown steadily, the size of the freshmen class has not grown at the same rate. As a result, admit rates have fallen over time. Interestingly, yield rates have also fallen over time. This may also be a result of the "apply everywhere" philosophy that seems to have taken hold in recent years. Admitted students may have more options of where to enroll, and therefore the probability of enrolling a particular admitted student may be falling. Schools in the sample enroll a small percentage of foreign freshmen, 4% in 2005, but there has been an increase over time for the bottom and top tier schools. The majority of the student bodies at the schools in the sample are composed of full-time students and this percentage has increased slightly over time for all schools.

In terms of charges, both room & board and tuition have increased significantly during the sample period. Changes in room & board charges have been comparable across tiers, at around a 20-30% change in charges, although the average charges do go

up as you move up a tier[5]. Tuition charges follow the same pattern in terms of means, but the large increases in tuition have occurred mostly at the bottom and middle tier colleges and universities. Despite these big increases in the bottom two tiers, the tuition levels at top tier schools are still significantly higher, with an average of almost $30,000 for top tier schools in 2005 versus only $13,000 at bottom tier schools and $21,000 at middle tier schools.

Colleges in all three tiers have seen similar percent increases in average faculty salaries. As with tuition, top tier colleges and universities have much higher average salaries at every rank than do colleges and universities from the bottom two tiers. Top tier schools employ more of their faculty full-time than do schools from the bottom two tiers. On average, 24% of the faculty at top-tier schools is employed part-time, versus 44-48% at bottom and middle tier schools.

The descriptive statistics in Tables 1a & 1b show that for both types of colleges in the main sample, those that begin offering aid at some point during the time period, and those that never do (for ease of discussion I will refer to them as Change and Never schools), there are definite time trends for all of the variables of interest. This does not, however, tell us if the practice of offering merit aid affects these variables, and by how much. Figure 2 shows the percentage of the student body that receives Pell Grants by the number of years since or until merit aid is first offered, for all of the Change schools and also separated by tier. There are fewer schools with many years of observations before they began offering merit aid causing the trends to be very jumpy before year zero, and then smooth out considerably. Despite the jumpy nature of the percentages before merit aid is offered, there is a distinct pattern that emerges at year 0. For all three tiers there is

[5] All dollar amounts have been adjusted for inflation and are reported in constant 2005 dollars.

a somewhat steady increase in percent Pell in the years leading up to the introduction of the merit aid policy, and then starting at year zero, this incline flattens out and may even start to reverse about 10 years following the policy change. This pattern, although not showing a strict decline in percent Pell following the policy change, does provide descriptive evidence that there was an effect on the income distribution of students following the switch to merit aid.

As mentioned previously, a likely main motivation for offering merit-based aid is to increase the quality of the student body by attracting more high-scoring students to enroll. Figure 3 shows the median SAT scores of the incoming freshman class by the number of years until or since merit aid is first offered. There is no clear pattern relating the number of years offering merit aid and the average median SAT scores, so perhaps these policies are if anything, only moderately successful in actually increasing the quality of the student body. It is also possible that instead of increasing student body quality, the policies work to maintain student body quality such that in the absence of such a financial aid program the institutions would have experienced decreases in their median SAT scores. A more formal regression analysis is required to examine this relationship. The next section examines empirically whether the descriptive relationships that do appear remain after controlling for other characteristics.

IV. Empirical Methods and Results

A. Factors Affecting the Decision to Offer Merit Aid

This paper has put forth a number of hypotheses in the introduction as to why private four-year colleges might begin to offer merit-based financial aid. To examine the

factors that affect this choice I estimate a proportional hazards model for the decision to begin offering merit aid in each academic year. Between each observed time period, institutions have the choice to continue not to offer merit aid or to begin offering merit aid. This decision is modeled as a function of an institution's own characteristics in the beginning of the time period and how these characteristics interact with those of peer institutions.

Following the hypotheses outlined above there are two measures of particular interest. If colleges notice that they are enrolling high ability students at a lower rate than their peer institutions, or in other words are experiencing slower growth in their median SAT scores than peer colleges, they may offer merit aid awards to increase their yield of high ability students. Lower tier colleges may want to increase the quality of their student body, but could also have trouble filling their freshman classes and therefore may respond to low enrollment growth by introducing a merit aid program. To investigate these two relationships I include indicators of whether the institution had lower growth in either median SAT scores or total undergraduate enrollment than their peer institutions and then include interactions of both measures with indicators for the tier of the college[6].

Hazard ratios from estimations of the probability of beginning to offer merit aid with several different peer group definitions are reported in Table 2. Column 1 (2) of Table 2 defines peer institutions as those with median SAT scores within a 50 (100) point band of the focus institution's own median SAT scores. Column 3 defines the peer institutions using a distance metric – including all private four-year institutions located

[6] As none of the institutions in the sample have started offering merit aid at the beginning of the sample period, their "spells" of not offering aid are already in progress. The proportional hazards model takes this into account, assigning all schools the same start date of 1960. The results are not sensitive to changes in this start date. The estimations also take account of the fact that the "spell" is right-censored for Never schools as we never observe their switch to merit aid.

within 200 miles of the focus institution. Column 4 combines these two types of peer group measures and defines peers as all institutions with median SAT scores within a 100 point band of the focus institution and also within a 200 mile radius. The results seem not to be very sensitive to the peer group definition. Colleges that are experiencing slower growth in median SAT scores as compared to their peer institutions are significantly more likely to begin offering merit aid in that time period. When peer group is defined only by distance top tier colleges are less likely to begin offering merit aid if they are experiencing low growth in their SAT scores. However, for top tier institutions it is unlikely that this is the correct peer group to consider – top tier institutions compete on a national scale for students. Although anecdotally it appears that some colleges, in particular lower tier colleges, may be using merit aid as a way to fill their classes, low enrollment growth as compared to peer institutions does not have a significant effect on the probability of beginning a merit aid program. Therefore it seems that colleges are strategically using merit aid as a way to stay competitive in the market for high ability students, and these results largely confirm the common hypothesis for the use of merit aid.

B. The Effects of Merit Aid on Institutional Characteristics

The descriptive statistics in the previous section suggest that for this sample of four-year colleges and universities, there have been significant changes in the variables describing the student bodies, costs and spending on faculty over the sample period, and that some of these changes may have followed the introduction of merit-based financial aid by the institutions. In order to examine this more closely I estimate the relationship

between the number of years a college or university has offered merit aid, and the outcome variables of interest. One might expect that if there are impacts on the distribution of students or institutional spending, these effects may not be constant over time once the school has decided to offer aid. There are a number of reasonable scenarios for the time pattern of the possible effects. Institutions might have an immediate response in terms of spending that over time may fade away as they find alternate funding sources for their merit awards. In contrast, there may not be an immediate effect if schools anticipate offering merit aid and have an alternate funding source in mind that is depleted over time leading to a need to cut spending in other areas in order to continue funding merit awards. Therefore, it seems most reasonable to allow a fairly flexible form for the effect of merit aid over time, rather than to take a difference-in-differences approach.

To allow for these possible nonlinearities, the model is estimated as a function of a series of indicators for the time elapsed since merit aid was first introduced. Quadratic time trends are also included to account for the common changes in the variables of interest over the sample period. These trends are allowed to differ for Change and Never institutions, as the types of schools that choose to begin offering merit aid during the sample period are often on quite different trajectories for the time period. Institutional fixed effects are included, as well as time-varying variables such as expenditures per student, percent residential, urbanicity, and whether the institution uses the common application in their admissions process. In order to investigate how the effect of offering

merit aid may differ for colleges of different initial quality, variables indicating how long a college has had merit aid were interacted with indicators for tier[7].

Of course there are likely other policy changes being made at these institutions at the same time as the switch to merit aid. In particular, it is likely that these colleges are moving to increase their institutional quality in a number of ways in addition to attempting to increase the quality of the student body through merit aid. Although many colleges are likely implementing other policies at the same time as their switch to merit aid, it is unlikely that there is anything systematic about these policy changes or their impacts. The estimations control for institution fixed effects and allow for differential time trends, hopefully capturing much of the differences in the types of institutions that begin offering merit aid and those that do not yet, as well as the differences in the other policy changes across institutions that do begin offering merit aid. Perhaps most importantly, what we are most interested in examining is how these outcome variables have changed at institutions that have chosen to switch to merit aid, not how these variables might change if a private four-year college were "forced" to exogenously adopt a merit aid policy in a vacuum.

Table 3 shows the results of Ordinary Least Squares (OLS) estimations of how the composition of the student body changes in the years following the introduction of a merit aid policy. Column 1 shows how the changes in the percent of the student body that is low-income, as proxied by the percent receiving Pell grants, has changed as merit-based financial aid was introduced for the institutions in the sample. There does not seem to be a significant immediate effect following the introduction of merit aid for middle and

[7] Alternative median SAT cutoffs were used to test for sensitivity of results to tier assignment, but all results are robust to changing the tier cutoffs by 20 points in any direction.

top tier institutions. However, there is an increase in the share of students that receive Pell Grants at bottom tier institutions in the first five years following the policy change. A negative relationship begins to take shape at middle and top tier colleges three to five years after adoption, and the percent of Pell grant students at schools that have offered merit aid for six to ten years is roughly 5 percentage points lower than for these schools before they started offering aid. As the time elapsed since introduction of merit aid increases to ten years or greater, the relationship becomes negative for all institutions, but the change is much smaller for bottom tier colleges. Middle and top tier institutions experience a net decrease of about 6 percentage points 10 years out, whereas bottom tier institutions see a decrease only about 2 percentage points. Although in the last section I did not find evidence that colleges experiencing low enrollment growth were more likely to switch to merit aid, there is anecdotal evidence that this is true, and it is argued that in this case there is the possibility of actually increasing the share of Pell Grant recipients in conjunction with merit aid. These results lend some credence to this argument as bottom tier institutions have an initial increase in percent Pell, but long-run there is still a crowding-out of low-income students.

The introduction of merit-based financial aid is associated with a decrease in the percentage of Black students enrolled at colleges in the top two tiers. As with percent Pell, there seems to be little immediate effect, but three to five years after adoption of merit aid there is a decrease in percent Black by about 1.5 percentage points at both top and middle tier colleges. Schools in the top two tiers continue to experience a decrease in the percentage of students that are Black with a total decline of about 2 percentage points after 10 years of offering merit aid. Bottom tier colleges experience an increase in

percentage of Black students of about 2 percentage points after having offered merit aid for more than 10 years, suggesting that Black students are being redistributed from top tier colleges to bottom tier colleges as a result of merit aid programs.

The results show that although following the introduction of merit aid percent Black falls in the top two tiers and rises in the bottom tier, there are only very small changes in percent Hispanic across the tiers. Ten years following the switch to merit aid there seems to be a decrease of about 0.5 percentage points at institutions in the bottom two tiers, and a corresponding increase of about 1 percentage point at top tier institutions. The introduction of merit aid is associated with a decrease in percent Asian at the institutions in the bottom tier, but no change for the top two tiers. The fall in percent Asian at the bottom two tiers is quite small with a decrease of 0.7 percentage points three to five years after adoption and a decrease of about 1.3 percentage points ten years out.

One possible way for institutions to increase tuition revenues in order to help fund the adoption of a merit-based financial aid policy is for these schools to enroll more freshmen from outside of the United States. International students generally receive little to no financial aid and are much more likely to pay the full posted tuition. Column 5 of Table 3 provides evidence that this might be a strategy some institutions are employing. Middle and top tier schools experience an increase in enrollment of international freshmen of about 2 percentage points 3-5 years following the introduction of merit aid, with a slightly larger increase at bottom tier colleges (3.5 ppts). Percent foreign then goes back to pre-merit levels ten years after adoption of merit aid for middle and top tier institutions, and the increase at bottom tier institutions falls slightly to 1.7 ppts.

Table 4 displays the results of estimating how successful the practice of offering merit aid has been at increasing median SAT scores and enrollment of high ability students, increasing the size of applicant pools and the number of enrolled freshmen, as well as the effect of merit aid on admit and yield rates. The results in column 1 indicate that for all schools the introduction of merit-based financial aid is followed by an increase in median SAT scores for the entering class. Top tier colleges actually experience drops in SAT scores in the first two years following the switch to merit aid, likely due to the fact that the institutions in this category that are most likely to begin offering merit aid are those that were having trouble attracting high ability students at the same rate as their peers, as shown in the previous section. However, these institutions rebound somewhat and return to pre-merit levels and possibly experience slight gains in median SAT scores 10 years out. For middle tier colleges, there is a lag with the effect arising about three to five following introduction of merit aid, and leading to an increase in median SAT scores of about 22 points, a fairly modest increase. Ten years out this effect rises to 35 points. It may be that it takes a few cycles of offering merit aid before word gets out and the program begins to attract many higher test score students, or that there is some critical mass that must be attracted before the median scores will actually rise significantly. Bottom tier institutions experience gains in median SAT scores similar to middle tier colleges following the introduction of merit aid. However, ten years after the introduction of the policy, bottom tier colleges have median SAT scores that are only slightly higher than before the policy.

Merit aid policies are meant to increase the size of the top tail of the ability distribution at colleges, so perhaps a better measure of whether colleges have been

successful in this goal is the 75th percentile SAT score. Column 2 shows how the 75th percentile changes following the introduction of merit aid. Colleges at all tiers experience an increase in these scores following the policy change. This effect is largest for middle tier colleges, with an increase of about 48 points, as compared to increases of about 20 points at top and bottom tier colleges ten years following the policy change.

As discussed previously, bottom tier colleges also likely have a second incentive for offering merit aid, to increase enrollment. In column 3, results show that bottom tier institutions that have offered merit aid for 10 years or more actually have slightly smaller freshmen classes than before they began offering merit aid, by about 32 students. Top tier institutions also seem to experience slight decreases in their freshmen class sizes 6-10 years following a switch to merit aid. For both tiers that experience changes in freshmen class size it is possible that the use of merit aid has allowed the institutions to reach a standing where they can begin to decrease class sizes, leading to lower student to faculty ratios and higher quality education. It is also possible for bottom tier colleges that although we did not find evidence for slow enrollment growth as an incentive to begin offering merit aid, this is indeed the case and perhaps merit aid is not a successful tool to reach this goal.

Top tier colleges experience increases in applicant pool size six to ten years following the introduction of merit aid. For the bottom two tiers, applicant pool sizes remain unchanged ten years following the policy change. Columns 5 and 6 of Table 4 show the results for the admit rate (calculated as the number of students admitted divided by the number of students that applied) and yield (calculated as the number of students that enroll divided by the number of students that were granted admission). There is a

decrease in the admit rate, about 5 percentage points, in the three to ten years following the introduction of merit aid. This negative relationship remains over time with only a slightly decrease in the size of the fall in admit rate, and a slightly smaller fall in admit rate for top tier institutions. The results in column 6 show that the introduction of merit aid is followed by increases in yield rates at middle and top tier colleges, and decreases in yield at bottom tier colleges. For middle tier colleges the strategy of using merit-based financial aid to increase enrollment of high-test score students seems to be somewhat fruitful given the slight increase in median and 75th percentile SAT scores associated with this policy, and increase in overall yield rates. Evidence is mixed for the success of merit aid at bottom and top tier colleges. Bottom tier colleges experience an increase in SAT scores but see a fall in freshman enrollment. Top tier colleges see only very slight increases in median SAT scores, but larger increases in yield and 75th percentile SAT scores.

Table 5 examines the relationship between the introduction of merit aid and tuition, room & board, and the percentage of the student body that is enrolled full-time. All three are measures of direct ways by which an institution could make changes in order to fund increases in merit-aid funding. Middle and bottom tier colleges experience an increase in tuition rates of 2.7% six to ten years following the adoption of a merit aid policy, and this effect increases over time to a 6.5% increase in tuition rates ten years out, as compared to before the adoption of merit aid. In contrast, top tier colleges experience decreases in tuition over this time period of about 5 percentage points 6-10 years following the switch to merit aid and about 3 percentage points 10 years out.

The relationship between a merit aid policy and changes in room & board charges is somewhat different from that of tuition charges. Middle and bottom tier colleges see decreases in room & board charges 3-5 years following the introduction of merit aid, but this change reverses such that ten years following the policy introduction room & board levels are similar to before the policy. Top tier institutions do not experience changes in room & board charges following a switch to merit aid. Column 3 shows how these changes in tuition and room & board costs affect total student costs. For all colleges there is an overall increase in total student costs by ten years out. Bottom tier colleges experience slightly higher increases in total costs of about 5 percent versus 2.7 percent for schools in the top two tiers.

Another way in which institutions could increase tuition revenues in order to balance increases in merit aid expenditures would be to enroll more full-time students. This seems to be a successful strategy for schools at all levels, although the relationship is strongest for the middle tier. Three to five years following the introduction of a merit aid program the percentage of students that are enrolled full-time increases by about 3 percentage points at middle tier colleges and 1 percentage point at bottom and top tier colleges. Middle tier colleges continue to see increases in the percentage of students enrolled full-time with an overall net increase of about 8.5 percentage points ten years following the policy change. After the immediate bump, top tier colleges return to original levels. Bottom tier colleges also experience increases in enrollment of full-time students and ten years following the policy change have student populations that are about 6 percentage points more likely to be enrolled full-time.

Table 6 shows results of the effect of merit aid on faculty salaries and the proportion of faculty that are employed part-time. Bottom tier colleges and universities experience an increase in faculty salaries at the assistant professor level of about 5% immediately following the introduction of merit aid. This increases to about 6% ten years following the policy change. However, there doesn't seem to be a relationship between the policy change and assistant faculty salaries at top or middle tier colleges. Middle and bottom tier colleges experience increases in associate faculty salaries of about 5 percent ten years following the switch, and there is a similar positive relationship with full professor salary levels for bottom tier colleges in the first five years following the adoption of merit aid. Top tier colleges experience decreases in associate faculty salaries of almost 6 percent and similarly, average full professor salaries decrease by about 5 percent at top tier colleges ten years following the introduction of merit aid. Middle and bottom tier colleges are likely trying to increase their overall quality by simultaneously attracting more high-ability students through the use of merit aid, and by retaining and attracting high-quality faculty through higher salaries resulting in the positive relationship identified here. Top tier colleges may be spending less on salary increases for tenured faculty in order to help fund merit aid awards and therefore attract more high ability students to their institution.

Ten years following the introduction of merit aid, the colleges and universities in the whole sample experience a decrease in part-time faculty of 8 percentage points. It is encouraging that these findings point to an increase in the quality of the faculty (through the use of more full-time faculty members) associated with the use of merit-based aid, rather than a decrease in quality. Although colleges may need to divert funds to cover

increased expenditures on merit aid, they are likely not doing so by employing more part-time faculty members which may lead to decreases in instructional quality.

A potential concern regarding the results is that the measure of having had merit aid for ten years or more not only captures effects ten years out but specifically for colleges that adopted a merit aid policy early enough to have ten years of data following. This should not be a huge concern for this particular sample as over 90% of the schools that switch to merit during the time period do so before 1997 at a fairly steady rate and therefore have more than ten years of observations following the switch. However, in an effort to test whether the results shown here are specific to "early-adopters" I split the sample into those who adopted early (pre-1995) and late-adopters (1996 and on). Although you cannot identify effects 10 years out for the late-adopters (of which there are very few), the patterns regarding changes in the variables of interest in the years following a switch to merit aid are qualitatively and quantitatively very similar to the results shown for the whole sample. Therefore it does not seem that early-adopters experienced very different changes in outcomes than more recent adopters.

V. Conclusion

An increase in the use of merit-based financial aid by private colleges and universities has prompted many questions regarding the effects of this type of policy on the socioeconomic and racial composition of the student body, as well as other areas of educational expenditures and charges. Some argue that merit aid will lead to a crowding-out of low-income and minority students, who on average earn lower test scores and are less likely to receive a merit award. Others feel that merit aid will allow colleges to

enroll more high-ability students that are able to pay an amount close to full tuition thereby increasing overall tuition revenues which can then be used to increase the funding of need-based financial aid awards. This paper uses data from the College Board, IPEDS and on Pell Grant recipients to examine this question, as well as to examine what factors cause institutions to begin offering merit aid and to assess how successful merit aid is at increasing the median test scores of entering students and/or increasing freshman enrollment. In addition, this study examines how a switch to a merit aid policy could affect the costs students bear in the form of tuition and room & board, as well as the spending on salaries and full-time faculty which can have impacts on the quality of the education provided at a college.

Colleges adopt a policy of awarding merit-based aid in response to low growth in median SAT scores of their incoming classes as compared to their peer institutions, and therefore to remain competitive with peer institutions at recruiting high-ability students. The results of this study show that most private colleges and universities have been successful at increasing the 75th percentile SAT scores of their incoming freshman class through the use of merit aid. However, these gains are fairly modest – an average gain of about 47 points for the middle tier colleges and 20 point gains for bottom and top tier colleges ten years following the adoption of the policy.

The use of merit aid is associated with changes in the socioeconomic and racial composition of the student body. The percentage of students receiving Pell grants decreases by about 6 percentage points at colleges in the top two tiers and 2 percentage points in the bottom tier ten years following the introduction of the merit aid policy. The use of merit aid is also associated with a decrease in the percentage of students that are

Black at the top two tiers of about 2 percentage points. Bottom tier colleges experience a slight increase in international student enrollments following the introduction of merit aid. As international students more often than not pay full tuition and costs, this may be one mechanism by which these colleges can increase tuition revenues to balance the increased outlay on financial aid created by merit aid awards.

The introduction of merit aid policies are accompanied by increases in tuition at middle and bottom tier colleges of about 7%, a fairly substantial increase, resulting in a 3 percent increase in net cost. The posted tuition levels at top tier colleges either do not change following the introduction of a merit aid policy or decrease slightly, but total costs rise by about 3%. Bottom tier colleges experience slightly higher increases in total costs of about 5 percent.

There is some evidence that the use of merit aid leads to a decrease in spending in other areas, in particular on faculty salaries at top tier colleges. Top tier colleges see decreases in spending on associate and full professor salaries following the introduction of merit aid, which could result in higher turnover, and increased difficulty of recruiting high quality new faculty members. Middle tier colleges accompany the use of merit aid with increases in spending on associate faculty salaries, which may help these colleges to retain and attract more high-quality professors. Bottom tier colleges experiences increases in faculty salaries at the assistant and associate level. These increases following the switch to merit aid may signal a move by the institutions to increase quality at both the student level and the faculty level. At all colleges, the introduction of a merit aid policy is associated with an increase in the percentage of faculty that is employed full-time. As Ehrenberg and Zhang (2005) and Bettinger & Long (2004) find that a decrease

in the use of part-time faculty has a positive impact on student persistence, this move by colleges should have a positive impact on educational quality.

Overall, this study finds that merit aid programs are modestly successful at increasing test scores. As shown in the first section of results, the decision to begin offering merit aid is endogenous. Therefore, the results show what is happening at private four-year colleges and universities following the introduction of a merit aid policy but it should be kept in mind that institutions are not operating in a vacuum and there are likely other policy changes occurring in addition to the switch to merit aid. The sample used in the estimations is fairly small and selected, so there may be significant effects that this study is not able to identify. Keeping these caveats in mind, it is worrisome, given the already low levels of representation of low-income and minority students at four-year colleges, to find that the introduction of a merit aid policy is associated with a decrease in the percentage of low-income and Black students, particularly at the more selective institutions in the sample. This crowding-out is likely due to an increase in merit aid spending at the expense of need-based financial aid. In conjunction with the rising costs to students following the switch to merit, this relationship is something that needs more research. Institutions with merit aid policies may want to consider the unintended consequences of these programs, as they seem to be at odds with the current move to increase representation of low-income and minority students at four-year colleges and universities.

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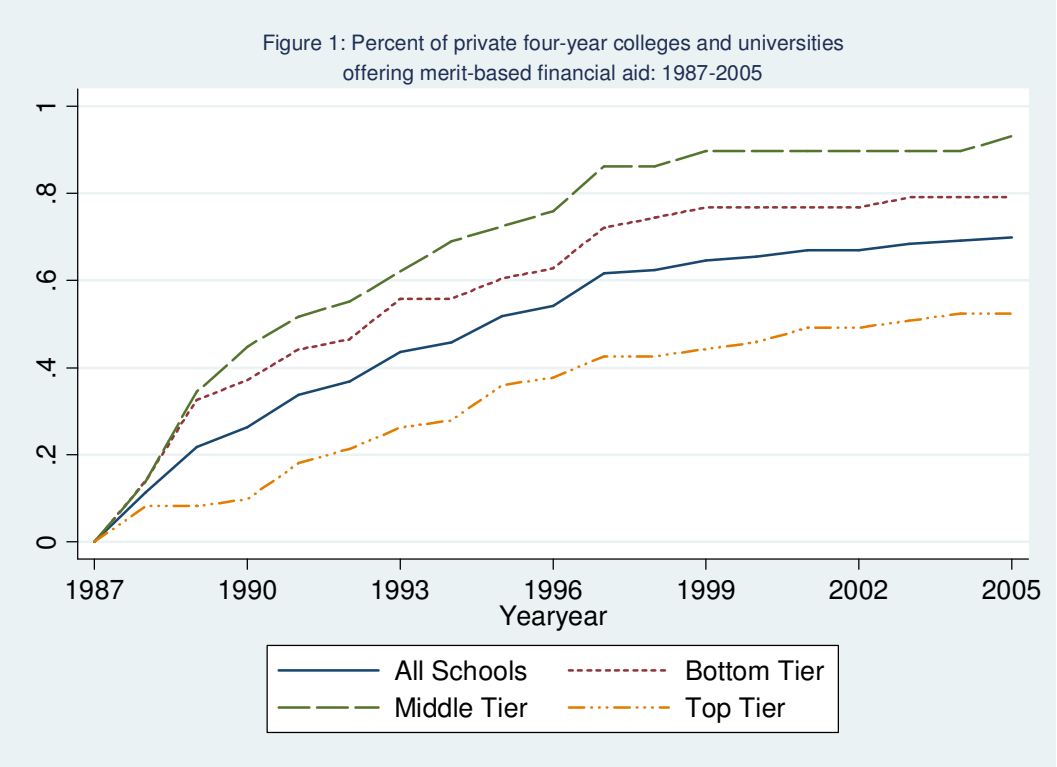
Figure 1: Percent of private four-year colleges and universities
offering merit-based financial aid: 1987-2005
0
.2
.4
.6
.8
1
1987
1990
1993
1996
1999
2002
2005
Yearyear
All Schools
Bottom Tier
Middle Tier
Top Tier

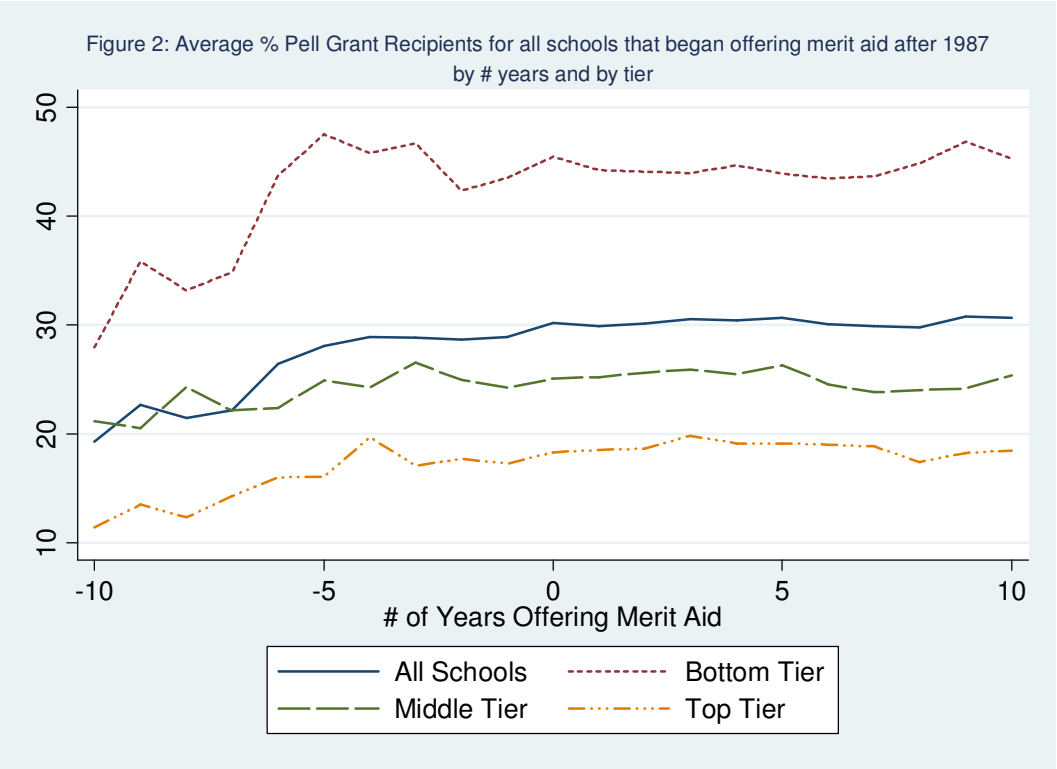
Figure 2: Average % Pell Grant Recipients for all schools that began offering merit aid after 1987
by # years and by tier
10
20
30
40
50
-10
-5
0
5
10
# of Years Offering Merit Aid
All Schools
Bottom Tier
Middle Tier
Top Tier

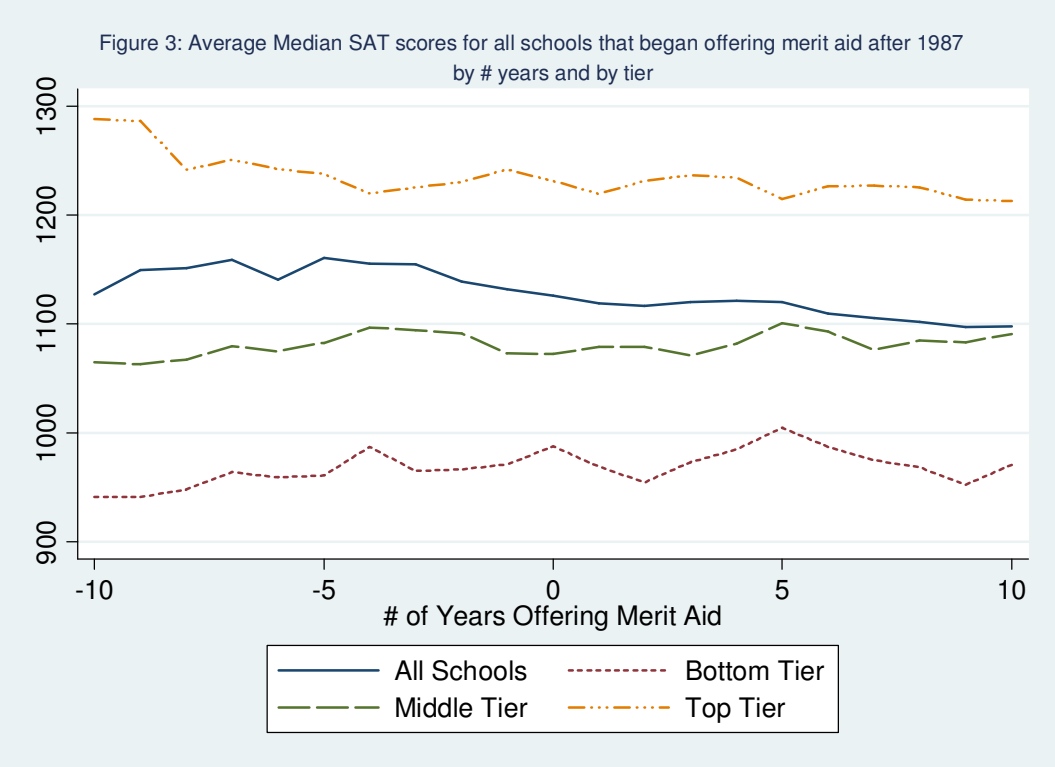
Figure 3: Average Median SAT scores for all schools that began offering merit aid after 1987
by # years and by tier
1300
1200
1100
1000
900
-10
-5
0
5
10
# of Years Offering Merit Aid
All Schools
Bottom Tier
Middle Tier
Top Tier

Table 1A: Descriptive Statistics for Outcome Variables in 1987 and 2005 for main sample and by tier

Variable	All Schools			Bottom Tier		
	1987	*2005*	*% Change*	*1987*	*2005*	*% Change*
Pct. Pell	23.48	27.07	15%	39.97	47.03	18%
	(21.63)	(21.65)		(25.07)	(25.70)	
Pct. Black	13.31	13.74	3%	30.93	31.06	0%
	(27.76)	(26.18)		(41.94)	(39.68)	
Pct. Hispanic	2.63	5.02	91%	2.65	4.48	69%
	(5.36)	(5.03)		(8.92)	(7.55)	
Pct. Asian	3.78	6.02	59%	2.05	2.50	22%
	(6.69)	(7.77)		(9.34)	(8.42)	
# Applicants	3467	4490	29%	554	1207	118%
	(4219)	(5292)		(528)	(1268)	
# Freshmen	474	546	15%	186	220	18%
	(467)	(519)		(165)	(204)	
Median SAT	1153	1174	2%	953	954	0%
	(153)	(195)		(48)	(132)	
75th Percentile SAT	1257	1275	1%	1067	1069	0%
	(148)	(187)		(54)	(140)	
Admit Rate	58.81	54.68	-7%	83.33	68.71	-18%
	(23.39)	(24.91)		(10.63)	(23.93)	
Yield	46.20	40.15	-13%	54.15	47.86	-12%
	(15.49)	(18.32)		(18.95)	(25.71)	
% Foreign Freshmen	3.35	4.24	26%	2.35	2.85	21%
	(3.38)	(3.17)		(3.70)	(1.86)	
% FT Students	83.24	88.28	6%	70.48	77.09	9%
	(20.21)	(17.32)		(26.44)	(24.19)	
Room & Board	6044	7821	29%	4639	5553	20%
	(1573)	(2129)		(1328)	(1771)	
Tuition	13750	22348	63%	7113	12855	81%
	(6184)	(8627)		(2679)	(4301)	
% PT Faculty	30.38	35.87	18%	34.79	44.71	28%
	(16.24)	(21.95)		(16.78)	(22.32)	
Avg. Asst. Prof Salary	43949	52905	20%	32418	40621	25%
	(11127)	(13417)		(7752)	(7656)	
Avg. Assoc. Prof Salary	54645	63813	17%	39068	47101	21%
	(14299)	(16985)		(8675)	(8862)	
Avg. Prof. Salary	71750	83821	17%	45132	55464	23%
	(24132)	(31053)		(13764)	(15341)	
Observations	133	133		43	43	

Note: Reported statistics for 1987 race variables are from 1988. All dollar amounts are in 2005$. Median SATs before 1996 were adjusted for re-centering Tiers are defined by reported Median SAT scores in 1987: Bottom Tier schools have SAT scores less than 950, Middle Tier schools have SAT scores between 950 and 1030, and Top Tier schools have SAT scores greater than or equal to 1030.

Table 1B: Descriptive Statistics for Outcome Variables in 1987 and 2005 for main sample and by tier

Variable	Middle Tier			Top Tier		
	1987	*2005*	*% Change*	*1987*	*2005*	*% Change*
Pct. Pell	22.84	26.46	16%	12.71	13.94	10%
	(16.50)	(14.64)		(12.78)	(5.25)	
Pct. Black	6.82	8.40	23%	3.97	4.64	17%
	(16.51)	(16.50)		(2.31)	(2.30)	
Pct. Hispanic	1.80	3.86	114%	3.00	5.94	98%
	(2.12)	(2.91)		(2.21)	(3.33)	
Pct. Asian	2.64	4.68	77%	5.55	9.03	63%
	(5.26)	(8.14)		(4.30)	(5.83)	
# Applicants	1461	2604	78%	5055	6956	38%
	(900)	(1857)		(4777)	(6289)	
# Freshmen	413	515	25%	697	775	11%
	(269)	(302)		(558)	(620)	
Median SAT	1061	1111	5%	1273	1327	4%
	(23)	(108)		(87)	(100)	
75th Percentile SAT	1176	1209	3%	1365	1420	4%
	(31)	(92)		(97)	(95)	
Admit Rate	71.92	68.59	-5%	46.86	41.40	-12%
	(15.72)	(15.76)		(20.18)	(21.61)	
Yield	48.10	35.99	-25%	43.20	38.49	-11%
	(17.40)	(16.93)		(12.80)	(13.47)	
% Foreign Freshmen	3.45	3.00	-13%	4.02	5.05	26%
	(3.96)	(3.24)		(2.65)	(3.15)	
% FT Students	80.82	88.64	10%	93.38	95.63	2%
	(13.46)	(9.38)		(10.04)	(8.83)	
Room & Board	5888	7758	32%	6824	8902	30%
	(1634)	(2184)		(1091)	(1266)	
Tuition	11742	21172	80%	18624	29886	60%
	(4894)	(5615)		(3285)	(3625)	
% PT Faculty	38.72	48.32	25%	23.34	24.17	4%
	(14.01)	(22.60)		(14.07)	(14.42)	
Avg. Asst. Prof Salary	40909	49788	22%	52156	62305	19%
	(7212)	(10197)		(6731)	(10308)	
Avg. Assoc. Prof Salary	48216	60022	24%	65331	76163	17%
	(11555)	(13721)		(7037)	(11613)	
Avg. Prof. Salary	60233	72555	20%	89250	107463	20%
	(16859)	(21923)		(14323)	(23336)	
Observations	29	29		61	61	

Note: Reported statistics for 1987 race variables are from 1988. All dollar amounts are in 2005$. Median SATs before 1996 were adjusted for re-centering. Tiers are defined by reported Median SAT scores in 1987: Bottom Tier schools have SAT scores less than 950, Middle Tier schools have SAT scores between 950 and 1030, and Top Tier schools have SAT scores greater than or equal to 1030.

Table 2: Probability of offering Merit Aid - Hazard Ratios from proportional hazards model estimation

	(1)	(2)	(3)	(4)
	50 SAT Pts.	**100 SAT Pts.**	**200 Miles**	**200 Miles & 100 SAT Pts**
Expenditures/Student	0.803***	0.801***	0.806***	0.803***
	[0.068]	[0.068]	[0.067]	[0.068]
Bottom Tier	0.728	0.689	1.163	0.744
	[0.281]	[0.274]	[0.696]	[0.292]
Top Tier	0.528	0.519	0.884	0.521
	[0.250]	[0.252]	[0.542]	[0.253]
Lower SAT Growth than Peers	2.015*	2.271**	2.697	2.216*
	[0.829]	[0.938]	[1.641]	[0.911]
Lower SAT Growth than Peers X Top Tier	0.436	0.482	0.183**	0.466
	[0.235]	[0.261]	[0.124]	[0.252]
Lower SAT Growth than Peers X Bottom Tier	0.477	0.579	0.418	0.522
	[0.291]	[0.333]	[0.294]	[0.299]
Lower UG Growth than Peers	0.656	0.682	0.899	0.657
	[0.276]	[0.288]	[0.369]	[0.276]
Lower UG Growth than Peers X Top Tier	1.342	1.376	1.752	1.396
	[0.739]	[0.759]	[0.998]	[0.771]
Lower UG Growth than Peers X Bottom Tier	1.498	1.69	1.187	1.489
	[0.811]	[0.916]	[0.671]	[0.804]
Observations	1262	1262	1262	1262

Note: Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Also includes controls for Common Application status, and University.

Table 3: Effects of a Merit aid policy on student body demographics

	(1)	(2)	(3)	(4)	(5)
	% Pell	**% Black**	**% Hispanic**	**% Asian**	**% Int'l Fresh.**
Merit ≤ 2yrs	-0.77	-0.52	-0.047	-0.177	-0.524
	[1.027]	[0.616]	[0.242]	[0.360]	[0.836]
X Bottom Tier	3.216**	1.730**	-0.103	-0.074	1.899*
	[1.311]	[0.791]	[0.311]	[0.462]	[1.073]
X Top Tier	-0.247	0.061	0.021	-0.185	1.044
	[1.302]	[0.764]	[0.300]	[0.446]	[0.980]
Merit 3-5 yrs	-2.166**	-1.066*	-0.045	-0.181	-0.827
	[1.002]	[0.587]	[0.230]	[0.342]	[0.747]
X Bottom Tier	3.312***	0.764	-0.14	-0.612	1.888**
	[1.176]	[0.694]	[0.272]	[0.405]	[0.955]
X Top Tier	0.37	0.582	0.378	0.087	1.765**
	[1.170]	[0.677]	[0.266]	[0.395]	[0.834]
Merit 6-10yrs	-5.073***	-1.554**	-0.438*	-0.327	1.073
	[1.074]	[0.645]	[0.253]	[0.376]	[0.799]
X Bottom Tier	4.125***	2.539***	0.025	-0.661*	1.293
	[1.067]	[0.647]	[0.254]	[0.378]	[0.870]
X Top Tier	0.516	0.515	1.005***	0.125	-0.527
	[1.074]	[0.639]	[0.251]	[0.373]	[0.779]
Merit >10yrs	-6.141***	-2.192***	-0.590*	-0.047	0.186
	[1.385]	[0.836]	[0.328]	[0.488]	[1.024]
X Bottom Tier	4.358***	4.017***	0.019	-1.138***	1.681*
	[1.183]	[0.722]	[0.284]	[0.421]	[0.974]
X Top Tier	-1.504	0.603	0.991***	-0.272	0.128
	[1.223]	[0.728]	[0.286]	[0.425]	[0.881]
Observations	2493	2251	2251	2251	1802
R-squared	0.93	0.99	0.95	0.96	0.58

Note: All estimations include institution fixed effects and controls for expenditures per student, % residential, urbanicity, and whether the institution uses the common application, and differential quadratic time trends (Change vs. Never).

Table 4: Effects of a Merit Aid policy on admissions and student body characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
	Median SAT	**SATQ75**	**# Freshmen**	**Applicants**	**Admit Rate**	**Yield**
Merit ≤ 2yrs	12.322	12.413	0.309	9.086	-3.011*	-0.498
	[8.715]	[8.949]	[13.494]	[142.611]	[1.799]	[1.862]
X Bottom Tier	-4.974	-10.992	-13.688	50.878	3.007	-3.602
	[12.325]	[12.742]	[17.345]	[207.498]	[2.617]	[2.706]
X Top Tier	-24.536**	-16.319	-6.456	-1.043	1.966	2.917
	[10.369]	[10.631]	[17.115]	[172.390]	[2.174]	[2.252]
Merit 3-5 yrs	22.246**	18.433**	-12.652	-49.929	-5.020***	3.361*
	[8.725]	[9.036]	[13.420]	[143.468]	[1.809]	[1.880]
X Bottom Tier	0.993	6.13	-2.04	238.379	-0.91	-8.568***
	[11.043]	[11.459]	[16.109]	[187.054]	[2.359]	[2.438]
X Top Tier	-19.330**	-5.525	-12.683	119.498	2.808	-3.673*
	[9.595]	[9.911]	[16.001]	[159.486]	[2.011]	[2.087]
Merit 6-10yrs	29.196***	27.918***	19.737	-145.356	-5.316***	3.704*
	[9.088]	[9.397]	[14.483]	[151.944]	[1.916]	[1.983]
X Bottom Tier	11.379	15.152	-39.886***	222.124	-0.903	-15.120***
	[10.081]	[10.452]	[14.588]	[171.619]	[2.164]	[2.221]
X Top Tier	-33.228***	-17.523*	-31.137**	391.068***	3.312*	-1.423
	[8.782]	[9.051]	[14.661]	[146.029]	[1.842]	[1.907]
Merit >10yrs	34.498***	47.604***	10.96	-58.731	-4.466*	-1.985
	[11.232]	[11.647]	[19.255]	[191.857]	[2.420]	[2.503]
X Bottom Tier	-28.495***	-27.672**	-32.476**	-273.813	0.869	-10.173***
	[10.893]	[11.353]	[16.245]	[181.118]	[2.284]	[2.364]
X Top Tier	-31.041***	-26.262***	-2.503	353.307**	2.27	5.207**
	[9.577]	[9.907]	[16.755]	[163.617]	[2.064]	[2.136]
Observations	1879	1898	2267	2049	2049	2054
R-squared	0.95	0.94	0.98	0.98	0.87	0.76

Note: All estimations include institution fixed effects and controls for expenditures per student, % residential, urbanicity, and whether the institution uses the common application, and differential quadratic time trends (Change vs. Never). Estimations in column (3) have a linear trend only.

Table 5: Effects of a Merit Aid Policy on student costs and enrollments

	(1)	(2)	(3)	(4)
	Log(Tuition)	Log(Room/Board)	Log(Total Cost)	% Full-time Stud.
Merit ≤ 2yrs	0.014	-0.028	0.004	1.482
	[0.016]	[0.023]	[0.014]	[0.961]
X Bottom Tier	-0.02	-0.004	-0.014	-0.23
	[0.022]	[0.031]	[0.019]	[1.227]
X Top Tier	-0.016	0.034	0.007	-0.497
	[0.021]	[0.028]	[0.017]	[1.219]
Merit 3-5 yrs	0	-0.108***	-0.028**	2.687***
	[0.015]	[0.021]	[0.013]	[0.938]
X Bottom Tier	0	0.029	0.001	-1.840*
	[0.020]	[0.029]	[0.018]	[1.101]
X Top Tier	-0.026	0.109***	0.030*	-1.851*
	[0.020]	[0.027]	[0.016]	[1.096]
Merit 6-10yrs	0.027*	-0.082***	-0.001	3.807***
	[0.015]	[0.020]	[0.012]	[1.006]
X Bottom Tier	-0.015	0.02	0.006	-0.709
	[0.018]	[0.026]	[0.016]	[0.999]
X Top Tier	-0.071***	0.101***	-0.001	-2.513**
	[0.018]	[0.024]	[0.014]	[1.006]
Merit >10yrs	0.065***	-0.018	0.027*	8.459***
	[0.017]	[0.024]	[0.015]	[1.297]
X Bottom Tier	-0.027	0.014	0.031*	-2.195**
	[0.020]	[0.029]	[0.018]	[1.107]
X Top Tier	-0.097***	0.04	-0.02	-7.471***
	[0.020]	[0.027]	[0.016]	[1.145]
Observations	2262	1820	1795	2517
R-squared	0.98	0.88	0.98	0.92

Note: All estimations include institution fixed effects and controls for expenditures per student, % residential, urbanicity, and whether the institution uses the common application, and quadratic time trends. Estimations in columns (2) & (3) have a linear trend only. Estimation in column (4) allows for differential time trends by Change/Never

Table 6: Effects of a Merit Aid policy on Faculty employment and salaries

	(1) log(avg asst. salary)	(2) log(avg assc. salary)	(3) log(avg prof salary)	(4) Pct. PT Faculty
Merit ≤ 2yrs	-0.012	0.025*	-0.009	-1.271
	[0.019]	[0.015]	[0.023]	[3.047]
X Bottom Tier	0.049**	0.005	0.067**	1.23
	[0.025]	[0.020]	[0.030]	[4.021]
X Top Tier	-0.005	-0.037**	-0.006	-1.38
	[0.024]	[0.019]	[0.029]	[3.937]
Merit 3-5 yrs	-0.008	0.041***	0.018	-1.274
	[0.019]	[0.015]	[0.023]	[3.068]
X Bottom Tier	0.056**	-0.008	0.012	-1.139
	[0.023]	[0.018]	[0.028]	[3.763]
X Top Tier	-0.026	-0.062***	-0.047*	-5.582
	[0.022]	[0.018]	[0.027]	[3.632]
Merit 6-10yrs	-0.007	0.040**	0.027	-3.018
	[0.021]	[0.016]	[0.025]	[3.355]
X Bottom Tier	0.047**	-0.013	0.005	2.349
	[0.021]	[0.016]	[0.025]	[3.377]
X Top Tier	-0.026	-0.058***	-0.063**	-5.633*
	[0.020]	[0.016]	[0.024]	[3.319]
Merit >10yrs	-0.015	0.051**	0.023	-8.223*
	[0.027]	[0.021]	[0.032]	[4.374]
X Bottom Tier	0.057**	-0.02	0.025	0.113
	[0.022]	[0.018]	[0.027]	[3.445]
X Top Tier	-0.022	-0.058***	-0.045*	-2.108
	[0.023]	[0.018]	[0.027]	[3.411]
Observations	1876	1873	1881	1115
R-squared	0.88	0.93	0.92	0.72

Note: All estimations include institution fixed effects and controls for expenditures per student, % residential, urbanicity, and whether the institution uses the common application, and quadratic time trends. Estimation in column (4) has a linear trend only. Estimations allow for differential time trends by Change/Never.