Ability, Gender, and Performance Standards: Evidence from Academic Probation*

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Abstract

We use a regression discontinuity design to examine students' responses to being placed on academic probation. Consistent with a model of introducing performance standards, we find that being placed on probation at the end of the first year discourages some students from returning to school while improving the performance of those who return. We find heterogeneous responses across ability, gender, and native language, and extend the model to explain why low ability students are not more discouraged than high ability students. We also analyze the effects on GPAs, suspension, and graduation rates.

1 Introduction

Academic probation is a nearly universal tool used by universities to ensure currently enrolled students achieve minimum academic standards. The general structure of such programs is simple—if a student's grade point average (GPA) is below a certain threshold, the student is placed on academic probation which serves as a wake-up call and can lead to escalating penalties. Our paper uses longitudinal data from three campuses at a large Canadian university to estimate the causal impact of being placed on academic probation by exploiting the discontinuous nature of the policy in a regression discontinuity (RD) design. Despite the prevalence of academic probation, we are the first to analyze its causal impacts on student outcomes.[1] More generally, our paper serves as an analysis of how individuals respond to a threat of punishment, as failure to improve one's grades after being placed on probation leads to suspension.

Due to concerns about welfare, experiments providing such a large negative incentive are not often viable. As such, examining students' responses to academic probation provides a rare opportunity to examine the impacts of a negative incentive in an important real world setting. While there is a fairly extensive literature on the causal effects of other explicit university policies, these studies have focused primarily on positive incentives and services.[2] We offer the first study examining the

[1]The only prior empirical analysis of academic probation compares the mean retention rate of engineering students on probation to the mean retention rate of those in good academic standing (Scalise, Besterfield-Sacre, Shuman, and Wolfe 2000).

[2]Examples include papers analyzing the effects of advising and merit scholarships (Angrist, Lang, and Oreopoulos 2007; Leuven, Oosterbeek, and van der Klaauw 2006), tuition costs (Hakkinen and Uusitalo 2003; Heineck, Kifmann, and Lorenz 2006; Garibaldi, Giavazzi, Ichino, and Rettore 2007), financial aid (DesJardins, Ahlburg, and McCall 2002), and appointment to the Dean's List (Seaver and Quarton 1976; revisited by Cook and Campbell 1979).

causal effects of a negative incentive program.

Once a student has been placed on academic probation, she must earn a GPA above the campus-set standard in the next term or she will be suspended from the university for one year. Placing students on academic probation is equivalent to setting a minimum standard for their future performance. In this sense, our results have implications for the wide variety of circumstances in which setting a standard might be used as a means of affecting performance. In addition to school administration, applications include management, parenting, and health and safety regulation.

Our results also provide an opportunity to empirically examine theoretical models of imposing performance standards. Bénabou and Tirole (2000) outline one such model which predicts that setting a performance standard involves an inherent tradeoff between motivating some agents to improve their performance and discouraging other agents from making any attempt at all. The model further predicts that a performance standard will be most discouraging for agents of low ability who do not believe they can meet the standard. We explore the extent of this tradeoff by analyzing the effect of being placed on academic probation on students' decision to drop out and on the subsequent performance for those who remain, using students' college entrance information as a measure of ability.

This paper also contributes to the growing literature on gender differences in response to educational incentives. Previous studies have found that women are more responsive to positive incentives than men: women respond to advising and scholarship programs while men do not (Angrist, Lang, and Oreopoulos 2007); tuition reductions impact college completion rates for women more than men (Dynarski 2005); and the effects of high school achievement awards appear limited to women (Angrist and Lavy 2002). However, because the existing literature has focused on policies providing positive incentives, little is known about gender differences in response to negative incentives.

Our RD research design is motivated by the idea that students with a GPA just above the academic probation threshold after the first year provide a good counterfactual for those who have

a GPA just below. As long as characteristics related to student outcomes are continuous through the threshold, we can measure the effect of being placed on probation in a RD design framework.

Our results indicate that the effects of academic probation are remarkably heterogeneous. Consistent with Bénabou and Tirole's model, being placed on academic probation after the first year discourages some students from returning to school and motivates those who remain to improve their subsequent performance. However, while the model predicts that low ability students should be most discouraged from returning to school, we do not find this to be the case. We discuss an extension of the model that can explain our results by allowing academic probation to have heterogeneous impacts on self-confidence. We also find that the impact on students' decisions to drop out of school differs by gender and native language. Being placed on academic probation doubles the probability that men drop out but has no such effect on women, and discourages native English speakers from returning but has no such effect for non-native English speakers.

Finally, we consider the effect of being placed on academic probation on graduation rates. We find being placed on probation simultaneously motivates some students to improve their grades while causing others to drop out, so there is no clear prediction of a positive or a negative effect on the probability of graduation. Overall, our estimates suggest that being placed on academic probation reduces graduation rates, especially for high ability students.

The rest of the paper is organized as follows. Section 2 describes the university and its academic probation program in more detail. Section 3 reviews Bénabou and Tirole's (2000) model of performance standards. Sections 4 and 5 describe the data and our empirical strategy. Section 6 presents our main results. Section 7 discusses our main results. Section 8 concludes.

2 Institutional Background

Our data comes from a large Canadian university made up of three individual campuses—one central campus and two smaller satellite campuses. The central campus (Campus 1) has an acceptance rate of about 55% while the two satellite campuses (Campus 2 and Campus 3) have acceptance

rates of approximately 77%. The central campus resembles a large US state college while the satellite campuses have more part-time and commuter students. Campus 1 and Campus 2 share identical rules regarding academic probation—students with a cumulative GPA below 1.5 grade points are placed on academic probation. Campus 3 has a GPA cutoff at 1.6 grade points. For the purposes of our analysis, students from all three campuses have been combined into a single sample.[3] We account for the difference in cutoff points in our RD analysis by using students' distances from their campus' cutoff as the running variable rather than absolute GPA.

When a student is placed on academic probation, a letter is sent notifying them of their current academic standing. The letter specifies why the student has been placed on probation, how to regain good academic standing, and the consequences of failing to improve. The letter also encourages students to continue at the university and improve their academic performance, and lists various services provided by the university aimed at helping them to do so. A copy of the letter is included in the appendix.

Because many freshman classes span the entire year, students' academic standings are not evaluated for the first time until the end of their first year.[4] At Campus 1 and Campus 2, students' academic standings are evaluated again at the end of every subsequent full scholastic year and summer term. At Campus 3, students' academic standings are evaluated again at the end of each subsequent term.

Students on academic probation face the threat of suspension after subsequent sessions if their grades do not improve. At all campuses, students on probation can avoid suspension and return to good academic standing by bringing their cumulative GPA up to the cutoff or by achieving a

[3] In an earlier version of the paper, we used this across-campus variation to examine the effects of academic probation in a difference-in-difference framework. These results were similar to the RD estimates but imprecise due to a smaller sample size.

[4] Students also must attempt a minimum number of credits before they are evaluated. We omit all students who have not yet been evaluated by the end of their first full year. It is possible this is endogenous, though unlikely. If a student drops a course before the deadline, the course grade will not be counted in determining academic probation (or GPA in general). If this incentive to drop is continuous through the cutoff, however, this should not pose a problem.

per-session GPA above a particular minimum specified by their campus.[5] Students who avoid suspension via a per-session GPA but fail to improve their cumulative GPA above the cutoff remain on academic probation and continue to face the threat of suspension until they regain good academic standing.

Students failing to sufficiently improve their grades are suspended for one full academic year. If suspended students choose to return to the university and again fail to sufficiently improve their grades, they can be suspended for three years. A third failure to meet the GPA requirement can lead to permanent suspension from all campuses.

3 Theoretical Background

In this section, we first review Bénabou and Tirole's (2000) model of agents' responses to a performance standard. The model is framed as a game between a principal and an agent, where the principal has the ability to set standards for the agent. While Bénabou and Tirole consider the model from the perspective of both the agent and the principal, we focus only on the agent. We then relate this model to academic probation.

Consider an agent facing a choice between three possible paths: option 1, option 2, or neither. If the agent chooses neither option, both her costs and benefits are 0. If the agent attempts option i, she incurs cost c_i and, if successful, gains the benefit V_i. If the agent attempts option i and fails, she still incurs a cost but receives no benefit. Option 1 is an easy option with a low potential benefit while option 2 is a difficult option with a high potential benefit. Costs and benefits can be summarized as

$$0 < c_1 < c_2 \qquad 0 < V_1 < V_2 \tag{1}$$

Ability is expressed as the probability of successfully completing either option, where higher ability translates into a higher probability of success. The probability of success for either option

[5] At Campuses 1 and 2, the GPA cutoff is 1.7. At Campus 3, it is 1.6.

is θ. Assuming the agent has perfect information regarding her ability (θ), she solves

$$max\{0, \theta V_1 - c_1, \theta V_2 - c_2\}. \tag{2}$$

Let $\underline{\theta}$ be the level of ability for which the agent is indifferent between attempting neither option and attempting option 1 and $\overline{\theta}$ be the level of ability for which the agent is indifferent between attempting option 1 and attempting option 2. With the following assumption,

$$\underline{\theta} \equiv \frac{c_1}{V_1} < \overline{\theta} \equiv \frac{c_2 - c_1}{V_2 - V_1} < 1, \tag{3}$$

which ensures that both options are optimal for at least some θ, it can be shown that the lowest ability individuals ($\theta < \underline{\theta}$) choose neither option, the highest ability individuals ($\overline{\theta} < \theta$) choose the difficult option, and the remaining individuals ($\underline{\theta} < \theta < \overline{\theta}$) choose the easier option.[6]

If the principal removes option 1 as a possible course of action, perhaps by forbidding it or imposing an additional cost on it such that it is always inferior to other options, then the agent will choose option 2 if and only if

$$\theta \geq \frac{c_2}{V_2} \equiv \theta^\star \tag{4}$$

and pursue neither option otherwise. Within the range of agents who would choose option 1 if it remained a possibility, the model predicts those with the higher ability will work harder (engaging in option 2) while those with the lower ability will give up (pursuing neither option).[7]

This model naturally lends itself to analyzing how students might respond to being placed on

[6]Interestingly, the same results arise from a model in which the agent is sure to be successful in whichever task she chooses but the cost of each task is inversely related to the ability measure θ. That is, the agent would solve $max\{0, V_1 - \frac{c_1}{\theta}, V_2 - \frac{c_2}{\theta}\}$. Expressed in this way, the model can feature decreasing marginal returns to ability. The same results can also arise from a model in which the probability of success is increasing in ability and the cost is decreasing in ability. For example, if the agent solves $max\{0, \sqrt{\theta}V_1 - \frac{c_1}{\sqrt{\theta}}, \sqrt{\theta}V_2 - \frac{c_2}{\sqrt{\theta}}\}$.

[7]Specifically, those with θ in $[\theta^\star, \overline{\theta}]$ will now choose option 2 while those with θ in $[\underline{\theta}, \theta^\star]$ will now choose not to pursue either option.

academic probation. Consider the choice faced by two students (agents) whose first year GPAs were near the academic probation threshold, one just above and one just below. Since the student just above the threshold remains in good academic standing, their options are unrestricted. These options can be placed into three categories: return to school with the intent of achieving some low GPA (option 1), return with the intent of achieving some high GPA (option 2), or dropping out of school (neither option 1 nor 2).

As a result of being placed on probation, the student just below the cutoff faces a different set of choices. We can think of academic probation as the administration forbidding, or placing an extremely large negative incentive on, pursuing option 1. In the framework of the model, if the student below the cutoff chooses to pursue option 1, she will be suspended from the university.

The testable implications of Bénabou and Tirole's theoretical framework are the following:

1. Low ability students should be more likely to drop out, whether option 1 is forbidden or not.

2. Forbidding option 1 will increase the overall probability of students dropping out and increase the performance of those who return.

3. Forbidding option 1 will cause relatively low ability students to drop out and relatively high ability students to return and work harder.

4 Data

The data used in the analysis is from a administrative data set of college students from the large Canadian university described in Section 2. Observations are at the student level and cover a nine-year period from 1996 to 2005 with each scholastic year broken into Fall, Winter, and Summer terms. The data includes student term registration status, GPA, academic standing, gender, age, first language, and a measure of high school performance. We use the set of background variables for falsification tests and as controls in some regression specifications.

We restrict the sample to students we can potentially observe for two years. Since the data

spans through the end of the 2005 school year, we restrict to students who entered in the 2004 school year or earlier. This leaves eight cohorts of students. We omit students with missing data for any variables of interest. The variable that is most often missing is the high school grade measure which is only available for students who attended high school in the province (84% of the sample). This variable, which we use as a proxy for ability, is a students average GPA in courses that are universally taken by high school students in the province. This measure of high school achievement is intended to be consistent across high schools and is used as a part of the criteria that determines admissions at Canadian universities. We refer to students with a high school grade measure above and below the median of the sample as "high" and "low" ability, respectively.

We also restrict the sample to students entering the university between the ages of seventeen and twenty-one (99% of the remaining sample). Additionally, we keep only students who have had their academic standing evaluated at the end of their first year (98% of the remaining sample).[8] Finally, we limit the sample to students within 1.2 grade points of their academic probation cutoff (corresponding to the largest bandwidth we consider in our regressions). This effectively drops students who failed all of their first year classes in addition to students who cleared the cutoff by a wide margin. The resulting sample includes 25,389 students.

The first column of Table 1 shows the descriptive statistics for the sample. The students average entry age is 18.7 years. Approximately 38% are male, 72% have English as their first language, and 87% were born in North America.[9] 51% of the students attend Campus 1 (the central campus). Of the remaining students, 20% attend Campus 2 and 29% attend Campus 3. For the most part the means *at the limits of the cutoff* are most relevant and these are discussed in subsequent sections. Before proceeding, we should note that a sizable fraction of students in our sample (25%) are placed on academic probation after their first year.[10] While it is unfortunate that so many students

[8] In almost all cases, a student is not evaluated due to an insufficient number of attempted credits.

[9] If a student's first language is not English, it is usually an Asian language. Despite being a Canadian institution, less than one percent of students have French as their first language.

[10] Of the entire student body, 16% are placed on probation after their first year.

fail to meet their campus' academic requirements, this is a positive aspect for our research design because it improves our ability to obtain estimates on both sides of the probationary cutoff.

5 Empirical Strategy

We begin by estimating the impacts of being placed on academic probation after the first year. At the end of the first year the probation status for student i at campus c is a deterministic function of their GPA, which can be expressed as

$$PROB_{ic}^{year\,1} = 1(GPANORM_{ic}^{year\,1} < 0) \tag{5}$$

where $GPANORM_{ic}^{year\,1}$ is the distance between student i's first year GPA and the probationary cutoff at her campus c. Because the discontinuity in probation status is "sharp," as we will show in Section 6.1, as long as other student characteristics related to the outcomes are continuous through the threshold, the treatment effect for students near the threshold can be obtained by comparing the outcomes of students just below the threshold to those just above.

The following equation can be used to estimate the impact of being placed on academic probation after the first year on student outcomes:

$$Y_{ic} = m(GPANORM_{ic}^{year\,1}) + \delta 1(GPANORM_{ic}^{year\,1} < 0) + u_{ic}, \tag{6}$$

where Y_{ic} is an outcome for student i at campus c, $m(GPANORM_{ic}^{year\,1})$ is a continuous function of students' standardized first year GPAs (the distance from their campus' probationary cutoff), $1(GPANORM_{ic}^{year\,1} < 0)$ is an indicator equal to one if the student's GPA is below the probationary cutoff, and u_{ic} is a random error term. The coefficient of interest is δ, the estimated impact of being placed on academic probation after the first year.

As suggested by Imbens and Lemieux (2008), we estimate the discontinuity using local linear

regressions with rectangular kernel weights.[11] We use three different bandwidths (1.2, 0.6, and 0.3 grade points) and estimate the effects controlling for observables as a robustness check. Since GPA data are discrete (in hundredths of a grade point), we cluster the standard errors as recommended by Lee and Card (2008). [12]

We use the strategy described thus far to estimate the impacts of being placed on academic probation after the first year. However, we are also interested in analyzing the impacts of *ever* being placed on academic probation. The approach described above does not produce such an estimate because "control" students just above the cutoff after their first year may be placed on probation after later evaluations. As a result, we must use a slightly different approach.

To estimate the impact of ever being placed on academic probation, we rely on the fact that students' first year GPAs create a discontinuity in whether or not a student is ever placed on academic probation (as shown in Section 6.1). Since this discontinuity is fuzzy (the change in the probability of treatment is less than one), the impact on student outcomes can be obtained by adjusting estimated discontinuities in outcomes by the estimated discontinuity in treatment status. This is equivalent to a two-stage least squares estimate in which the variation in treatment status is driven by the discrete change occurring at the threshold (Hahn, Todd, and Van der Klaauw 2001). We obtain estimates and their standard errors based on two-stage least squares regression in which the excluded instrument is $1(GPANORM_{ic}^{year\,1} < 0)$.[13]

[11] Our regression equation is given by:

$$Y_{ic} = \alpha + \delta 1(GPANORM_{ic}^{year\,1} < 0) + \beta(GPANORM_{ic}^{year\,1}) + \gamma(GPANORM_{ic}^{year\,1}) \times 1(GPANORM_{ic}^{year\,1} < 0) + u_{ic}$$

where the notation is the same as in equation 6.

[12] Similar estimates based on models controlling for a second-order polynomial are presented in a prior version of the paper, which is available upon request.

[13] These estimates take the same approach to bandwidth choice, kernel weights, and standard errors as the other estimates.

6 Results

In this section, we begin by testing the validity of the regression discontinuity design. We then examine the effects of being placed on academic probation on students' decisions to drop out, subsequent GPAs, probabilities of suspension, and graduation rates in addition to the heterogeneity of these effects across student ability, gender, and native language.

6.1 Tests of the Validity of the RD Approach

Non-random sorting is a main concern with any RD design in which those who could be affected by the policy might know the cutoff. In our case, this would appear if students just below the cutoff were actively influencing their GPAs to avoid probation (e.g. convincing teachers to give them a higher grade to raise their GPA above the cutoff point) or expending just enough effort to get grades above the cutoff. By focusing on academic probation status at the end of first year, we decrease the likelihood of this concern. First year students are less familiar with campus policies and, thus, less likely to know what grades would be required to avoid academic probation. In addition, though Campus 3 has semester-length first year courses, at Campuses 1 and 2 most first year courses span the entire year and the majority of the grade is based on evaluation at the end of the term. This makes it difficult for students to correctly "hit" a performance point just above the cutoff, especially given that their overall GPA is calculated over several courses.

If sorting were a problem, we would expect to see a discontinuity in the distribution of grades at the cutoff, as a disproportionate number of students would fall just above the cutoff relative to the number of students just below the cutoff.[14] Figure 1 shows the distribution of students' first year grades relative to their campus cutoff, with cell sizes of 0.1 grade points. Using each of these cells as an observation, the figure also shows the predicted cell sizes based on local linear regressions using rectangular kernel weights and a bandwidth of 0.6. The estimated discontinuity at the threshold is not statistically significant, indicating that the distribution of students is continuous

[14] At the same time, this might not be the case if the distribution of grades is fixed. For example, there might be a situation in which some students manipulate their grades to get themselves above the cutoff but, as a result of their efforts, other marginal students are pushed below the cutoff.

through the threshold.[15] We have also verified that the discontinuity is not significant using smaller cell sizes and bandwidths.[16]

Our research design requires both observable and unobservable characteristics related to student outcomes to be continuous through the threshold. Table 2 and Figure 2 explore the extent to which a wide range of observable characteristics are continuous through the cutoff. Significant discontinuities would indicate that students with particular characteristics are more or less able to manipulate their grades so as to avoid being placed on probation. As a whole, these estimates support the validity of our research design. We find no significant discontinuities in students' high school grades, credits attempted in the first year at the university, age at entry, gender, birthplace, native language, or campus attended.

The graphs in Figure 2 are also useful because the slopes of the curves inform us about the relationship between students' characteristics and their performances in their first year of college. Most relevant to the results that follow, the strong positive relationship between high school grades and college grades indicates that high school grades are a good predictor of a student's success in college. Within our sample, a one-percentile increase in the high school grade measure is associated with a 0.1 increase in first year GPA. This motivates our use of the label "high ability in reference to students with high school grades above the sample median and "low ability for those with grades below the sample median.[17] In Section 7, we will return to this issue and further consider whether high school grades are a good measure of ability conditional on students' first year grades at the university.

6.2 First Year GPAs and Academic Probation

Figure 3 and the first panel of Table 3 show the estimated discontinuity in probation status at the end of the first year. Because the discontinuity is sharp, discontinuities in other student outcomes can

[15]This test is similar to that proposed by McCrary (2008).

[16]We have also verified that there are not significant discontinuities in the distributions of students in each of the subgroups we consider in our analysis.

[17]Note that the sample of low ability students near the academic probation threshold will be greater than the sample of high ability students near the threshold since the median is based on all entering students.

be interpreted as the causal effect of being placed on probation at the end of the first year.[18] Such estimates are equivalent to the following thought experiment: what if students' academic standings were not evaluated after the first year and, instead, were first evaluated after the completion of their next term?

In looking at the effects on long-term measures of achievement, we are also interested in the effect of *ever* being placed on academic probation. This question is distinct from the former because students just above the cutoff after their first year are placed on probation if their cumulative GPA falls below the cutoff in the future. As shown in Figure 4 and the second panel of Table 3, over 30% of those just above the cutoff at the end of their first year are placed on probation at some point in their academic careers. This implies that a substantial fuzzy discontinuity exists and we can estimate the impact of ever being placed on probation on long-run measures of student achievement using standard techniques associated with fuzzy regression discontinuity designs (as discussed in Section 5).

6.3 The Immediate Response to Academic Probation

The immediate question that all students face at the end of their first year is whether or not to continue at the university.[19] Students who have been placed on academic probation have been informed that they will be suspended if their GPA does not meet the campus-set standard in their next term. However, their continued enrollment is not impeded in any other way at this point in time.

Table 4 and Figure 5 show the estimated impact on students' decisions to permanently leave the university after their first year. The estimates, which are statistically significant at the five percent level in all specifications, indicate that being placed on academic probation at the end of the first year increases the probability that a student leaves the university by 1.3 to 2.3 percentage points,

[18] While the estimated discontinuity is approximately equal to one, it may not be *identically* equal to one because of administrative errors in data reporting.

[19] Manski (1989) and Altonji (1993) develop extensive models that explore the sequential nature of the schooling decision under uncertainty.

or by 36 to 51% of the control mean.[20]

Table 5 and Figure 6 explore the extent to which different subgroups of students respond to being placed on probation after the first year in different ways. The table is limited to estimates using the two smaller bandwidths of 0.6 and 0.3. These results suggest that the average effects shown in Table 4 and Figure 5 mask substantial heterogeneity.

The estimated impact on the "low ability" group (those with high school grades below the median of students entering the university) is small in magnitude and not significant in any of the specifications. Our results suggest that the estimated impact is greater for students of higher ability (high school grades above the median of students entering the university), for whom being placed on academic probation approximately doubles the probability of dropping out, although these estimates are imprecise. The estimated impact is so great for high ability students near the cutoff that they are just as likely to drop out as their lower ability counterparts. This is not the case among students just above the cutoff.

We also find heterogeneous effects across gender. Our estimates indicate that being placed on academic probation doubles the probability that men drop out after the first year but has no effect on women's decision to continue at the university. It is unlikely that this finding reflects a general unresponsive nature of females at the university we study—a prior study at the same university found that women were more responsive to experimentally offered peer advising and organized study group services (Angrist, Lang, and Oreopoulos 2007). In results not shown, we find this gender difference does not appear to be driven by differences in the types of courses that men and women attempt in their first year.[21] The results that follow indicate that it is not that women do not

[20] It should be noted that the control mean is not the overall dropout rate but, rather, the drop-out rate for students just above the cutoff.

[21] Specifically, we have separately considered the impact for students who took first year courses that disproportionately enrolled men and for students who took first year courses that disproportionately enrolled women. Regardless of the gender composition of the peers in their first year courses, we find no evidence that being placed on academic probation impacts the decision to drop out for women and we do find evidence that it impacts men. We have also analyzed the impact for students who took at least half of their first year credits in science courses versus those who did not; similar gender differences appear in these results.

respond to being placed on probation but that they respond differently.

Lastly, we find that probation increases the probability of dropping out for native English speakers but that there is no impact on non-native English speakers. It is important to note that this difference cannot be attributed to characteristics specific to students who move to Canada for college since all of the students in the sample attended high school in the same province.[22]

6.4 The Impact on Subsequent GPA

Students on academic probation who choose to remain at the university have a substantial incentive to improve their grades to the campus-set standard—failing to do so results in being suspended from the university for a year. The first panel of Figure 7 and Table 6 show the impact of being placed on academic probation on students' subsequent GPAs. Specifically, the outcome variable is a student's GPA in the next session in which they are evaluated.[23] The estimates suggest that being placed on academic probation causes students to improve their GPAs by approximately 0.23 grade points, a 74% greater improvement than students who just surpass the probationary cutoff.

It is important to note that these estimates might be biased by the effect of academic probation on the composition of students who continue to enroll in the university. For example, if academic probation results in the attrition of relatively low ability students, then we would expect the estimated impact on GPAs to be positive even if being placed on probation has no effect on individual behavior beyond the choice to drop out. However, in the previous section we showed that it is the higher ability students who are most discouraged from returning to the university, which suggests that our estimates represent a lower bound of the true effect on GPAs. As an additional check, the second and third panels of Table 6 show that the impact on GPAs remains positive and significant

[22]Those who attended high school outside the province were omitted due to a missing high school grade measure.

[23]Note that the "next session" will be a summer session if students are enrolled in summer classes and a second year session if they are not. If we were to use only second year GPAs, there would be missing data for students placed on academic probation after their first year who do poorly in summer school and are suspended for their second year. While summer school grades tend to be higher than grades during the rest of the year, in results not shown but available upon request, we find no statistically significant impact of academic probation on the probability that a student takes summer courses, and estimates are nearly identical when controlling for whether or not a students next session is in the summer.

under very conservative assumptions about what GPAs would have been observed for students who did not return for another session after being placed on probation.[24]

Figure 8 and Table 7 show the estimated impacts on students' subsequent GPAs separately for low ability students, high ability students, men, women, native English speakers, and non-native English speakers. All of the estimates suggest that being placed on academic probation after the first year improves students' subsequent GPAs.[25] Since we found no effect on the continued enrollment of low ability students, women, and non-native English speakers, the estimated impact of academic probation on subsequent GPAs is unlikely to be driven by composition bias for these groups.[26] Thus, at least for these groups of students, we can be relatively confident that the impact on students' GPAs is truly positive.

6.5 The Impacts on Suspension and Graduation

The previous sections analyzed the impact of being placed on academic probation after the first year on students' outcomes immediately following their first evaluation. When those outcomes are measured, students are either currently on probation or in good standing. In this section, in which we consider long-run effects, we will continue to estimate the impact of being placed on academic probation after the first year. Since these outcomes are measured at a later date, some students who were in good standing after their first year have been placed on academic probation in subsequent evaluations. We exploit the fuzzy discontinuity in whether or not students are ever placed on academic probation to estimate the impact of ever being placed on probation.

Figure 9 and Table 8 show the estimated impacts on ever being suspended. Not surprisingly, being placed on probation substantially increases the probability of ever being suspended. One

[24] Using the same RD approach, we have also looked at the difficulty of the classes that returning students take using average course grades as a proxy. There is no evidence that being placed on probation causes students to take courses in which average grades tend to be higher.

[25] We cannot rule out that the effects are the same across groups. Even if the estimates were substantially different for a particular group, we would not be able to ascertain the extent to which the difference was due to composition bias.

[26] We have also verified that the covariates remain balanced across the threshold for returning students in each of these subgroups, which suggests that attrition for these groups is random.

important thing to note is that the control means are not zero—some of the students who just avoided academic probation after their first year are placed on probation after later terms, fail to improve their grades, and are subsequently suspended.

Figure 10 and Table 9 show the estimated impacts on ever being suspended by subgroups. These results indicate that academic probation increases the probability of suspension for all of the subgroups considered but that the magnitude of the effect varies across groups. We find that the effect on suspension is greater for high ability students than low ability students. Previous results suggested that probation has a greater effect on high ability students continued enrollment. As such, this result cannot be attributed to relatively fewer high ability students who are at risk of suspension after returning to school. This finding is consistent, however, with our previous estimates suggesting that probation has a greater positive impact on the grades of low ability students.

We also find that the estimated effect on suspension is larger for women than men, but this may be a result of the differences in academic probation's impact on dropout rates documented in Section 6.3. Specifically, since probation increases the probability that men leave the university before registering for any future terms, there are relatively fewer men at risk of being suspended in future terms.

Lastly, we find that academic probation has a greater impact on the probability of suspension for students whose first language is not English. Like the results by gender, this finding might be partially explained by the differences in academic probation's impact on students' decisions to return to the university that were documented in Section 6.3.

While it is relatively simple to analyze the impact of academic probation on the probability of graduation, it is difficult to unpack the various mechanisms that are set into motion by the treatment. The estimates in Section 6.3 demonstrated that a sizable share of students around the threshold drop out of the university as a result of being placed on probation. If this were the only effect, then we would expect academic probation to either reduce the probability of graduating or to have no effect if the only students who drop out are those who would not have graduated regard-

less. However, if academic probation motivates the remaining students to improve their grades, as our estimates suggest in Section 6.4, then academic probation might increase the probability of graduating. Finally, academic probation might reduce the probability of graduation because it increases the probability of suspension, which in turn likely increases the probability that a student drops out before finishing their degree.

Figure 11 and Table 10 show the estimated impacts of academic probation on whether or not a student has graduated within four, five, or six years of their initial enrollment. For these estimates, our sample is restricted to students in cohorts who are observed for at least four, five, or six years, respectively, whether they graduate or not. The estimates are consistently negative which suggests that being placed on academic probation reduces the probability of graduating, although these estimates are not statistically significant in all specifications.

Figure 12 and Table 11 show the estimated impacts on graduation rates across different subgroups. In most cases, we cannot rule out that the impacts are the same across the groups. However, the estimated impact on the probability of graduating within five or six years is especially large for students with high school grades above the median. For these students, ever being placed on academic probation reduces the probability of graduation within five or six years by approximately 20 percentage points. While these magnitudes are very large, they are less surprising given that we found that these students are especially discouraged from continuing their enrollment immediately after being placed on probation and the only weak evidence that being placed on probation has a positive impact on the GPAs of those who return.

7 Discussion

As a whole, the most striking feature of our results is the heterogeneity in students' responses to academic probation. Consistent with Bénabou and Tirole's (2000) theoretical model of performance standards, we find that some students are discouraged from putting forth any effort to meet the standard (choosing to drop out) while those who return are motivated to improve their GPAs.

Bénabou and Tirole's model also predicts that the individuals with the lower relative ability should be the most likely to give up. This is fairly intuitive since these individuals are least likely to be able to meet the standard. However, we find that the performance standard imposed by academic probation leads to higher ability students having a dropout rate at least as high as that of lower ability students.

This unexpected result raises the question: are high school grades a good measure of ability for students near the cutoff? Given that all of the students entered the same university and that students near the cutoff earned approximately the same first year GPA, some concern about this labeling may be warranted. For example, the students with relatively low high school grades may have been admitted to the university based on other characteristics that signal high ability to admissions officers that we cannot observe. These signals might include the difficulty of a student's high school, the number of advanced placement classes taken, or involvement in extracurricular activities. Similarly, success in college may require a different academic skill set than success in high school.

To answer this question, we can compare the subsequent performance of students in our "high ability" and "low ability" groups who barely avoided being placed on academic probation at the end of their first year.[27] The control means from Tables 5, 7, 9, and 11 indicate that, even though they earned the same first year GPA as the students we label "low ability," the students we label "high ability" are less likely to leave the university at the end of their first year, earn higher GPAs in their next term, are less likely to ever be suspended, and are more likely to graduate within four, five, and six years. As a whole, these results suggest that our measure of ability effectively predicts academic performance for students at the university, even conditional on first year GPA.

Given that we are confident about our measure of ability, we suspect that Bénabou and Tirole's model does not predict the results that we observe across ability because the assumption of perfect

[27] We focus on control students to avoid confounding differences in performance due to ability with differences due to heterogeneous treatment effects.

information does not hold in this setting.[28] That is, students may not know their true ability (or their probability of meeting the performance standard). We can reconcile the model with our findings if we extend it to allow agents to act according to *self-perceived ability*, where self-perceived ability can be affected by being subjected to a performance standard.

In a situation in which students do not have perfect information and act according to self-perceived ability, being placed on academic probation can be thought of as a negative signal sent by the administration to the student. Thus, being placed on academic probation not only reduces a students second year choice set but also negatively affects her perceived ability.[29]

In this framework, an imperfectly informed student acts according to her self-perceived ability, $\tilde{\theta}$, which is a function of her true ability, θ, and whether or not she has been placed on academic probation. Here, an unrestricted student solves

$$max\{0, \tilde{\theta}(\theta, AP)V_1 - c_1, \tilde{\theta}(\theta, AP)V_2 - c_2\}. \tag{7}$$

Analogous to the previous version of the model, students with the lowest self-perceived abilities will choose to drop out, students with the highest self-perceived abilities will pursue option 2, and the remainder will pursue option 1 if it is allowed. However, it is not necessarily the case that those with the highest self-perceived ability have the highest *true* ability. While we would generally expect a positive relationship between self-confidence and true ability, subjecting agents to a performance standard might alter this relationship.

In this light, there are several possible explanations for why high ability students react more

[28] Falk, Huffman, and Sunde (2006) find that individuals are substantially uncertain about their abilities in an experimental setting.

[29] This feature is similar to models of performance rewards offered by principals and their impacts on the self-confidence of agents discussed in Bénabou and Tirole (2003). In a related study, Eriksson, Poulsen, and Villeval (2008) find that agents rarely quit the provided task regardless of differences in performance feedback. However, the decision to quit in their experiment is quite different from the decision faced by the students in our analysis. Whereas dropping out of school has important long-term implications, the primary incentive for individuals to quit the experimental task was the chance to use the remaining time available to read a newspaper (or materials they brought with them).

strongly to being placed on academic probation. One possibility is that the two ability groups differ in how they update their self-confidence. We would expect being placed on probation to reduce everyones self-confidence. However, the high ability group may do a relatively more accurate job revising their perceived ability while those in the low ability group discount the signal too much which causes them to be overconfident.

Alternatively, students in the two ability groups may respond differently because they have different prior experiences. Since high ability students are likely to be more accustomed to success, being placed on academic probation may come as a greater shock and, as a result, have a greater impact on their self-confidence. Differences in prior experiences could also lead to qualitatively different "shocks for the two groups. In a study of children, Mueller and Dweck (1998) show those who are consistently praised for their intelligence tend to attribute their successes and failures to intelligence rather than effort. Students who attribute their performance to intelligence may be more likely to give up after performing poorly, as they will have a more difficult time seeing how they might improve, e.g. "I am not smart enough." Those who attribute their performance to effort, on the other hand, might be more likely to view improvement as a matter of simply increasing their effort, e.g "I'm not working hard enough." If high ability students are more likely to fall into the former category, this type of psychological explanation would explain our results.[30]

Within this perceived ability framework, the decision to return to school can be taken as a measure of revealed self-confidence. As such, our results can help us to further understand the relationship between self-confidence and ability. While there have been prior survey studies on this subject, focusing on *revealed* self-confidence is arguably more informative than traditional surveys in which participants do not face penalties for misrepresenting their true beliefs about

[30]It is also possible that the differences we observe could be driven by differential returns to education by ability, as documented by Altonji and Dunn (1996) and Ashenfelter and Rouse (1998). More specifically, high ability students might have better outside options for continuing their post-secondary education, i.e. they might have a lower return to continuing their education at the university. However, if this were the case, then we should observe high ability students in good academic standing drop out at a higher rate than low ability students in good academic standing, which we do not.

their abilities. Our estimates imply that low ability students in good academic standing have lower confidence than high ability students in good academic standing (since low ability students are less likely to return to school among students in good standing). Our estimates also imply that the low ability students on probation are at least as confident as the high ability students on probation (since low ability students are at least as likely to return among students on probation). That is, there is a positive relationship between self-confidence and ability for those in good standing and a very weak negative relationship between self-confidence and ability for those on academic probation.[31] These findings are roughly consistent with the prior psychological literature, reviewed in Furnham (2001), which tends to find a weak positive relationship between intelligence and self-confidence.[32]

Though these models have no testable predictions regarding gender, the heterogeneity in changes to self-confidence discussed above may be relevant for these results as well. Under the interpretation that the decision to continue at the university is determined by self-confidence, our findings suggest that men and women in good academic standing have roughly the same self-confidence while men on academic probation have lower self-confidence than women on academic probation.

Like the ability results, these findings may be related to differences in overconfidence. Studies have repeatedly shown that men are more likely to overestimate their scholastic abilities while women are more accurate in their assessments.[33] If being placed on academic probation causes students to more accurately assess their own abilities, which is plausible given the high stakes that are involved, then the gender difference would be expected since men would be required to make a

[31] Note that we cannot use this type of comparison to discuss the self-confidence of individuals on academic probation to the those who are in good standing since the two groups of individuals face different choice sets.

[32] This interpretation of the results raises a question: which students more accurately assess their own ability—those of high or low ability? We cannot answer this question directly since we do not know the dropout rates that we would observe if students had perfect information. In an experimental study of students at the University of British Columbia, Heine, Takata, and Lehman (2000) found that, even when confronted with information implying that their performance was below average, students still thought they could outperform most of their classmates. If we follow this finding and assume that students are generally overconfident, then our results imply that, among students placed on academic probation, low ability students are *especially* overconfident and high ability students more accurately assess their abilities.

[33] See Lundeberg, Fox, and Punćochaŕ (1994), Pajeres (1996), Beyer (1999), Furnham (2001), and Chevalier, Gibbons, Thorpe, and Hoskins (2007). Male overconfidence has also been documented in non-scholastic environments such as finance (Barber and Odean 2001).

greater adjustment. Alternatively, the gender differences we observe could be driven by men being more likely to attribute their poor performance to a lack of ability and women being more likely to attribute their poor performance to a lack of effort.

8 Conclusion

We show that being placed on academic probation significantly discourages students from returning to school after their first year of university study. Because the effect on those with high school grades above the median of entering students is relatively large, they end up being just as likely to drop out as students of lower ability. We discuss how this surprising finding might be reconciled with a theory of performance standards.

Consistent with a sizable literature on gender differences in students' responses to positive incentives, we find substantial gender differences in response to a *negative* incentive. We find that academic probation doubles the probability that men drop out but has no such effect on women. We also find evidence that being placed on probation improves the grades for individuals of both genders.

Ideally, a performance standard might just "weed out" those who have no chance at success and serve as a motivation for others. We do find positive effects on the subsequent GPAs for students who continue to enroll. In our setting, we might hope the standard would improve graduation rates. Instead our results suggest that being placed on probation reduces the probability that a student graduates. The impact is especially strong for high ability students for whom ever being placed on probation reduces the probability of graduation by approximately 20 percentage points. Like the effects on the probability of dropping out after the first year, this effect is so large that these students are no more likely to graduate than students of lower ability.

Our results have important consequences for the wide variety of circumstances in which standards might be applied as a means of improving performance. We confirm that a performance standard can entail a tradeoff between causing some to improve and causing others to give up.

Further, our results indicate that introducing a performance standard is particularly effective in motivating those of low ability and women. On the other hand, concerns about discouragement are especially relevant for those of high ability and men.

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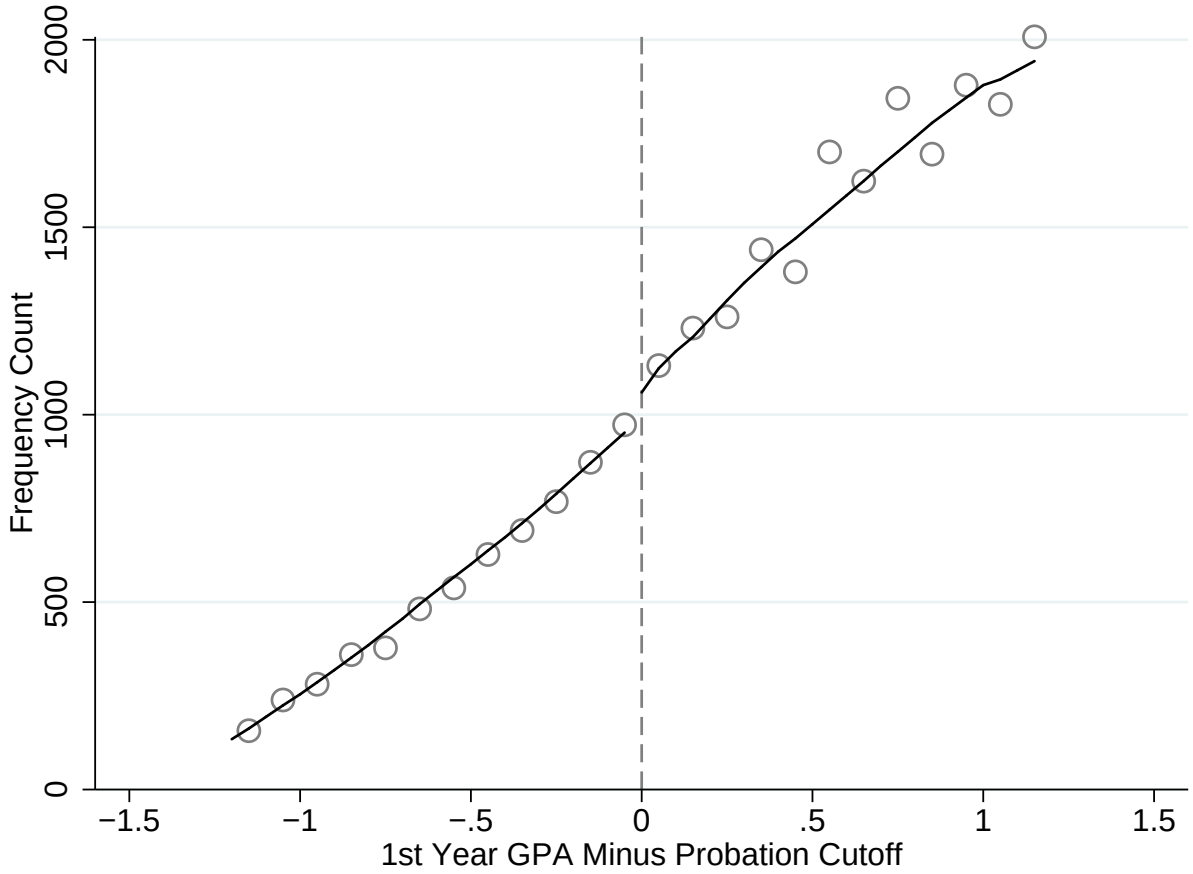
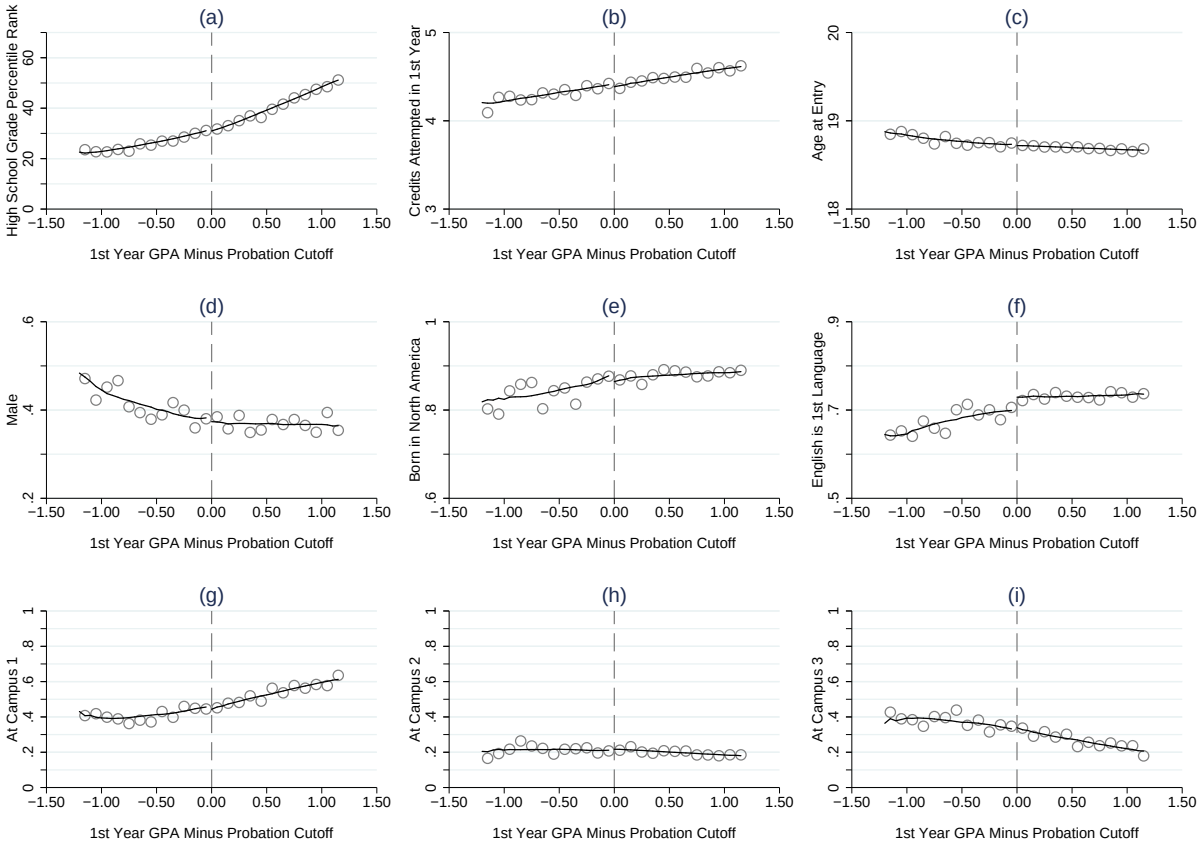
Figure 1
Distribution of Student Grades Relative to their Cutoff



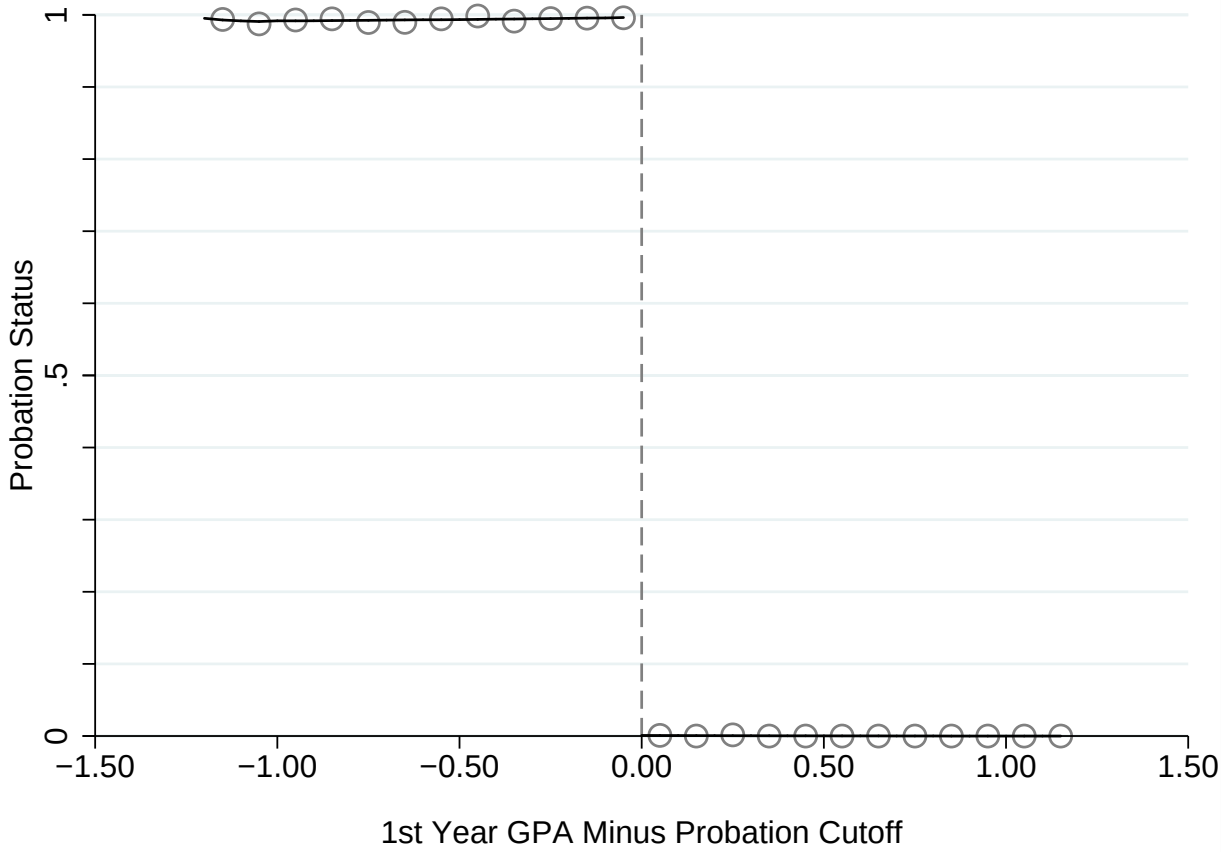
Notes: Each small hollow circle indicates the number of students with a distance from their cutoff within 0.05 points (including the lower but not the upper endpoint). Using each of these cells as an observation, the curve is predicted from local linear regressions with a bandwidth of 0.6 using rectangular kernel weights. The estimated control mean is 1059 and the estimated discontinuity is 58 (p-value = 0.219).

Figure 2
Estimated Discontinuities in Observable Characteristics



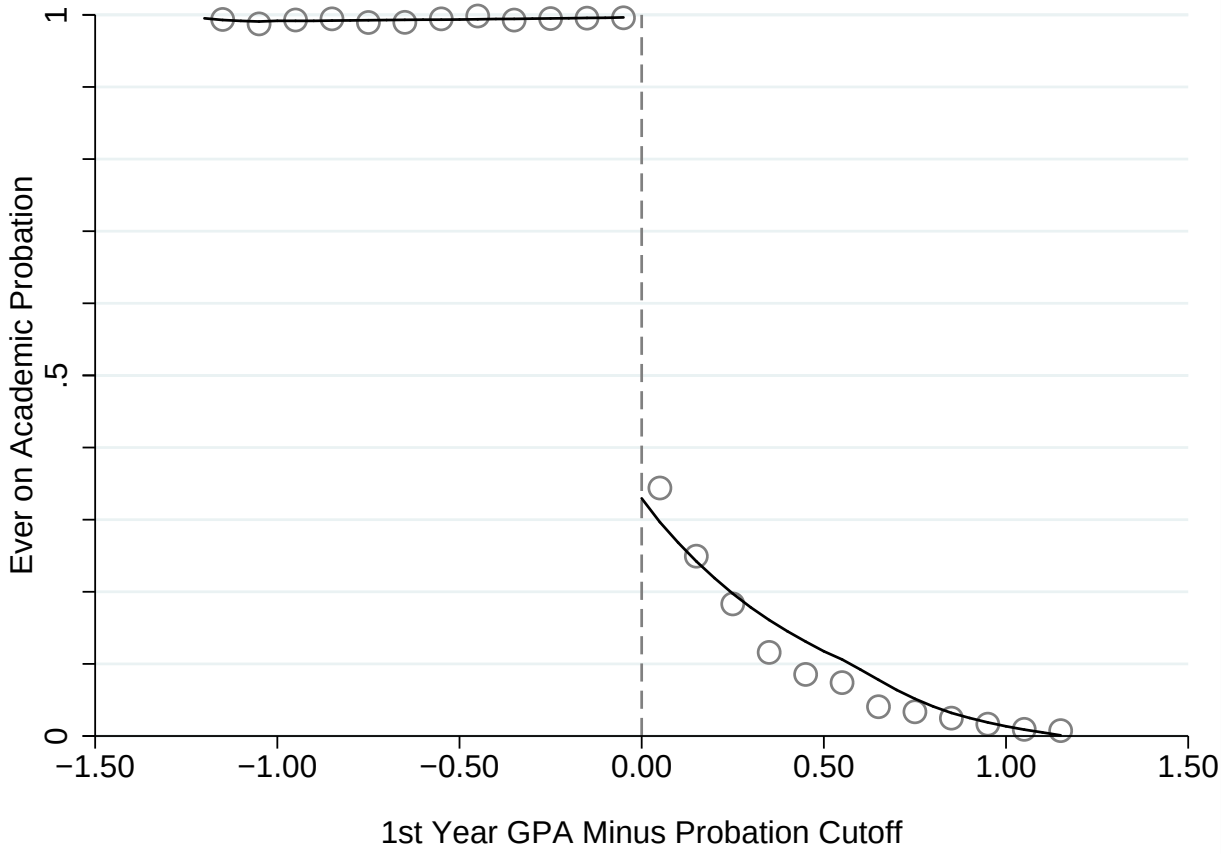
Notes: Each hollow circle is the mean of the outcome in an interval of 0.05 around the point (including the lower but not the upper endpoint). The curve is predicted from local linear regressions with a bandwidth of 0.6 using rectangular kernel weights.

Figure 3
Probation Status at the End of the First Year



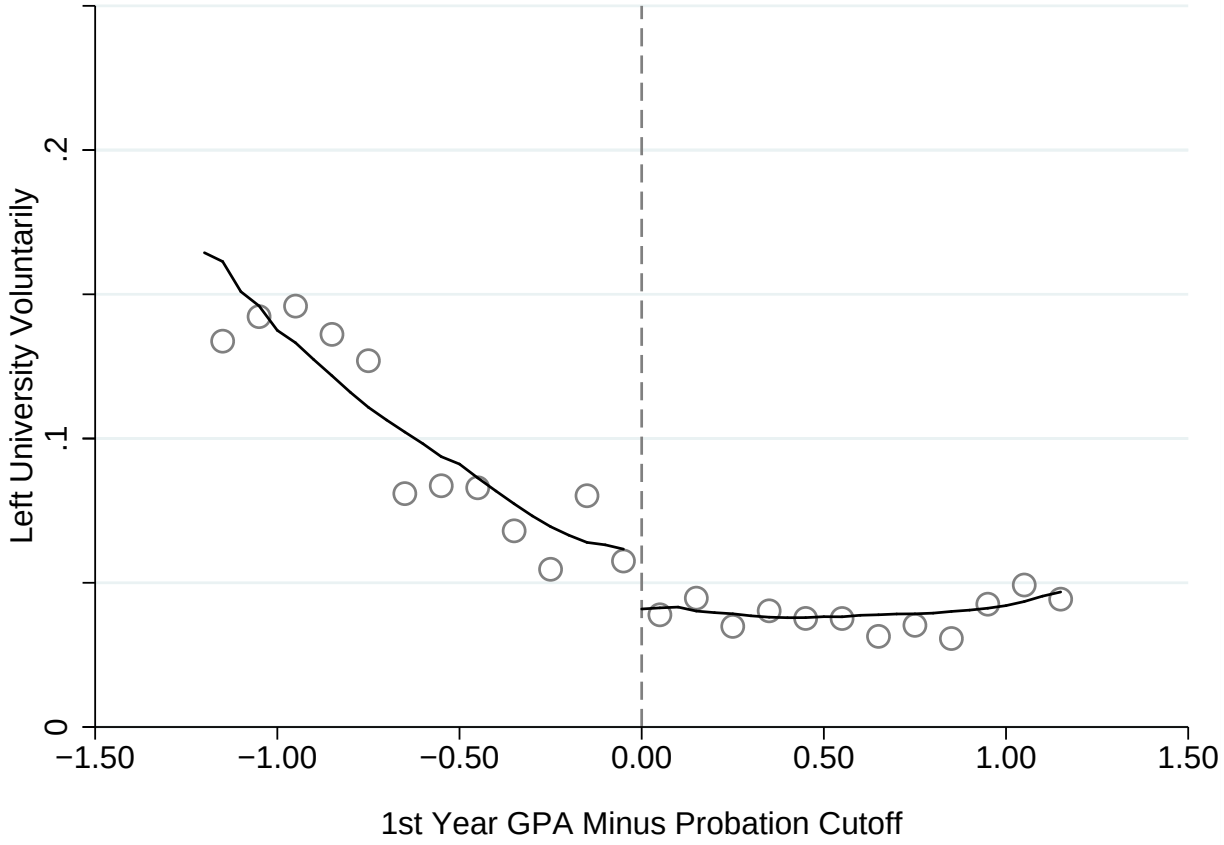
Notes: Same as Figure 2.

Figure 4
Ever on Academic Probation



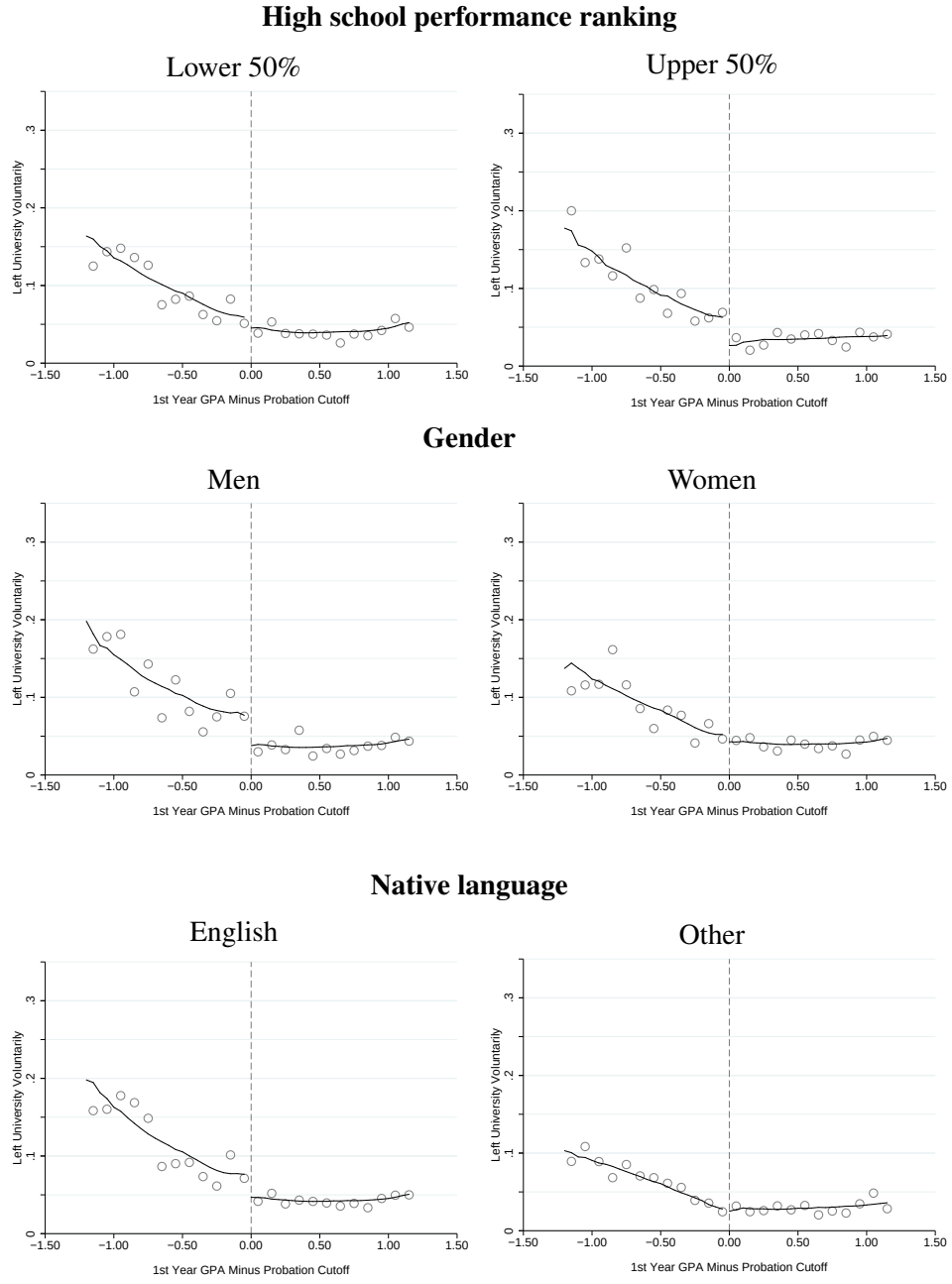
Notes: Same as Figure 2.

Figure 5
Student Voluntarily Drops out of School at the End of the First Year



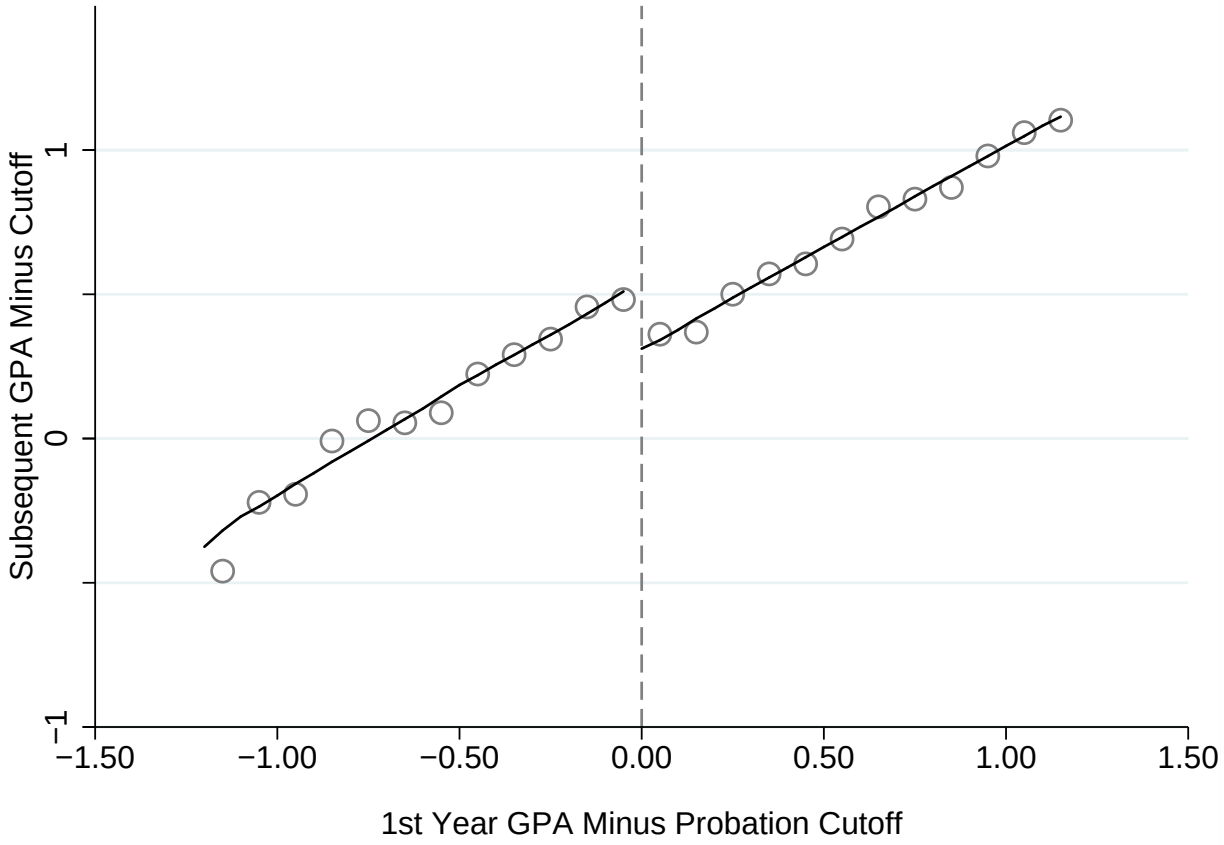
Notes: Same as Figure 2.

Figure 6
Stratified Results for Voluntarily Leaving School at the End of the First year



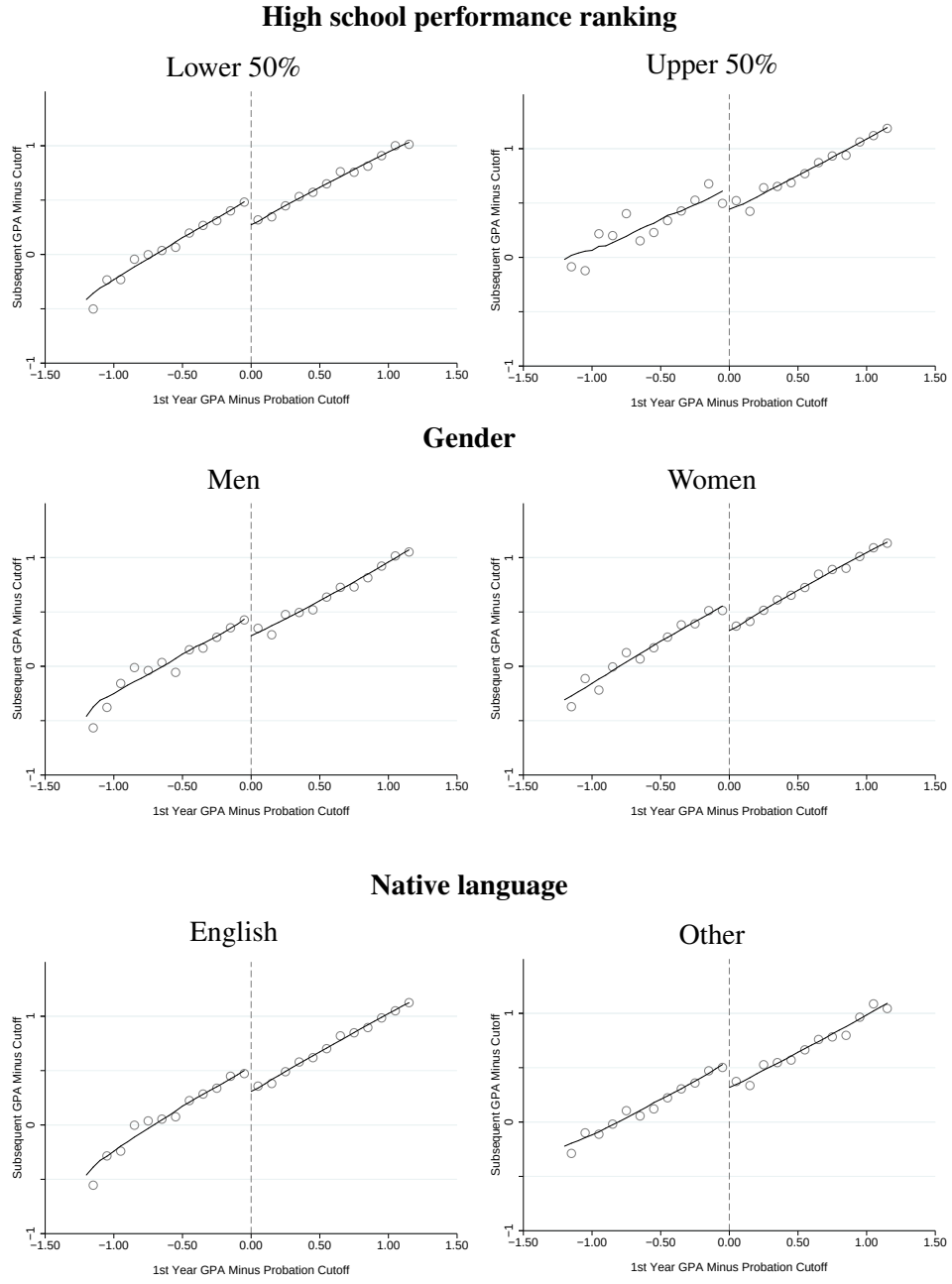
Notes: Same as Figure 2.

Figure 7
GPA in Next Enrolled Term



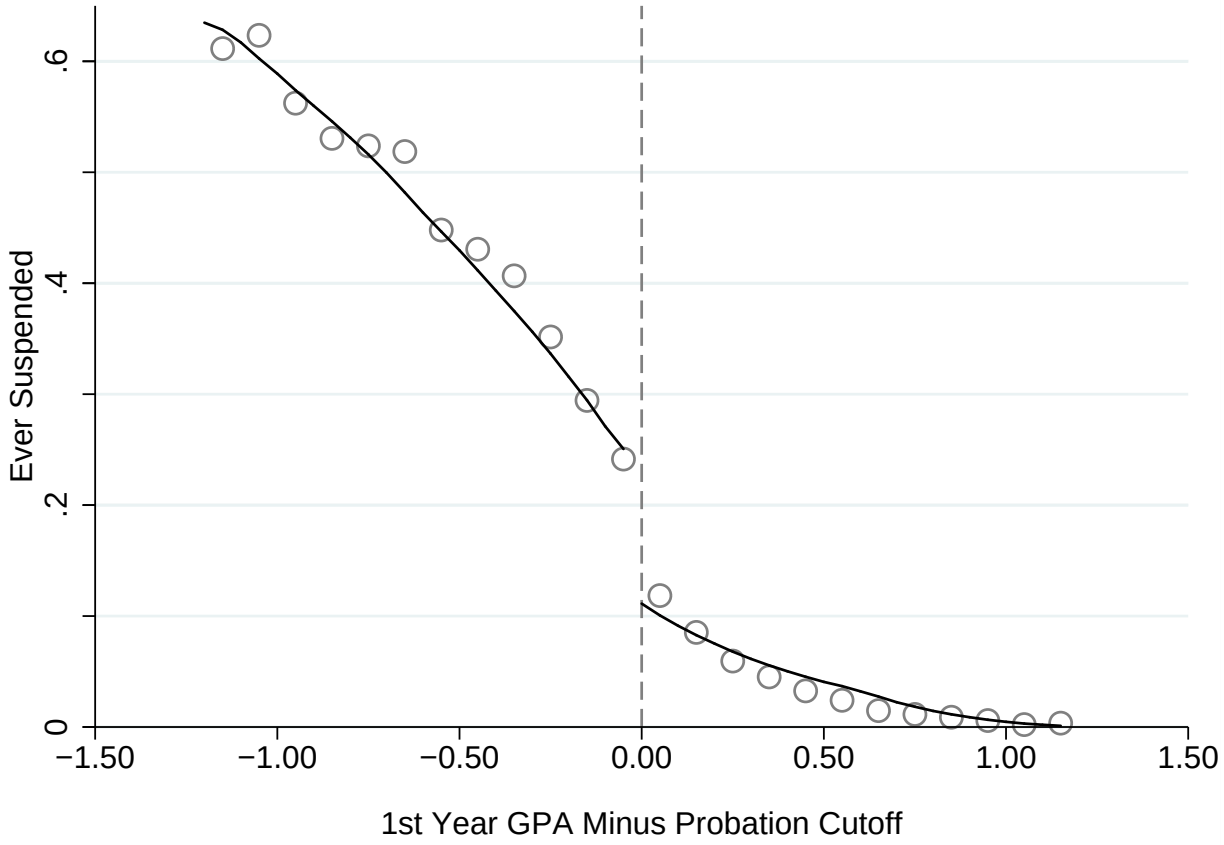
Notes: Same as Figure 2.

Figure 8
Stratified Results for GPA in Next Enrolled Term



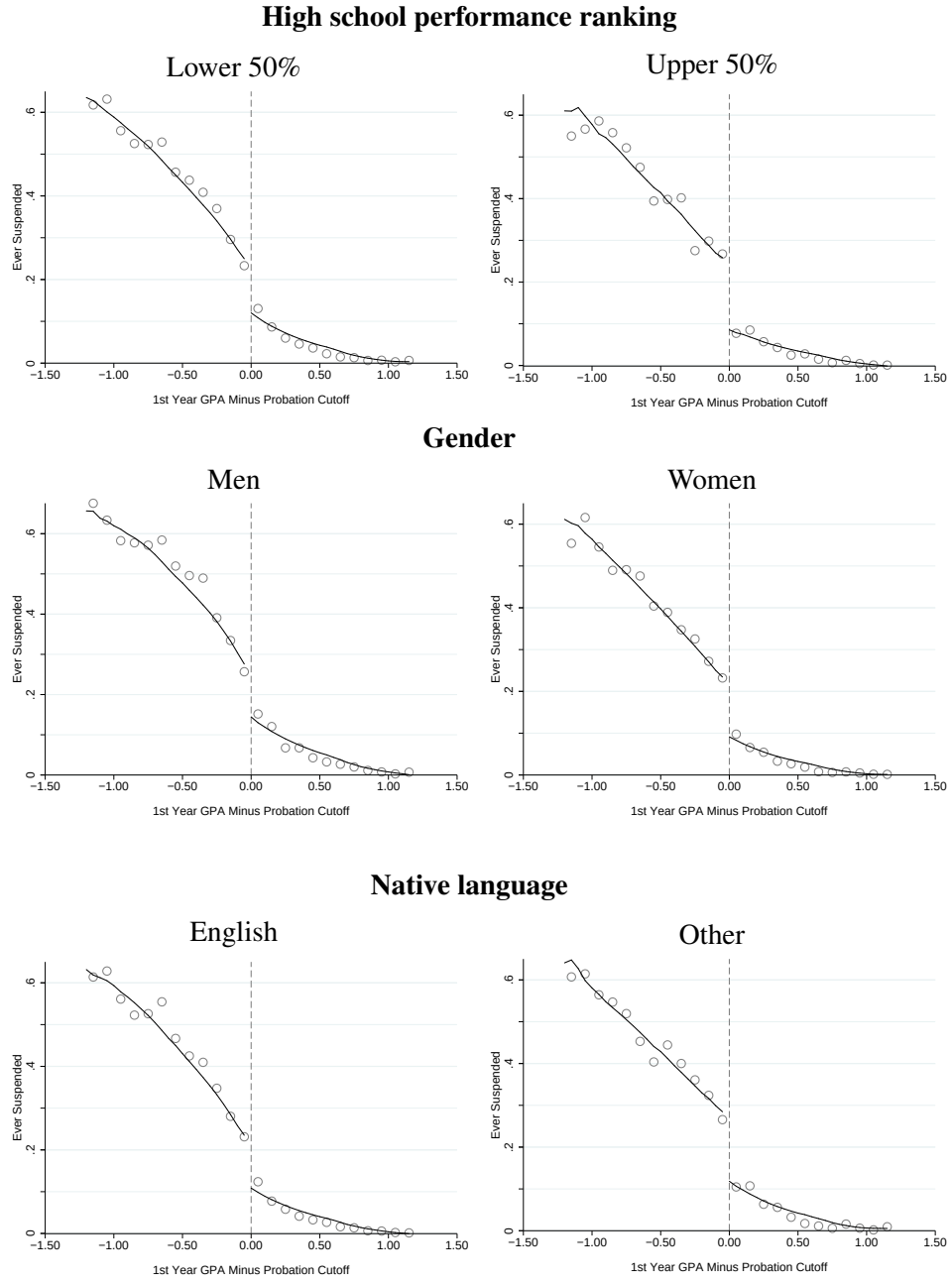
Notes: Same as Figure 2.

Figure 9
Ever Suspended from the University



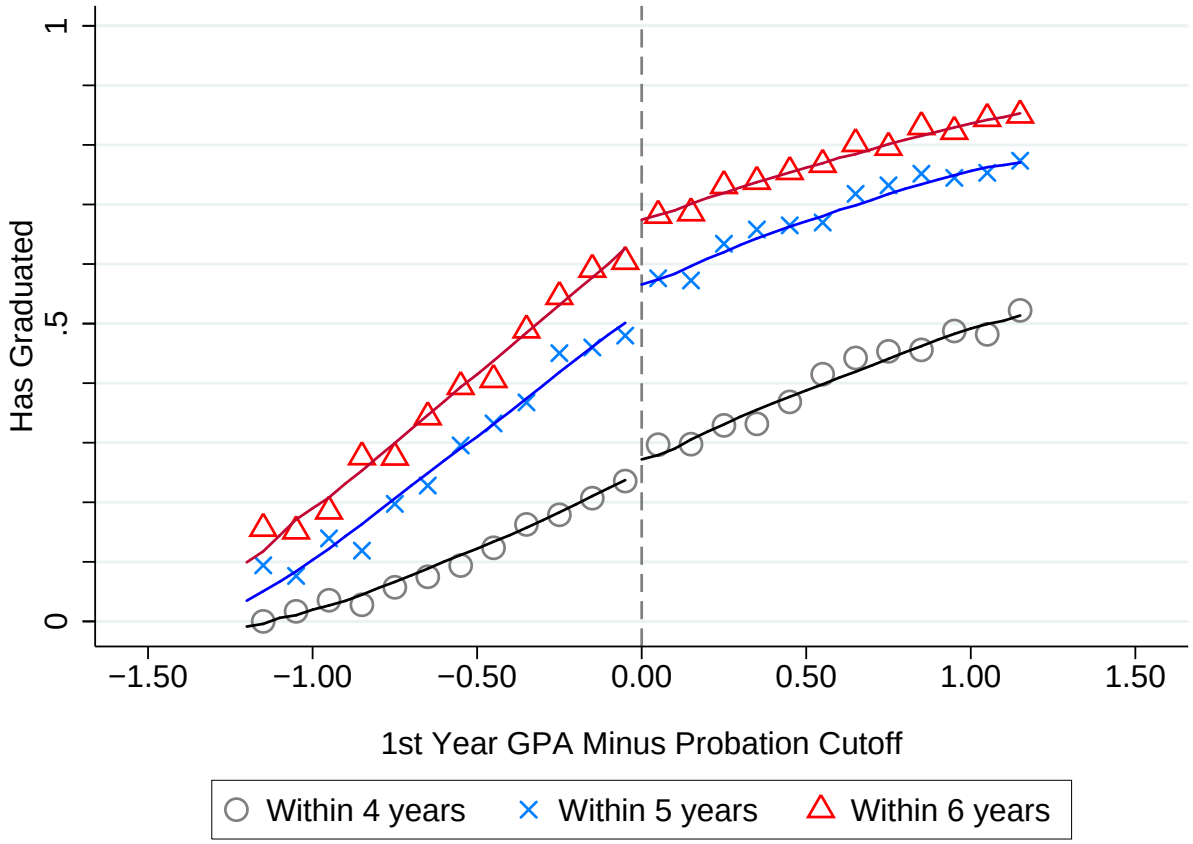
Notes: Same as Figure 2.

Figure 10
Stratified Results for Ever Being Suspended



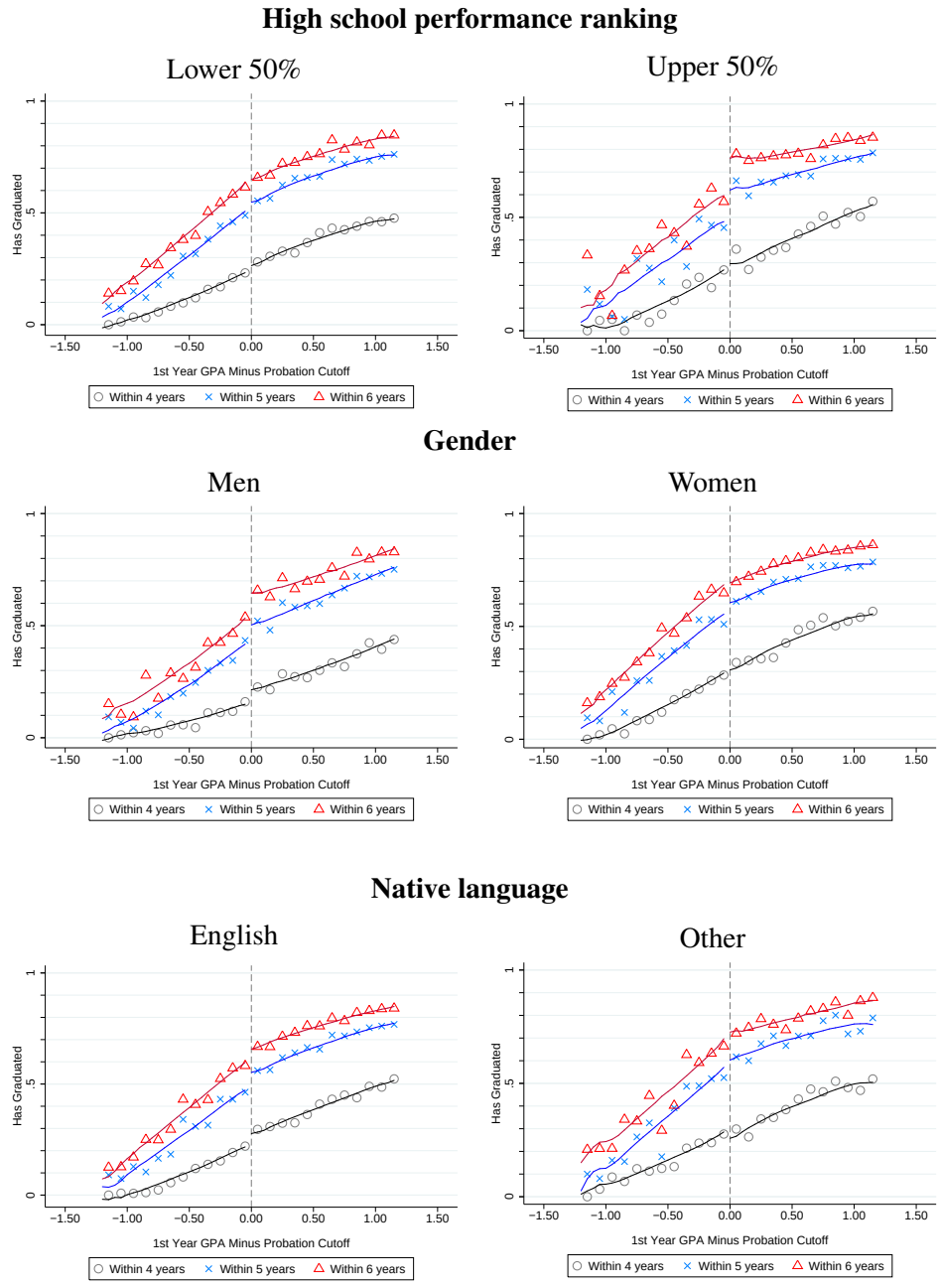
Notes: Same as Figure 2.

Figure 11
Graduation Rates



Notes: Same as Figure 2.

Figure 12
Stratified Results for Graduation Rates



Notes: Same as Figure 2.

Table 1
Summary Statistics

	Mean	Standard Deviation
Characteristics		
High School Grade Percentile	38.24	24.80
Credits Attempted in First Year	4.48	0.53
Age at Entry	18.71	0.74
Male	0.38	0.48
English is First Language	0.72	0.45
Born in North America	0.87	0.33
At Campus 1	0.51	0.50
At Campus 2	0.20	0.40
At Campus 3	0.29	0.45
Outcomes		
Distance from Cutoff in 1st Year	0.38	0.58
On Probation After 1st Year	0.25	0.43
Ever on Academic Probation	0.31	0.46
Left University after 1st Evaluation	0.05	0.22
Distance from Cutoff Next Evaluation	0.65	0.83
Ever Suspended	0.12	0.33
Graduated by Year 4	0.35	0.48
Graduated by Year 5	0.60	0.49
Graduated by Year 6	0.70	0.46

Note: For all variables except graduation rates, the sample consists of the 25,389 students within 1.2 grade points of the cutoff in their first year. Graduation rate samples are 17,559 for 4 years, 14,445 for 5 years, and 11,788 for six years.

Table 2
Estimated Discontinuities in Observable Characteristics

Bandwidth	1.2	0.6	0.3
Observations	25,389	12,530	6,142
	(1)	(2)	(3)
Dependent variable: High school grade (percentile ranking)			
1st Year GPA < probationary cutoff	0.808	0.450	1.851
	(0.927)	(1.259)	(1.728)
Constant (control mean)	30.205***	30.991***	30.476***
	(0.557)	(0.745)	(1.081)
Dependent variable: Credits attempted in 1st year			
1st Year GPA < probationary cutoff	0.020	0.024	0.057
	(0.057)	(0.076)	(0.107)
Constant (control mean)	4.397***	4.386***	4.369***
	(0.036)	(0.046)	(0.066)
Dependent variable: Age at entry			
1st Year GPA < probationary cutoff	-0.008	0.015	0.013
	(0.025)	(0.032)	(0.042)
Constant (control mean)	18.722***	18.719***	18.715***
	(0.015)	(0.021)	(0.031)
Dependent variable: Male			
1st Year GPA < probationary cutoff	-0.003	0.000	-0.007
	(0.017)	(0.024)	(0.033)
Constant (control mean)	0.371***	0.374***	0.378***
	(0.009)	(0.012)	(0.013)
Dependent variable: Born in North America			
1st Year GPA < probationary cutoff	-0.001	0.017	0.002
	(0.010)	(0.013)	(0.018)
Constant (control mean)	0.872***	0.864***	0.877***
	(0.006)	(0.008)	(0.011)
Dependent variable: English is 1st Language			
1st Year GPA < probationary cutoff	-0.021	-0.037	-0.038
	(0.017)	(0.024)	(0.035)
Constant (control mean)	0.728***	0.729***	0.729***
	(0.010)	(0.015)	(0.022)
Dependent variable: Attending Campus 1			
1st Year GPA < probationary cutoff	-0.006	0.012	-0.004
	(0.027)	(0.034)	(0.040)
Constant (control mean)	0.455***	0.444***	0.445***
	(0.017)	(0.022)	(0.024)
Dependent variable:Attending Campus 2			
1st Year GPA < probationary cutoff	-0.007	-0.010	-0.018
	(0.019)	(0.027)	(0.037)
Constant (control mean)	0.218***	0.217***	0.223***
	(0.013)	(0.018)	(0.021)
Dependent variable: Attending Campus 3			
1st Year GPA < probationary cutoff	0.014	-0.002	0.022
	(0.035)	(0.046)	(0.057)
Constant (control mean)	0.327***	0.339***	0.332***
	(0.024)	(0.032)	(0.035)

Notes: Same as Table 3

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3
Estimated Discontinuity in Probation Status

Bandwidth	1.2	1.2	0.6	0.6	0.3	0.3
Observations	25,389	25,389	12,530	12,530	6,142	6,142
Control variables	no	yes	no	yes	no	yes
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: On academic probation after first evaluation						
1st Year GPA $<$ probationary cutoff	0.995***	0.995***	0.994***	0.994***	0.996***	0.996***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Constant (control mean)	0.001	-	0.001	-	0.000	-
	(0.000)	-	(0.001)	-	(0.001)	-
Dependent variable: Ever on academic probation						
1st Year GPA $<$ probationary cutoff	0.751***	0.752***	0.665***	0.666***	0.623***	0.625***
	(0.015)	(0.015)	(0.014)	(0.014)	(0.017)	(0.015)
Constant (control mean)	0.245***	-	0.330***	-	0.372***	-
	(0.015)	-	(0.014)	-	(0.016)	-

Notes: Estimated standard errors, clustered on GPA, are displayed in parentheses. Estimates are based on linear regression as described in Section 5, with rectangular kernel weights and bandwidths noted in the table header. Constants are included in all specifications, though they are not shown for models with covariates as they do not represent the control mean in such cases.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4
Estimated Effect on the Decision to Leave after the First Evaluation

Bandwidth	1.2	1.2	0.6	0.6	0.3	0.3
Control variables	no	yes	no	yes	no	yes
	(1)	(2)	(3)	(4)	(5)	(6)
1st Year GPA $<$ probationary cutoff	0.013**	0.014**	0.018**	0.019***	0.021**	0.023***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.008)	(0.008)
Constant (control mean)	0.036***	-	0.041***	-	0.041***	-
	(0.003)	-	(0.004)	-	(0.004)	-
Observations	25,389	25,389	12,530	12,530	6,142	6,142

Notes: Same as Table 3

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5
Estimated Effect on the Decision to Leave after the First Evaluation for Subgroups

Subgroup	HS Grades < Median		HS Grades > Median		Men		Women		Native English		Non-native English	
Bandwidth	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1st Year GPA < cutoff	0.010	0.015	0.032*	0.031	0.037**	0.046**	0.006	0.006	0.028***	0.031**	-0.004	0.001
	(0.008)	(0.009)	(0.017)	(0.022)	(0.015)	(0.018)	(0.009)	(0.012)	(0.010)	(0.012)	(0.011)	(0.014)
Constant (control mean)	0.045***	0.041***	0.026***	0.037***	0.038***	0.035***	0.043***	0.045***	0.047***	0.047***	0.025***	0.025**
	(0.005)	(0.005)	(0.007)	(0.009)	(0.007)	(0.009)	(0.004)	(0.005)	(0.005)	(0.007)	(0.007)	(0.010)
Observations	9,342	4,709	3,057	1,374	4,701	2,322	7,829	3,820	9,006	4,384	3,524	1,758

Notes: Estimated standard errors, clustered on GPA, are displayed in parentheses. Estimates are based on linear regression as described in Section 5, with rectangular kernel weights and bandwidths noted in the table header.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6
Estimated Discontinuities in Subsequent GPA

Bandwidth	1.2	1.2	0.6	0.6	0.3	0.3
Control variables	no	yes	no	yes	no	yes
	(1)	(2)	(3)	(4)	(5)	(6)
No adjustment for students not returning						
1st Year GPA $<$ probationary cutoff	0.233***	0.229***	0.233***	0.229***	0.233***	0.226***
	(0.020)	(0.019)	(0.026)	(0.026)	(0.039)	(0.037)
Constant (control mean)	0.313***	-	0.312***	-	0.311***	-
	(0.012)	-	(0.018)	-	(0.026)	-
Observations	22,977	22,977	11,258	11,258	5,489	5,489
Assuming students who left after being placed on AP would have performed the same in year 2 as in year 1						
1st Year GPA $<$ probationary cutoff	0.180***	0.179***	0.167***	0.165***	0.163***	0.159***
	(0.019)	(0.018)	(0.024)	(0.023)	(0.035)	(0.033)
Constant (control mean)	0.313***	-	0.312***	-	0.311***	-
	(0.012)	-	(0.018)	-	(0.026)	-
Observations	24,031	24,031	11,873	11,873	5,826	5,826
Assuming students on AP who left would have GPA change in the 10th percentile of similar students						
1st Year GPA $<$ probationary cutoff	0.125***	0.124***	0.103***	0.102***	0.098***	0.093***
	(0.019)	(0.018)	(0.024)	(0.023)	(0.035)	(0.032)
Constant (control mean)	0.313***	-	0.312***	-	0.311***	-
	(0.012)	-	(0.018)	-	(0.026)	-
Observations	24,031	24,031	11,873	11,873	5,826	5,826

Notes: Estimated standard errors, clustered on GPA, are displayed in parentheses. Estimates are based on linear regression as described in Section 5, with rectangular kernel weights and bandwidths noted in the table header. Constants are included in all specifications, though they are not shown for models with covariates as they do not represent the control mean in such cases. In the third panel, students that left after being placed on probation have their second year GPA imputed as their first year GPA minus 0.5—only 10% of students within 0.6 of the cutoff who return after being placed on probation perform worse.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7
Estimated Discontinuities in Subsequent GPA for Subgroups

Subgroup	HS Grades < Median		HS Grades > Median		Men		Women		Native English		Non-native English	
Bandwidth	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1st Year GPA < cutoff	0.251***	0.259***	0.179**	0.119	0.207***	0.203***	0.246***	0.247***	0.229***	0.221***	0.240***	0.258***
	(0.028)	(0.045)	(0.081)	(0.106)	(0.044)	(0.059)	(0.036)	(0.052)	(0.036)	(0.057)	(0.055)	(0.070)
Constant (control mean)	0.273***	0.280***	0.443***	0.435***	0.281***	0.286***	0.330***	0.326***	0.309***	0.315***	0.318***	0.302***
	(0.020)	(0.031)	(0.044)	(0.059)	(0.027)	(0.033)	(0.024)	(0.032)	(0.020)	(0.030)	(0.035)	(0.048)
Observations	8,342	4,182	2,801	1,257	4,166	2,039	7,092	3,450	8,012	3,863	3,246	1,626

Notes: Same as Table 5

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8
Estimated Effects on Ever Being Suspended

Bandwidth	1.2	1.2	0.6	0.6	0.3	0.3
Control variables	no	yes	no	yes	no	yes
	(1)	(2)	(3)	(4)	(5)	(6)
Effect of probation after the first year						
1st Year GPA $<$ probationary cutoff	0.163***	0.164***	0.115***	0.115***	0.084***	0.086***
	(0.011)	(0.011)	(0.013)	(0.013)	(0.019)	(0.020)
Constant (control mean)	0.084***	-	0.111***	-	0.122***	-
	(0.006)	-	(0.007)	-	(0.008)	-
Observations	25,389	25,389	12,530	12,530	6,142	6,142
Effect of ever being placed on probation						
Ever on probation	0.217***	0.219***	0.173***	0.172***	0.135***	0.138***
	(0.013)	(0.013)	(0.018)	(0.019)	(0.029)	(0.031)
Constant (control mean)	0.031***	-	0.054***	-	0.072***	-
	(0.005)	-	(0.009)	-	(0.015)	-
Observations	25,389	25,389	12,530	12,530	6,142	6,142

Notes: Estimated standard errors, clustered on GPA, are displayed in parentheses. Estimates are based on linear regression as described in Section 5, with rectangular kernel weights and bandwidths noted in the table header. Constants are included in all specifications, though they are not shown for models with covariates as they do not represent the control mean in such cases. The effect of ever being placed on probation is based on a 2SLS estimate as described in Section 5

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9
Estimated Effects on Ever Being Suspended for Subgroups

Subgroup	HS Grades < Median		HS Grades > Median		Men		Women		Native English		Non-native English	
Bandwidth	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Effect of probation after the first year												
1st Year GPA < cutoff	0.103***	0.059***	0.159***	0.166***	0.099***	0.057**	0.126***	0.102***	0.100***	0.069**	0.149***	0.117***
	(0.015)	(0.022)	(0.027)	(0.035)	(0.019)	(0.027)	(0.017)	(0.026)	(0.018)	(0.027)	(0.022)	(0.025)
Constant (control mean)	0.120***	0.135***	0.086***	0.081***	0.144***	0.161***	0.091***	0.098***	0.109***	0.124***	0.118***	0.119***
	(0.007)	(0.008)	(0.010)	(0.013)	(0.012)	(0.016)	(0.007)	(0.009)	(0.007)	(0.008)	(0.012)	(0.018)
Observations	9,342	4,709	3,057	1,374	4,701	2,322	7,829	3,820	9,006	4,384	3,524	1,758
Effect of ever being placed on probation												
1st Year GPA < cutoff	0.158***	0.095***	0.226***	0.254***	0.159***	0.095**	0.246***	0.247***	0.147***	0.109**	0.236***	0.200***
	(0.022)	(0.036)	(0.037)	(0.053)	(0.029)	(0.045)	(0.023)	(0.039)	(0.026)	(0.042)	(0.033)	(0.041)
Constant (control mean)	0.066***	0.099***	0.021	-0.004	0.086***	0.123***	0.035***	0.042**	0.062***	0.085***	0.033*	0.036
	(0.012)	(0.017)	(0.016)	(0.024)	(0.018)	(0.029)	(0.011)	(0.017)	(0.012)	(0.019)	(0.019)	(0.031)
Observations	9,342	4,709	3,057	1,374	4,701	2,322	7,829	3,820	9,006	4,384	3,524	1,758

Notes: Estimated standard errors, clustered on GPA, are displayed in parentheses. Estimates are based on nonlinear regression as described in Section 5, with rectangular kernel weights and bandwidth as noted in the table header. The effect of ever being placed on probation is based on a 2SLS estimate as described in Section 5.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10
Estimated Effects on Graduation

Bandwidth	1.2	1.2	0.6	0.6	0.3	0.3
Control variables	no	yes	no	yes	no	yes
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Graduated after 4 years						
Effect of probation after the first year						
1st Year GPA $<$ probationary cutoff	-0.041***	-0.044***	-0.020	-0.023	-0.031	-0.037
	(0.013)	(0.012)	(0.017)	(0.016)	(0.025)	(0.022)
Constant (control mean)	0.281***	-	0.272***	-	0.289***	-
	(0.009)	-	(0.011)	-	(0.014)	-
Observations	17,559	17,559	8,821	8,821	4,338	4,338
Effect of ever being on probation						
Ever on probation	-0.056***	-0.060***	-0.031	-0.036	-0.051	-0.060
	(0.018)	(0.016)	(0.027)	(0.024)	(0.041)	(0.036)
Constant (control mean)	0.296***	-	0.283***	-	0.309***	-
	(0.013)	-	(0.019)	-	(0.026)	-
Observations	17,559	17,559	8,821	8,821	4,338	4,338
Dependent variable: Graduated after 5 years						
Effect of probation after the first year						
1st Year GPA $<$ probationary cutoff	-0.059***	-0.061***	-0.044*	-0.048**	-0.049	-0.057
	(0.018)	(0.016)	(0.026)	(0.024)	(0.041)	(0.037)
Constant (control mean)	0.581***	-	0.566***	-	0.553***	-
	(0.012)	-	(0.018)	-	(0.030)	-
Observations	14,445	14,445	7,293	7,293	3,622	3,622
Effect of ever being on probation						
Ever on probation	-0.081***	-0.084***	-0.069*	-0.076**	-0.082	-0.094
	(0.024)	(0.022)	(0.041)	(0.038)	(0.066)	(0.061)
Constant (control mean)	0.603***	-	0.590***	-	0.586***	-
	(0.016)	-	(0.030)	-	(0.051)	-
Observations	14,445	14,445	7,293	7,293	3,622	3,622
Dependent variable: Graduated after 6 years						
Effect of probation after the first year						
1st Year GPA $<$ probationary cutoff	-0.038**	-0.041***	-0.024	-0.031	-0.037	-0.050
	(0.016)	(0.016)	(0.024)	(0.024)	(0.038)	(0.036)
Constant (control mean)	0.684***	-	0.674***	-	0.667***	-
	(0.011)	-	(0.018)	-	(0.030)	-
Observations	11,788	11,788	6,005	6,005	2,993	2,993
Effect of ever being on probation						
Ever on probation	-0.052**	-0.058***	-0.039	-0.049	-0.062	-0.083
	(0.022)	(0.022)	(0.038)	(0.037)	(0.062)	(0.058)
Constant (control mean)	0.698***	-	0.689***	-	0.692***	-
	(0.015)	-	(0.029)	-	(0.052)	-
Observations	11,788	11,788	6,005	6,005	2,993	2,993

Notes: Same as Table 8

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 11
Estimated Effects of Ever Being Placed on Probation on Graduation for Subgroups

Subgroup	HS Grades < Median		HS Grades > Median		Men		Women		Native English		Non-native English	
Bandwidth	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent variable: Has graduated after 4 years												
Ever on probation	-0.024	-0.029	-0.029	-0.103	-0.075	-0.053	-0.005	-0.049	-0.073**	-0.085*	0.074	0.032
	(0.030)	(0.048)	(0.068)	(0.105)	(0.047)	(0.072)	(0.040)	(0.064)	(0.031)	(0.050)	(0.054)	(0.082)
Constant (control mean)	0.274***	0.285***	0.304***	0.385***	0.244***	0.226***	0.309***	0.361***	0.303***	0.327***	0.231***	0.266***
	(0.024)	(0.038)	(0.050)	(0.076)	(0.035)	(0.053)	(0.022)	(0.031)	(0.020)	(0.030)	(0.039)	(0.054)
Observations	6,736	3,395	1,995	904	3,373	1,680	5,448	2,658	6,406	3,132	2,415	1,206
Dependent variable: Has graduated after 5 years												
Ever on probation	-0.033	-0.034	-0.161**	-0.244**	-0.091	-0.023	-0.060	-0.123*	-0.103**	-0.095	0.005	-0.053
	(0.048)	(0.081)	(0.068)	(0.098)	(0.066)	(0.107)	(0.044)	(0.066)	(0.044)	(0.070)	(0.065)	(0.094)
Constant (control mean)	0.560***	0.548***	0.667***	0.711***	0.539***	0.493***	0.626***	0.646***	0.590***	0.577***	0.601***	0.615***
	(0.038)	(0.066)	(0.042)	(0.058)	(0.051)	(0.086)	(0.029)	(0.045)	(0.030)	(0.049)	(0.048)	(0.073)
Observations	5,531	2,812	1,683	777	2,799	1,423	4,494	2,199	5,320	2,620	1,973	1,002
Dependent variable: Has graduated after 6 years												
Ever on probation	0.017	-0.011	-0.212***	-0.261**	-0.137**	-0.110	0.012	-0.045	-0.066	-0.084	0.011	-0.017
	(0.046)	(0.074)	(0.078)	(0.117)	(0.068)	(0.113)	(0.048)	(0.068)	(0.047)	(0.074)	(0.072)	(0.111)
Constant (control mean)	0.644***	0.650***	0.826***	0.855***	0.700***	0.688***	0.689***	0.702***	0.682***	0.688***	0.722***	0.711***
	(0.038)	(0.065)	(0.038)	(0.061)	(0.050)	(0.089)	(0.032)	(0.048)	(0.028)	(0.049)	(0.054)	(0.088)
Observations	4,584	2,349	1,356	614	2,313	1,170	3,692	1,823	4,417	2,196	1,588	797

Notes: Same as Table 9.

* significant at 10%; ** significant at 5%; *** significant at 1%

A Appendix: Letter Sent to Students at Campus 2

Dear <first name> :

Your academic record indicates that you are experiencing challenges with your studies at xxxxxxxxxxx. As a result, you have been placed ”On Probation” at the end of the xxxxxxx session. “On Probation” is an academic status applied to a student if he or she:

1. Is having difficulty achieving a term average of at least 1.7 GPA or a yearly average of 1.5 CGPA.

2. Is having difficulty meeting performance expectations and/or deadlines as outlined by the course instructor.

3. Is having difficulty achieving the minimum grades required for graduation.

A student who at the end of any session during which they are on probation has a cumulative GPA of less that 1.5 and a sessional of less that 1.7 shall be suspended therefore it is imperative that you seek assistance to improve your academic standing to avoid further sanction.

Rest assured that you can improve this status and that xxxxxxxxxxxxx offers assistance at many junctions. First, you can access help by making an appointment with an academic advisor in the Office of the Registrar to develop strategies to improve your academic record. Book an appointment at xxx-xxx-xxxx or online at www.xxxxxxxxxx. Second, contact xxxxxxxxx for assistance with study habits, note taking, effective research, time management, study groups and peer mentors. Finally, the xxxxxxxxxx offers skills and interest testing which can help you focus on your strengths.

We know that you are capable to academic success, based on your academic record at admission. A good academic record is essential for entry to Limited Enrolment programs, graduate school, and professional schools. Let us review your goals and help you develop a plan to achieve them.

You have the opportunity and available support to be successful. Please utilize our services to insure your future success.

For further information on academic status, please refer to xxxxxxxx of the Academic Calendar or here: http://www.xxxxxxxxxxxxx