The Effects of Merit-Based Financial Aid on Academic Choices in College: Evidence from Georgia's HOPE Scholarship Program

by

Kyung Hee Lee

(Under the direction of Christopher M. Cornwell)

Abstract

A common justification for HOPE-style merit-aid programs is to promote and reward academic achievement, thereby inducing greater investments in human capital. However, grade-based eligibility and retention rules encourage other behavioral responses. Using data extracted from the longitudinal records of all undergraduates who enrolled at the University of Georgia (UGA) between 1989 and 1997, I estimate the effects of HOPE on grade-point average (GPA), course enrollment, withdrawal and completion, and the choice of courses and program of study, treating non-residents as a control group.

First, I find that HOPE has increased resident freshman GPA by 0.13 point, while HOPE's effect on GPA is weak after the first year. Second, I find that HOPE has decreased full-load enrollments and increased course withdrawals among resident freshmen. The combination of these responses results in an 11% lower probability of full-load completion and an annual average reduction in credits completed of 1.0. The latter implies that between 1993 and 1997 Georgia-resident freshmen completed 15,710 fewer credit hours or 3,142 individual course enrollments than non-residents. Third, the scholarship's influence on course-taking behavior is concentrated on students with GPAs on or below the scholarship-retention margin

and increased with the lifting of the income cap. Fourth, these freshmen credit-hour reductions appear to represent an intertemporal substitution, not a general slowdown in academic progress.

Next, I find that HOPE has led students to choose easier classes and avoid more challenging areas of study. Specifically, residents diverted an average of 1.65 more credits from the regular academic year to the first summer term after their matriculation, which amounts to a 72% rise in summer course taking. Also residents completed about 1.2 fewer credit hours in math and science core courses than non-residents during the first two years, and almost 0.2 more credits in each core area of arts and humanities and social sciences but not more in the math and sciences area during the first summer. Finally, the propensity to take easier courses extends to pursuing a less challenging undergraduate major. Average residents were 1.2 percentage points more likely to choose education majors upon matriculation than average non-residents.

INDEX WORDS: Merit-based financial aid, Georgia's HOPE Scholarship, Unintended consequences, Strategic course taking, Course enrollment, withdrawal and completion, Freshman grade-point average, Course selection, Major choice

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Dedication

To my parents, my husband, Young Han, and my son, Eugene

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Chapter 1

Introduction

Historically a large share of financial aid for attending college was need-based with the objective of increasing both access and choice. Merit-based aid constituted a relatively small fraction of total financial assistance, usually awarded by individual colleges attempting to attract academically talented/gifted and high-achieving students to their institutions. However, since the early 1990s there has been a radical transformation in college financing, as many state governments have allocated a considerable amount of their budgetary fund to merit aid programs which in many cases do not require the evaluation of students' financial need. The model for these state programs has been Georgia's HOPE ("Helping Outstanding Pupils Educationally") Scholarship.[1]

Introduced in 1993 and funded by a state lottery, the HOPE Scholarship provides tuition, mandatory fees and a book allowance for all eligible high-school graduates who are seeking a degree at one of Georgia's public postsecondary institutions. Eligible degree-seeking students attending in-state private institutions receive a fixed payment comparable to the value of the public-school scholarship. To qualify for the HOPE scholarship, a student—whether attending a public or private college— must be a legal resident of Georgia and have graduated from high school with a "B" average. The eligibility is not restricted by family income.[2] To retain the scholarship a student must have a 3.0 cumulative grade-point average (GPA) at each checkpoint, the point where she has attempted 45, 90 and 135 quarter or 30, 60 and

[1] Fifteen other states have implemented or proposed merit scholarships fashioned after HOPE. See Cornwell, Leidner and Mustard (2003) for a review of these programs.

[2] There were income restrictions in the first two years of the program. A household income cap was set at $66,000 in 1993 and raised to $100,000 in 1994, but abolished in 1995.

90 semester hours. From September 1993 through May 2004, more than $2 billion in HOPE funds were disbursed to almost 800,000 students.[3]

States have justified HOPE-style merit scholarships in three ways. One is to increase college enrollments in the state; another is to keep their best and brightest high-school graduates from attending college elsewhere. Cornwell, Mustard and Sridhar (2004) find that Georgia's program raised overall enrollments in Georgia colleges by 6-9% between 1993 and 1997, but "keeping the best and brightest in state" accounts for only about a third of the overall program effect. Further, they show that the enrollment increase attributable to HOPE amounts to less than 10% of award recipients.

A third justification commonly offered for merit aid is the incentive it creates for academic achievement. At the same time, GPA requirements for eligibility and retention also encourage other behavioral responses like enrolling in fewer classes per term, withdrawing from classes when performing unsatisfactorily, and choosing less challenging courses and majors. However, little attention has been devoted to these unintended consequences.

This study addresses this gap in the literature with the first empirical examination of the effects of HOPE's retention rules on academic choices in college. Using data extracted from the longitudinal records of all undergraduates who enrolled at the University of Georgia (UGA) between 1989 and 1997, I first estimate HOPE's impact on grade-point average. In addition, I estimate the effects of HOPE on credit-hour adjustment (credit hours enrolled, withdrawn and completed, and intertemporal substitution) and course and major selection (the diversion of course taking from the academic year to the summer and from more to less demanding core curriculum areas, and the choice of major field). The empirical strategy treats non-residents, who are ineligible for HOPE, as a control group in a series of difference-in-differences (DD) regressions that contrast the behavior of in-state and out-of-state students

[3] Note that these figures include both HOPE Scholarship and Grant recipients. The most recent data on the number of HOPE recipients and the total value of their awards are available from the Georgia Student Finance Commission (www.gsfc.org).

before and after HOPE was implemented. Main results of this study can be summarized as follows.

First, in line with Figure 2, a simple DD regression using all the sample produces a statistically significant positive effect of the HOPE Scholarship on freshman GPA that amounts to 0.058. The estimate of the program effect is still positive when controlling for personal traits, pre-college characteristics and high-school fixed effects, but reduced almost by half to 0.034, which is statistically insignificant. However, DD analysis contrasting 1990- and 1995-class students reveals stronger results. Holding individual and high-school characteristics constant, Georgia-resident freshmen have had a 0.13-point higher GPA at the end of their first year than their non-resident counterparts because of HOPE. HOPE's effect on GPA continues to be positive but is weaker and imprecisely estimated in the second and third year. These positive effects on GPA seem to support HOPE's incentive for academic achievement in college.

Second, I find that HOPE has induced course-load adjustments, one of the unintended consequences. Baseline DD results indicate that HOPE has decreased full-load enrollments and increased course withdrawals by 4.2 percentage points among resident freshmen and that HOPE has reduced enrolled hours by 0.47 and increased withdrawn credits by 0.44 in the first year. The combination of these responses results in about 9% lower probability of full-load completion and an annual average reduction in credits completed of a little less than 1.0. These credit-accumulation results are robust to the inclusion of high-school achievement variables. On average, first-year residents were almost 11% less likely to complete a full load and take 1.0 fewer credit hours than non-resident freshmen. The latter implies that between 1993 and 1997 Georgia-resident freshmen completed almost 15,710 fewer credit hours than non-residents, or about 3,142 individual course enrollments.

Third, estimating full-specification DD regressions by *predicted* freshman cumulative GPA category as well as high-school GPA and SAT total score category suggests that the scholarship's influence on strategic credit-hour adjustment is concentrated on students whose

GPAs place them on or below the scholarship-retention margin. First-year residents with predicted cumulative GPAs below 2.7 and between 2.7 and 3.3 were 11.1 and 7.3 percentage points less likely to complete a full load of courses than their non-resident counterparts, respectively, the latter of which is not precisely estimated. As expected, those students in the highest predicted GPA category did not respond to HOPE's retention rules by lowering full-load completion in their first year, because they are unlikely to fail to meet the 3.0 threshold and lose their scholarship and therefore have no incentive to defer the first evaluation point. The likelihood of taking a full-course load rather increased by 8.6 percentage points for resident freshmen with GPAs over 3.3, which is primarily driven by a lower course-withdrawal rate. Credit-hour results are generally consistent with these extensive-margin findings. HOPE has negative effects on credit hours taken for students below and at the retention margin, and a positive impact for those above it, although the latter two effects are statistically insignificant. DD regressions by HSGPA and SAT score category yield basically the same but somewhat stronger results. Students in the bottom and middle categories of HSGPA (lower than 3.0 and 3.0-3.5) and SAT total score (below 25th percentile and 25th-75th percentile) are less likely to complete a full load and take fewer credit hours in their first year because of HOPE, while those in the highest HSGPA and SAT categories do not respond to the scholarship.

Fourth, allowing the HOPE effects to vary by year shows that the scholarship effects were consistent with the time of HOPE's introduction and rose in magnitude with the elimination of the income cap and thereby the increase in the number of students eligible for the award. For both extensive and intensive margins of course enrollment, withdrawal and completion, the estimated pre-1993 effects were uniformly small and statistically insignificant, while the effects were in general larger and more precisely estimated in 1995 and after. By 1997, the likelihood of full-load completion and the number of credit hours taken for first-year students declined by 13 percentage points and 1.4 hours (relative to 1993), respectively, because of HOPE. These results imply that the overall program effects are likely under-

estimated, because the treatment group includes students in 1993 and 1994 who did not receive the scholarship.

Fifth, while students respond to HOPE's retention rules by taking fewer credit hours and less than a full load in the first year, these freshmen credit-hour reductions appear to represent an intertemporal substitution, not a general slowdown in academic progress. The HOPE effect on completed hours, estimated by school year only with 1990- and 1995-class students, is negative and statistically significant in the first year (-1.75), while being positive but imprecisely estimated in the second (1.732 with a p-value of 0.109) and third years. The first- and second-year results seem to imply that students make up for the first-year credit-hour loss in the following school year.

Sixth, I find other evidence of the unintended consequences that HOPE has led students to choose easier classes that are more generously graded (e.g., summer-school classes) and avoid more challenging areas of study that involve "hard" subjects such as math and sciences and thus lead to lower grades. Specifically, residents diverted an average of 1.65 more credits from the regular academic year to the first summer term after their matriculation. While residents completed about 0.6 fewer credit hours in each core curriculum area of Humanities and Fine Arts (AREA I) and Mathematics and Natural Sciences (AREA II) during their first year, they seemed to take about 0.6 more and fewer credits in AREAs I and II during their second year, respectively, suggesting an intertemporal substitution in the former and a general cutback in the latter. Furthermore, residents' core-course taking rose by nearly 0.2 credits in each area of Social Sciences (AREA III) and AREA I but did not increase in AREA II during the first summer. Finally, the propensity to take easier courses extends to the choice of a less demanding program of study. The results of multinomial (polytomous) logit analysis imply that average Georgia residents were 1.2 percentage points more likely to choose education as their major when entering college than average non-residents due to the HOPE Scholarship.

The rest of this study is organized as follows. Chapter 2 overviews the basic features and facts of Georgia's HOPE Scholarship program and how it should alter the academic choices of college students. Chapter 3 reviews the literature and Chapter 4 presents the details of the empirical strategy. Chapters 5, 6 and 7 present and discuss the results regarding HOPE's effects on grade-point average, credit accumulation and the choice of courses and major, respectively. Then Chapter 8 concludes.

Chapter 2

Georgia's HOPE Scholarship

Given that almost 800,000 students have received HOPE benefits exceeding $2 billion in total since 1993, Georgia's HOPE Scholarship is the largest state-funded, merit-based financial aid program in the United States.[1] By 2002, total non-need-based financial aid awarded to Georgia ($360,661,000) was 60 percent of total non-need aid of the other 15 member states of the Southern Regional Education Board (SREB) *combined*,[2] and about 47 percent higher than that of the second-ranked state, Florida ($245,791,000).[3] In 2001-02, over $323 million of HOPE funds were awarded to nearly 196,000 Georgia undergraduates, while $246 million of Pell Grants were given to about 122,000 recipients.[4] During the 2001-02 academic year, about 73% of full-time undergraduate students in Georgia received state-

[1] Georgia's HOPE Scholarship and Grant programs are administered by the Georgia Student Finance Commission (GSFC) and entirely funded by the Georgia Lottery for Education. The Georgia Lottery for Education was established in 1991 at the request of Zell Miller, Georgia's 79th Governor, aiming at supporting improvements and enhancements for "educational purposes and programs" with lottery net proceeds. According to the Georgia Lottery for Education Act and Georgia Code (O.C.G.A. 50-27), "educational purposes and programs" are defined as tuition grants and scholarship, construction of educational facilities, technology for educational facilities and pre-kindergarten for four-year-old children.

[2] Sixteen member states of SREB are Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.

[3] See the National Association of State Student Grant and Aid Programs (NASSGAP), *33rd Annual Survey Report on State-Sponsored Student Financial Aid, 2001-2002 Academic Year*.

[4] Data on annual Pell Grant disbursements and recipients are available from the US Department of Education's Office of Postsecondary Education (www.ed.gov/about/offices/list/ope).

sponsored grant awards[5] largely due to the HOPE Scholarship, compared with just over half (56.37%) of those in the second-ranked state, Kentucky.

2.1 Scholarship Rules and Awards

The HOPE program is composed of two separate components, the HOPE Scholarship and the HOPE Grant. The key distinctive feature of the former is the merit requirement: the widely-publicized scholarship is awarded only if the minimum GPA standard is satisfied, while the lesser-known grant is provided to non-degree seekers at public institutions regardless of their academic performance.[6] This study focuses on the effects of the merit-based *scholarship*, especially the incentives of its retention rules.

To qualify for the scholarship as an entering freshman ("first tier"), a student must have completed high school with at least a "B" average (i.e., a 3.0 cumulative GPA on a 4.0 scale or an 80 numeric average) since 1993 and be a legal Georgia resident.[7] For students who graduated from an eligible high school between 1993 and 1999, all high-school course work taken from the ninth through twelfth grades was counted and used in GPA calculation. The eligibility rules were then stiffened for the high-school graduating class of 2000 to require a "B" average in college preparatory "core curriculum" subjects,[8] in the hope of avoiding future funding shortages. However, the number of HOPE Scholars declined by only 4.3%—as

[5] Grant awards include both need-based and non-need-based grant aid awarded by state grant programs. 2001-02 total grant aid awarded in Georgia was $362.2 million, of which $360.7 million was from non-need aid including the HOPE Scholarship, and only $1.5 million was from state-financed need-based aid.

[6] See Appendix A.2 for further information on the HOPE Grant.

[7] Students who graduated from high school before 1993 (non-traditional students) may now qualify for HOPE beginning their sophomore year (specifically, after the school term a student has attempted *first* 30 semester or 45 quarter hours of study with a 3.0 cumulative grade-point average). The eligibility rule changed in 1995 to allow non-traditional students to receive HOPE awards after their sophomore year, and then re-amended in 1997 to allow them to be eligible for HOPE after their freshman or sophomore year.

[8] College preparatory "core curriculum" subjects (and their number of units) used to determine HOPE eligibility are English language arts (4), mathematics (3 for the class of 2000 and 4 for 2001 and beyond), social studies (3), science (3) and foreign language (2).

opposed to the predicted 35% drop— from the previous year, raising the question of grade inflation in response to the stricter eligibility requirements.[9]

HOPE monies can be used at 103 postsecondary institutions in Georgia, which includes 34 public (twenty 4-year and fourteen 2-year), 35 private (thirty 4-year and five 2-year) and 34 technical schools (see Figure 1). For HOPE Scholars seeking a degree at a public institution, the program covers tuition, HOPE-approved mandatory fees and a book allowance.[10] The value of the award is about $3,600 for the 2002–03 academic year. HOPE Scholars enrolled full-time (12 or more hours) in eligible private institutions receive a fixed payment of $3,000 per academic year toward tuition and fees.[11] From the fall term of 2004, half-time students attending private colleges who enroll in 6–11 hours per semester or quarter can receive a standard award of $1,500 per academic year.[12]

To retain HOPE in college, scholarship recipients must maintain a 3.0 GPA. Each student's GPA is checked at three intervals, corresponding to points where she has *attempted* (not earned) enough credits to be a sophomore, junior and senior (second, third and fourth tier).[13] During the sample period, UGA operated on the quarter system, so these checkpoints occurred at 45, 90 and 135 credit hours.[14] Fifteen credit hours is considered a full load for one term; therefore, 45 credit hours constitutes a full load over the academic year. If a student's cumulative GPA is at least 3.0 at a given checkpoint, the scholarship is awarded until the

[9] "Hope Suffers Funding Shortage," *Athens Banner Herald*, 30 September 2000.

[10] A book and supplies allowance is $150 per semester or $100 per quarter if a student is enrolled for 6 or more credit hours. For students enrolled in less than 6 hours, the allowance is $75 per semester or $50 per quarter.

[11] Full-time HOPE Scholars at private schools received a *non-merit-based* HOPE Tuition Grant in the amount of $500 per academic year in 1993, $1,000 in 1994 and $1,500 in 1995. The HOPE Tuition Grant was phased out beginning in 1997 after the *merit-based* HOPE Private College Scholarship, which provides a standard award of $3,000 to full-time private-school attendees who meet the GPA requirements, was introduced in 1996. As of June 2004, this private-school HOPE payment supplements a $1,045 Georgia Tuition Equalization Grant (TEG) which is financed by state appropriations and available to students attending in-state private schools. See Sridhar (2001).

[12] Note that half-time students in private colleges or universities are not eligible for TEG.

[13] See Table B1 for what grades are counted toward HOPE attempted hours.

[14] Until 1997, the year the sample ends, the University system was on quarters. In 1998 it switched to semesters, and students are now evaluated at 30, 60 and 90 semester hours.

next checkpoint. If a student's cumulative GPA falls below 3.0 at a checkpoint, she loses her award, but can regain it at the next checkpoint if she raises her GPA to the 3.0 threshold. Those who do not qualify for HOPE based on their high-school GPA can become eligible after 45 credit hours if their GPA is at least 3.0 (see Appendix A.1 for details of changes in retention rules).

2.2 Incentives of Retention Rules

Figure 2 plots kernel density estimates of cumulative GPA distributions[15] of typical resident and non-resident first-year students at UGA between 1990 and 1995 (three years prior to and post the introduction of HOPE, with the last year being the year when the income cap was eliminated).[16] "Typical" students are those who matriculate at UGA in the fall term of the same year they graduate from high school. Prior to HOPE, the grade distribution for non-residents lies to the right of the resident distribution and exhibits less variance. After

[15] Cumulative GPA is the average of *earned* grade points accumulated since a student matriculated at UGA:

$$\text{Cumulative GPA}^m = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n}(\text{Grade point}_j^i \times \text{Credit hours}_j^i)}{\sum_{i=1}^{m}\sum_{j=1}^{n}\text{Credit hours}_j^i}$$

where i and j index the academic term and GPA-relevant courses (i.e., courses whose grades are included in GPA computation), respectively. See Table B1 for the grades entering a student's GPA.

[16] The kernel density estimation is a nonparametric technique for density estimation in which no particular functional form (e.g., normal, log normal and gamma) is specified in advance, but a kernel function (e.g., Gaussian and rectangular) is chosen and averaged across the observed data points for a smooth approximation. To produce the kernel density estimates of freshmen cumulative GPAs, I used the KDE procedure of SAS Version 8.0 in which a Gaussian density is employed as the kernel when estimating a density function $f(x)$:

$$\widehat{f(x)} = \frac{1}{N}\sum_{i=1}^{N}\frac{1}{h}K\left(\frac{x - X_i}{h}\right)$$

where h is the bandwidth and

$$K(z) = \frac{1}{\sqrt{2\pi}}\exp(-\frac{z^2}{2})$$

is the Gaussian kernel or standard normal density re-scaled by the bandwidth. The Sheather-Jones plug-in (SJPI) method (the default for univariate smoothing in SAS V8) was used to compute the bandwidth h.

HOPE, and especially after the income cap was increased and removed in 1994 and 1995, the situation reverses, with the resident distribution exhibiting a conspicuous peak at 3.0. More specifically, much of the mass of the resident distribution between 2.5 and 2.9 in 1992 (one year before HOPE's inception) moved to the 3.0–3.2 interval by 1995. These shifts suggest that the HOPE retention rules have led first-year residents to earn higher grades. Of course, tying retention to having a 3.0 GPA at regular credit-hour intervals encourages a variety of grade-enhancing strategies. Some of these are intended and may lead to greater investments in human capital, while others are unintended and probably do not increase human capital.

As intended, some students increase their effort. Others respond by substituting school work for market work due to the income effect associated with HOPE. To the extent that students attend classes more regularly and complete their assignments more assiduously, human capital investments will rise. Trading work hours for study hours may also increase human capital, since typical college-student jobs require few skills and involve little training.

Among the possible unintended consequences, I concentrate on two program responses involving relatively low-cost adjustments in course loads and potentially high-cost adjustments in course taking and major field. One is for a student to enroll in fewer courses at the beginning of the term, and/or withdraw from classes in which she is performing poorly. A one-course reduction from a full load during the first year guarantees an extra term of funding by forestalling the HOPE checkpoint no matter how low a student's GPA is. In addition, a lighter load can translate into higher per-class effort and the likelihood of earning a higher grade in each class without raising overall effort. Non-expiring HOPE benefits exacerbates any propensity to take lighter loads. Furthermore, because withdrawn classes do not enter the GPA, students who are near the HOPE margin and are not doing well in a class have an added benefit from withdrawing. The combined effects of enrolling in lighter loads and withdrawing more frequently will show up in reduced credits completed.

The other is for a student to take easier classes where the average student can expect to receive a higher grade, all else equal. Such a choice could be made on the basis of course

content, a professor's reputation for grading leniently, or timing. An example of the former is taking courses in humanities and social sciences rather than mathematics and natural sciences, while one of the latter is deferring course taking to the summer, provided that grade distributions are significantly more generous during the summer sessions and in the areas of "soft" sciences where a high level of mathematical rigor is not required—students taking credits in the summer and core courses in the areas of arts and humanities and social sciences, on average, have lower high-school achievement but earn higher grades than those enrolled for regular-term hours and math and science core courses (see Tables C7 and C8). Further, the incentive to take easier classes may extend to choose a less challenging major when entering college. To the extent that "soft" majors comprise a bundle of less demanding courses of study, grade-conscious students may be induced to pursue their undergraduate career in a "soft" discipline. Assuming that economic returns to majoring in a "soft" field of study are potentially low, this grade-enhancing strategy could jeopardize one's lifetime earnings, although it would probably increase the likelihood of retaining HOPE and thus attending college free.

While the empirics focus on these unintended behavioral responses, an additional factor, unrelated to the retention rules, must be considered: whether, relative to out-of-state students, HOPE has led to the selection of higher-quality residents in the admissions process. The grade distribution shifts in Figure 2 could be entirely or partially due to an improvement in residents' SAT scores, high-school GPAs (HSGPAs) and advanced course taking in high school, relative to non-residents' after HOPE. This will be checked by estimating DD regressions of SAT scores, HSGPAs and AP courses taken. As will be shown, there is evidence that HOPE has increased the relative quality of in-state enrollees in terms of SAT verbal score and HSGPA, suggesting the importance of including these high-school performance variables as controls in the empirical analysis to estimate the "net" (not total) effect of the HOPE Scholarship.

Finally, I acknowledge that even these unintended responses could enhance human-capital acquisition. For example, taking fewer courses as a first-year student could aid in the transition to college and better facilitate learning throughout one's college career. However, the option to take fewer (and easier) courses has always existed and did not arise with the HOPE Scholarship. Further, at an institution like UGA where most students come from middle- and upper-income households (65% of freshmen were ineligible for HOPE in 1993, when there was an income cap of $66,000), the scholarship matters little for college attendance (even attendance at UGA). Thus, a reasonable conjecture might be that the scholarship incentives should be trumped by other factors such as the labor-market returns to academic choices.

However, the course-taking decisions of freshmen operating under the HOPE rules suggest otherwise. Consider the fractions of typical resident and non-resident first-year students who enrolled in a full-course load, withdrew from a class and completed a full load, plotted in Figures 5, 6, and 7. The percentage of resident freshmen enrolling in full-course loads fell from 82% to 70% after 1993, while the percentage of non-resident full-load enrollees remained at 80% or above. Similarly, the fractions of resident and non-resident freshmen withdrawing from a class diverged sharply with the introduction of the scholarship. The combined effect of first-year residents' drop in full-load enrollments and rise in course withdrawals was a precipitous decline in the full-load completion rate from 67.6% to 44.2%. In contrast, the percentage of non-residents completing full loads in their first year fluctuated fairly narrowly around 60 during the entire period.

Further evidence is provided by Figure 8 plotting the mean credit hours taken in the first summer[17] for typical in-state and out-of-state students. Between 1990 and 1997 academic years, mean credits taken in the first summer by typical residents rose from 2.2 to 2.6 hours, while those for non-residents fell from 1.8 to 1.7 hours. Although on average residents took more credit hours during the first summer-term sessions both before and after 1993, the gap

[17] The summer quarter in the second year, which is the summer immediately following the first academic year, is the first summer at UGA for typical students, since the academic year runs from the summer to the next spring term. For example, the summer term of 1996 is the first summer for the 1995-class of typical students, that is, those who matriculated in the fall term of 1995.

between residents and non-residents widened during the HOPE period. In 1990–92, residents took less than 0.4 more summer credits, while in 1994–95, they took almost 0.7 more summer credits. By 1997, this resident–non-resident gap in summer course taking reaches nearly 1.0 credit hours.

Chapter 3

Literature Review

As noted in Chapter 2, HOPE could influence academic outcomes of college students, because the scholarship retention depends on their grades. The grade-based retention rules of HOPE may motivate students to take lighter course loads in the first year ("off-sheet" choices) and choose less demanding courses and majors ("on-sheet" choices).[1] This HOPE-induced strategic course taking will likely come to fruition in the form of an improved GPA. Thus, it appears that merit-based financial aid for higher education should be included in the list of the determinants of college GPA, especially if its retention rules are tied to the student's performance in college, as in the case of the HOPE Scholarship. Although many efforts have been devoted to studying the issues in higher education finance, including the merit-based aid, research interest has been primarily in student enrollment or returns to higher education,[2] and little attention has been paid to its impacts on academic performance and choices of students. To my knowledge, few studies have examined whether and how students receiving merit-based aid behave to earn better grades and maintain their financial support *after* they enter college. Thus, in this chapter, I first review research studies that have examined the predictors of college GPA, and then a short list of the previous studies that have directly linked merit aid to college student quality, academic achievement and choices, and course-taking strategies. Then I conclude with the contribution of this study to the literature.

[1] The name "on-sheet" comes from the fact that major and course choices are likely discussed with academic advisors and remain on the "sheet" or academic record. On the other hand, "off-sheet" choices are based on rather informal individual decisions and thus not traced on the "sheet."

[2] Refer to Sridhar (2001) for general discussion of higher education finance and special treatment of student enrollment studies.

3.1 Determinants of College GPA

There exists a large literature concerned with the factors that influence college students' academic performance, typically measured in terms of grade-point average (GPA). Many researchers have found that high-school GPA and scores on standardized tests such as the SAT and ACT are the two key predictors of college GPA (Betts and Morell, 1999; Bowen and Bok, 1998; Burton and Ramist, 2001; Maloney and McCormick, 1993; Nettles, Thoeny and Gosman, 1986; Sloop, 2000; Weitzman, 1982; Wilson, 1983; Young, 1991), while a student's gender and race play a relatively minor role in determining academic achievement of undergraduates (Astin, 1971; Betts and Morell, 1999; Bowen and Bok, 1998; Maloney and McCormick, 1993; Nettles, Thoeny and Gosman, 1986). Generally, females are reported to perform better than males, and whites better than nonwhite minorities. Others have provided evidence that a student's field of study and course selection also matter in academic success of students once they start postsecondary education (Betts and Morell, 1999; Dee and Jackson, 1999; Maloney and McCormick, 1993).

Betts and Morell (1999) is an exemplary study of this kind. The authors used detailed data on undergraduate enrollees at the University of California at San Diego (UCSD) between the fall terms of 1991 and 1993 to examine the relative importance of various factors affecting college GPA. Consistent with the existing literature, they found that high-school GPA (HSGPA), SAT scores and individual characteristics (e.g., gender and race) were significant predictors of college GPA at UCSD. Specifically, they suggested that, all else equal, the university GPA was predicted to rise by 0.55 and 0.0007 points as HSGPA and each of SAT verbal and math scores increased by one point, respectively, and female-male and white-Asian gaps in college GPA were about 0.08 point, with the latter group of each pair compared (male and Asian students) having lower GPA. However, they emphasized that GPA differences in racial groups considerably diminished or disappeared, when conditioning on high-school GPA and SAT scores. They also found significant variations in college GPA across majors, with engineering and science majors being in the lowest end of GPA dis-

tribution, and arts and humanities in its highest end. Furthermore, their results indicated that high-school characteristics (e.g., the socioeconomic and demographic environment and the resources of the high school attended) were significantly related to college GPA, even after controlling for family background, personal characteristics and high-school performance variables.

These findings by Betts and Morell (1999) suggest the importance of controlling for pre-college achievement and individual and high-school characteristics in the identification of the true effect of HOPE on college GPA. Especially if HOPE has influenced the college admissions process and led to a differential change in student quality between Georgia residents and non-residents, excluding high-school performance variables from the GPA model would cause an omitted variable bias. Thus, all the aforementioned variables will be included as controls in the estimation of the net program effect.[3]

3.2 HOPE-Related Studies

There are few research studies connecting the HOPE Scholarship to academic performance and choices. A study by Henry and Rubenstein (2002) examined the impact of HOPE's eligibility rules on students' performance in high school, using data on all 229,307 students who graduated from a Georgia high school between 1988 and 1998 academic years and enrolled in an in-state public postsecondary institution during the academic year following high-school graduation. They found that the fraction of high-school graduates who are eligible for HOPE has risen steadily since 1993. They also found that, compared to the national average, the average post-HOPE predicted SAT scores of Georgia high-school graduates who are at the margin of the 3.0 GPA cut-off point (i.e., 2.9 and 3.1), have remained constant or increased since HOPE was launched. From these findings, they contend with little concern about grade inflation that HOPE has induced high-school students to work much harder.

[3] Student's major field of study will not enter the estimating equation, because it is likely to be endogenous: unobserved characteristics may affect both major choice and college GPA. Instead, HOPE's effect on major choice will be examined in Chapter 7.

Several studies have researched how the retention rules of the HOPE Scholarship influence academic outcomes of college students. Curran (1998) concluded, analyzing a self-selected sample of 131 HOPE recipients and 107 non-recipients from the University of Georgia (UGA), that HOPE provided an incentive for capable students to work harder and made HOPE recipients more grade-conscious than their non-recipient counterparts. Using data on 1,189 HOPE Scholars who first matriculated in the summer or fall of 1996 and had completed 45 quarter credit hours at Georgia Institute of Technology, Dee and Jackson (1999) studied the HOPE attrition rate. The authors showed that the engineering students, whose curriculum is tied to classes with lower average grades, were more likely to lose their scholarships, leading them to suggest that some students may be induced to forgo an engineering major and choose a less challenging course of study.

Sloop (2000) sampled in her study only first-time degree-seeking freshmen who matriculated at one of thirty University System of Georgia institutions in the fall term immediately following their high-school graduation between 1988 and 1997. She reported that fewer traditional students had attempted at least 45 quarter credit hours, but more had attempted 25-45 quarter hours in their first year since HOPE was introduced. She also found a marked increase (about a 0.3 grade-point increase from the fall of 1993 to 1997) in the mean post-HOPE GPAs for traditional students who attempted at least 45 hours in their first year at UGA and suggested that grade inflation occurred in the post-HOPE years at this institution (UGA). Henry, Rubenstein and Bugler (2002) studied a matched sample of Georgia students from the high-school class of 1995 who barely satisfied and failed to meet the eligibility requirement (i.e., overall high-school GPA between 3.0 and 3.1 vs. below 3.0). Henry et al. found that students who started as HOPE Scholars (HOPE-qualifiers), on average, earned about 3.5 more credit hours (worth one three-credit course) per year than those who did not receive the scholarship initially (non-qualifiers), and that four-year college GPAs of the former were 0.17 points higher than those of the latter. Further, they found that the effect of the initial qualifying dominated that of the subsequent losing of HOPE—HOPE losers who

were initially qualified for HOPE but lost it, on average, had 12.4 more credits accumulated (3.1 more per year) and 0.14-point higher GPAs earned after four years than non-qualifiers. As noted by the authors, their numbers are very much likely an upper bound or "ceiling point" of HOPE's effects on academic outcomes in college, because they are based on the students at the scholarship margin who are most likely to be affected by the program.

3.3 Limitations and Contribution

The merit-aid literature lacks not only HOPE-related research, but also *rigorous* empirical studies on HOPE. Earlier studies are mainly descriptive (e.g., Sloop (2000)), subject to sample selection bias (e.g., Curran (1998)), or misleading. For example, the study by Henry et al. (2002) is problematic for a number of reasons. First, there are really no "treatment" and "control" groups in their study. All students in their sample are affected by HOPE, because even those who do not start as HOPE Scholars (non-qualifiers) can receive HOPE award after 45 credit hours if they meet the 3.0 cumulative-GPA threshold. Second, there is no guarantee that non-qualifiers are observationally equivalent to HOPE-qualifiers. The former are more likely to have "negative" characteristics, while the latter are more likely to have "positive" characteristics. However, since Henry et al. used only one post-HOPE cohort, they were precluded from statistically testing for any difference between matched groups (HOPE-qualifiers vs. non-qualifiers) in the sample.

Thus, it is fair to say that no study has quantified the "true" impacts of HOPE on students' performance and course-taking behavior in college. Moreover, none has explored whether and when (i.e., in what school year) students take more or fewer credit hours, and what kinds of courses and programs of study they favor and avoid in light of HOPE. Henry et al.'s analysis (2002)—although their empirical methods are flawed, bringing their results into question— just attempted to identify the scholarship's influence on four-year aggregate outcomes and overall grades (i.e., cumulative GPA and credit hours accumulated after studying four years in college). This study attempts to fill this gap in the literature

by empirically estimating the HOPE Scholarship's influence on college GPA, taking into consideration both "off-sheet" and "on-sheet" academic choices that students make in college to enhance their grades—with the former being credit-hour adjustments and the latter, course type and major choices. Given ample evidence on the impact of college major on earnings (Black, Sanders and Taylor, 2003; Grogger and Eide, 1995; Hamermesh and Donald, 2003; Turner and Bowen, 1999), this study will also aid in linking merit-based aid for postsecondary education to earnings.

Chapter 4

Empirical Strategy

4.1 Model

As described in Chapter 2, the HOPE Scholarship may influence students' grades and course-taking behavior in a number of ways. The empirics in this study deal with four: cumulative grade-point average, credit hours enrolled, withdrawn and taken, summer-school and required-course enrollments, and major choice. For the second and third outcomes— i.e., credit-hour adjustment and summer-course taking— both qualitative (e.g., whether a student enrolls in a full load) and quantitative (e.g., number of credit hours taken in the summer for fulfilling science requirements) responses are examined.

To estimate the scholarship's effect on these academic outcomes, I contrast the responses of residents before and after the HOPE "treatment" with those of non-residents who serve as a control group. This strategy leads to a simple DD regression for each school year of the form

$$y_{it} \quad = \quad \alpha + \beta GA_i \cdot H_t + \gamma GA_i + \delta H_t + \epsilon_{it}, \tag{4.1}$$

where y_{it} is an outcome measure (either discrete or continuous) for typical student i ($i = 1, \ldots, N$) in academic year t ($t = 89, 90, \ldots, 97$); H_t is a HOPE indicator that equals 1 for students who matriculated in 1993 or later; GA_i is Georgia-resident dummy; and ϵ_{it} is the error term. Since this simple model exploits one of the natural experiment features[1]

[1] Another natural experiment feature of HOPE is the imposition of an income cap for the first two years of the program: a household income cap of $66,000 in the first year and $100,000 the following year. Thus, if the household income data were available, I could also exploit this feature to estimate the impact of HOPE on academic outcomes using a similar analysis of the difference in differences between students who are ineligible because of the income cap and those for whom the cap does not bind.

of the HOPE Scholarship that in-state students are eligible for HOPE, whereas out-of-state students are not, typical out-of-state students provide the basis of the counterfactual, that is, academic outcomes for typical in-state students during post-HOPE periods that would have been observed if they had not received the HOPE "treatment." The effect of HOPE on academic outcomes—without partialling out the impacts of personal characteristics and pre-college achievement and high-school fixed effects— is captured by β, which is the coefficient of interest. Since pre-HOPE means for out-of-state and in-state students are α and $\alpha+\gamma$, and post-HOPE means for the former and the latter are $\alpha+\delta$ and $\alpha+\beta+\gamma+\delta$, respectively, the estimate of β represents difference between pre- and post-HOPE years in resident–non-resident differences. The coefficient δ reflects the time trend of academic outcomes or how they are influenced by time passing from pre- to post-HOPE years, and the coefficient γ shows the time-invariant difference in overall group means between the typical in-state and out-of-state student groups. Therefore, if both δ and γ are close to zero, academic outcomes of typical non-residents in pre- and post-HOPE years are expected to be similar to those of typical residents in the pre-HOPE period.

	Pre-HOPE ($H_t = 0$)	Post-HOPE ($H_t = 1$)
A. Out-of-state ($GA_i = 0$)	$E[y_{it}\|GA_i, H_t] = \alpha$	$E[y_{it}\|GA_i, H_t] = \alpha + \delta$
B. In-state ($GA_i = 1$)	$E[y_{it}\|GA_i, H_t] = \alpha + \gamma$	$E[y_{it}\|GA_i, H_t] = \alpha + \beta + \gamma + \delta$
Difference between A and B	γ	$\beta + \gamma$
Difference in A-B differences	β	

However, the simple model in (4.1) is insufficient to measure the true impact of HOPE on academic outcomes, since there are other influential factors such as individual and high-school characteristics which have been suggested by previous studies discussed in Chapter 3. The following extended model including these covariates and control variables can separate

out the net effect of HOPE:

$$y_{it} = \beta GA_i \cdot H_t + \gamma GA_i + C_t'\delta + X_{i,1}'\theta_1 + X_{i,2}'\theta_2 + HS_i'\alpha + \epsilon_{it}, \quad (4.2)$$

where y_{it}, GA_i and H_t are the same variables as defined in (4.1); C_t is a set of dummy variables for class years, C_ks equal to 1 for students who matriculated in academic year k ($k = 89, 90, \ldots, 97$); $X_{i,1}$ includes race and gender dummies; $X_{i,2}$ contains pre-college characteristics such as HSGPA, SAT scores and AP credit hours; HS_i is a vector of high-school dummies, HS_{ij}s equal to 1 if student i graduated from high school j (e.g., $HS_{i,CS}$ equals 1 for Cedar Shoals high-school graduates); and ϵ_{it} is the error term. Note that different intercepts are allowed for different high schools in (4.2) to take into account the possible idiosyncracy of the students from the same high school (e.g., high-school resources, neighborhood and "peer group" effects) or unobserved heterogeneity.[2] $X_{i,2}$ are added not only because they are significantly related to college academic outcomes, but because HOPE could lead to a change in student quality, which then likely affects y_{it}. It is crucial to partial out the indirect effects of HOPE through $X_{i,2}$ to obtain the direct or *net* effects of HOPE. The program effect is again captured by β, the coefficient on the interaction term between the Georgia residency and HOPE-period dummies, which measures the difference in differences between typical in-state and out-of-state students and reflects the extent to which the HOPE criterion has influenced typical students' grades, course-taking behavior and academic choices. Results reported are primarily based on full specification (4.2) unless comparisons between models are necessary.

[2] High-school resources include teacher-pupil ratio, class size, years of teaching experience and teacher's education level (bachelor, master or doctor), while neighborhood and "peer group" refer to the socioeconomic environment by which the high school a student attended is surrounded (e.g., characteristics of high-school student body and average level of education, median household income and population in the high-school district).

4.2 Data

The empirical analysis is implemented with data compiled on all undergraduates enrolled at UGA between 1989 and 1997 (see Appendix B for the data merging process). The Office of Student Financial Aid provided information on each student's HOPE status, the dollar amount of each HOPE award, the reason for HOPE ineligibility (if any), the number of HOPE attempted hours and GPA for HOPE scholars by term. Incomplete and withdrawn credit hours are included in HOPE attempted hours, but not in UGA attempted hours. I distinguish the term "HOPE Scholar" from "HOPE recipient" throughout this study. The former designates a student who received the scholarship for at least one year in her UGA career. The latter refers to a HOPE Scholar receiving the award in a specific term or year.

From the Registrar's Office, the following course-related information was obtained: credit hours enrolled, attempted and earned, cumulative GPA, matriculation and graduation terms (if available), course selection, major field of study, and AP credits. HOPE cumulative GPA is calculated to determine HOPE eligibility and differs from the UGA cumulative GPA. The latter depends only on grade points *earned* since matriculation at the university, while the former reflects those after high-school graduation. Also, withdrawn credit hours are counted in HOPE attempted hours, but neither UGA attempted nor earned hours (see Table B1).

Finally, the Undergraduate Admissions Office provided data on various pre-college and personal characteristics such as HSGPA, SAT scores,[3] high school attended, residency, ethnicity, gender, and age. There were two versions of HSGPA obtained, one from the Registrar's Office which was unweighted, and the other from the Admissions Office which was weighted according to the scheme designed for UGA admission rules and standards. Weighted HSGPA was computed by adding a weight to raw HSGPA, where the additive weight assigned was

[3] The College Board recentered SAT scores for tests taken on or after 1 April 1995 to reestablish the average SAT I verbal and math scores near the midpoint of the 200-to-800 scale. SAT scores from the Admissions Office for students in 1989 through 1994 classes were on the original scale. I recentered pre-April 1995 SAT scores using the College Board's SAT I individual score conversion table (see Table B2).

the same for all the applicants from each high school in a given year and ranged from -0.1 to 0.7. The average weighted GPA was 3.29 over the sample period. Because the grading scale was not equivalent across high schools and the quality of curriculum or the level of the courses taken (e.g., standard, college preparatory, honors, and AP classes) was not the same for all students, the Admissions Office developed and used weighted HSGPA for admissions process. Consequently, the weight component in weighted HSGPA has changed for some high schools over time, rendering possible correlation with HOPE introduction. Hence I use throughout this study the unweighted HSGPA provided by the Registrar's Office.[4]

Over the sample period, about 38,200 enrollees are included in the data set.[5] However, because I want to examine how HOPE affects academic choices throughout students' college careers, I exclude transfer students and limit the sample to those who enrolled at UGA as first-time freshmen (FTF), or those who have never attended any postsecondary school before entering UGA. Further, I restrict attention to those FTF whom I regard as "typical" (those who matriculated at UGA in the fall term of the same year as they graduated from high school). Thus I exclude students who matriculated at UGA (1) before graduating from high school, (2) during the summer term after they graduated from high school, and (3) after the fall term following their high-school graduation, among first-time (non-transfer) freshmen. Table C1 shows that typical FTF (TFTF)[6] number roughly 31,000 and take up nearly 95% of all FTF from 1989 to 1997, compared to only 1,750 "atypical" FTF.

[4] Since unweighted HSGPA from the Registrar's Office was missing for many students, it was backed out from weighted HSGPA provided by the Admissions Office, using the formula: unweighted HSGPA = weighted HSGPA - weight.

[5] Between 1989 and 1997, 10,648 students have transferred to UGA. Although Admissions data were available only for freshman applicants (107,364 observations), since about half of transfer students (5,327 out of 10,648) had applied for UGA as freshmen at least once before they transferred to UGA, pre-college and personal characteristics for those students were recovered from their past freshman applications. And among 107,364 freshman applicants, 32,866 students matriculated at UGA as first-time freshmen (FTF) with no previous college attendance. Thus, 38,193 enrollees (5,327 transfer students plus 32,866 FTF) could be used for the analysis.

[6] "Typical first-time freshmen (TFTF)" refers to those who matriculate at UGA in the fall term of the same year as their high-school graduation and have never entered any postsecondary institution prior to UGA matriculation.

Table C2 provides a breakdown of typical FTF in the sample by residency and scholarship status for each class year. After dropping to 3,042 in 1991, the number of typical FTF rose steadily to 4,165 in 1997. In HOPE's first year, when the $66,000 income cap was in force, only 35.2% (949) of typical FTF Georgia residents entered with the scholarship. In 1994, the income cap was increased to $100,000 and this percentage increased to 75.5. After the income cap was removed in 1995, almost all resident typical FTF started their careers at UGA as HOPE Scholars. Thus, the treatment group in 1993 and 1994 is comprised of a large number of residents who are not scholarship recipients. The effect of this will be to *underestimate* the effects of HOPE on academic outcomes, because the non-scholarship residents operate under the same incentives as out-of-state students. In an attempt to avoid this 1993-94 data problem caused by income restrictions, more refined DD analysis contrasting a pre-HOPE cohort never to be benefitted from and a post-HOPE panel to be fully covered by the program—for example, 1990 and 1995 entering class students— will be conducted whenever needed.

Despite the growing number of students qualifying for HOPE, Table C3 shows that 33% of HOPE Scholars who matriculated as typical FTF at UGA in the fall term of 1996 (39% of TFTF HOPE Scholars in the incoming classes of 1993 through 1996), lost their HOPE awards by the first checkpoint. This HOPE-loss rate at UGA is much smaller than Dee and Jackson's (1999) at Georgia Institute of Technology (GT). According to Dee and Jackson, about half (56.5%) of 1,189 HOPE Scholars who first matriculated in the summer or fall of 1996 and had completed 45 quarter credit hours at GT lost their scholarships after reaching their 45-credit checkpoint. Further, 56.5% (43.1%) of typical FTF HOPE Scholars of 1993 (1995) class at UGA lost HOPE by the second checkpoint, which is similar to Bugler, Henry and Rubenstein's report (1999) that 52.4% (46.6%) of those in Georgia lost their support after studying two years in college. Consistent with Bugler et al. (1999), HOPE-loss rate at the first checkpoint is the greatest for black students (61.22%), compared to the overall rate of 38.83% for all typical FTF HOPE Scholars (see Table C4). White, Hispanic and

Asian TFTF HOPE Scholars have the similar rate of HOPE attrition at the first checkpoint (36.15%, 35.37% and 34.98%, respectively), with the Asians' percentage being the lowest. Table C4 also suggests that females (36.43%) are about 6 percentage points less likely to lose HOPE after 45 quarter credit hours than males (42.31%). As one would expect, average high-school achievement levels are lower for HOPE losers than HOPE keepers, with the biggest gap arising in AP credits earned—the latter (5.76) earned more than double AP credit hours than the former (2.32). On average, typical students who lose HOPE at the first checkpoint have lower HSGPA and SAT scores (both verbal and math scores) by about 0.3 and 30 points, respectively, than those who retain HOPE.

Table C5 reports the means and standard deviations of the selected variables in the sample, separately for residents and non-residents, over the pre- and post-HOPE periods. The resident–non-resident contrasts in the first four rows of the table are consistent with those displayed in Figures 2, 5, 6, and 7 and serve as a preview of the empirical results that follow.

Chapter 5

Grade-Point Average

5.1 HOPE Effects on Freshman GPA

Because the grade distribution changes in Figure 2 can be generally captured by the model that includes only dummy variables for Georgia residency, HOPE period and their interaction, I first estimate a simple DD regression in (4.1) for typical first-year students. Then I extend the analysis by incrementally adding individual characteristics, SAT scores, HSGPA and high-school fixed effects. The results are presented in Table D1. Column 1 shows the simple DD result. In line with Figure 2, in-state students are found to have higher GPA than out-of-state students at the end of their first year after HOPE. The estimated HOPE effect on freshman GPA is positive (0.058) and statistically significant at the 0.01 level. The results also imply that Georgia residents earn lower grades on average and that students who matriculated since the introduction of HOPE perform better than those who entered the university during the pre-HOPE period.

Controlling for gender and race affects the results little: the estimated program effect increases by only 0.005 point (see column 2). Consistent with previous studies, female and white students are predicted to have significantly higher GPAs than male and black students, respectively. However, these gender and racial differences and HOPE's effect may not persist if student quality, high-school performance and peer group effects are properly controlled.

It is important to control for high-school achievement variables when estimating the impact of HOPE on college GPA for two reasons. One is that high-school GPA and SAT scores are highly significant predictors of college GPA (Betts and Morell, 1999; Bowen and Bok, 1998; Burton and Ramist, 2001; Maloney and McCormick, 1993; Nettles, Thoeny

and Gosman, 1986; Sloop, 2000; Weitzman, 1982; Wilson, 1983; Young, 1991). The other is that there is a possibility that HOPE influences college GPA *indirectly* through these pre-college performance variables. As noted before, HOPE could affect the college admission process and raise the relative quality of Georgia-resident enrollees, which may then lead to a relative increase in residents' GPAs, like what we see in Figure 2. If this is true, the HOPE effect estimates in columns 1 and 2 will be overstated or biased upward, and the estimated program effect should be driven down when these selection effects are controlled. Suppose an extreme case where the grade distribution changes in Figure 2 are explained entirely by an increase in the relative quality of Georgians. In this case, the estimated HOPE effect would be very close to zero after netting out high-school achievement.

Hence I examine HOPE's effect on selection, prior to controlling for high-school characteristics. To test the hypothesis that HOPE has led to admitting higher-quality residents, I estimate DD regressions for SAT scores, HSGPA and AP credit hours earned, the results of which are given in Table D2. The estimated HOPE effects are 9.305 and 0.065 for SAT verbal score and HSGPA, respectively, which are statistically significant at the 0.01 level. Given that the pre-HOPE means (in percentile) of resident HSGPA and SAT verbal score are 3.11 (49th percentile) and about 560 (49th), and their 54th-percentile points are 3.18 and 570, respectively, a 0.07- and 9.3-point increase in the former and the latter translates into about a 5-percentile increase.[1] The program effects for the other high-school achievement variables (SAT math score and AP credits) are both small and statistically insignificant. Thus, it appears that HOPE has led to the relative improvement in the quality of resident enrollees, at least in terms of SAT verbal score and HSGPA, and that the grade distribution shifts in Figure 2 may be ascribed *in part* to HOPE's influence on these admission standards. Accordingly, we expect to see HOPE's effect decreased when all the pre-college achievement controls are added.

[1] Note that in the pre-HOPE period, 47th- to 51st-percentile SAT verbal scores for residents are 560 and their 52nd- to 56th-percentile points are 570.

I now estimate HOPE's impact on freshman GPA conditional on high-school achievement as well as personal characteristics, the results of which are given in columns (3)–(5) in Table D1. Note that high-school performance variables and fixed-effects are incrementally added, with column 3 adding only SAT verbal and math scores and the last column reporting the coefficients estimated by the full-specification fixed-effects model in (4.2). When the SAT scores are additionally controlled, the estimated HOPE effect decreases by about 0.015 point to 0.049 (compared to the baseline estimate in column 2), which is statistically significant at the 0.05 level. Adding HSGPA and AP credits earned (in addition to the SAT scores) further reduces the coefficient estimate by almost half to a statistically insignificant 0.025. As predicted, the full-specification DD regression produces the diminished program effect of 0.034, which is only 50% of the baseline estimate in column 2 and not precisely estimated (t-statistic of 1.49). This result may suggest that the shifts in Figure 2 stem largely from a HOPE-induced increase in the relative quality of in-state students. Alternatively, it may be due to the weakness of the "treatment" group in 1993 and 1994 classes—65% and 25% of residents are non-HOPE Scholars in 1993 and 1994, respectively. Thus I re-estimate DD regressions for freshman GPA with only 1990 and 1995 classes, directly parallel to the kernel density plots in Figure 2 (see Table D3). The estimated HOPE effects follow the same pattern, but are much stronger and statistically significant even after controlling for high-school characteristics. The baseline estimate of 0.176 is decreased to 0.115 with the SAT verbal and math scores added and further to 0.076 with all high-school achievement variables additionally controlled. While the full-specification estimate with high-school fixed effects included (0.13 in column 5) almost doubles the one without (in column 4), it is about 0.05 points or 30% smaller than the baseline estimate. This proposes that Georgia residents have higher GPAs—by as much as 0.13 point—than non-resident counterparts after one year of college study because of the HOPE Scholarship, implying a positive role of HOPE in improving college freshman GPA.

The other predictors produce the results supporting the extant literature. First, male-female and black-white differences still matter after conditioning on high-school factors, although the magnitude of their impacts decreases substantially. Second, high-school achievement variables such as the SAT scores and HSGPA are positively related to college GPA, with the latter being the most influential. An increase of 1.0 point in HSGPA increases college GPA by 0.72-0.75 points, which is much larger than 0.55 reported by Betts and Morell (1999). Interestingly, the effect of the SAT verbal score is twice that of the SAT math, while the two effects are about the same in Betts and Morell (1999). Nevertheless, the total effect of both SAT scores combined is almost identical to theirs; a 200-point increase in the SAT composite score composed of 100-point increases in both SAT verbal and math scores translates into little more than a 0.15-point increase in college GPA. Furthermore, it is noteworthy that the effects of the SAT verbal and math scores decline by nearly 50% and 75-80%, respectively, when conditioning on additional high-school factors (i.e., HSGPA, AP credits earned and high-school fixed effects), and that the HSGPA impact rises by about 20% with the addition of high-school fixed effects.

5.2 HOPE Effects on GPA through Third Year

Section 5.1 shows that first-year residents obtain higher GPA than non-residents because the HOPE retention decision is based on their GPA. Then one might ask what happens to their GPA beyond their first year. Do residents continue to perform better through later years, or does this GPA difference dissipate after one year of studying in college? This section addresses this question by estimating HOPE's effects on cumulative GPA at the end of the second and third years. The analysis is confined to 1990 and 1995 classes to follow the same pre- and post-HOPE cohorts through the third year.[2] The results are reported in Table D4.

[2] It would be ideal to follow the students up to their graduation, provided that GPA at the time of college graduation is one of the most important deciding factors in their employment or their admission to post-baccalaureate degree programs. However, the sample used in this study ends at 1997, and 1995 is the first post-HOPE year when there was no income restriction. Thus, the second- and third-year cumulative GPAs are examined in this section.

The estimated HOPE effects decrease as students progress into their second and third years of college. The estimates for the second and the third year are 0.072 and 0.081, but neither is statistically significant at the 0.10 level. In contrast to the findings of Henry et al. (2002), the influence of HOPE retention rules on college GPA is weak after the first year, probably because it is much harder to change *cumulative* GPA at the margin in the later years.[3]

The GPA effects of gender, ethnicity and high-school achievement variables, however, persist after the first year in college. The estimated gender effect almost doubles from the first (0.045) to the third year (0.088). By the end of the third year, female students have about 0.1 point higher GPA than male students. Black-white and Asian-white gaps widen during school years two and three, while the differences between the other ethnic minority groups and white diminish or disappear. HSGPA, SAT scores and AP credits earned continue to have highly significant effects on college GPA beyond the first year, but their effects also decrease from earlier to later years.

5.3 Discussion

One goal of the HOPE Scholarship program is to promote academic efforts. Curran (1998) and Henry and Rubenstein (2002) have suggested that HOPE retention rules induce students to be more conscious about their grades and work harder. But how can we measure whether and to what extent students work harder due to the scholarship? Can we simply infer from an increase in students' grades that students put more effort into their school work and make more investment in their human capital? Probably not, because better grades in college can reflect different things. They can result not only from assiduous work, but

[3] One might suspect that HOPE's effects in the second and third years are likely underestimated, because 38% of the 1995 class lose their scholarships at the first checkpoint and therefore are not influenced by HOPE retention rules. However, those who lose HOPE at a checkpoint can regain it if they raise their GPA to at least 3.0 by the next checkpoint. Thus, it is presumed that both HOPE "losers" and "keepers" have incentives to maintain 3.0 cumulative GPA, and respond to HOPE retention rules.

from various options that students have at their disposal, such as credit-hour adjustment and course selection. Students can obtain higher grades by registering for fewer credits, dropping the courses where their progress is unsatisfactory, or choosing less challenging majors and courses of study. Correspondingly, the positive effect of HOPE on freshman GPA found in this chapter may be driven by increased effort, or these alternative grade-enhancing strategies, or both. Thus, in the following chapters, I examine unintended consequences of the HOPE Scholarship program by estimating its effects on course enrollment, withdrawal and completion (Chapter 6), as well as major and course selection (Chapter 7). If students are found to adjust their credit loads and/or choose easier courses due to the concerns about their HOPE retention, we should not directly link the estimated HOPE effect on GPA to an increase in student effort.

Chapter 6

Credit Accumulation

6.1 Empirical Estimation

For each outcome of credit-hour adjustments, two basic specifications are estimated—a simpler model that omits the controls in $X_{i,2}$ in (4.2) and a more complete specification that includes these high-school performance variables. In case of discrete outcomes, the dependent variable, y_{it} equals 1 if student i enrolls in a full-course load, withdraws from a course or takes a full load in the first year. In case of continuous outcomes, y_{it} is the number of credit hours enrolled, withdrawn or taken in the first year.

Because the influence of the retention rules should be greater for students on or below the retention margin than those with high GPAs whose risk of loss is low, I also estimate the effects of the scholarship at different intervals of the *predicted* grade distribution. This involves estimating an ordered probit model of the form

$$y_{it} = \beta GA_i + C_t'\gamma + X_{i,1}'\delta_1 + X_{i,2}'\delta_2 + HS_i'\alpha + \epsilon_{it}, \tag{6.1}$$

where y_{it} equals 0 if a pre-HOPE student i's cumulative GPA at the end of her first academic year t ($CGPA_{it}$, $t = 89, 90, \ldots, 92$) is lower than 2.7, 1 if $2.7 \leq CGPA_{it} < 3.3$, and 2 if $CGPA_{it} \geq 3.3$; GA_i (Georgia-resident dummy), C_t (class-year dummies), $X_{i,1}$ (gender and race dummies) and HS_i (high-school dummies) are the same as defined in (4.2); $X_{i,2}$ includes the deciles of HSGPA and SAT verbal and math scores and two dummy variables for AP credit hours (i.e., $AP_{i,1}$ equals 1 if pre-HOPE student i earned AP credits (AP_i) greater than 0 but less than or equal to 15 hours, and $AP_{i,2}$ equals 1 if $AP_i > 15$); and ϵ_{it} is the error term. First, the ordered probit model in (6.1) is estimated with only pre-HOPE sample (1989-92

classes) to avoid any potential contamination by the program. Next, using the ordered probit estimates, the group in which a student's freshman GPA falls is predicted for both pre- and post-HOPE samples. Then the full-specification DD regression model in (4.2) is estimated separately for first-year students predicted to fall in each category of cumulative GPA. In addition, the same DD analysis is conducted directly by HSGPA and SAT score categories.

Further, I extend (4.2) to allow the estimated HOPE effects to vary over time. This analysis is conducted for three reasons: (1) to determine whether the reported effects are coincident with HOPE's introduction, (2) to assess the importance of the income cap in the empirics, and (3) to see whether students' credit accumulation is more influenced by the HOPE Scholarship in the later years of the program. As noted earlier, the income restriction on eligibility in 1993 and 1994 weakens the "treatment," and thus, the estimated HOPE effects in those years are likely underestimated. Also it is expected that students' strategic course-taking would be more pervasive as information about the retention rules becomes more widely diffused. Finally, I examine the extent of intertemporal substitution of course load by estimating (4.2) by school year.

6.2 Full-Course Loads

First, consider HOPE's impact on the probability a student enrolls in a full load, withdraws from a class, and completes a full load of courses in the first year. The program effect on completion reflects adjustments in both course enrollment and withdrawal. These results are provided in Table D5, with columns 1, 3 and 5 presenting the base specification, and the even-numbered columns adding the high-school performance control variables (HSGPA, SAT math and verbal scores, and the number of AP credits).[1] Column 1 reports an estimated HOPE effect on the probability of enrolling in a full-course load of -0.042, which is statistically significant at the 0.01 level. This estimate implies resident freshmen are 4.2 percentage

[1] Compared to baseline regressions, 412 students are lost when the full-specification models are estimated, because of missing values in high-school performance controls.

points less likely to enroll in a full load because of HOPE. When high-school performance characteristics are included in the regression (column 2), the estimated HOPE effect changes only slightly, rising in magnitude to 4.8 percentage points. Since the percentage of typical first-year residents enrolling in a full load in the pre-HOPE years is 82.2, these results mean a 5.1 to 5.8% drop in the full-course-load enrollment rate.

Students can respond to the HOPE incentive to reduce course loads both by signing up for fewer credits and withdrawing from courses in which they are not performing well. Course withdrawal may be an especially important strategy for a student on the margin of HOPE retention, because withdrawing will not affect her GPA. The program effect estimated in column 3 indicates that the scholarship has increased the likelihood of Georgia-resident freshman withdrawals by 4.2 percentage points. This translates into a 16.1% increase in the withdrawal rate, given that the pre-HOPE mean for resident enrollees is 26.1. As in the full-load enrollment case, this finding is robust to the inclusion of high-school achievement variables.

HOPE's influence on course enrollments and withdrawals is ultimately realized in credits taken (completed). The last two columns of Table D5 give the estimated HOPE effects on the probability of taking a full load. The base specification suggests that the scholarship has caused the likelihood of taking a full load in the first year to drop by 6.0 percentage points. Adding the high-school achievement variables leaves this result qualitatively unchanged—the scholarship effect increases in magnitude to 7.1 percentage points. Since the pre-HOPE percentage of typical first-year residents taking a full load is 64.2, this implies a 9.3-11.1% decline in the full-course-load completion rate.

Before turning to the intensive margin, it is worth noting some of the other findings in Table D5. Holding high-school achievement constant, women are more likely to complete a full-course load by 2.5 percentage points and less likely to withdraw from a class by 2.4 percentage points, but no more likely to enroll in a full load in their first year. Black freshmen are 4.2 and 6.2 percentage points more likely to enroll in and complete a full load

of courses, respectively, and 2.2 percentage points less likely to withdraw. Not surprisingly, the probability of taking a full load increases with high-school achievement, with HSGPA having the greatest impact. Qualitatively, these findings are repeated in the credit-hours regressions.

6.3 Credit Hours

On average, how many fewer credit hours are completed by freshmen because of HOPE, and to what extent is the decrease due to enrolling in a lighter load versus course withdrawal? Table D6 reports DD regression results for the number of credit hours enrolled (columns 1 and 2), withdrawn (columns 3 and 4), and taken (columns 5 and 6) by typical first-year students. Again, columns 1, 3 and 5 give the base specification, and columns 2, 4 and 6 add the high-school performance variables.

The baseline estimated program effect on credit hours enrolled is -0.474 (with a p-value of 0.075), which implies that HOPE has reduced the average Georgia-resident freshman course load by about 0.47 credits. As in Table D5, including the high-school achievement control has little impact; the coefficient estimate rises in absolute value to -0.492 (and the p-value falls slightly).[2] Since the pre-HOPE mean credit hours of typical first-year residents is 44.22, this result translates into about a 1.1% decrease in enrolled hours.

Columns 3 and 4 show the estimated program effects on withdrawn hours are nearly equivalent to those for hours enrolled, but with somewhat smaller standard errors. Thus, the impact of the scholarship on completed hours is roughly 0.9–1.0 credits. This is shown explicitly in columns 5 and 6. A 1.0 credit per year program effect means that between 1993 and 1997 Georgia residents completed almost 15,710 fewer credit hours, or about 3,142 individual course enrollments than non-residents.

[2] Although its eligibility and retention rules are somewhat different, Binder and Ganderton (2002), in their study of New Mexico's merit-based SUCCESS Scholarship, report that program also led college students to reduce the number of registered and completed credit hours during their first two semesters.

Consistent with the extensive-margin findings in Table D5, holding high-school performance constant, women withdraw 0.15 fewer credit hours, and blacks enroll in 1.5 more hours and withdraw about 0.3 fewer credits, thus completing 1.8 more credit hours in their first year. Further, the number of credit hours taken rises with HSGPA, SAT math scores and AP credits, while it appears to be unaffected by SAT verbal scores.

6.4 HOPE Effects throughout the GPA Distribution

The program effects reported in Tables D5 and D6 should be driven by students on or below the margin for HOPE retention. Students far above the 3.0 GPA standard should be the least affected by the retention rules, because they have the lowest risk of scholarship loss. To test this, I repeat the analyses depicted in Tables D5 and D6 by cumulative GPA category *predicted* using the ordered probit estimates obtained from (6.1).[3] Tables D8 and D9 present the results of this exercise. The full specification given in (4.2) is estimated for three separate predicted freshman GPA categories: < 2.7, 2.7–3.3 and ≥ 3.3. Of 30,703 typical first-year students (whose records contain high-school performance controls and the name of high school attended), there are 18,653 students with predicted cumulative GPAs below 2.7, 7,092 between 2.7 and 3.3, and 4,958 of 3.3 and above.[4]

First, consider the scholarship's influence on the extensive margin in Table D8. Panel A shows that first-year residents predicted to be at or below the retention margin are less likely to enroll in a full load of courses because of HOPE. For those with predicted cumulative GPAs (CGPAs) between 2.7 and 3.3, the effect is 7.9 percentage points; 5.2 percentage points for students with predicted CGPAs below 2.7. Both estimates are statistically significant at the 0.05 level. In contrast, the coefficient estimate for students in the highest CGPA category is positive, but not statistically significant at the 0.10 level. Panel B presents the withdrawal

[3] The ordered probit estimates obtained using only the pre-HOPE sample are given in Table D7.

[4] Since there are 238 students with no cumulative GPA (CGPA), 13,673 with CGPA < 2.7, 9,723 with $2.7 \leq$ CGPA < 3.3, and 7,069 with CGPA ≥ 3.3, the bottom CGPA category is over-predicted and the middle and top CGPA categories are under-predicted.

results, which display a somewhat different pattern. As predicted, the estimated program effect is large and statistically significant for first-year students with predicted CGPAs under 2.7 and insignificant for those with predicted CGPAs of 3.3 and above. In this case, however, the HOPE effect is also statistically insignificant for those whose CGPAs are predicted to be at the retention margin (between 2.7 and 3.3). The results for full-load completion, given in panel C, follow the pattern of the course-enrollment estimates: negative coefficients for students predicted to be below or at the retention margin and positive for those above it. Georgia-resident freshmen with predicted CGPAs less than 2.7 and between 2.7 and 3.3 are less likely to complete a full load by 11.1 and 7.3 percentage points, respectively, although the latter estimate is not as precise. For students in the highest CGPA category, the estimate of HOPE effect is 0.86, which is statistically significant at the 0.05 level. Those in the highest CGPA category are 8.6 percentage points more likely to take a full-course load because of HOPE, which is primarily driven by lower likelihood of course withdrawal. Students who are unlikely bound by the retention rules do not seemingly withdraw from a class very often—probably because withdrawn hours are counted toward HOPE attempted hours— and have no incentive to forestall the first checkpoint by completing less than a full load in the first year—because they are least likely to fail to meet the 3.0 GPA threshold and lose their scholarship.

The estimated program effects on credit hours, reported in Table D9, are consistent with the extensive margin findings. In general, HOPE's influence weakens as predicted CGPA rises and the statistically significant program responses are concentrated in the < 2.7 category. Overall, the results suggest that HOPE had led to a little less than one and a half credit-hours reduction for students with the lowest predicted CGPAs and about a 0.7 credit drop among students in near the retention margin, although the latter result is not statistically significant even at the 0.20 level. The estimated HOPE effect for those in the highest CGPA category is positive, but also very imprecise.

Since as noted in Chapter 3, high-school performance and test scores are highly significant predictors of college GPA, the program effects are also estimated by HSGPA and SAT score category, and the same basic (but somewhat stronger) pattern emerges. Tables D10 and D11 show that students with HSGPAs lower than 3.0 and between 3.0 and 3.5 are less likely to complete a full load and take fewer credit hours in their first year because of HOPE, while those with HSGPAs greater than 3.5 do not respond to the scholarship. Also Tables D12 and D13 suggest that HOPE's effects on full-load completion and credit hours taken decrease as SAT total score rises and that the estimated program effects are negative for students with SAT total scores below the 25th percentile and between the 25th and 75th percentiles, while statistically insignificant for those above the 75th percentile.[5]

To summarize, disaggregating the analysis by predicted CGPA, as well as HSGPA and SAT score, confirms that HOPE's influence on course-load-adjusting behavior is, as one would predict, concentrated on students who are more likely affected by the retention rules. Further, as expected, it shows that high-achieving students who are least likely to lose their merit awards are generally unaffected by the retention rules.

6.5 HOPE Effects over Time

Next I examine the temporal pattern of the scholarship's influence on credit-hour accumulation. This is important for three reasons. First, as a check on the empirical strategy, I want to determine whether the reported effects coincide with HOPE's introduction. Second, I would like to assess the importance of the income cap in the findings. The income restriction on eligibility in 1993 and 1994 places some students in the treatment group who do not receive the scholarship, which likely causes the impact of HOPE to be underestimated. Third, I want to examine whether HOPE's effect grows over time. As information about the retention rules becomes more widely diffused, students' strategic course-taking behavior is expected to be more pervasive.

[5] Note that the 25th and 75th percentile SAT total scores vary by year. See Table C6.

Tables D14 and D15 present the results of DD regressions where the HOPE effect varies by year. The year HOPE was introduced (1993) is the reference period. Again, consider first the extensive margin estimates, which are given in Table D14. Consistent with the date of HOPE's introduction, the estimated pre-1993 effects are uniformly small or of the "wrong" sign and statistically insignificant for each outcome. In contrast, after 1994 when the income cap was lifted, the coefficient estimates are larger in magnitude (and all with the "correct" sign) and much more precisely estimated. Second, in each case the post-HOPE coefficient estimates increase in magnitude over the period. After the income cap is removed in 1995, the estimated HOPE effects for course withdrawal a little less than doubled, while the full-load enrollment and completion effects rose by about 15-20%. By 1997, the scholarship had reduced the probability that a freshman would take a full load by almost 13 percentage points (relative to 1993). Clearly, as the income cap was eliminated and larger fractions of students became eligible, the extent of HOPE's influence on these extensive margins grew.

On the intensive margin, captured in Table D15, we see generally the same pattern, most clearly in the case of course withdrawals. Again, all pre-HOPE coefficient estimates are statistically insignificant. At the end of the sample period, first-year residents were completing, on average, 1.4 fewer credit hours (compared with 1993 levels). Interestingly, however, the program effect on course enrollments is precisely estimated only in 1995 and falls in magnitude and precision thereafter, so that course withdrawal becomes the dominant behavioral response.

6.6 Delay or Intertemporal Substitution

First-year students respond to the HOPE retention rules by enrolling in fewer courses, withdrawing more frequently, and reducing the total number of credits they take. While these findings are interesting, it is also important to understand how the retention standards are affecting students' course-taking behavior after their first year in college. Do the decisions of

residents to take fewer credits in their first year leave them behind their non-resident counterparts for the remainder of their undergraduate careers? Or do residents intertemporally substitute their course load by taking fewer credits in their early years and more hours in their later years?

I address this question by first estimating HOPE's effect on the probability of taking a full load and credits completed in each school-year.[6] The findings are reported in Table D16. Except for the first year (-0.071), the estimated HOPE effects for the extensive margin are all statistically insignificant: 0.005 for the second, -0.034 for the third and -0.024 for the fourth year. Correspondingly, none of the intensive margin effects are statistically significant after the first year. Thus, the retention rules do not simply induce intertemporal substitution, but on balance, slow the typical resident's progression through college.

However, the results presented in Table D16 may be problematic for two reasons. First, the income cap weakens the experiment for the 1993 and 1994 classes. Second, the prospects for intertemporal substitution are somewhat obscured because the analysis unevenly lumps together several pre- and post-HOPE cohorts. Therefore, I repeat this analysis with only 1990 and 1995 classes, the latter being the first "full-HOPE-coverage" cohort and the former being the most recent never to benefit from the scholarship. The estimates from these regressions are given in Table D17.[7] Two findings are evident in this more refined experiment: (a) the first-year program effect estimates are larger, and (b) the contrast between the first and later years grows. In this case, HOPE lowers the probability that first-year residents complete a full load by 11 percentage points and decreases the number of credits they take

[6] In the sample, there are 31,117 typical students in the first year, 23,923 in the second year, 18,981 in the third year, and 14,755 in the fourth year (note that these numbers are different from the number of observations in columns 1 through 4 in Table D16, because some students do not have the records for high-school achievements and the name of high school they attended). We lose students as we move from earlier to later years, not because they drop out, but because we cannot follow 1995-97 class-year students through their fourth, third and second years, respectively. Given that only 36% of 1993 typical FTF graduated in four years and 53% in five years, and 44% of 1994 typical FTF graduated in four years, it was also impossible to follow students through to their graduation.

[7] Unfortunately, I cannot follow the 1995 class into its fourth year.

by about 1.7 hours. The second- and third-year program effect estimates are smaller and all are statistically insignificant. However, it is worth noting that the second-year program effect on the intensive margin (1.732) is almost as big as the first-year effect and its p-value is 0.109. The comparison between these two classes suggests that the scholarship may have induced students to intertemporally substitute their course load without generally slowing down academic progress.

6.7 Discussion

The findings concerning the effects of HOPE's GPA-based retention rules motivate discussions on some of the broader implications of HOPE-style merit aid. First, one of its primary objectives is to promote effort, but the incentives for students to work harder are fairly narrowly tailored. Students who are slightly above or below the grade-point requirement will have stronger incentives to work harder, but incentives to put forth more effort are fairly modest for low and high achievers who are unlikely to gain or lose HOPE.

Second, grade-based retention rules create incentives that partially undermine the objectives to reward students for increased effort. Students can adjust their GPAs in numerous ways other than increasing their effort, such as enrolling in fewer credit hours, withdrawing from more classes, and taking fewer hours. Because effort is costly, students may seek ways to maintain their GPAs other than working harder.

Third, a grade-based merit-aid program will reward low-achieving students who take less than a full load. A student who initially qualifies for an award, but who cannot retain it in college, can extend her scholarship for an extra term by taking less than a full load and deferring the date when she is evaluated for retention.

Finally, UGA has become increasingly concerned about the institutional costs of students enrolling in fewer classes. While colleges encourage students to complete degrees in four years, the scholarship's incentives to take fewer classes and less than a full-course load may work against that goal. Also, although UGA has enrolled more students during the HOPE period,

the number of credit hours generated has been relatively flat. This is a concern for state institutions whose funding is largely based on the number of student credit hours generated. For example, given that an average of about 3,150 typical Georgia residents entered UGA in each post-HOPE year (1993-97), the HOPE effect of -1.0 means that residents completed almost 3,150 fewer credit hours per year than non-residents, resulting in a lower level of state funding than would have otherwise obtained.

Chapter 7

Major and Course Selection

As noted in Chapter 2, HOPE retention rules could induce students to take easier classes, where difficulty may be gauged by content, instructor's reputation, or timing. Students may take courses in the summer rather than the regular academic terms, substitute away from more demanding math and science courses, or even choose a relatively easier major field of study (i.e., a set of less demanding courses), to maintain their eligibility for the scholarship. Thus, whether and to what extent HOPE has influenced students' major and course selection are examined in this chapter.

7.1 Summer-School Course Taking

Because it is easily observed, HOPE's impacts on the timing of course taking—specifically HOPE's influence on the probability of taking courses in summer school and the number of credit hours completed during the summer— are first examined. Summer-school courses are generally more leniently graded and often cover less material. At UGA, for example, the mean GPA for typical FTF was 2.81 during the summer of 1993, compared with 2.66 in the fall of 1992, and this fall-summer GPA gap widens during the HOPE period. However, as shown in Table C7, higher GPAs in the summer quarters are not attributable to higher quality of summer-school enrollees. Students who take courses in the summer terms have lower HSGPA and SAT scores than those during the regular academic year (i.e., fall through spring quarters).

The estimated HOPE effects on summer-school course taking are presented in Table D18. First, consider the qualitative findings in panel A. Residents are 9.8 percentage points more

likely to take courses in their first summer (i.e., the summer immediately following the first academic year) due to HOPE. The program effect estimates for the subsequent summers are both smaller than the standard errors and statistically insignificant. However, the evidence on the intensive margin is stronger. Panel B shows that residents take nearly 1.65 more credits in their first summer and almost 1.0 more credit in the second summer, although the latter is not precisely estimated (p-value of 0.11). Since the pre-HOPE mean of resident summer credit hours is 2.28, this implies summer-school credits completed by residents rose as much as 72% and 40% in the first and the second summer because of the scholarship, respectively. Together, panels A and B imply that HOPE has induced students to divert course taking to the summer to meet HOPE retention requirements. It also suggests that the incentive to forestall the first checkpoint (by taking fewer courses in the first year) is dominated by the incentive to take easier classes in the first summer and that the intertemporal substitution of course load between the first and second years—taking 1.745 fewer credits in the first year and 1.732 more hours in the second year (see Section 6.6)— is mostly driven by summer-school course taking in the first summer term.[1]

7.2 Core Course Taking

7.2.1 Data

The analysis in this section is confined to only 112 basic courses included in the general core curriculum that are most commonly required or recommended across individual colleges at UGA, and taken by most typical first- and second-year students. Elective courses are excluded from the analysis to minimize the selection bias. Because a student's selection into elective courses is more flexible and likely affected by individual characteristics (both observed and unobserved), including elective courses may confound the estimation results. Thus only core-course data are used to address a HOPE-induced course selection issue.

[1] Note that since the academic year runs from the summer to the next spring term, credit hours taken in the second year includes credits taken in the summer immediately following the first academic year, which is the first summer after matriculation for typical students.

Further, the sample is restricted to typical students who do not have AP credits earned in these areas, because those with AP credits take fewer core courses in college, have more degrees of freedom in course selection, and behave differently than those with no AP course credits.

The general core courses fall into one of the following three categories: (1) AREA I–Humanities and Fine Arts, (2) AREA II–Mathematics and Natural Sciences, and (3) AREA III–Social Sciences. Each area includes introductory or intermediate courses in each field of study. Specifically, AREA I includes English, foreign language and literature courses (49 courses), and AREA II includes mathematics and a 10-hour sequence of laboratory courses in the biological, chemical or physical sciences (42 courses). AREA III comprises history, American government, economics, psychology, sociology and other social sciences (21 courses). Although there are certain courses that all undergraduate students at UGA are required to take (e.g., English Composition),[2] students are generally allowed to choose from a list of the approved courses in each area. To satisfy the core requirements, students must take at least 20 quarter credit hours (four 5-credit courses) in each of AREAs I, II and III. For a complete listing of the basic core courses used in the analysis, see Table B3.

7.2.2 Substitution across Areas

Chapter 6 shows that, on average, residents take about one less credit hour than non-residents in their first year due to HOPE. This credit-hour result includes *all* the courses taken by the first-year students. How this result is parsed within and across curriculum areas depends on the perceived differences in course difficulty within and across categories. Mean category GPAs relative to mean HSGPA and SAT scores reported in Table C8 suggest that

[2] English 101 and 102 (English Composition) are required for all undergraduate degrees from the University of Georgia. A grade of C or better is required for English 101 and an average of 2.0 or better is required for both courses. To be exempted from the examinations on the Constitution and history of the United States and those of the state of Georgia, all degree-seeking students must take the courses dealing with these constitutions and histories (e.g., Political Science 101 (American Government), History 251 (American History to 1865), and History 252 (American History since 1865)).

AREA II is more difficult and demanding than AREAs I and III. Thus, if students perceive math and science courses to be more challenging and substitute away from these difficult core courses toward easy ones, we will see greater HOPE effects in AREA II.

To examine the extent of the substitution between core courses, I estimate full fixed-effects DD regression models in (4.2) for the number of credit hours taken by typical first-year students in each of three general core curriculum areas. As in Section 6.3, HOPE's effects on core credits enrolled and withdrawn are also estimated to quantify the contribution of enrollment and withdrawal effects to completion effect. Table D19 reports these DD regression results in which the first three columns are for credits enrolled, the next three for credits withdrawn, and the last three for credits taken. Columns 1, 4, and 7 provide the results for AREA I (Arts and Humanities), columns 2, 5 and 8, for AREA II (Mathematics and Sciences), and columns 3, 6 and 9, for AREA III (Social Sciences).

The estimated program effect on core credit hours enrolled is negative for AREAs I and II, but positive for AREA III: -0.438 for AREA I, -0.222 for AREA II, and 0.437 for AREA III. However, none of the effects are precisely estimated enough to be statistically significant at the 0.10 level (although t-statistics of 1.4 in AREAs I and III suggest weak enrollment effects). Columns 4 through 6 show that HOPE has positive effects on core credits withdrawn in all areas, with the greatest effect arising in AREA II (0.409), which is the only coefficient estimate statistically significant at the 0.01 level. This result implies that HOPE has increased core course withdrawal in the area of math and sciences by about 0.4 credit hours, which translates into about a 65% increase in withdrawn hours in AREA II, given that the pre-HOPE mean withdrawn hours of typical first-year residents in AREA II is 0.624.

These enrollment and withdrawal effects combined are summarized in completion effects. As expected, the impact of the scholarship on credit hours taken in core courses (-0.87) is smaller than that in all the first-year courses (-1.002), and HOPE has differential effects on completed hours by core curriculum area. The coefficient estimates for AREAs I, II and III are -0.573, -0.631 and 0.334, respectively, the former two of which are statistically significant,

while the latter is imprecisely estimated. Therefore, HOPE's effect on core credits taken is equal to -0.87 ($= (-0.573) + (-0.631) + 0.334$). Moreover, significantly negative effects in AREAs I and II suggest that HOPE has reduced core course completion in the areas of arts and humanities and math and sciences by 0.57–0.63 hours. Given that the pre-HOPE means of credit hours taken by typical first-year residents are 11.14 and 10.21 in AREAs I and II, respectively, this result translates into about 5–6% decrease in completed hours in each of these two areas. Thus, it appears that the propensity to take a lighter course load in the first year is concentrated on AREAs I and II, and most evident in AREA II. Although the substitution between core courses is less supported in the first year, the second-year results in Table D20 imply that students tend to substitute math and science courses with arts and humanities courses.

Consistent with the existing literature, gender matters in course selection. Holding high-school performance constant, women take significantly more courses in arts and humanities but fewer courses in math and sciences and social sciences. Also, ethnic minorities take more credits in math and sciences and fewer hours in arts and humanities and social sciences than do whites. These differences in the types of courses taken may account for some of the gender and racial gaps in freshman GPA shown in Chapter 5. Further, the number of credit hours taken rises with HSGPA in all core-course areas. However, SAT verbal and math scores have differing effects. Not surprisingly, students with higher SAT math scores take more credits in math and sciences but fewer in the other two areas, while those who have better SAT verbal scores take fewer hours in the former but more in the latter.

7.2.3 Intertemporal Substitution

First-year students respond to the HOPE retention rules by taking fewer credit hours in the core areas of arts and humanities and math and sciences. A logical question that follows is whether students just delay core course taking to the second year or persistently avoid courses in certain categories. To examine intertemporal substitution within the core

curriculum area, I estimate HOPE's effects on credit hours taken in each area during the first and second school years, the results of which are given in Table D20.[3] Note that the left three columns (columns 1 through 3) duplicate the first-year results in Table D19, while the right three columns report the additional second-year results. The focus is on completed hours in panel C of Table D20.

The estimated HOPE effect in AREA I is -0.573 for the first year, but its sign is reversed for the second year (0.600) although it is not very strong (t-statistic of 1.44). These estimates suggest that students tend to intertemporally substitute arts and humanities courses by taking fewer credits in the first year and more in the next year. Thus credit-hour reduction in the first year for AREA I seems to indicate the dominance of the incentives to take lighter loads to forestall the first checkpoint, but not a general cutback because of the hardship associated with AREA I courses.

On the contrary, HOPE has negative impacts on credit hours taken in AREA II for both first and second years (even though the second-year effect is again not as strong). As expected, Georgia residents take almost 1.2 fewer credit hours in math and sciences during the first two years in college due to the merit-based scholarship. Thus, the retention rules tied to college GPA do not simply induce intertemporal substitution, but reduces the credits earned in the area of math and sciences during the second year as well. The comparison between these two areas (I and II) strongly suggests that HOPE has led students to choose courses based on the returns (in terms of grade) to their efforts and thereby substitute away from difficult courses.

[3] As indicated in Table D20, there are 22,802 and 16,529 typical first- and second-year students with no AP credits in core areas, respectively. The number of students in the sample decreases from the first to the second year, mainly because the data end at 1997 academic year, and therefore 1997 class-year students cannot be followed through their second year. And students are not pursued after their second year, given that basic introductory courses are usually taken during the first two years of study.

7.2.4 Summer-School Core Course Taking

It is shown in Section 7.1 that HOPE retention rules have led to increased overall course taking in the first summer because summer-school courses are considered easier than the regular-term courses. The same logic applies to core course taking: HOPE may induce students to take core courses during the summer rather than in the other academic terms. Furthermore, as depicted in Figure 9, the trend of mean GPAs in each area, contrasting summer with non-summer terms, shows not only that grades given in summer school are higher than those in the regular academic year, but also that summer grades in AREAs I and III are much higher than those in AREA II. Table C10 suggests that it is a very remote possibility that students taking AREA I and III courses receive better grades than those taking AREA II courses in the summer terms because they are "better" students. Thus it is expected that summer-school course taking is concentrated on the relatively easier areas of I and III .

To test this proposition, I first estimate HOPE's influence on the probability of taking core courses in each area during the first summer for typical students, the results of which are provided in panel C of Table D21. As expected, residents are 3.9 and 2.7 percentage points more likely to take core courses in AREAs I and III in their first summer because of the scholarship. The estimated impact of the scholarship is very close to zero and statistically insignificant for AREA II. These qualitative findings on summer-school core course taking are primarily driven by enrollment effects (see panels A and B in Table D21).

The intensive-margin results correspond to the extensive-margin findings. Panel C in Table D22 shows that residents take almost 0.2 more credit hours in each of AREAs I and III in their first summer. Again, HOPE has no significant impact on credits taken in AREA II, and HOPE's effect on summer core credits taken is mostly ascribable to enrolled-hour effects. Tables D21 and D22 provide further evidence of HOPE-induced substitution toward less challenging courses.

7.3 Major Choice

7.3.1 Empirical Model

To examine HOPE's effect on a student's choice of major, the majors declared in the first quarter are grouped into six categories[4] and the following multinomial logit model is estimated:

$$y_{it} = \alpha + \beta GA_i \cdot H_t + \gamma GA_i + \delta H_t + X'_{i,1}\theta_1 + X'_{i,2}\theta_2 + \epsilon_{it}, \tag{7.1}$$

where y_{it} is a categorical or multiple-outcome qualitative dependent variable taking a value of 1 to 6 and indicating a first-year student i's major choice (i.e., $y_{it} = j$ if student i chooses major j in the first quarter after matriculation, where $j = 1$ for Fine Arts, Humanities and Social Sciences, 2 for Math and Sciences, 3 for Business, 4 for Education, 5 for other majors such as Social Work and Environmental Design, and 6 for unspecified Arts and Sciences); GA_i (Georgia-resident indicator), H_t (HOPE-period indicator) and $X_{i,1}$ (gender and race dummies) are the same as in (4.2); $X_{i,2}$ includes high-school achievement variables (i.e., high-school GPA, SAT scores and AP credits) and an additive weight for high-school effects; and ϵ_{it} is the error term. The additive weights are developed by the Undergraduate Admissions Office to take into account varying effects of high school attended in the admission decisions, and included in the major-choice model to capture neighborhood and peer-group effects. Because the high-school weights are similar to high-school fixed effects in that the same weights are assigned to the same high schools—although the unique weight is not given to each school but a group of schools with comparable background— the former is used in place of the latter for computational purposes.

Unlike in DD regression model (4.2), the estimate of β in (7.1) is *not* HOPE's effect on major choice, because the dependent variable is in logits or the log odds of choosing major j relative to the baseline major, and the variable of interest ($GA_i \cdot H_t$) is an interaction term

[4] Major fields of study are lumped into six broad categories to avoid the "Independence of Irrelevant Alternatives" (IIA) problem.

between two dummy variables. The effect of the scholarship on the probability of choosing major j should be calculated as $(P_{11}^j - P_{10}^j) - (P_{01}^j - P_{00}^j)$ where $P_{lk}^j = Pr(y_{it} = j|\ H_t = l$ and $GA_i = k)$, using multinomial logit estimates and certain values of independent variables. Note that the predicted probability depends on the values of independent variables. Thus the program effects in this section are computed post-estimation as the discrete double difference at the means of independent variables and by individual characteristics such as gender and race.[5] The marginal effects of each explanatory variable (i.e., dP/dX_k where $P = Pr(y_{it} = j|X)$) are also calculated because their interpretation is more straightforward and easily understandable.

7.3.2 Results

The incentive to take easier courses in college may realize in the form of favoring a major such as education where higher average GPAs are expected, and avoiding a major such as business where required courses tend to give lower grades. Table C11 shows that at UGA, on average, typical first-year residents majoring in business during the post-HOPE years have the same cumulative GPA as those majoring in education, even though business majors have higher high-school GPA and SAT scores than education majors. It also shows that in the pre-HOPE period, typical out-of-state math and science majors who performed better in high school obtain just about the same freshman GPA as those non-resident education majors. This suggests that majoring in education is probably less demanding than majoring in business and sciences, and we may see more in-state students in education and fewer in business after HOPE was introduced. Thus, a multinomial logit analysis in (7.1) is conducted to estimate HOPE's influence on a student's choice of major—probability of choosing a major from (1) Fine Arts, Humanities and Social Sciences (AH&SS), (2) Math and Sciences (M&S), (3) Business, (4) Education, (5) other majors (including Agricultural and Environmental Sciences, Family and Consumer Sciences, Forest Resources, Social Work, Environmental

[5] Refer to Ai and Norton (2003) for the importance of correct calculation of interaction effect in nonlinear models.

Design, and Evening Classes or University Studies), and (6) unspecified Arts and Sciences (unspecified A&S).

Table D23 provides the estimated HOPE's effects on a typical first-year student's choice of major based on multinomial logit coefficients in Table D24.[6] As emphasized before, since the predicted probability of and therefore the predicted HOPE's effects on choosing a certain major are dependent upon personal characteristics, HOPE effects are computed separately for each gender and racial group as well as for average students.[7] Each column in Table D23 reports the estimated HOPE effects for the corresponding major: column 1 for AH&SS, 2 for M&S, 3 for Business, 4 for Education, 5 for other majors, and column 6 for unspecified A&S.

The estimated program effects for AH&SS, M&S, unspecified A&S and other majors are all very close to zero and statistically insignificant. As expected, the predicted HOPE's effects on the probability of majoring in business in the first year are all negative; -0.017 for average students, -0.015 for females, -0.020 for males, -0.018 for whites, -0.012 for Asians, -0.017 for blacks, -0.015 for Hispanics, and -0.010 for other races. It appears that male students have experienced slightly more of a decline in business major than female students due to HOPE, and that there is no significant difference between the decreased probabilities of majoring in business among ethnic groups. However, all the program effects for the business major are imprecisely estimated and none are statistically significant at the 0.10 level (the t-statistics are between -1.1 and -1.23).

The results for the education major are also as expected. The predicted scholarship effects on the probability of opting for education major when entering college are all positive:

[6] Note that the baseline category in the multinomial logit model is unspecified Arts and Sciences.

[7] HOPE effects (i.e., interaction effects between HOPE-period and Georgia-residency dummies) for average students are evaluated at the means of the independent variables in the model: 0.575 for $FEMALE$, 0.028 for $ASIAN$, 0.088 for $BLACK$, 0.009 for $HISPN$, 0.008 for $OTHER$, 3.258 for $HSGPA$, 5.961 for $SATV$, 5.754 for $SATM$, 3.919 for AP and 0.084 for high-school weights. (Note that $SATV$ and $SATM$ are in 100 points.) The program effects for male ($FEMALE$=0) and female ($FEMALE$=1) are computed at the means of race dummies and high-school performance and weights, while those for each ethnic group are calculated at the means of gender dummy, pre-college characteristics and high-school effects.

0.012 for average students, 0.019 for females, 0.006 for males, 0.013 for whites, 0.005 for Asians, 0.007 for blacks, 0.005 for Hispanics, and 0.009 for other ethnic minorities. Except for Hispanics (p-value of 0.111), the estimates of HOPE's effects are statistically significant at the 0.10 level. Average Georgia residents are 1.2 percentage points more likely to be education majors in their first year than average non-residents due to HOPE. Typical in-state first-year female students are about 2 percentage points more likely to major in education than their out-of-state counterparts, because of the HOPE Scholarship, while in-state first-year male students are not as strongly (only 0.6 percentage-point increase) affected by the scholarship program when deciding to become education majors at the time of matriculation. White residents have experienced more increase in the likelihood of choosing an education major than their non-white minority counterparts during post-HOPE years. In general, the results suggest that education majors have grown at the expense of business majors because of HOPE.

Other factors also influence a student's choice of major. Table D25 shows the marginal effects of each predictor for six major fields.[8] Typical first-year students who matriculated since 1993 are on average less likely to major in AH&SS and business and more likely to choose M&S, education and other majors than those who entered UGA before 1993. Average students from Georgia are less likely to specialize in AH&SS and business and more likely to major in M&S, education and unspecified A&S in their first year than those from other states. As expected, gender and race are deciding factors of student's major field. Female students are on average less likely to study in math and sciences and business and more likely in arts and humanities, social sciences and education during the first year than male students. The probability of majoring in education and business for females is 6.4 percentage points greater and 8.7 percentage points smaller than that for males, respectively. Average non-white minorities are less likely to be AH&SS, business and education majors and more likely to be math and science majors than whites. High-school GPA is positively related

[8] Note that the marginal effect of each dummy variable such as residency, gender and race dummies is calculated for a discrete change of each dummy variable from 0 to 1.

to the probability of choosing math, sciences and business majors, and negatively to that of choosing arts, humanities and social sciences majors. As predicted, SAT verbal score is positively associated with the likelihood of majoring in AH&SS and inversely with that of majoring in M&S and business, while the SAT math score has a positive effect on the latter and a negative effect on the former. All high-school performance variables, including HSGPA, SAT scores and AP credits, decrease the likelihood of majoring in education.

7.4 Discussion

It is evident that students take less challenging classes and choose easier curriculums and major fields of study to meet HOPE-retention requirements, especially in their freshman year. While these course-taking strategies may increase the likelihood that students earn 3.0 GPA and maintain their scholarship, as the results of this chapter indicate, they may lead to career paths that would not be followed in the absence of HOPE. According to Hamermesh and Donald (2003), adjusted earnings differ significantly across undergraduate majors, and the course-taking pattern in college affects post-college earnings even within a major. Using a survey of 7,970 randomly-chosen undergraduates who graduated from the University of Texas at Austin between 1980 and 2000, the authors found that earnings in "soft" and "hard" business majors[9] were 1.5-1.7 times as high as those in education, even after controlling or adjusting for high-school background (high-school area income), individual characteristics (gender, marital status, final degree obtained and class year), college achievements (GPA and credits and grades in upper-division science and math courses), weekly hours of work, and self-selectivity bias.[10] Furthermore, they found that those who took more advanced

[9] "Hard" business majors include accounting, actuarial science, business engineering, data processing, finance, and management information science, while "soft" business majors include all the rest of business majors such as general business, management and marketing.

[10] Self-selectivity bias refers to non-response bias or non-randomness in the likelihood of responding to the survey. Hamermesh and Donald (2003) suggested a way to identify the selectivity and take into account this non-response bias, and emphasized the importance of selectivity adjustments in empirical settings. They found a small but consistent decrease in earnings differentials across college majors when a non-response correction term is additionally controlled.

science or math courses in college earned more after graduation, all else equal. Thus, if a student decides to become an education major only for fear of losing HOPE who would otherwise choose business as her major, or if she does not take math and science courses to keep qualifying for HOPE, it will likely cost her in terms of lifetime earnings potential.

Chapter 8

Conclusion

The recent and striking transformation from need- to merit-based aid in the last decade has been justified in part by its incentives to encourage students to work harder and thereby invest more in human capital. However, because students can increase their GPAs through a variety of mechanisms, grade-based, merit-aid programs produce some unintended consequences. Using a unique data set constructed from the longitudinal records of all undergraduates who enrolled at the University of Georgia between 1989 and 1997, I estimated difference-in-differences (DD) regressions of the effects of HOPE on grade-point average, course enrollment, withdrawal and completion, and the choice of courses and major field, treating non-residents as a control group. The main findings are listed below.

First, there is evidence that HOPE increased the relative quality of Georgia-resident enrollees in terms of HSGPA and SAT verbal score. However, even holding high-school achievements and personal traits constant, resident freshmen had 0.13 points higher cumulative GPA than non-resident counterparts due to the HOPE Scholarship. HOPE effects are also positive in the subsequent years, but not as strong as in the first year.

Second, controlling for a detailed set of student characteristics that includes high-school GPA, SAT scores, advanced placement credits, high school attended, class year, race and gender, the first-year residents were almost 6% less likely to enroll in a full-course load and over 16% more likely to withdraw from a class because of HOPE. The combination of these responses decreased the probability that a resident freshman would complete a full load by about 11%. On the intensive margin, HOPE reduced the average completed credits by 1.0, which implies that between 1993 and 1997 Georgia-resident freshmen completed almost

15,710 fewer credit hours, or about 3,142 individual course enrollments than non-resident freshmen. Further, these effects can be attributed roughly equally to HOPE's influence on course enrollments and withdrawals.

Third, estimating these program effects by predicted cumulative GPA as well as HSGPA and SAT score category confirmed that HOPE's influence on course-taking behavior is concentrated on students who are on the scholarship-retention margin or whose GPA falls below the 3.0 cutoff. First-year residents with predicted cumulative GPAs below 2.7 were 10.5 percentage points more likely to withdraw from a class, and 5.2 and 11.1 percentage points less likely to enroll in and complete a full load of courses, respectively, than their non-resident counterparts. Full-load enrollment and completion rate for resident freshmen at the retention margin (with predicted cumulative GPAs between 2.7 and 3.3) decreased by 7.9 and 7.3 percentage points, respectively, the latter of which is not as strong and precisely estimated. As expected, those students in the highest predicted GPA category did not respond to HOPE's retention rules by lowering full-load completion in their first year, because they are unlikely to lose their scholarship by having their GPAs fall below the 3.0 cutoff and thus have no incentive to defer the first checkpoint. The likelihood of taking a full-course load rather increased by 8.6 percentage points for resident freshmen whose GPAs were greater than or equal to 3.3, which is primarily driven by a lower course-withdrawal rate. Credit-hour results generally conform with these extensive-margin findings. HOPE has negative effects on credit hours taken for students below and at the retention margin, and a positive impact for those above it, although the latter two effects are statistically insignificant. DD analysis by HSGPA and SAT score category produces basically the same but somewhat stronger results. Students with HSGPAs lower than 3.0 and between 3.0 and 3.5 are less likely to complete a full load and take fewer credit hours in their first year because of HOPE, while those with HSGPAs greater than 3.5 are not affected by the scholarship. Further, HOPE's effects on full-load completion and credit hours taken decrease as SAT total score rises and the estimated program effects are negative for students with SAT total scores below the 25th

percentile and between the 25th and 75th percentiles, compared to statistically insignificant effects for those above the 75th percentile.

Fourth, allowing the HOPE effects to vary by year reveals that the program effects coincided with the introduction of HOPE and rose in magnitude as the income cap was lifted and more students became eligible for the award. For both extensive and intensive margins of course enrollment, withdrawal and completion, the estimated pre-1993 effects were small and statistically insignificant, while the effects were in general larger and more precisely estimated after 1994. By 1997, first-year residents were on average 13 percentage points less likely to complete a full load of courses and take 1.4 fewer credit hours (compared with 1993 levels). Another implication of this exercise is that the overall program effects are likely underestimated, because students were assigned to the treatment group in 1993 and 1994 who did not receive the scholarship.

Fifth, it appears that these freshmen credit-hour reductions represent an intertemporal substitution of course load, not a slowdown in academic progress. Credit-hour DD regressions involving the 1990 and 1995 entering classes in their first, second and third years presented a statistically significant program effect of -1.75 credit hours in the first year and an imprecisely estimated—marginally significant (with a p-value of 0.109)—scholarship effect of 1.732 in the second year, followed by a much smaller and statistically insignificant credit-hour increase in the third year.

Sixth, I examined HOPE's incentive to take less challenging courses by estimating the program effect on summer-school and general core course taking. Residents were more likely to take courses in the summer following their first academic year, but there was very little difference between residents and non-residents in the subsequent summers. However, the estimated effects were stronger in terms of credit hours; the comparison between 1990 and 1995 classes suggests that residents' summer-school course-taking rose 72% and seemingly 40% because of HOPE in the first and second summers after their matriculation, respectively. During the first two years, residents also completed about 1.2 fewer credit hours in math and

science core courses than non-residents, while they appear to intertemporally substitute arts and humanities core courses by taking fewer credits in the first year and more in the second year. Moreover, residents' core-course taking rose by nearly 0.2 credits in each general-core area of arts and humanities and social sciences, but did not increase in the area of math and sciences during the first summer. These findings on core-course taking provide an evidence of HOPE-induced decline in the completion of more challenging courses and increase in the enrollment of less demanding courses.

Finally, grade-based retention rules influence students' choice of a major field of study when entering college. Multinomial logit analysis indicated that HOPE increased the likelihood of an average freshman's majoring in education disciplines by 1.2 percentage points and may have decreased that in business majors. These results on major choice imply that HOPE has induced students to choose less challenging programs of study or curriculums with low earnings potential.

Although HOPE-style aid may enhance human capital investment by encouraging some students to work harder, it induces others to take fewer and easier courses, especially early in their college careers. The findings of this study clearly indicate that the latter are the empirically more important behavioral responses. While it is difficult to determine the optimal pattern of class taking within and across school years for maximizing the value of the human capital investment, the option to take fewer and easier courses existed prior to HOPE. Further, as pointed out in Chapter 2, it is somewhat surprising that HOPE influences behavior at all, given the overriding importance of the labor market and that HOPE is infra-marginal for virtually all UGA students in their decisions *whether* to attend college. A likely explanation of the scholarship's influence is that the student responses we observe emerge from intra-household bargaining over HOPE rents in the decision *where* to attend college. It is not uncommon for UGA undergraduates to admit to being "bribed" to forgo an out-of-state or private-school alternative with an offer of a car. Using county-level data on car registrations and HOPE incidence in Georgia over the 1993-96 period, Cornwell and Mustard (2002)

examine the relationship between car registrations and the number of HOPE recipients. They report an estimated elasticity of registrations with respect to the number of recipients attending public, 2- and 4-year colleges of 0.02. The implication is that doubling a county's scholarship winners (attending a public college) will increase the number of registered cars in the county by 2%. Alternative explanations for the HOPE-induced behavioral changes might be that students have quasi-hyperbolic discounting or time-inconsistent preferences, or perceive the disutility associated with the loss is greater than the utility derived from the same—or even larger—amount of the gains. Students may take courses in such a way that increases the likelihood of retaining HOPE but likely decreases lifetime earnings potential, because they tend to "seize short-term rewards at the expense of long-term preferences" or "have a bias towards near-term utility and immediate gratification" (Fang and Silverman, 2003, p.1), or because they feel the benefit from increased future earnings is not enough to compensate HOPE loss in college and therefore, avoid a risk that they could lose their scholarship by choosing more demanding majors and courses of study.

This study is a pioneer in empirically estimating the impacts of HOPE-style merit aid on academic choices of college students, using detailed longitudinal data on individual course taking. However, data limitations faced by this study precluded the precise assignment of 1993- and 1994-class students to the treatment group and the follow-up of "full-HOPE-coverage" cohorts to graduation and all class-year students beyond college level. Expanding the sample period and adding high-school curriculum and working data as well as post-college earnings information will strengthen the results and enhance the empirical analysis. Among the issues that merit future consideration are to identify the role of high-school course-taking pattern in HOPE loss and the prospectus of losing HOPE in major choice and to quantify HOPE's impact on earnings after college graduation.

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Appendix A

HOPE Scholarship and Grant

A.1 Major Changes in HOPE Scholarship Rules and Awards

- July 1, 1994.
  - HOPE Scholarship expands to cover four rather than two years of tuition, mandatory fees and a $100-per-quarter book allowance.
  - Household income cap is raised from $66,000 to $100,000.
- July 1, 1995.
  - Family income cap for the eligibility is abolished.
  - Students who lose their HOPE Scholarship after their freshman year are given a second chance. If those who lose HOPE in their freshman year complete their sophomore year with a cumulative "B" average, they will receive the scholarship in their junior year.
  - Students who graduated from high school before the inception of HOPE Scholarship program in 1993 (non-traditional students) may qualify for HOPE after their sophomore year.[1]

[1] However, the data used in this study indicate that non-traditional students could receive the scholarship even in 1993 and 1994 academic years. Specifically, in 1993 academic year (between June 1993 and May 1994), there were 266 typical students awarded HOPE as sophomores: 1 typical student in 1990 class, 19 in 1991, and 246 in 1992. In 1994 academic year, HOPE Scholars in their junior and senior years numbered 714 and 628, respectively: junior HOPE Scholars include 1 typical student in 1989 class, 2 in 1990, 82 in 1991, 574 in 1992, and 55 in 1993, while senior Scholars include 11 typical students in 1989 class, 70 in 1990, 427 in 1991, and 120 in 1992. Note

- July 1, 1996.

  Students who attend an in-state private college must earn and maintain a "B" average to receive HOPE awards. As a result, the previous $1,500 grant (HOPE Tuition Grant) is changed to $3,000 scholarship (Private College Scholarship).[2]

- July 1, 1997.

  Non-traditional students who graduated from high school prior to 1993 may now be eligible for HOPE after their freshman or sophomore year.

- November 3, 1998.

  Entering freshmen who graduate from high school in 2000 (high-school graduating class of 2000) must now earn a "B" average in the core curriculum courses of English, math, social studies, foreign language and science to receive HOPE upon graduation.

- July 1, 2000.

  Students can receive the full benefits of Georgia's HOPE Scholarship and the federal Pell Grant.

A.2 The HOPE Grant

All Georgia residents are eligible for the HOPE Grant in non-degree programs of study (certificate or diploma) at public institutions. To qualify for HOPE Grant funding, the certificate or diploma program must be approved by the Georgia Department of Technical and Adult Education or be a comparable program of study approved by the Board of Regents. The

that HOPE level (i.e., freshman (1–45), sophomore (46–90), junior (91–135), and senior ($\geq$ 136) levels) is determined on the basis of the number of HOPE attempted (not earned) hours, which includes withdrawn hours but excludes any credit hours attempted or earned before high-school graduation and hours exempted by examination. This complication causes little problem for this study because the analysis is mainly focused on typical *first-year* students.

[2] Note that HOPE Scholars in private colleges are also entitled to receive a Georgia Tuition Equalization Grant funded by state appropriations. The value of the grant is $1,045 as of June 2004.

certificate or diploma must be awarded and issued by the institution. Continuing education programs are not eligible for HOPE Grant funding.

Regardless of high-school GPA and the full-time enrollment status (no minimum number of hours of enrollment required for eligibility), the HOPE Grant provides full tuition, HOPE-approved mandatory fees and a book allowance[3] to recent high-school graduates, home-study students, General Education Development (GED) recipients and non-traditional students[4] who seek a technical diploma or certificate at one of Georgia's public postsecondary institutions (mostly technical schools). Unlike the HOPE Scholarship, there is neither a specific grade requirement nor a restriction based on high-school graduation year. In addition, there is no limitation on the number of grant eligibility: a student can receive the grant payment for more than one certificate or diploma program. According to the HOPE Grant rules changed to become effective in the fall term of 2004, although an eligible student may receive the HOPE Grant for all the course work required by the institution for a program of study leading to a certificate or diploma, she is limited by the number of credit hours allowed for the grant payment ("Paid-Hours" limit). Except for special cases, the HOPE Grant "Paid-Hours" limit is reached when the total number of credit hours for which a student received the grant payment is 95 quarter or 63 semester hours. "Paid-Hours" includes all the credit hours for which a student received the HOPE Grant in the summer term of 2003 and after, except the hours paid before the fall term of 2004 to the student who was also enrolled in high school. Thus, the hours for which a student was paid the HOPE Grant (1) prior to the summer term of 2003 and (2) between the summer terms of 2003 and 2004 before graduating from high school, are not counted as "Paid-Hours".[5]

[3] The amount of book and supplies allowance depends on the enrollment status. Full- and half-time students enrolled in six or more hours receive a book allowance of $100 per quarter or $150 per semester. The value of the payment is reduced to $50 per quarter or $75 per semester for students who are enrolled for less than half-time (fewer than six hours). Note that students enrolled in more than one non-degree program are awarded only *one* book allowance payment based on the total number of enrolled hours.

[4] "Non-traditional students" refers to those who graduated from high school before the inception of the HOPE program in 1993.

[5] Source: The Georgia Student Finance Commission (www.gsfc.org).

Appendix B

Data Construction

B.1 Data Merging and Sample Selection

The master data set primarily used for the analysis in this study was constructed through several steps, because data obtained from the four sources were in different formats. While HOPE-related data from the Office of Student Financial Aid and pre-college and personal data from the Undergraduate Admissions Office were individual-level data (i.e., one observation per student), course and grade information from the Registrar's Office were in a student-course format (i.e., one observation per course per student), and the other curriculum-related data (e.g., matriculation and graduation terms and major field of study) from the Student Information Reporting System (SIRS) were in a student-quarter format (i.e., one observation per quarter term per student).

Thus, course-grade data from the Registrar's Office were first aggregated up to quarterly data (e.g., credit hours enrolled, withdrawn and taken in each quarter and quarter GPA) and then merged with term-level data from the SIRS using the student identification number[1] and a four-digit term variable.[2] Next, these course-related data were merged with financial-aid data, once again using student I.D. and term variables, after disaggregating the latter to the quarter level (e.g., HOPE status and amount and HOPE GPA per term). Then, these

[1] Student I.D. used for data merging is not student social security number, but some 9-digit number randomly assigned to each student.

[2] The first two digits in the quarter variable indicate the calendar year, while the last two digits denote the month and therefore the academic term. For example, the variable values 9309, 9401 and 9403 mean the fall, winter and spring terms of 1993 academic year, respectively.

quarter-level data were collapsed into yearly data (e.g., cumulative GPA[3] and credit hours enrolled, withdrawn and taken in each core curriculum area for each school year). Finally, these annual data per student were merged with the admissions data, matching for the student identifier variable, yielding the data set that contained all the variables necessary for the school-year-level analysis.

The student data set on the academic-year basis included all 107,364 freshman applicants and 10,648 transfer students between 1989 and 1997. However, pre-college and personal characteristics for about half of the latter (5,321 out of 10,648) were not available from the Admissions data set,[4] and only 30.6% of the former (32,866 out of 107,364) matriculated at UGA as first-time freshmen (FTF) with no previous college attendance and therefore had college course-taking data. Thus, 38,193 enrollees (5,327 transfer students plus 32,866 FTF) could be used for the analysis.

However, since the focus of this study was on examining HOPE's effects on academic choices *throughout* students' college careers, transfer students were excluded and the sample was limited to FTF, those who have never attended any postsecondary institution before entering UGA. Further, the sample was restricted to typical FTF (TFTF), those FTF who matriculated at UGA in the fall term of the same year as they graduated from high school, which took up nearly 95% of all FTF from 1989 to 1997. Accordingly, the main data set used for the analysis in this study included year-by-year data for 31,118 TFTF. Note that not all students in the data set had high-school records (e.g., HSGPA, SAT scores[5] and the name of high school attended) and personal information and therefore were used in the regressions.

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[3] Cumulative GPA is the average of *earned* grade points accumulated since a student matriculated at UGA. Refer to the UGA grading system in Table B1 for the grades entering a student's GPA.

[4] Although Admissions data were available only for freshman applicants, since about 50% of transfer students (5,327 out of 10,648) had applied for UGA as freshmen at least once before they transferred to UGA, pre-college and personal characteristics for those students were recovered from their past freshman applications.

[5] SAT scores taken prior to April 1995 were recentered according to the College Board's SAT I individual score conversion table (see Table B2).

Table B1
The Grading System for UGA vs. HOPE[a]

Grade	Description	Grade point	Credit Hours				
			Attempted		Earned	GPA	
			UGA	HOPE	UGA	UGA	HOPE
A	Excellent	4.0	O	O	O	O	O
B	Good	3.0	O	O	O	O	O
C	Satisfactory	2.0	O	O	O	O	O
D	Passing	1.0	O	O	O	O	O
F	Failure	0.0	O	O	X	O	O
WF[b]	Withdrawn failure	0.0	O	O	X	O	O
S	Satisfactory	N/A	O	O	O	X	X
U	Unsatisfactory	N/A	O	O	X	X	X
K	Credit by exam	N/A	O	X	O	X	X
V	Audit	N/A	X	X	X	X	X
I[c]	Incomplete	N/A	X	O	X	X	X
W[d]	Withdrawn-no grade	N/A	X	O	X	X	X
NR	Grade not received	N/A	X	O	X	X	X
ER[e]	Error in reporting	N/A	X	O	X	X	X

[a] The symbol "O" indicates that the number of credit hours of the course with each grade is counted towards attempted, earned or GPA hours, while "X" indicates that it is not included in those hours.

[b] "WF" indicates that a student is permitted to withdraw from the course while doing unsatisfactory work or withdrawn by the instructor for excessive absences. Withdrawal under these circumstances is equivalent to a failure (i.e.,"F") and therefore included in GPA calculation.

[c] "I" grades not removed within the next two academic terms become "F".

[d] "W" indicates that a student is officially permitted to withdraw from the course without academic penalty, which means that this grade does not enter GPA. But note that the corresponding credit hours are counted as HOPE attempted hours.

[e] "ER" grades not removed 7 days prior to the end of the next semester are converted to "WF".

Table B2
SAT I Individual Score Equivalents

Original to Recentered Scale							
Verbal		**Verbal**		**Math**		**Math**	
Original	Recentered	Original	Recentered	Original	Recentered	Original	Recentered
800	800	500	580	800	800	500	520
790	800	490	570	790	800	490	520
780	800	480	560	780	800	480	510
770	800	470	550	770	790	470	500
760	800	460	540	760	770	460	490
750	800	450	530	750	760	450	480
740	800	440	520	740	740	440	480
730	800	430	510	730	730	430	470
720	790	420	500	720	720	420	460
710	780	410	490	710	700	410	450
700	760	400	480	700	690	400	440
690	750	390	470	690	680	390	430
680	740	380	460	680	670	380	430
670	730	370	450	670	660	370	420
660	720	360	440	660	650	360	410
650	710	350	430	650	650	350	400
640	700	340	420	640	640	340	390
630	690	330	410	630	630	330	380
620	680	320	400	620	620	320	370
610	670	310	390	610	610	310	350
600	670	300	380	600	600	300	340
590	660	290	370	590	600	290	330
580	650	280	360	580	590	280	310
570	640	270	350	570	580	270	300
560	630	260	340	560	570	260	280
550	620	250	330	550	560	250	260
540	610	240	310	540	560	240	240
530	600	230	300	530	550	230	220
520	600	220	290	520	540	220	200
510	590	210	270	510	530	210	200
		200	230			200	200

Source: College Board (available at http://www.collegeboard.com/sat/cbsenior/equiv/rt019019.html)

B.2 General Core Curriculum of the University of Georgia

The core curriculum was established within the University System of Georgia as a means of facilitating the transfer of credit for students at the lower division level as they work toward baccalaureate degrees within the University System colleges and universities. Each school or college of the University of Georgia that offers a baccalaureate degree program has developed its core program complying with the University System core curriculum requirements. The general core courses are decomposed into the following three categories: (1) AREA I–Humanities and Fine Arts, (2) AREA II–Mathematics and Natural Sciences, and (3) AREA III–Social Sciences. Each area includes introductory or intermediate courses in each field of study. Specifically, AREA I includes English, foreign language and literature courses, and AREA II includes mathematics and a 10-hour sequence of laboratory courses in the biological, chemical or physical sciences. AREA III comprises history, American government, economics, psychology, sociology and other social sciences. Although there are certain courses that all undergraduate students at UGA are required to take (e.g., English Composition), students are generally allowed to choose from the approved courses in each area that are listed in the following pages. To satisfy the core requirements, students must take (1) 20 quarter credit hours (four 5-credit courses) in each of AREAs I, II and III; (2) English 101 and 102 (English Composition) unless exempted by AP examinations (a grade of C or better is required for English 101 and an average of 2.0 or better is required for both courses); (3) the courses dealing with the Constitution and history of the United States and those of Georgia (e.g., Political Science 101 (American Government), History 251 (American History to 1865), and History 252 (American History since 1865)) for the exemption from the examinations on these constitutions and histories.[6]

[6] For full description of the University System of Georgia core curriculum and college-specific core programs at the University of Georgia, see the Undergraduate Bulletins in 1989-97.

Table B3
General Core Courses at The University of Georgia

AREA	Course ID	Course Title
1	ART200	Appreciation of the Visual Arts
1	ART287	Introduction to the History of Ancient and Medieval Art
1	ART288	Introduction to the History of Art Renaissance-18th Century
1	ART289	Introduction to 19th and 20th Century Art
1	CLC120	Classical Culture: Greece
1	CLC121	Classical Culture: Rome
1	CLC150	Mythology in Classical Literature
1	CML221	Western World Literature
1	CML222	Western World Literature
1	DRA200	Appreciation of Theatre
1	DRA212	Introduction to Cinema
1	ENG101	English Composition
1	ENG102	English Composition
1	ENG231G	Masterpiece of English Literature to 1700
1	ENG232G	Masterpiece of English Literature after 1700
1	ENG233G	Masterpiece of American Literature
1	FR 101	Elementary French
1	FR 102	Elementary French
1	FR 103	Elementary French
1	FR 201	Intermediate French
1	FR 202	Intermediate French
1	FR 202B	Intermediate French
1	GER101	Elementary German
1	GER102	Elementary German
1	GER103	Intermediate German
1	GER221	Intermediate German
1	ITA101	Elementary Italian
1	ITA102	Elementary Italian
1	ITA103	Elementary Italian
1	ITA201	Intermediate Italian

Continued

Table B3 (Continued), General Core Courses at The University of Georgia

AREA	Course ID	Course Title
1	LAT101	Elementary Latin I
1	LAT102	Elementary Latin II
1	LAT103	Elementary Latin III
1	MUS202	Appreciation of Music
1	PHY100	Survey of Philosophy
1	PHY101	Introduction to Philosophical Issues
1	PHY102	Logic and Critical Thinking
1	REL115	Introduction to Western Religious Traditions
1	REL116	Introduction to the Major Religious Perspectives of Mankind
1	RUS101	Elementary Russian
1	RUS102	Elementary Russian
1	RUS103	Intermediate Russian
1	SP 101	Elementary Spanish
1	SP 102	Elementary Spanish
1	SP 103	Elementary Spanish
1	SP 201	Intermediate Spanish
1	SP 202	Intermediate Spanish
1	SPC108	Fundamentals of Speech Communication
1	SPC256	Introduction to Small Group Communication
2	AST107	Introduction to Astronomy
2	AST108	Introduction to Astronomy
2	AST291	Descriptive Astronomy
2	BIO101	Principles of Biology (offered in 1989 & 90 and continued as BIO103)
2	BIO102	Principles of Biology (offered in 1989 & 90 and continued as BIO104)
2	BIO103	Principles of Biology
2	BIO104	Principles of Biology
2	BIO107	General Biology
2	BIO108	General Biology
2	BOT121	Elementary Botany
2	BOT122	Elementary Botany

Continued

Table B3 (Continued), General Core Courses at The University of Georgia

AREA	Course ID	Course Title
2	CHM111	Elementary Chemistry
2	CHM112	Elementary Chemistry
2	CHM121	General Chemistry
2	CHM122	General Chemistry
2	CS 101	Introduction to Information Processing and Microcomputers
2	CS 201	Introduction to Computing
2	GGY104	Earth Science Survey
2	GGY120	Introductory Weather and Climate
2	GGY121	Introduction to Landforms
2	GGY122	Introduction to Bio and Soil Geography
2	GLY115	Earth Processes and Environments
2	GLY116	The Earth Through Time
2	GLY125	Physical Geology
2	GLY126	Historical Geology
2	MAT102	College Algebra
2	MAT105	Introduction to Mathematics
2	MAT106	Introduction to Mathematics II
2	MAT109	Trigonometry
2	MAT116	Precalculus Mathematics
2	MAT205	Mathematics for Elementary Teachers
2	MAT206	Mathematics for Elementary Teachers
2	MAT253	Analytic Geometry and Calculus
2	PCS101	Physical Science
2	PCS127	Introductory Physics - Mechanics
2	PCS128	Introductory Physics - Thermodynamics, Electricity and Magnetism
2	PCS137	Introductory Physics for Science and Engineering Students - Mechanics
2	PCS138	Introductory Physics for Science and Engineering Students - Thermodynamics, Electricity and Magnetism
2	PHY110	Symbolic Logic
2	STA200	Elementary Statistics
2	STA221	Introduction to Statistics and Programming
2	STA222	Introduction to Statistics and Programming II

Continued

Table B3 (Continued), General Core Courses at The University of Georgia

AREA	Course ID	Course Title
2	ZOO212	Human Anatomy
2	ZOO213	Human Physiology
3	ANT102	Introduction to Anthropology
3	ECN106	Principles of Microeconomics
3	ECN107	Principles of Macroeconomics
3	GGY101	Introduction to Human Geography
3	HIS111	History of Western Civilization to 1500
3	HIS112	History of Western Civilization Since 1500
3	HIS121	Early Modern Western Civilization
3	HIS122	Modern Western Civilization
3	HIS251	American History to 1865
3	HIS252	American History Since 1865
3	LIN210	The Study of Language
3	POL101	American Government
3	POL202	Introduction to Political Science
3	POL203	Introduction to Global Studies
3	PSY101	Elementary Psychology
3	PSY251	Brain and Behavior
3	PSY253	Mental Processes
3	PSY257	Applications of Psychology
3	SOC105	Introductory Sociology
3	SOC160	Contemporary Social Problems
3	SOS104	Contemporary Georgia

Appendix C

Data Tables

List of Tables

Table C1
Number and Percentage of
Different Types of First-Time Freshman Matriculators[a]

	FTF				
Class Year	HS[b] N(%)[c]	Early[b] N(%)[c]	Typical[b] N(%)[c]	Late[b] N(%)[c]	Total N
1989	19 (0.54)	2 (0.06)	3,441 (97.42)	70 (1.98)	3,532
1990	8 (0.23)	3 (0.09)	3,432 (97.36)	82 (2.33)	3,525
1991	12 (0.36)	192 (5.71)	3,042 (90.45)	117 (3.48)	3,363
1992	9 (0.27)	158 (4.69)	3,092 (91.78)	110 (3.27)	3,369
1993	16 (0.43)	309 (8.36)	3,264 (88.34)	106 (2.87)	3,695
1994	28 (0.77)	1 (0.03)	3,521 (96.49)	99 (2.71)	3,649
1995	17 (0.45)	2 (0.05)	3,651 (97.05)	92 (2.45)	3,762
1996	38 (1.04)	1 (0.03)	3,510 (95.93)	110 (3.01)	3,659
1997	33 (0.77)	1 (0.02)	4,165 (96.59)	113 (2.62)	4,312
Total	180(0.55)	669 (2.04)	31,118 (94.68)	899 (2.74)	32,866

[a] "First-time freshmen (FTF)" refers to those students who have never attended any postsecondary school before entering UGA.

[b] High-school matriculators refer to those who enroll in UGA before graduating from high school; Early matriculators, those who enter UGA in the summer term of the same year as high-school graduation; Typical students, those who matriculate at UGA in the fall term of the same year as they graduate from high school; Late matriculators, those who matriculate at UGA after the fall term following high-school graduation, but have never been enrolled in any other postsecondary institution between high-school graduation and UGA matriculation.

[c] Percent of FTF who are high-school, early, typical and late matriculators, respectively.

Table C2
Number and Percentage of Typical FTF Georgia Residents
Who Are Admitted as HOPE Scholars

Class Year	TFTF[a] *N*	TFTF GA-Residents *N* (%)[b]	TFTF HOPE Scholars *N* (%)[c]
1989	3,441	2,923 (84.95)	0 (0.00)
1990	3,432	2,887 (84.12)	0 (0.00)
1991	3,042	2,598 (85.40)	0 (0.00)
1992	3,092	2,610 (84.41)	0 (0.00)
1993	3,264	2,695 (82.57)	949 (35.21)
1994	3,521	3,026 (85.94)	2,284 (75.48)
1995	3,651	3,133 (85.81)	2,968 (94.73)
1996	3,510	3,155 (89.89)	3,034 (96.16)
1997	4,165	3,703 (88.91)	3,608 (97.43)
Mean			
Pre-HOPE (89-92)	3,252	2,755 (84.72)	0 (0.00)
Post-HOPE (93-97)	3,622	3,142 (86.75)	2,569 (81.76)
Total	31,118	26,730 (85.90)	12,843 (48.05)

[a] "Typical first-time freshmen (TFTF)" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school and have never attended any postsecondary institution before entering UGA.

[b] Percent of typical FTF (TFTF) who are Georgia residents.

[c] Percent of TFTF Georgia residents who are admitted as HOPE Scholars.

Table C3
Number and Percentage of Typical FTF HOPE Scholars[a]
Who Lose Their HOPE Awards at Each Checkpoint[b]

Class Year	TFTF	TFTF HOPE Losers		
	HOPE Scholars *N*	First Check *N* (%)[c]	Second Check *N* (%)[c]	Third Check *N* (%)[c]
1993	949	479 (50.47)	58 (6.11)	16 (1.69)
1994	2,284	983 (43.04)	145 (6.35)	47 (2.06)
1995	2,968	1,134 (38.21)	145 (4.89)	N/A
1996	3,034	990 (32.64)	N/A	N/A
Mean	2,309	897 (38.85)	116 (5.02)	32 (1.39)
Total	9,235	3,586 (38.83)	348 (3.77)	63 (0.68)

[a] Typical FTF (TFTF) who are admitted as HOPE Scholars.

[b] There are three checkpoints at 45, 90, and 135 credit hours, respectively.

[c] Percent of TFTF HOPE Scholars who lose their scholarship at each checkpoint.

Table C4
Characteristics of Typical FTF HOPE Scholars[a]
Who Lose Their HOPE Awards at the First Checkpoint[b]
HOPE Keepers vs. Losers, 1993-96 Classes

		At the First Checkpoint	
	HOPE Scholars	HOPE Keepers	HOPE Losers
Gender	*N*	*N*(%)[c]	*N*(%)[d]
Male	3,772	2,176 (57.69)	1,596 (42.31)
Female	5,463	3,473 (63.57)	1,990 (36.43)
Total	9,235	5,649 (61.17)	3,586 (38.83)
Race			
White	7,751	4,949 (63.85)	2,802 (36.15)
Asian	323	210 (65.02)	113 (34.98)
Black	1,003	389 (38.78)	614 (61.22)
Hispanic	82	53 (64.63)	29 (35.37)
Other Races	76	48 (63.16)	28 (36.84)
Total	9,235	5,649 (61.17)	3,586 (38.83)
HS Achievements	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)
High School GPA	3.43 (0.40)	3.54 (0.37)	3.25 (0.37)
SAT Verbal Score	590.34 (70.84)	602.53 (71.49)	571.14 (65.37)
SAT Math Score	582.62 (68.79)	595.08 (68.55)	563.02 (64.46)
AP Credits Earned	4.43 (7.61)	5.76 (8.65)	2.32 (4.91)

[a] Typical FTF (TFTF) who are admitted as HOPE Scholars.

[b] The first checkpoint occurs at 45 quarter credit hours.

[c] Percent of TFTF HOPE Scholars who keep their scholarship at the first checkpoint.

[d] Percent of TFTF HOPE Scholars who lose their scholarship at the first checkpoint.

Table C5
Sample Means and Percentages for Typical First-Year Students[a]
(Standard Deviations in Parentheses)

Variable	Pre-HOPE (1989-92)		Post-HOPE (1993-97)	
	Non-resident	Resident	Non-resident	Resident
Cumulative Grade Point Average[b]	2.62 (0.70)	2.57 (0.72)	2.83 (0.65)	2.85 (0.70)
Full-Load Enrollment Rate[c] (%)	81.2	82.2	81.2	77.0
Withdrawal Rate[d] (%)	25.7	26.1	33.7	39.4
Full-Load Completion Rate[e] (%)	63.5	64.2	58.8	50.9
Credit Hours Enrolled	43.65 (7.13)	44.22 (6.22)	44.10 (6.95)	44.25 (5.86)
Credit Hours Withdrawn	1.61 (3.29)	1.57 (3.18)	2.10 (3.66)	2.53 (3.92)
Credit Hours Taken	42.04 (8.00)	42.65 (7.22)	42.00 (7.84)	41.71 (7.33)
High-School GPA[f]	2.99 (0.45)	3.12 (0.51)	3.21 (0.43)	3.40 (0.42)
SAT Math Score	564.51 (64.06)	559.78 (67.93)	585.17 (65.80)	582.40 (69.38)
SAT Verbal Score	574.01 (73.63)	565.92 (77.26)	592.70 (73.21)	589.22 (71.74)
SAT Total Score	1138.52 (113.63)	1125.70 (124.78)	1177.88 (117.89)	1171.62 (120.98)
AP Credit Hours Earned	3.27 (6.10)	2.77 (6.01)	5.24 (8.38)	4.55 (8.15)

[a] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

[b] Cumulative GPA is calculated through the spring quarter of the first year on the basis of credits earned since matriculation at UGA.

[c] Percentage of typical first-year students enrolling in a full-credit load.

[d] Percentage of typical first-year students withdrawing from a class.

[e] Percentage of typical first-year students completing a full-credit load.

[f] HSGPA is raw or unweighted high-school GPA reported by students.

Table C6
Percentile SAT Total Scores[a] by Entering-Class Year
Typical Students[b], 1989-97 Classes

Class Year	Percentile SAT Scores		
	25th	50th	75th
1989	1,040	1,110	1,190
1990	1,020	1,100	1,190
1991	1,050	1,120	1,200
1992	1,060	1,140	1,230
1993	1,080	1,150	1,240
1994	1,080	1,150	1,230
1995	1,110	1,170	1,260
1996	1,100	1,180	1,260
1997	1,090	1,170	1,250
Pre-HOPE (1989-92)	1,040	1,120	1,200
Post-HOPE (1993-97)	1,090	1,160	1,250

[a] SAT composite or total score is the the sum of the verbal and math scores.

[b] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Table C7
Mean Quarter GPA[a], HSGPA and SAT Scores of Typical Students[b]
First Academic Year and First Summer[c]
(Standard Deviations in Parentheses)

Variable	Academic Terms			
	Fall	Winter	Spring	Summer
Pre-HOPE Years (1989-92)				
Quarter GPA	2.57 (0.81)	2.60 (0.80)	2.68 (0.81)	2.89 (0.91)
High-School GPA	3.15 (0.47)	3.11 (0.49)	3.11 (0.49)	3.10 (0.51)
SAT Verbal Score	574.30 (72.14)	568.82 (75.25)	568.16 (75.96)	566.01 (76.56)
SAT Math Score	566.51 (64.34)	562.20 (66.83)	561.53 (67.35)	560.61 (66.51)
Post-HOPE Years (1993-97)				
Quarter GPA	2.79 (0.78)	2.86 (0.76)	2.97 (0.79)	3.16 (0.83)
High-School GPA	3.38 (0.42)	3.38 (0.42)	3.38 (0.42)	3.38 (0.44)
SAT Verbal Score	591.27 (70.49)	590.24 (71.89)	590.20 (72.09)	587.90 (74.89)
SAT Math Score	584.15 (67.99)	583.52 (68.94)	583.68 (69.11)	582.38 (70.07)

[a] Quarter GPA is the average of the grade points earned in a quarter term.

[b] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

[c] The first summer for typical students is the summer quarter in the second year which immediately follows the first academic year, since the academic year runs from the summer to the next spring term.

Table C8
Mean Grade Point, HSGPA and SAT Scores in Core Curriculum Areas
Typical Resident vs. Non-resident Students[a], 1989-97 Classes
(Standard Deviations in Parentheses)

	Pre-HOPE (1989-92)		Post-HOPE (1993-97)	
Variable	Non-resident	Resident	Non-resident	Resident
AREA I: Arts & Humanities				
Grade-Point Average	2.89	2.85	3.01	3.03
	(0.88)	(0.89)	(0.88)	(0.89)
High-School GPA	2.98	3.09	3.12	3.31
	(0.44)	(0.51)	(0.44)	(0.45)
SAT Verbal Score	576.73	569.97	591.23	587.45
	(72.66)	(76.10)	(70.98)	(72.56)
SAT Math Score	561.36	558.08	577.44	576.13
	(61.80)	(66.83)	(63.49)	(68.47)
AREA II: Math & Sciences				
Grade-Point Average	2.42	2.40	2.58	2.66
	(1.17)	(1.17)	(1.09)	(1.10)
High-School GPA	3.01	3.13	3.14	3.33
	(0.45)	(0.50)	(0.45)	(0.45)
SAT Verbal Score	572.11	564.50	586.78	581.62
	(73.93)	(74.35)	(70.80)	(71.12)
SAT Math Score	569.41	562.96	579.09	576.80
	(63.02)	(65.85)	(63.22)	(67.62)
AREA III: Social Sciences				
Grade-Point Average	2.60	2.55	2.76	2.79
	(0.95)	(0.99)	(0.95)	(0.97)
High-School GPA	2.97	3.07	3.12	3.32
	(0.43)	(0.50)	(0.43)	(0.44)
SAT Verbal Score	570.85	561.31	586.50	580.90
	(70.82)	(71.75)	(70.16)	(69.38)
SAT Math Score	562.61	555.52	577.28	574.60
	(61.17)	(64.25)	(63.51)	(66.80)

[a] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Table C9
Mean Credit Hours Enrolled, Withdrawn and Taken in Core Curriculum Areas
Typical First-Year Students[a], 1989-97 Classes
(Standard Deviations in Parentheses)

	Pre-HOPE (1989-92)		Post-HOPE (1993-97)	
Variable	Non-resident	Resident	Non-resident	Resident
<u>AREA I: Arts & Humanities</u>				
Credit Hours Enrolled	12.36	11.48	13.86	12.71
	(6.31)	(5.84)	(6.51)	(6.23)
Credit Hours Withdrawn	0.40	0.34	0.45	0.52
	(1.53)	(1.37)	(1.61)	(1.71)
Credit Hours Taken	11.97	11.14	13.40	12.19
	(6.23)	(5.83)	(6.51)	(6.23)
<u>AREA II: Math & Sciences</u>				
Credit Hours Enrolled	9.80	10.83	9.64	10.75
	(5.82)	(6.20)	(5.82)	(6.02)
Credit Hours Withdrawn	0.61	0.62	0.84	1.06
	(1.75)	(1.73)	(2.03)	(2.24)
Credit Hours Taken	9.19	10.21	8.80	9.69
	(5.83)	(6.19)	(5.70)	(5.97)
<u>AREA III: Social Sciences</u>				
Credit Hours Enrolled	13.02	12.58	11.01	10.53
	(6.65)	(6.62)	(6.33)	(6.24)
Credit Hours Withdrawn	0.35	0.34	0.40	0.50
	(1.44)	(1.37)	(1.45)	(1.63)
Credit Hours Taken	12.67	12.25	10.61	10.03
	(6.65)	(6.62)	(6.29)	(6.18)

[a] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Table C10
Mean Grade Point, HSGPA and SAT Scores in Core Curriculum Areas
Summer vs. Non-summer, Typical Students[a]
(Standard Deviations in Parentheses)

	Pre-HOPE (1989-92)		Post-HOPE (1993-97)	
Variable	Non-summer	Summer	Non-summer	Summer
AREA I: Arts & Humanities				
Grade-Point Average	2.84	3.06	3.01	3.20
	(0.89)	(0.88)	(0.89)	(0.91)
High-School GPA	3.08	3.00	3.29	3.23
	(0.50)	(0.51)	(0.45)	(0.48)
SAT Verbal Score	571.94	555.22	588.84	574.87
	(75.62)	(73.69)	(72.27)	(72.41)
SAT Math Score	558.96	552.29	576.83	568.44
	(66.13)	(64.89)	(67.77)	(67.87)
AREA II: Math & Sciences				
Grade-Point Average	2.38	2.63	2.64	2.78
	(1.18)	(1.06)	(1.10)	(1.08)
High-School GPA	3.12	3.05	3.31	3.20
	(0.50)	(0.49)	(0.45)	(0.47)
SAT Verbal Score	566.26	554.93	583.06	569.62
	(74.42)	(72.24)	(71.04)	(70.82)
SAT Math Score	565.26	542.79	578.40	555.94
	(65.47)	(62.40)	(66.96)	(65.55)
AREA III: Social Sciences				
Grade-Point Average	2.54	3.00	2.76	3.15
	(0.98)	(0.90)	(0.96)	(0.91)
High-School GPA	3.06	3.07	3.29	3.30
	(0.49)	(0.52)	(0.44)	(0.46)
SAT Verbal Score	563.38	549.12	582.68	565.79
	(71.39)	(76.35)	(69.16)	(72.89)
SAT Math Score	556.85	550.75	575.49	566.71
	(63.73)	(66.08)	(66.16)	(69.28)

[a] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Table C11
Mean Cumulative GPA, HSGPA and SAT Scores in Selected Majors
Typical First-Year Students[a], 1989-97 Classes
(Standard Deviations in Parentheses)

	Pre-HOPE (1989-92)		Post-HOPE (1993-97)	
Variable	Non-resident	Resident	Non-resident	Resident
Math & Science Majors				
Cumulative GPA	2.67	2.64	2.91	2.84
	(0.85)	(0.75)	(0.67)	(0.76)
High-School GPA	3.21	3.29	3.37	3.49
	(0.47)	(0.47)	(0.43)	(0.41)
SAT Verbal Score	581.87	575.97	604.84	591.00
	(78.30)	(76.75)	(73.18)	(74.27)
SAT Math Score	595.61	582.57	610.00	602.08
	(64.38)	(68.96)	(70.32)	(74.99)
Business Major				
Cumulative GPA	2.66	2.70	2.82	2.88
	(0.61)	(0.63)	(0.59)	(0.65)
High-School GPA	3.15	3.28	3.28	3.44
	(0.42)	(0.43)	(0.38)	(0.37)
SAT Verbal Score	576.55	578.15	593.50	585.03
	(59.80)	(62.96)	(57.47)	(60.91)
SAT Math Score	593.11	587.17	606.48	599.92
	(55.97)	(62.28)	(56.61)	(63.31)
Education Major				
Cumulative GPA	2.66	2.59	2.77	2.88
	(0.55)	(0.68)	(0.64)	(0.69)
High-School GPA	3.04	3.15	3.18	3.42
	(0.43)	(0.48)	(0.45)	(0.40)
SAT Verbal Score	558.70	550.00	560.51	572.37
	(69.65)	(69.13)	(68.19)	(63.35)
SAT Math Score	548.62	536.53	562.43	560.23
	(55.79)	(61.14)	(62.52)	(63.06)

[a] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Appendix D

Results Tables

List of Tables[1]

[1] Tables report the results for typical first-year students in 1989-97 classes, unless noted otherwise. The extensive margin of course taking refers to full-load enrollment, course withdrawal and full-load completion, while its intensive margin refers to credit hours enrolled, withdrawn and taken.

Table D1
Estimated HOPE Effect on Cumulative Grade-Point Average[a]
Typical First-Year Students[b], 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	(1)	(2)	(3)	(4)	(5)
$GA \cdot H$	0.058	0.063	0.049	0.025	0.034
	(0.022)	(0.022)	(0.021)	(0.019)	(0.023)
GA	-0.053	-0.024	-0.005	-0.090	-0.004
	(0.017)	(0.017)	(0.016)	(0.015)	(0.037)
$FEMALE$		0.165	0.256	0.092	0.059
		(0.008)	(0.008)	(0.007)	(0.008)
$ASIAN$		0.057	0.066	-0.026	-0.044
		(0.025)	(0.023)	(0.021)	(0.022)
$BLACK$		-0.441	-0.134	-0.140	-0.066
		(0.014)	(0.014)	(0.013)	(0.016)
$HISPN$		-0.035	0.023	-0.037	-0.045
		(0.043)	(0.041)	(0.038)	(0.040)
$OTHER$		-0.077	-0.087	-0.072	-0.088
		(0.046)	(0.043)	(0.038)	(0.039)
$SATV$			0.193	0.107	0.109
			(0.006)	(0.006)	(0.006)
$SATM$			0.254	0.090	0.053
			(0.006)	(0.006)	(0.007)
$HSGPA$				0.620	0.749
				(0.009)	(0.010)
AP				0.013	0.011
				(0.001)	(0.001)
Class Year Effects	Yes	Yes	Yes	Yes	Yes
HS Fixed Effects	No	No	No	No	Yes
R^2	0.051	0.091	0.212	0.367	0.446
N	30,874	30,874	30,546	30,467	30,465

[a] Cumulative GPA is calculated through the spring quarter of the first year on the basis of credits earned since matriculation at UGA.

[b] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Table D2
Estimated HOPE Effect on Admission Characteristics
Typical Students[a], 1989-97 Classes
(Robust Standard Errors in Parentheses)

	SAT Scores[b]		HSGPA[c]	AP Credits
Variables	Math	Verbal		
$GA \cdot H$	1.502	9.305	0.065	-0.013
	(2.397)	(2.700)	(0.016)	(0.281)
Class Year Effects	Yes	Yes	Yes	Yes
Residency	Yes	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes	Yes
R^2	0.256	0.193	0.289	0.148
N	30,784	30,784	31,021	31,116

[a] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

[b] Since the College Board recentered SAT scores for tests taken on or after 1 April 1995, SAT verbal and math scores prior to 1995-class year are recentered according to the College Board's SAT I individual score conversion table (see Table B2).

[c] HSGPA is raw or unweighted high-school GPA reported by students.

Table D3
Estimated HOPE Effect on Cumulative Grade-Point Average[a]
Typical First-Year Students[b], 1990 and 95 Classes
(Robust Standard Errors in Parentheses)

Variables	(1)	(2)	(3)	(4)	(5)
$GA \cdot H$	0.148	0.176	0.115	0.076	0.130
	(0.045)	(0.044)	(0.043)	(0.039)	(0.057)
H_{95}	0.272	0.259	0.129	0.022	-0.065
	(0.041)	(0.041)	(0.041)	(0.037)	(0.055)
GA	-0.088	-0.065	-0.029	-0.119	-0.150
	(0.033)	(0.033)	(0.032)	(0.029)	(0.076)
$FEMALE$		0.165	0.244	0.081	0.045
		(0.017)	(0.016)	(0.015)	(0.016)
$ASIAN$		0.091	0.099	0.003	-0.021
		(0.052)	(0.047)	(0.038)	(0.043)
$BLACK$		-0.477	-0.145	-0.166	-0.074
		(0.027)	(0.028)	(0.027)	(0.035)
$HISPN$		-0.139	-0.037	-0.115	-0.162
		(0.100)	(0.094)	(0.089)	(0.097)
$OTHER$		-0.130	-0.027	-0.044	0.038
		(0.083)	(0.079)	(0.066)	(0.081)
$SATV$			0.200	0.113	0.110
			(0.012)	(0.012)	(0.013)
$SATM$			0.261	0.084	0.052
			(0.013)	(0.013)	(0.015)
$HSGPA$				0.597	0.722
				(0.016)	(0.020)
AP				0.013	0.011
				(0.001)	(0.001)
HS Fixed Effects	No	No	No	No	Yes
R^2	0.076	0.124	0.246	0.394	0.513
N	7,022	7,022	6,940	6,918	6,916

[a] Cumulative GPA is calculated through the spring quarter of the first year on the basis of credits earned since matriculation at UGA.

[b] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Table D4
Estimated HOPE Effect on Cumulative Grade-Point Average[a]
Typical Students[b], 1990 and 95 Classes
(Robust Standard Errors in Parentheses)

Variables	1st-Year	2nd-Year	3rd-Year
$GA \cdot H$	0.130	0.072	0.081
	(0.057)	(0.055)	(0.056)
H_{95}	-0.065	-0.006	-0.037
	(0.055)	(0.053)	(0.054)
GA	-0.150	-0.161	-0.229
	(0.076)	(0.079)	(0.086)
$FEMALE$	0.045	0.082	0.088
	(0.016)	(0.015)	(0.015)
$ASIAN$	-0.021	-0.057	-0.082
	(0.043)	(0.043)	(0.045)
$BLACK$	-0.074	-0.104	-0.102
	(0.035)	(0.033)	(0.031)
$HISPN$	-0.162	-0.047	-0.117
	(0.097)	(0.077)	(0.082)
$OTHER$	0.038	0.042	0.009
	(0.081)	(0.071)	(0.067)
$HSGPA$	0.722	0.681	0.637
	(0.020)	(0.018)	(0.018)
$SATV$	0.110	0.084	0.066
	(0.013)	(0.012)	(0.012)
$SATM$	0.052	0.040	0.025
	(0.015)	(0.013)	(0.013)
AP	0.011	0.009	0.009
	(0.001)	(0.001)	(0.001)
HS Fixed Effects	Yes	Yes	Yes
R^2	0.513	0.546	0.532
N	6,916	6,224	5,706

[a] Cumulative GPA is the average of earned grade points accumulated since a student matriculated at UGA.

[b] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Table D5
Estimated HOPE Effect on
Full-Load Enrollment, Course Withdrawal and Full-Load Completion[a]
Typical First-Year Students[b], 1989-97 Classes
(Robust Standard Errors in Parentheses)

	Full-Load Enrollment		Course Withdrawal		Full-Load Completion	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
$GA \cdot H$	-0.042	-0.048	0.042	0.051	-0.060	-0.071
	(0.016)	(0.016)	(0.018)	(0.018)	(0.019)	(0.020)
GA	-0.017	-0.012	0.025	0.026	-0.033	-0.031
	(0.024)	(0.025)	(0.028)	(0.028)	(0.029)	(0.029)
$FEMALE$	0.020	0.006	-0.047	-0.024	0.049	0.025
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
$ASIAN$	0.039	0.032	0.004	0.031	0.038	0.013
	(0.014)	(0.014)	(0.017)	(0.017)	(0.018)	(0.017)
$BLACK$	-0.004	0.042	0.032	-0.022	-0.017	0.062
	(0.011)	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)
$HISPN$	-0.026	-0.035	0.006	0.023	0.013	-0.008
	(0.026)	(0.025)	(0.030)	(0.030)	(0.030)	(0.030)
$OTHER$	-0.001	-0.003	0.032	0.027	-0.006	-0.009
	(0.030)	(0.029)	(0.034)	(0.033)	(0.034)	(0.033)
$HSGPA$		0.097		-0.150		0.177
		(0.007)		(0.008)		(0.008)
$SATV$		0.021		0.012		0.010
		(0.004)		(0.005)		(0.005)
$SATM$		0.001		-0.012		0.014
		(0.005)		(0.005)		(0.006)
AP		0.002		-0.005		0.006
		(0.000)		(0.000)		(0.000)
Class Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.094	0.109	0.099	0.124	0.108	0.147
N	31,115	30,703	31,115	30,703	31,115	30,703

[a] (i) Probability that a student enrolls in a full load in the first year;
$y_{it} = 1$ if credits enrolled ≥ 45.
(ii) Probability that a student withdraws from a course in the first year;
$y_{it} = 1$ if credits withdrawn > 0.
(iii) Probability that a student takes a full load in the first year;
$y_{it} = 1$ if credits taken ≥ 45, where credits taken = credits enrolled − credits withdrawn.

Table D6
Estimated HOPE Effect on
Credit Hours Enrolled, Withdrawn and Taken[a]
Typical First-Year Students[b], 1989-97 Classes
(Robust Standard Errors in Parentheses)

	Enrolled Hours		Withdrawn Hours		Taken Hours	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
$GA \cdot H$	-0.474	-0.492	0.441	0.510	-0.915	-1.002
	(0.267)	(0.273)	(0.140)	(0.142)	(0.306)	(0.312)
GA	0.678	0.884	0.156	0.183	0.522	0.701
	(0.421)	(0.424)	(0.254)	(0.261)	(0.503)	(0.503)
$FEMALE$	-0.087	-0.187	-0.336	-0.147	0.249	-0.040
	(0.074)	(0.080)	(0.045)	(0.047)	(0.089)	(0.095)
$ASIAN$	0.583	0.394	0.047	0.279	0.536	0.115
	(0.219)	(0.216)	(0.138)	(0.138)	(0.265)	(0.259)
$BLACK$	0.977	1.489	0.124	-0.269	0.853	1.758
	(0.148)	(0.157)	(0.094)	(0.097)	(0.181)	(0.190)
$HISPN$	-0.309	-0.522	-0.011	0.104	-0.299	-0.626
	(0.412)	(0.408)	(0.222)	(0.222)	(0.498)	(0.490)
$OTHER$	-0.454	-0.502	0.453	0.429	-0.908	-0.931
	(0.509)	(0.506)	(0.285)	(0.279)	(0.613)	(0.601)
$HSGPA$		0.968		-1.226		2.193
		(0.106)		(0.062)		(0.127)
$SATV$		0.018		0.117		-0.099
		(0.064)		(0.037)		(0.076)
$SATM$		0.128		-0.081		0.208
		(0.070)		(0.042)		(0.084)
AP		0.061		-0.033		0.094
		(0.006)		(0.003)		(0.007)
Class Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.110	0.116	0.103	0.127	0.109	0.133
N	31,115	30,703	31,115	30,703	31,115	30,703

[a] Number of credit hours (i) enrolled, (ii) withdrawn, or (iii) taken by a typical student in the first year. Note that (iii) = (i) − (ii).

[b] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Table D7
Ordered Probit Estimates of Cumulative GPA[a]
Typical First-Year Students, 1989-92
(Robust Standard Errors in Parentheses)

Variables	Coefficients	Variables	Coefficients
H_{89}	-0.214	$HSGPA^b$	0.239
	(0.036)		(0.006)
H_{90}	-0.352	$SATV^b$	0.071
	(0.036)		(0.005)
H_{91}	-0.134	$SATM^b$	0.045
	(0.036)		(0.006)
GA	0.124	$AP_1{}^c$	0.402
	(0.136)		(0.032)
$FEMALE$	0.129	$AP_2{}^c$	0.945
	(0.028)		(0.076)
$ASIAN$	-0.085		
	(0.087)		
$BLACK$	-0.100		
	(0.063)		
$HISPN$	-0.102		
	(0.135)		
$OTHER$	-0.006		
	(0.365)		
HS Fixed Effects	Yes		
N	12,701		

[a] Three cumulative GPA (CGPA) categories are (i) CGPA < 2.7, (ii) $2.7 \leq$ CGPA < 3.3 and (iii) CGPA ≥ 3.3.

[b] High-school GPA and the SAT scores are in deciles.

[c] $AP_1 = 1$ if $0 <$ AP credits earned ≤ 15 hours, and 0, otherwise.
$AP_2 = 1$ if AP credits earned > 15 hours, and 0, otherwise.

Table D8
Estimated HOPE Effect on
Full-Load Enrollment, Course Withdrawal and Full-Load Completion[a]
by Predicted Cumulative GPA Category[b]
Typical First-Year Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	Predicted Cumulative GPA < 2.7	2.7-3.3	≥ 3.3
A. Full-Load Enrollment			
$GA \cdot H$	-0.052	-0.079	0.042
	(0.022)	(0.039)	(0.032)
R^2	0.121	0.155	0.165
B. Course Withdrawal			
$GA \cdot H$	0.105	0.012	-0.062
	(0.026)	(0.044)	(0.041)
R^2	0.133	0.156	0.154
C. Full-Load Completion			
$GA \cdot H$	-0.111	-0.073	0.086
	(0.027)	(0.048)	(0.044)
R^2	0.139	0.175	0.178
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	18,653	7,092	4,958

[a] (i) Probability that a student enrolls in a full load in the first year;
$y_{it} = 1$ if credits enrolled ≥ 45.
(ii) Probability that a student withdraws from a course in the first year;
$y_{it} = 1$ if credits withdrawn > 0.
(iii) Probability that a student takes a full load in the first year;
$y_{it} = 1$ if credits taken ≥ 45 (credits taken = credits enrolled − credits withdrawn).

[b] Cumulative GPA categories—(i) CGPA < 2.7, (ii) $2.7 \leq$ CGPA < 3.3 and (iii) CGPA ≥ 3.3— are predicted for all typical students between 1989 and 1997, based on the ordered probit estimates obtained using only pre-HOPE sample (see Table D7).

Table D9
Estimated HOPE Effect on
Credit Hours Enrolled, Withdrawn and Taken[a]
by Predicted Cumulative GPA Category[b]
Typical First-Year Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	Predicted Cumulative GPA < 2.7	2.7-3.3	≥ 3.3
A. Credit Hours Enrolled			
$GA \cdot H$	-0.503	-0.577	0.499
	(0.361)	(0.690)	(0.653)
R^2	0.136	0.151	0.200
B. Credit Hours Withdrawn			
$GA \cdot H$	0.861	0.100	-0.274
	(0.202)	(0.316)	(0.259)
R^2	0.143	0.146	0.153
C. Credit Hours Taken			
$GA \cdot H$	-1.364	-0.677	0.773
	(0.418)	(0.770)	(0.701)
R^2	0.145	0.158	0.194
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	18,653	7,092	4,958

[a] Number of credit hours (i) enrolled, (ii) withdrawn, or (iii) taken by a typical student in the first year. Note that (iii) = (i) − (ii).

[b] Cumulative GPA categories—(i) CGPA < 2.7, (ii) $2.7 \leq$ CGPA < 3.3 and (iii) CGPA ≥ 3.3— are predicted for all typical students between 1989 and 1997, based on the ordered probit estimates obtained using only pre-HOPE sample (see Table D7).

Table D10
Estimated HOPE Effect on
Full-Load Enrollment, Course Withdrawal and Full-Load Completion[a]
by High-School GPA Category[b]
Typical First-Year Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	HSGPA1 (< 3.0)	HSGPA2 (3.0-3.5)	HSGPA3 (> 3.5)
A. Full-Load Enrollment			
$GA \cdot H$	-0.055	-0.079	0.004
	(0.029)	(0.029)	(0.042)
R^2	0.170	0.150	0.129
B. Course Withdrawal			
$GA \cdot H$	0.061	0.071	0.109
	(0.034)	(0.032)	(0.048)
R^2	0.184	0.157	0.123
C. Full-Load Completion			
$GA \cdot H$	-0.066	-0.107	-0.073
	(0.035)	(0.035)	(0.053)
R^2	0.188	0.172	0.148
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	8,965	11,584	10,471

[a] (i) Probability that a student enrolls in a full load in the first year;
$y_{it} = 1$ if credits enrolled ≥ 45.
(ii) Probability that a student withdraws from a course in the first year;
$y_{it} = 1$ if credits withdrawn > 0.
(iii) Probability that a student takes a full load in the first year;
$y_{it} = 1$ if credits taken ≥ 45.
Note: credit hours taken = credit hours enrolled − credit hours withdrawn.

[b] HSGPA is raw or unweighted high-school GPA reported by students and classified into 3 categories—(i) HSGPA < 3.0 (HSGPA1), (ii) $3.0 \leq$ HSGPA ≤ 3.5 (HSGPA2) and (iii) HSGPA > 3.5 (HSGPA3).

Table D11
Estimated HOPE Effect on
Credit Hours Enrolled, Withdrawn and Taken[a]
by High-School GPA Category[b]
Typical First-Year Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	HSGPA1 (< 3.0)	HSGPA2 (3.0-3.5)	HSGPA3 (> 3.5)
A. Credit Hours Enrolled			
$GA \cdot H$	-0.704	-0.919	1.361
	(0.433)	(0.517)	(0.830)
R^2	0.215	0.174	0.134
B. Credit Hours Withdrawn			
$GA \cdot H$	0.689	0.630	0.918
	(0.264)	(0.249)	(0.298)
R^2	0.199	0.160	0.122
C. Credit Hours Taken			
$GA \cdot H$	-1.392	-1.550	0.443
	(0.510)	(0.570)	(0.862)
R^2	0.219	0.178	0.143
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	8,965	11,584	10,471

[a] Number of credit hours (i) enrolled, (ii) withdrawn, or (iii) taken by a typical student in the first year. Note that (iii) = (i) − (ii).

[b] HSGPA is raw or unweighted high-school GPA reported by students and classified into 3 categories—(i) HSGPA < 3.0 (HSGPA1), (ii) $3.0 \leq$ HSGPA ≤ 3.5 (HSGPA2) and (iii) HSGPA > 3.5 (HSGPA3).

Table D12
Estimated HOPE Effect on
Full-Load Enrollment, Course Withdrawal and Full-Load Completion[a]
by SAT Total Score Category[b]
Typical First-Year Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	SAT1 (< 25%)	SAT2 (25-75%)	SAT3 (> 75%)
A. Full-Load Enrollment			
$GA \cdot H$	-0.181	-0.058	0.001
	(0.057)	(0.022)	(0.035)
R^2	0.177	0.117	0.157
B. Course Withdrawal			
$GA \cdot H$	0.190	0.059	-0.007
	(0.060)	(0.026)	(0.041)
R^2	0.176	0.125	0.150
C. Full-Load Completion			
$GA \cdot H$	-0.270	-0.084	-0.011
	(0.063)	(0.027)	(0.044)
R^2	0.195	0.135	0.164
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	7,170	16,314	7,299

[a] (i) Probability that a student enrolls in a full load in the first year;
$y_{it} = 1$ if credits enrolled ≥ 45.
(ii) Probability that a student withdraws from a course in the first year;
$y_{it} = 1$ if credits withdrawn > 0.
(iii) Probability that a student takes a full load in the first year;
$y_{it} = 1$ if credits taken ≥ 45.
Note: credit hours taken = credit hours enrolled − credit hours withdrawn.

[b] The recentered SAT composite or total score (SATTR) is classified into 3 categories—(i) SATTR $<$ 25th percentile (SAT1), (ii) 25th $\leq$ SATTR $\leq$ 75th percentile (SAT2), (iii) SATTR $>$ 75th percentile (SAT3).

Table D13
Estimated HOPE Effect on
Credit Hours Enrolled, Withdrawn and Taken[a]
by SAT Total Score Category[b]
Typical First-Year Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	SAT1 (< 25%)	SAT2 (25-75%)	SAT3 (> 75%)
A. Credit Hours Enrolled			
$GA \cdot H$	-2.090	-0.535	-0.772
	(0.870)	(0.350)	(0.620)
R^2	0.204	0.138	0.169
B. Credit Hours Withdrawn			
$GA \cdot H$	1.761	0.559	-0.011
	(0.468)	(0.200)	(0.306)
R^2	0.181	0.139	0.145
C. Credit Hours Taken			
$GA \cdot H$	-3.850	-1.094	-0.760
	(1.009)	(0.402)	(0.701)
R^2	0.207	0.139	0.169
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	7,170	16,314	7,299

[a] Number of credit hours (i) enrolled, (ii) withdrawn, or (iii) taken by a typical student in the first year. Note that (iii) = (i) − (ii).

[b] Since the College Board recentered SAT scores for tests taken on or after April 1, 1995, SAT verbal and math scores prior to 1995 class year are recentered according to the College Board's SAT I individual score conversion table (see Table B2). The recentered composite or total score (SATTR) is then computed as the sum of recentered verbal and math scores, and classified into 3 categories—(i) SATTR < 25th percentile (SAT1), (ii) 25th ≤ SATTR ≤ 75th percentile (SAT2), (iii) SATTR > 75th percentile (SAT3). Note that the 25th and 75th percentile SAT total scores vary by year (see Table C6).

Table D14
Temporal Pattern of Estimated HOPE Effect on
Full-Load Enrollment, Course Withdrawal and Full-Load Completion[a]
Typical First-Year Students[b], 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	Full-Load Enrollment	Course Withdrawal	Full-Load Completion
$GA \cdot H_{89}$	0.003	-0.021	0.012
	(0.031)	(0.035)	(0.038)
$GA \cdot H_{90}$	-0.016	0.010	-0.016
	(0.031)	(0.036)	(0.038)
$GA \cdot H_{91}$	0.016	-0.037	0.060
	(0.034)	(0.039)	(0.041)
$GA \cdot H_{92}$	0.018	0.050	-0.039
	(0.032)	(0.036)	(0.040)
$GA \cdot H_{94}$	-0.010	0.021	-0.017
	(0.032)	(0.038)	(0.039)
$GA \cdot H_{95}$	-0.068	0.061	-0.106
	(0.031)	(0.037)	(0.038)
$GA \cdot H_{96}$	-0.079	0.114	-0.126
	(0.036)	(0.040)	(0.044)
$GA \cdot H_{97}$	-0.078	0.104	-0.129
	(0.033)	(0.039)	(0.040)
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
R^2	0.110	0.124	0.148

[a] (i) Probability that a student enrolls in a full load in the first year;
$y_{it} = 1$ if credits enrolled ≥ 45.
(ii) Probability that a student withdraws from a course in the first year;
$y_{it} = 1$ if credits withdrawn > 0.
(iii) Probability that a student takes a full load in the first year;
$y_{it} = 1$ if credits taken ≥ 45 (credits taken = credits enrolled − credits withdrawn).

[b] "Typical first-year students" refers to those who matriculate at UGA in the fall term of the same year as high-school graduation, and are in their first year of UGA attendance.

Table D15
Temporal Pattern of Estimated HOPE Effect on
Credit Hours Enrolled, Withdrawn and Taken[a]
Typical First-Year Students[b], 1989-97 Classes
(Robust Standard Errors in Parentheses)

	Credit Hours		
Variables	Enrolled	Withdrawn	Taken
$GA \cdot H_{89}$	0.454	0.004	0.449
	(0.520)	(0.282)	(0.606)
$GA \cdot H_{90}$	0.251	-0.008	0.258
	(0.545)	(0.293)	(0.632)
$GA \cdot H_{91}$	0.471	-0.105	0.576
	(0.547)	(0.292)	(0.625)
$GA \cdot H_{92}$	-0.107	0.344	-0.451
	(0.531)	(0.288)	(0.628)
$GA \cdot H_{94}$	0.091	0.262	-0.171
	(0.542)	(0.317)	(0.625)
$GA \cdot H_{95}$	-0.932	0.728	-1.659
	(0.489)	(0.275)	(0.565)
$GA \cdot H_{96}$	0.066	1.014	-0.948
	(0.566)	(0.321)	(0.667)
$GA \cdot H_{97}$	-0.302	1.142	-1.444
	(0.565)	(0.295)	(0.640)
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
R^2	0.116	0.128	0.134

[a] Number of credit hours (i) enrolled, (ii) withdrawn, or (iii) taken by a typical student in the first year. Note that (iii) = (i) − (ii).

[b] "Typical first-year students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school, and are in their first year of UGA attendance.

Table D16
Estimated HOPE Effect on Intertemporal Substitution
Typical Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	1st-Year	2nd-Year	3rd-Year	4th-Year
A. Probability of Taking Full-Load[a]				
$GA \cdot H$	-0.071	0.005	-0.034	-0.024
	(0.020)	(0.023)	(0.026)	(0.031)
R^2	0.147	0.123	0.126	0.123
B. Annual Credit Hours Taken[b]				
$GA \cdot H$	-1.002	0.139	-0.028	0.265
	(0.312)	(0.461)	(0.570)	(0.724)
R^2	0.133	0.148	0.145	0.127
Class Year Effects	Yes	Yes	Yes	Yes
Residency	Yes	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes	Yes
N	30,703	23,644	18,771	14,595

[a] $y_{it} = 1$ if credits taken in the t-th school year ≥ 45.

[b] Credit hours taken = credit hours enrolled - credit hours withdrawn.

Table D17
Estimated HOPE Effect on Intertemporal Substitution
Typical Students, 1990 and 95 Classes
(Robust Standard Errors in Parentheses)

Variables	1st-Year	2nd-Year	3rd-Year
A. Probability of Taking Full-Load[a]			
$GA \cdot H$	-0.109	0.030	-0.038
	(0.046)	(0.056)	(0.058)
R^2	0.195	0.180	0.178
B. Annual Credit Hours Taken[b]			
$GA \cdot H$	-1.745	1.732	0.292
	(0.678)	(1.080)	(1.286)
R^2	0.206	0.206	0.212
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	6,977	6,226	5,706

[a] $y_{it} = 1$ if credits taken in the t-th school year ≥ 45.

[b] Credit hours taken = credit hours enrolled - credit hours withdrawn.

Table D18
Estimated HOPE Effect on Summer Course Taking
by Year in School
Typical Students, 1990 and 95 Classes
(Robust Standard Errors in Parentheses)

Variables	2nd-Year[a]	3rd-Year	4th-Year
A. Probability of Taking Summer Credits[b]			
$GA \cdot H$	0.098	0.032	-0.002
	(0.047)	(0.057)	(0.061)
R^2	0.176	0.173	0.169
B. Credit Hours Taken in Summer[c]			
$GA \cdot H$	1.649	0.914	-0.338
	(0.457)	(0.571)	(0.664)
R^2	0.173	0.169	0.177
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	6,226	5,706	5,541

[a] The summer quarter in the second year is the summer immediately following the first academic year, which is the first summer at UGA for typical students, since the academic year runs from the summer to the next spring term.

[b] $y_{it} = 1$ if credits taken in the summer of the t-th school year > 0.

[c] Summer credit hours taken = summer credit hours enrolled - summer credit hours withdrawn.

Table D19
Estimated HOPE Effect on
Credit Hours Enrolled, Withdrawn and Taken in Each Core Curriculum Area[a]
Typical First-Year Students[b], 1989-97 Classes
(Robust Standard Errors in Parentheses)

	Enrolled Hours			Withdrawn Hours			Taken Hours		
Variables	I	II	III	I	II	III	I	II	III
$GA \cdot H$	-0.438	-0.222	0.437	0.136	0.409	0.103	-0.573	-0.631	0.334
	(0.310)	(0.286)	(0.308)	(0.087)	(0.101)	(0.080)	(0.306)	(0.285)	(0.310)
GA	-0.350	0.012	-0.372	-0.129	-0.145	0.134	-0.221	0.156	-0.506
	(0.454)	(0.444)	(0.481)	(0.162)	(0.161)	(0.143)	(0.460)	(0.446)	(0.491)
$FEMALE$	0.945	-1.373	-0.408	-0.075	-0.175	0.036	1.020	-1.198	-0.443
	(0.090)	(0.092)	(0.095)	(0.025)	(0.034)	(0.024)	(0.090)	(0.091)	(0.095)
$ASIAN$	-1.121	0.384	-1.719	0.226	-0.038	-0.021	-1.347	0.422	-1.698
	(0.243)	(0.274)	(0.262)	(0.090)	(0.093)	(0.067)	(0.247)	(0.269)	(0.259)
$BLACK$	-0.951	0.057	-2.147	-0.101	-0.268	-0.124	-0.850	0.326	-2.023
	(0.170)	(0.177)	(0.182)	(0.048)	(0.066)	(0.046)	(0.171)	(0.173)	(0.181)
$HISPN$	-0.340	-0.067	-1.926	-0.044	-0.242	0.117	-0.296	0.174	-2.043
	(0.539)	(0.488)	(0.497)	(0.122)	(0.160)	(0.140)	(0.541)	(0.476)	(0.512)
$OTHER$	-0.360	-0.480	-1.343	0.178	0.016	-0.099	-0.539	-0.496	-1.244
	(0.469)	(0.434)	(0.415)	(0.147)	(0.164)	(0.110)	(0.481)	(0.433)	(0.406)
$HSGPA$	-0.006	2.447	0.570	-0.363	-0.418	-0.276	0.357	2.865	0.846
	(0.111)	(0.111)	(0.120)	(0.034)	(0.040)	(0.032)	(0.111)	(0.110)	(0.119)
$SATV$	0.935	-1.203	0.224	0.042	0.027	-0.110	0.892	-1.229	0.334
	(0.072)	(0.071)	(0.075)	(0.020)	(0.025)	(0.019)	(0.071)	(0.070)	(0.074)
$SATM$	-0.691	1.036	-0.635	0.037	-0.286	0.035	-0.728	1.323	-0.670
	(0.081)	(0.082)	(0.085)	(0.023)	(0.029)	(0.023)	(0.081)	(0.080)	(0.084)
Class Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.162	0.147	0.175	0.105	0.107	0.089	0.159	0.161	0.182
N	22,802	22,802	22,802	22,802	22,802	22,802	22,802	22,802	22,802

[a] Number of credit hours (i) enrolled, (ii) withdrawn, or (iii) taken by a typical first-year student in each general core curriculum area: (1) AREA I–Humanities and Fine Arts, (2) AREA II–Mathematics and Natural Sciences, and (3) AREA III–Social Sciences. Note that (iii) = (i) − (ii).

[b] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

Table D20
Estimated HOPE Effect on Intertemporal Substitution of Core Course Taking
by General Core Curriculum Area[a]
Typical First- and Second-Year Students[b], 1989-97 Classes
(Robust Standard Errors in Parentheses)

	1st-Year			2nd-Year		
Variables	I	II	III	I	II	III
A. Credit Hours Enrolled						
$GA \cdot H$	-0.438	-0.222	0.437	0.861	-0.312	-0.012
	(0.310)	(0.286)	(0.308)	(0.426)	(0.371)	(0.359)
R^2	0.162	0.147	0.175	0.146	0.126	0.139
B. Credit Hours Withdrawn						
$GA \cdot H$	0.136	0.409	0.103	0.261	0.250	0.056
	(0.087)	(0.101)	(0.080)	(0.105)	(0.133)	(0.103)
R^2	0.105	0.107	0.089	0.121	0.104	0.095
C. Credit Hours Taken[c]						
$GA \cdot H$	-0.573	-0.631	0.334	0.600	-0.563	-0.068
	(0.306)	(0.285)	(0.310)	(0.416)	(0.355)	(0.351)
R^2	0.159	0.161	0.182	0.143	0.127	0.136
Class Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Residency	Yes	Yes	Yes	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	22,802	22,802	22,802	16,529	16,529	16,529

[a] General core courses are decomposed into three areas: (1) AREA I–Humanities and Fine Arts, (2) AREA II–Mathematics and Natural Sciences, and (3) AREA III–Social Sciences.

[b] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

[c] Credit hours taken = Credit hours enrolled − Credit hours withdrawn.

Table D21
Estimated HOPE Effect on
Summary Course Taking in Each Core Curriculum Area[a]
Typical Second-Year Students, 1989-96 Classes
(Robust Standard Errors in Parentheses)

Variables	I	II	III
A. Summer Course Enrollment			
$GA \cdot H$	0.040	0.006	0.026
	(0.015)	(0.014)	(0.014)
R^2	0.087	0.088	0.093
B. Summer Course Withdrawal			
$GA \cdot H$	-0.001	0.001	0.002
	(0.003)	(0.004)	(0.004)
R^2	0.067	0.132	0.068
C. Summer Course Completion			
$GA \cdot H$	0.039	0.005	0.027
	(0.015)	(0.014)	(0.013)
R^2	0.084	0.084	0.092
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	22,802	22,802	22,802

[a] Probability that a student (i) enrolls in, (ii) withdraws from, or (iii) takes a course in each core curriculum area during the summer in the second year;
(i) $y_{it} = 1$ if summer credits enrolled in each area > 0.
(ii) $y_{it} = 1$ if summer credits withdrawn in each area > 0.
(iii) $y_{it} = 1$ if summer credits taken in each area > 0,
where credits taken = credits enrolled − credits withdrawn.
Note 1: The summer quarter in the second year is the summer immediately following the first academic year, which is the first summer at UGA for typical students, since the academic year runs from the summer to the next spring term.
Note 2: AREA I–Humanities and Fine Arts; AREA II–Mathematics and Natural Sciences; and AREA III–Social Sciences.

Table D22
Estimated HOPE Effect on
Summer Credit Hours in Each Core Curriculum Area[a]
Typical Second-Year Students, 1989-96 Classes
(Robust Standard Errors in Parentheses)

Variables	I	II	III
A. Summer Credits Enrolled			
$GA \cdot H$	0.178	0.044	0.178
	(0.097)	(0.085)	(0.088)
R^2	0.088	0.089	0.090
B. Summer Credits Withdrawn			
$GA \cdot H$	-0.006	0.015	0.006
	(0.016)	(0.022)	(0.020)
R^2	0.090	0.124	0.065
C. Summer Credits Taken			
$GA \cdot H$	0.184	0.029	0.172
	(0.093)	(0.081)	(0.086)
R^2	0.085	0.084	0.091
Class Year Effects	Yes	Yes	Yes
Residency	Yes	Yes	Yes
Gender and Race	Yes	Yes	Yes
HS Achievements	Yes	Yes	Yes
HS Fixed Effects	Yes	Yes	Yes
N	22,802	22,802	22,802

[a] Number of credit hours (i) enrolled, (ii) withdrawn, or (iii) taken in each general core curriculum area during the summer quarter in the second year.
Note 1: (iii) = (i) − (ii).
Note 2: AREA I–Humanities and Fine Arts, AREA II–Mathematics and Natural Sciences, and AREA III–Social Sciences.
Note 3: The summer quarter in the second year is the summer immediately following the first academic year, which is the first summer at UGA for typical students, since the academic year runs from the summer to the next spring term.

Table D23
Estimated HOPE Effect on Major Choice[a]
by Individual Characteristics
Typical First-Year Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

	(1)[b]	(2)[b]	(3)[b]	(4)[b]	(5)[b]	(6)[b]
On Average[c]						
Average Student	0.000	-0.001	-0.017	0.012	0.000	0.007
	(0.012)	(0.012)	(0.015)	(0.006)	(0.008)	(0.017)
Gender						
Female	-0.002	-0.002	-0.015	0.019	-0.001	0.002
	(0.013)	(0.011)	(0.012)	(0.010)	(0.008)	(0.017)
Male	0.001	0.001	-0.020	0.006	0.001	0.011
	(0.011)	(0.014)	(0.018)	(0.003)	(0.008)	(0.017)
Race						
White	0.000	-0.001	-0.018	0.013	0.000	0.006
	(0.012)	(0.011)	(0.015)	(0.007)	(0.009)	(0.017)
Asian	0.000	-0.001	-0.012	0.005	0.000	0.009
	(0.010)	(0.019)	(0.012)	(0.003)	(0.003)	(0.019)
Black	0.000	0.001	-0.017	0.007	0.000	0.009
	(0.010)	(0.020)	(0.016)	(0.003)	(0.004)	(0.017)
Hispanic	0.001	0.000	-0.015	0.005	0.000	0.009
	(0.013)	(0.017)	(0.014)	(0.003)	(0.007)	(0.017)
Others	-0.001	-0.002	-0.010	0.009	0.000	0.005
	(0.015)	(0.016)	(0.009)	(0.005)	(0.005)	(0.018)

[a] Probability of choosing major j ($j = 1, \ldots, 6$) in the first quarter at UGA.

[b] (1) Fine Arts, Humanities and Social Sciences; (2) Math and Sciences; (3) Business; (4) Education; (5) Other Majors; (6) Unspecified Arts and Sciences.

[c] HOPE effects (i.e., interaction effects between HOPE-period and GA-residency dummies) computed based on logit estimates in Table D24 and at the means of the independent variables in the model (0.575 for $FEMALE$, 0.028 for $ASIAN$, 0.088 for $BLACK$, 0.009 for $HISPN$, 0.008 for $OTHER$, 3.258 for $HSGPA$, 5.961 for $SATV$, 5.754 for $SATM$, 3.919 for AP and 0.084 for high-school weights. Note that $SATV$ and $SATM$ are in 100 points).

Table D24
Multinomial Logit Estimates for Major Choice
Typical First-Year Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

	Unspecified Arts and Sciences vs.				
Variables	(1)[a]	(2)[a]	(3)[a]	(4)[a]	(5)[a]
$GA \cdot H$	-0.031	-0.032	-0.137	0.168	-0.061
	(0.100)	(0.112)	(0.101)	(0.153)	(0.141)
H	-0.020	0.148	-0.163	0.221	0.518
	(0.091)	(0.106)	(0.095)	(0.144)	(0.132)
GA	-0.238	0.039	-0.089	0.086	0.066
	(0.074)	(0.087)	(0.074)	(0.115)	(0.111)
$FEMALE$	0.193	-0.396	-0.580	1.168	-0.188
	(0.041)	(0.039)	(0.036)	(0.068)	(0.052)
$ASIAN$	-0.356	0.477	-0.412	-1.165	-1.214
	(0.125)	(0.089)	(0.107)	(0.229)	(0.221)
$BLACK$	-0.185	0.859	0.208	-0.599	-0.778
	(0.078)	(0.061)	(0.068)	(0.097)	(0.108)
$HISPN$	0.087	0.581	0.027	-0.907	-0.140
	(0.179)	(0.167)	(0.192)	(0.395)	(0.264)
$OTHER$	0.111	0.343	-0.714	-0.470	-0.811
	(0.178)	(0.177)	(0.245)	(0.343)	(0.351)
$HSGPA$	0.025	0.989	1.250	0.354	0.116
	(0.046)	(0.048)	(0.043)	(0.067)	(0.067)
$SATV$	0.550	-0.090	-0.041	-0.115	-0.176
	(0.029)	(0.029)	(0.027)	(0.041)	(0.040)
$SATM$	-0.042	0.579	0.724	-0.092	0.091
	(0.037)	(0.034)	(0.033)	(0.052)	(0.047)
AP	0.010	-0.002	-0.052	-0.034	-0.017
	(0.003)	(0.003)	(0.003)	(0.006)	(0.005)
HS Weights	Yes	Yes	Yes	Yes	Yes
Scaled R^2			0.173		
Likelihood Ratio			5,650.14		
N			30,679		

[a] (1) Fine Arts, Humanities and Social Sciences; (2) Math and Sciences; (3) Business; (4) Education; (5) Other Majors.

Table D25
Marginal Effects[a] in Multinomial Logit Model of Major Choice
Typical First-Year Students, 1989-97 Classes
(Robust Standard Errors in Parentheses)

Variables	(1)[b]	(2)[b]	(3)[b]	(4)[b]	(5)[b]	(6)[b]
H	-0.008	0.016	-0.052	0.018	0.031	-0.005
	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.006)
GA	-0.030	0.011	-0.021	0.012	0.006	0.022
	(0.006)	(0.006)	(0.007)	(0.003)	(0.004)	(0.009)
$FEMALE$	0.037	-0.045	-0.087	0.064	-0.007	0.038
	(0.004)	(0.005)	(0.005)	(0.003)	(0.003)	(0.006)
$ASIAN$	-0.030	0.115	-0.046	-0.036	-0.049	0.046
	(0.011)	(0.015)	(0.011)	(0.004)	(0.005)	(0.018)
$BLACK$	-0.037	0.148	0.014	-0.029	-0.045	-0.051
	(0.007)	(0.011)	(0.010)	(0.003)	(0.003)	(0.011)
$HISPN$	0.000	0.094	-0.010	-0.034	-0.014	-0.035
	(0.020)	(0.027)	(0.024)	(0.008)	(0.013)	(0.030)
$OTHER$	0.028	0.077	-0.083	-0.017	-0.037	0.033
	(0.022)	(0.028)	(0.019)	(0.012)	(0.011)	(0.034)
$HSGPA$	-0.050	0.088	0.149	-0.002	-0.020	-0.165
	(0.005)	(0.006)	(0.006)	(0.003)	(0.004)	(0.007)
$SATV$	0.070	-0.019	-0.013	-0.008	-0.015	-0.015
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.005)
$SATM$	-0.034	0.055	0.090	-0.016	-0.008	-0.087
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.006)
AP	0.003	0.001	-0.007	-0.001	0.000	0.005
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
HS Weights	Yes	Yes	Yes	Yes	Yes	Yes
Scaled R^2			0.173			
Likelihood Ratio			5,650.14			
N			30,679			

[a] Marginal effects are calculated at the means of independent variables (see footnote b in Table D23). Note that the marginal effect of each dummy variable (e.g., GA and $ASIAN$) is for a discrete change of each dummy variable from 0 to 1.

[b] (1) Fine Arts, Humanities and Social Sciences; (2) Math and Sciences; (3) Business; (4) Education; (5) Other Majors; (6) Unspecified Arts and Sciences.

Appendix E

Figures

List of Figures

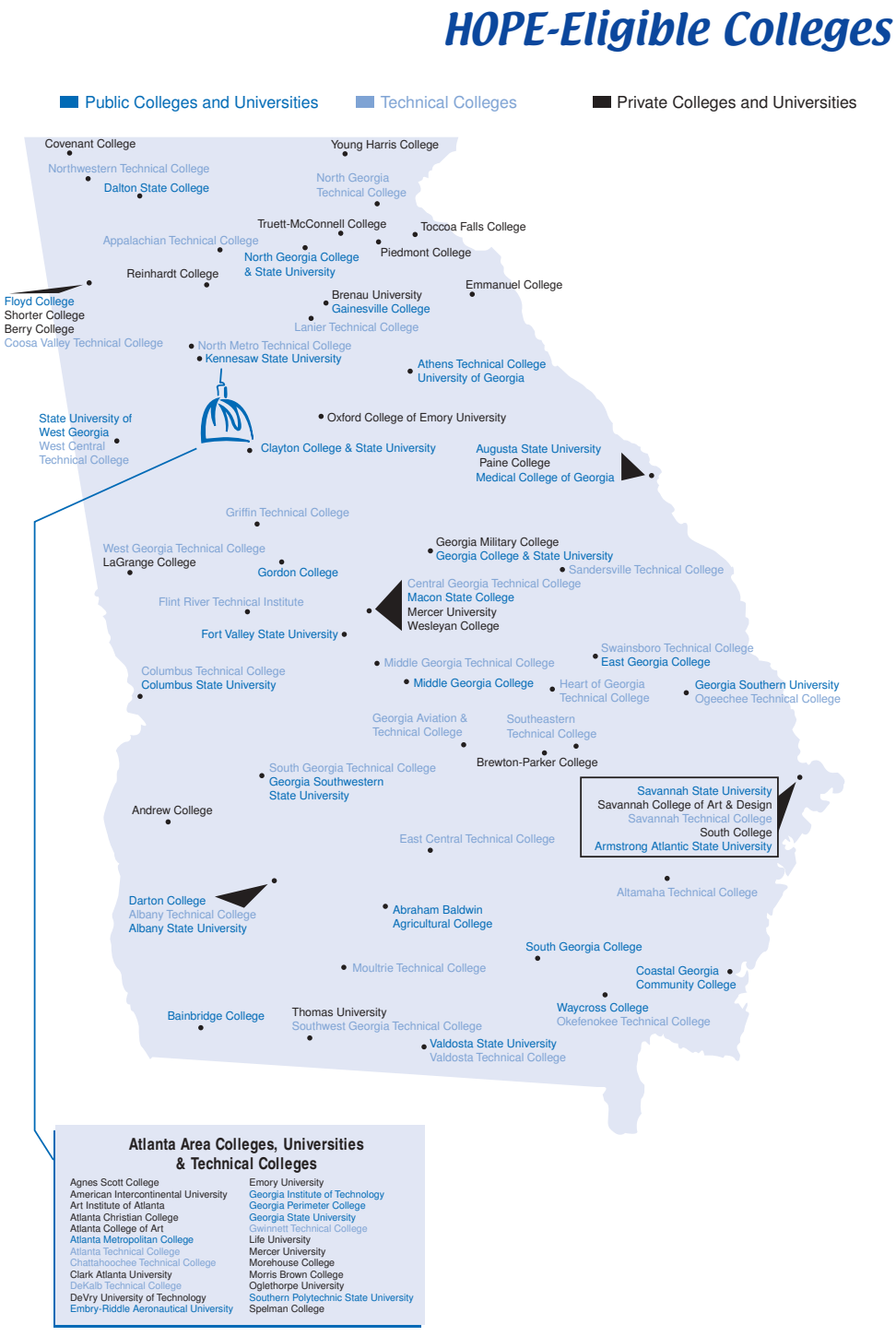
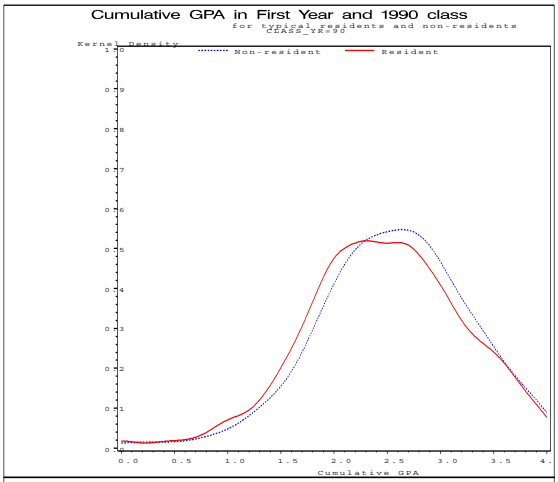
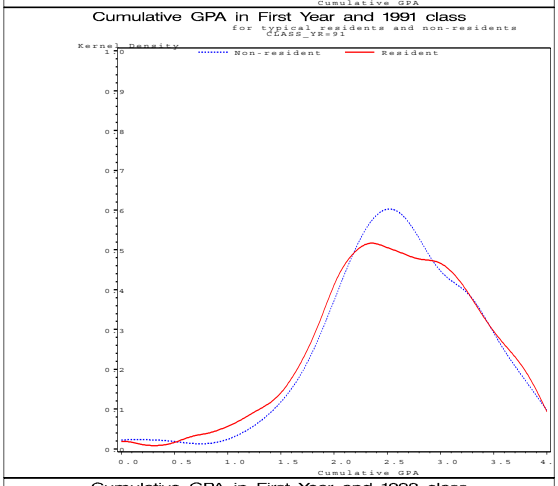
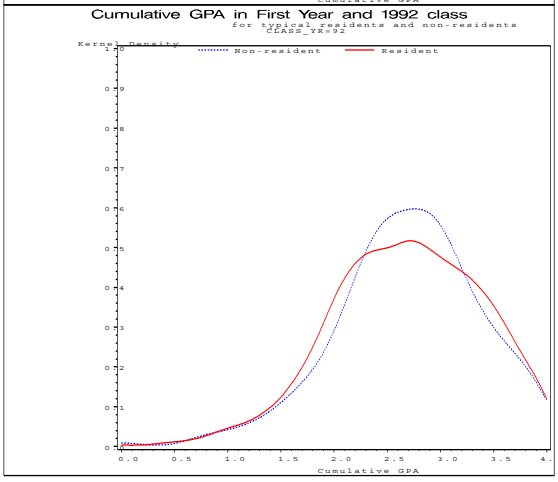
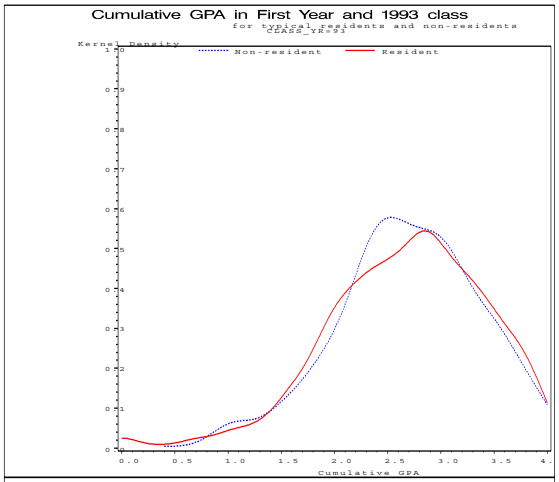


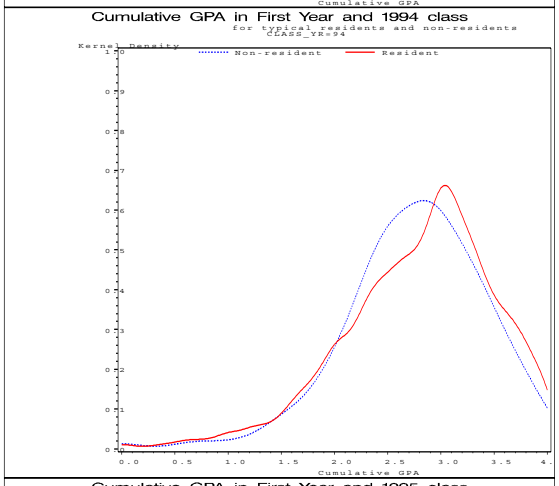
Figure 1. HOPE-Eligible Postsecondary Institutions in Georgia

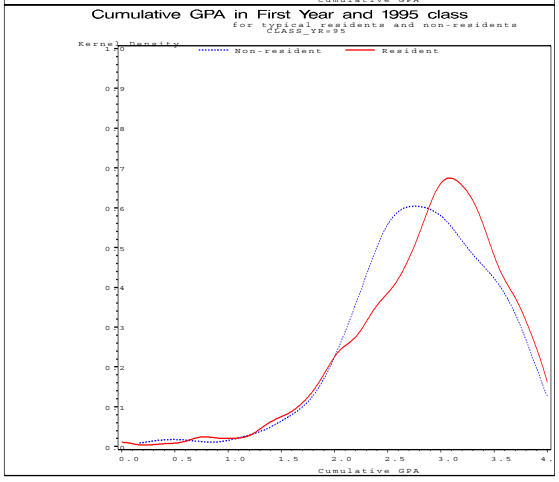








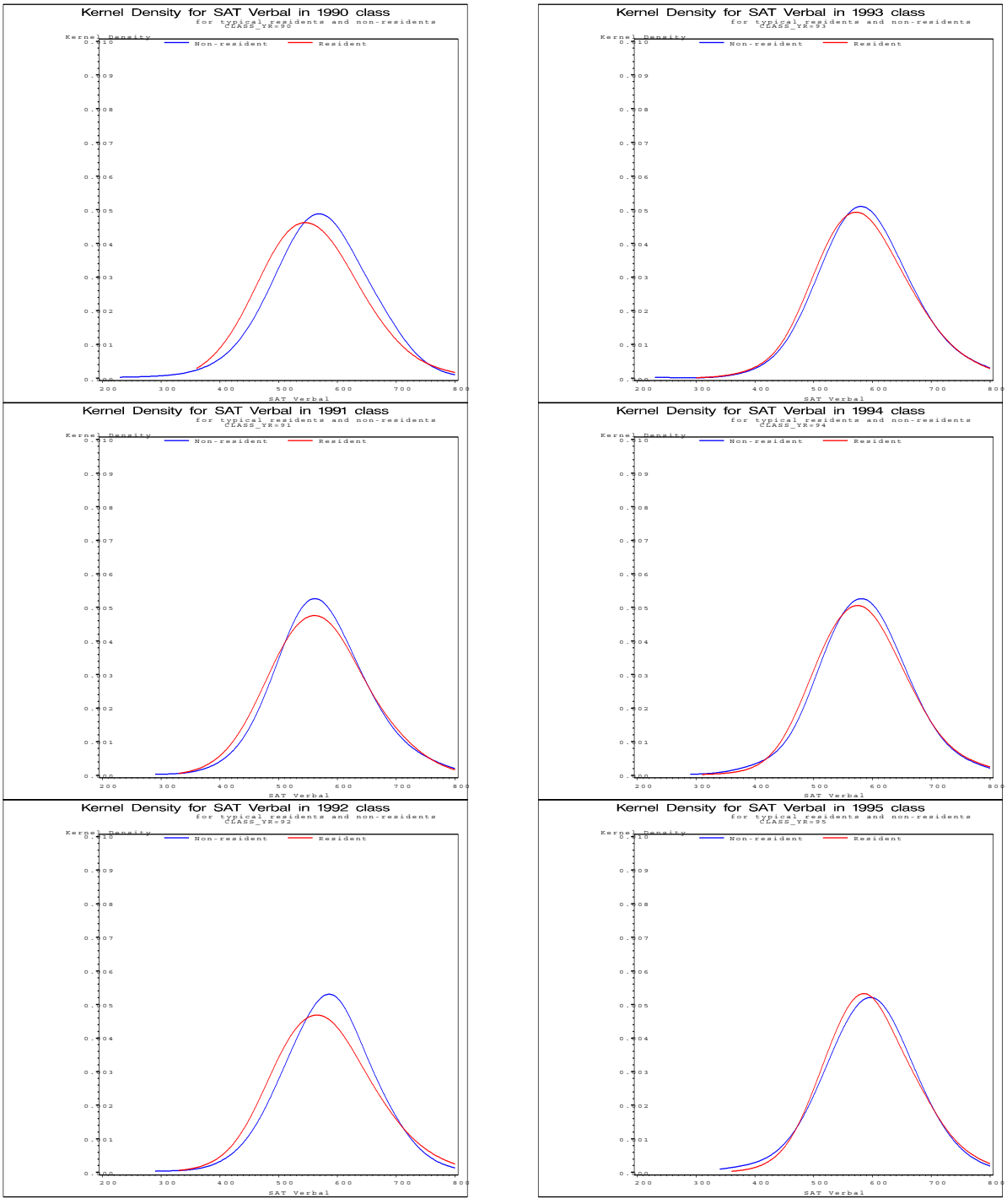




(a) Pre-HOPE

(b) Post-HOPE

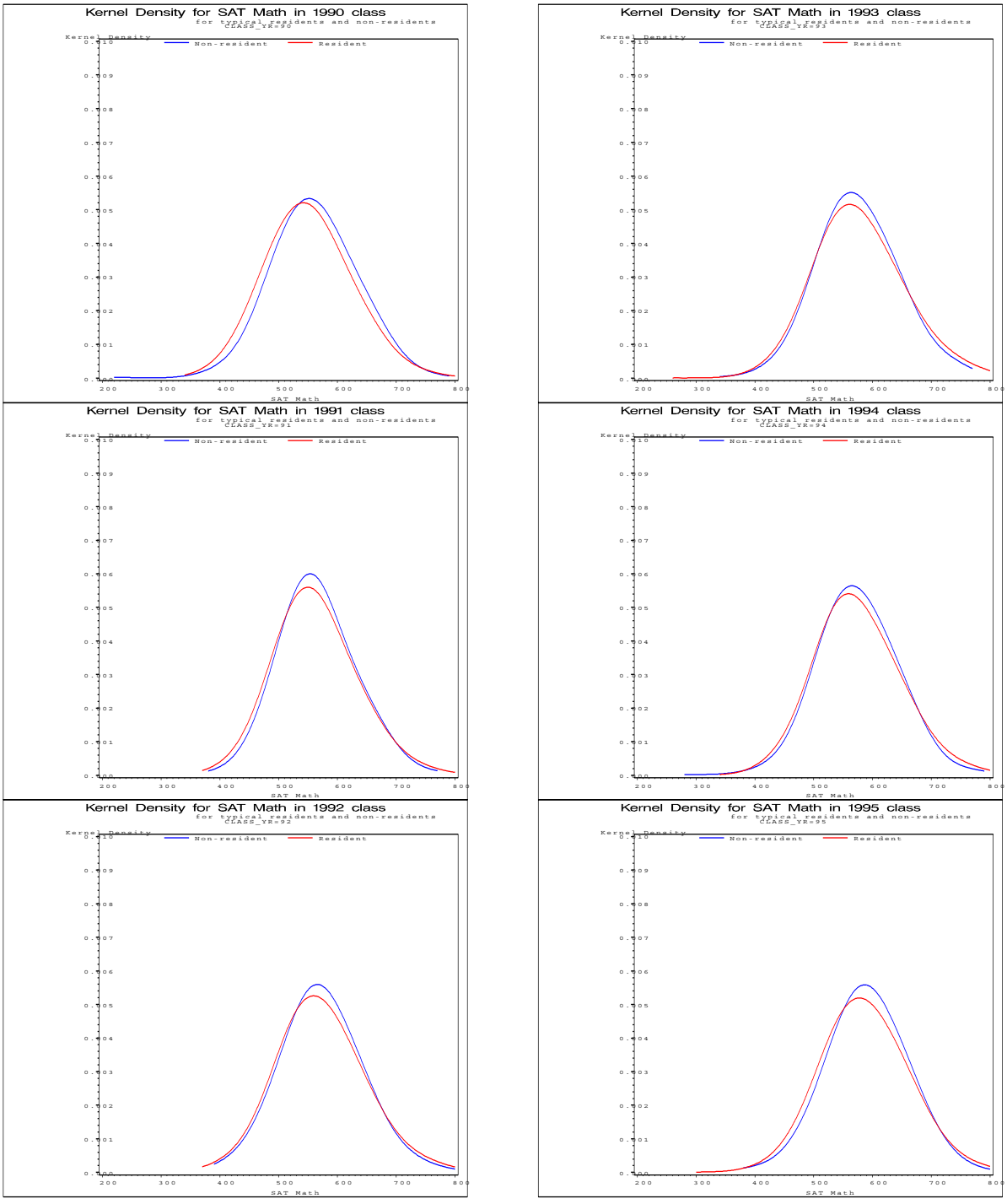
Figure 2. Cumulative GPA Distributions of Typical First-Year Students, Residents vs. Non-residents, 1990-95 Classes



(a) Pre-HOPE

(b) Post-HOPE

Figure 3. SAT Verbal Score Distributions of Typical FTF, Residents vs. Non-residents, 1990-95 Classes



(a) Pre-HOPE

(b) Post-HOPE

Figure 4. SAT Math Score Distributions of Typical FTF, Residents vs. Non-residents, 1990-95 Classes

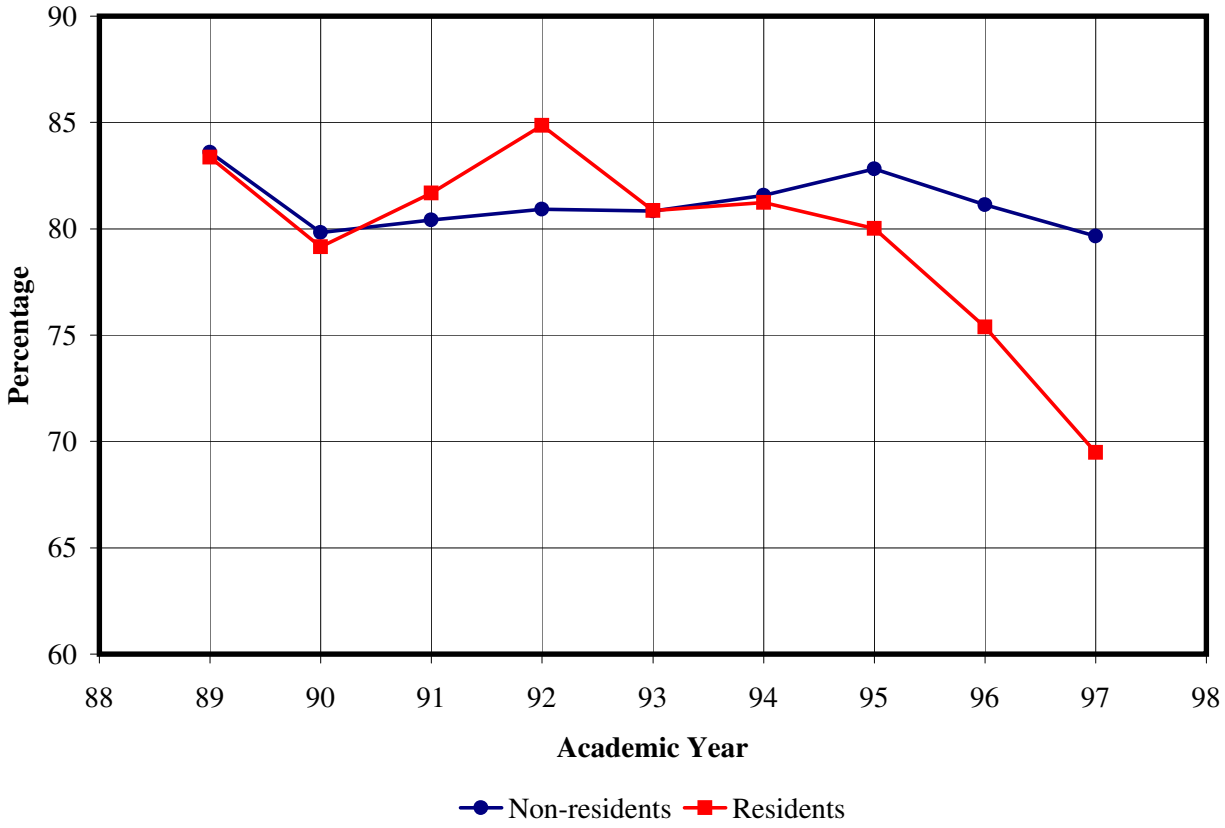


Figure 5. Percentage of Typical First-Year Students[a] Enrolling in Full Loads,[b] Residents vs. Non-residents, 1989-97 Classes

[a] "Typical first-year students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school, and are in their first year of UGA attendance.

[b] 15 credit hours per term and thus 45 credit hours per academic year are considered a full load.

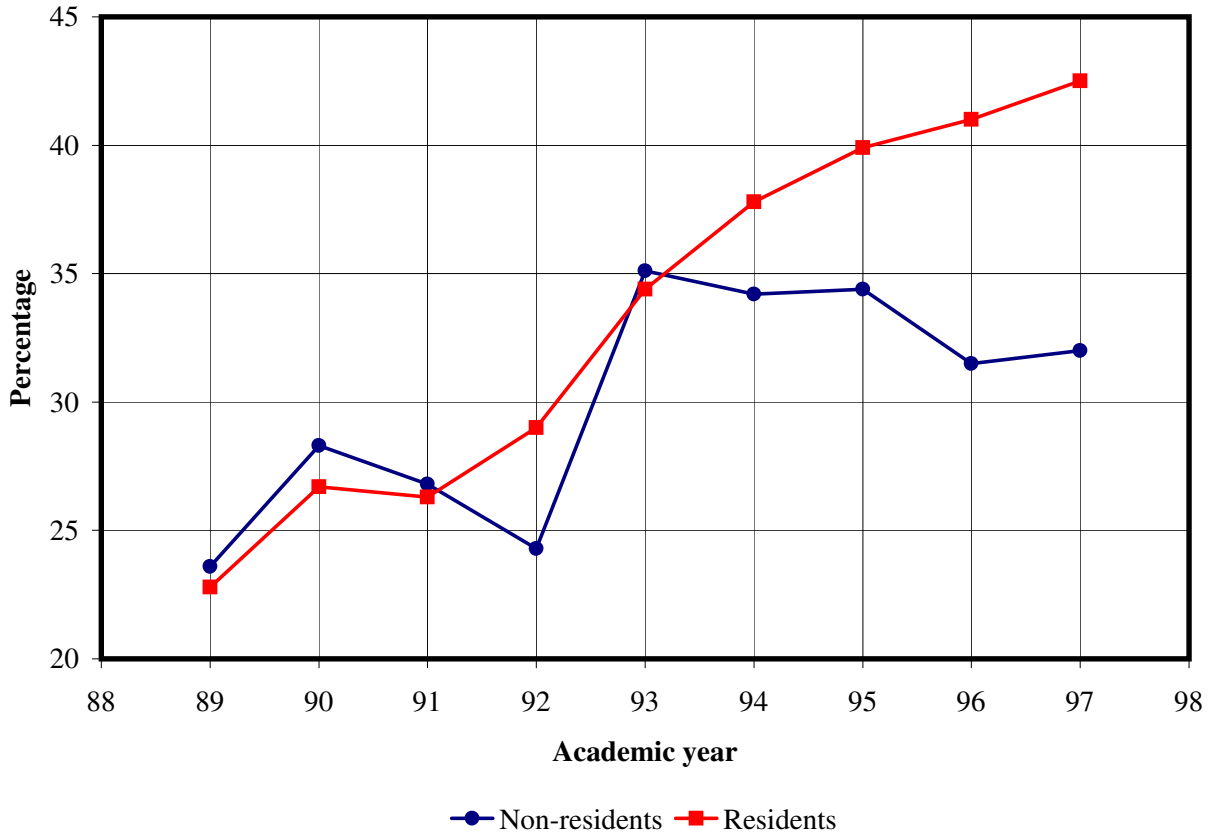


Figure 6. Percentage of Typical First-Year Students Withdrawing from a Course,[a] Residents vs. Non-residents, 1989-97 Classes

[a] "Typical first-year students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school, and are in their first year of UGA attendance.

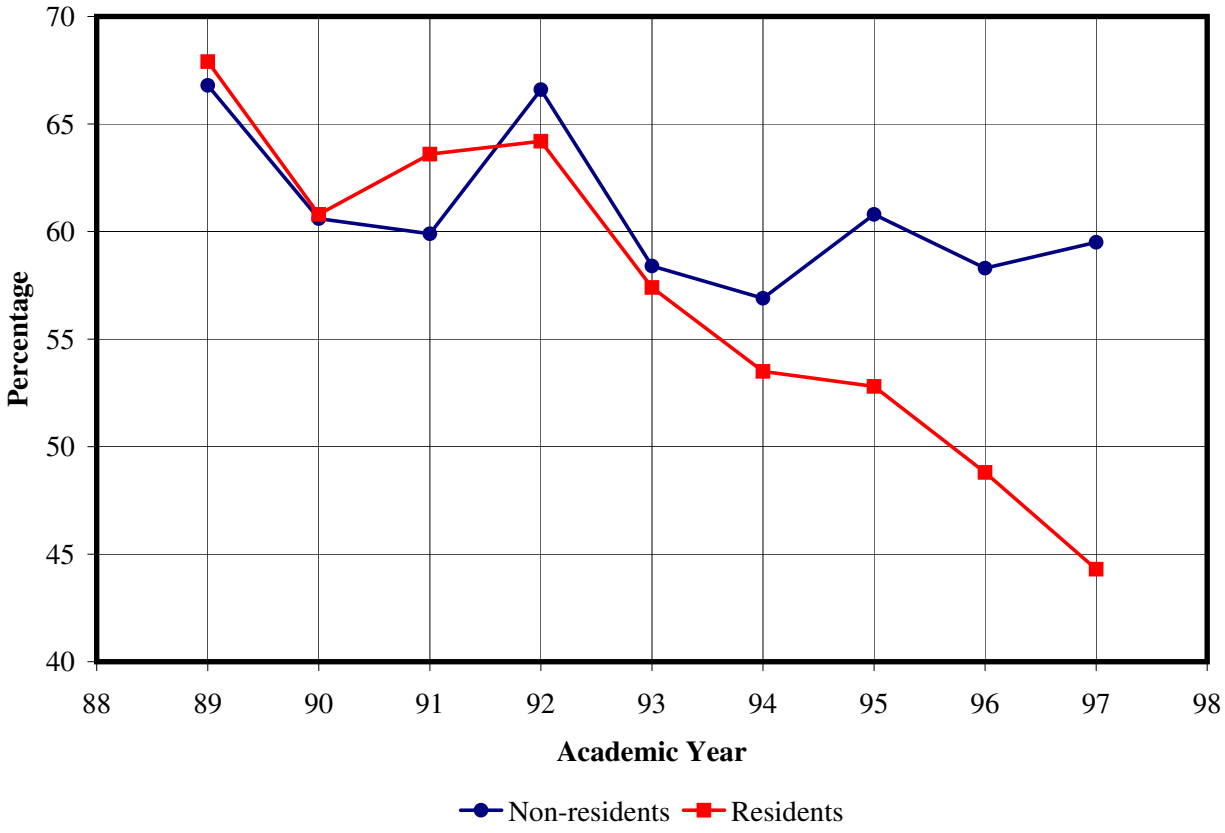


Figure 7. Percentage of Typical First-Year Students[a] Taking Full Loads,[b] Residents vs. Non-residents, 1989-97 Classes

[a] "Typical first-year students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school, and are in their first year of UGA attendance.

[b] 15 credit hours per term and thus 45 credit hours per academic year are considered a full load. Note that credit hours taken = credit hours enrolled − credit hours withdrawn.

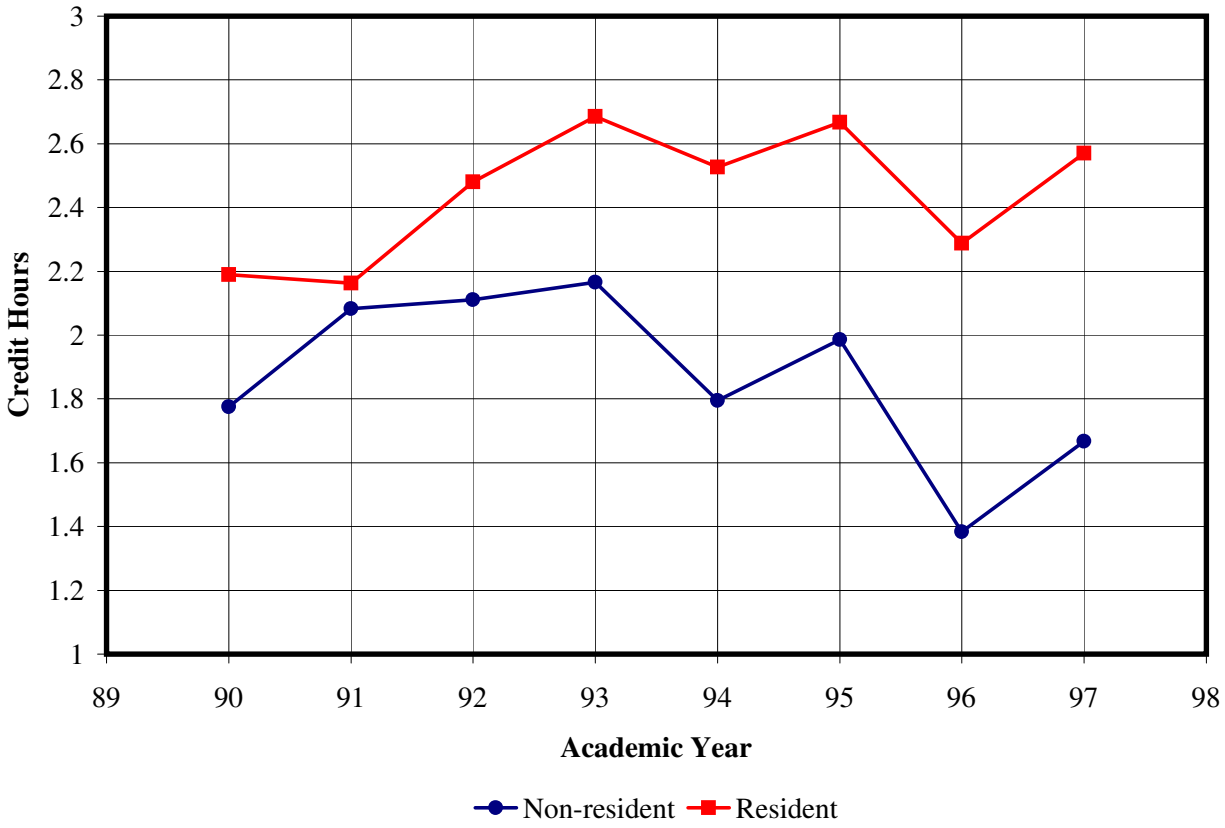


Figure 8. Mean Credit Hours Taken in the First Summer[a] by Typical Students,[b] Residents vs. Non-residents, 1989-96 Classes

[a] The summer quarter in the second year which is the summer immediately following the first academic year, is the first summer at UGA for typical students, since the academic year runs from the summer to the next spring term. For instance, the summer term in 1990 academic year is the first summer for the 1989-class of typical students, that is, those who matriculated in the fall term of 1989.

[b] "Typical students" refer to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

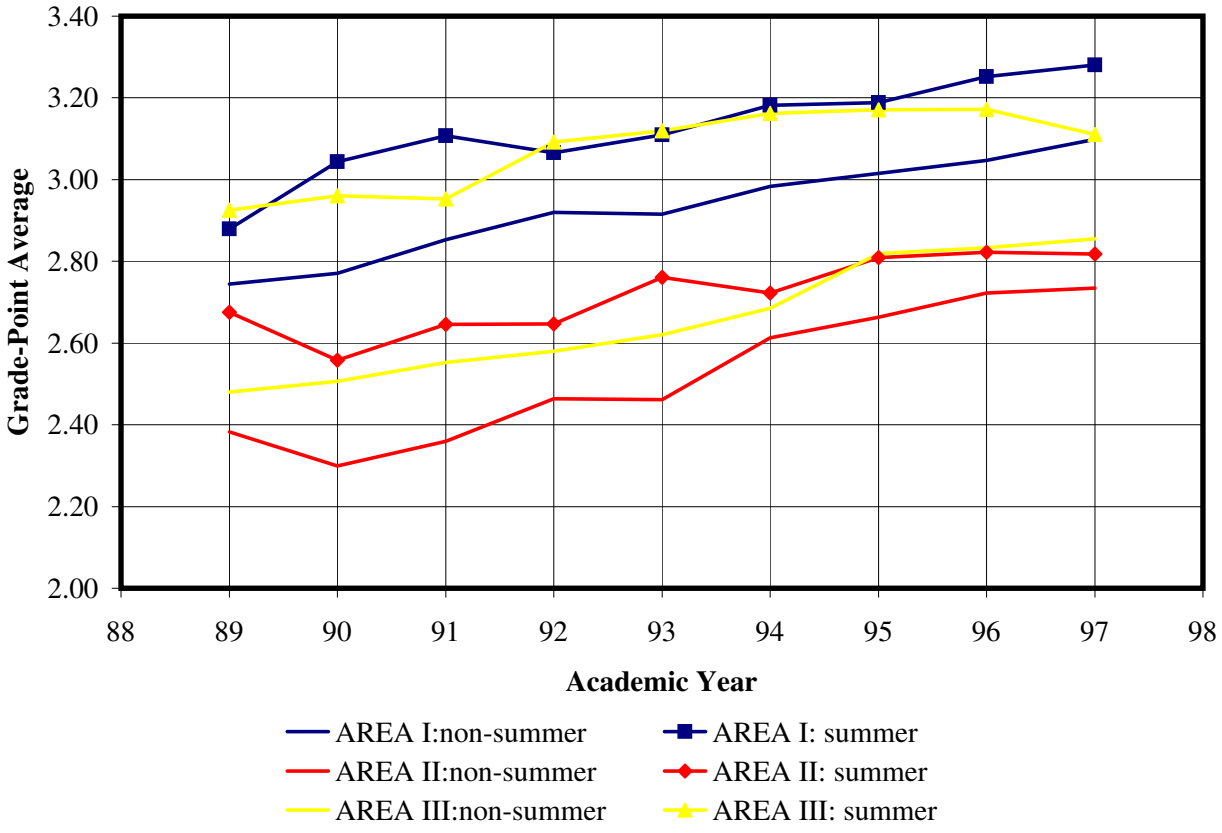


Figure 9. Mean Grade Point of Typical Students[a] in Core Curriculum Areas,[b] Summer vs. Non-summer, 1989-97 Academic Years

[a] "Typical students" refers to those who matriculate at UGA in the fall term of the same year as they graduate from high school.

[b] General core curriculum is composed of three areas: (1) AREA I–Humanities and Fine Arts, (2) AREA II–Mathematics and Natural Sciences, and (3) AREA III–Social Sciences.