

Hope for the Pell? The Impact of Merit-Aid on Needy Students

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Abstract: Prior empirical evidence finds that merit-aid programs such as the Georgia Hope Scholarship yield large and significant enrollment effects, whereas need-based aid programs such as the Pell Grant yield modest and often insignificant enrollment effects. This paper uses unpublished panel data on the number and level of Pell awards at Southern universities along with detailed institutional data from the National Center of Educational Statistics to examine whether the Georgia Hope Scholarship improved the college access of needy students relative to other Southern states. Fixed-effect analyses show that large increases in merit aid improve college access of needy students and leverage Hope Scholarship funds with greater federal Pell assistance. Whereas most institution-specific increases in both Pell enrollment and funding are found for two-year and less selective, four-year institutions, the results also suggest that Pell students are not crowded out of more selective schools by Hope's intent to retain the best Georgia high-school students.

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In 1972, the Federal government began the Pell grant program that from the outset has been the single largest provider of need-based grant aid in the United States. For example, in 1999-2000, the Pell program disbursed over 7.5 billion in grants that provided at least some level of support to roughly one quarter of all U.S. college students. However, over the last several decades Pell grants have also become a decreasing share of the average financial aid package, in part, because the federally mandated maximum Pell grant has not kept pace with tuition growth that has far exceeded the rate of inflation (Li, 1999; Ehrenberg, 2000). Thus, there are concerns among university administrators and policy makers regarding the access of financially-needy students to higher education because they are increasingly relying on loans in order to finance their college education (e.g., McPherson, 1998; Duffy and Goldberg, 1998, Dynarski, 2003).

At the same time, state governments and universities have begun to place greater emphasis on non-need-based aid in an attempt to attract and retain the best students (e.g., McPherson and Shapiro, 1994). A prominent example is the Georgia Hope Scholarship that began in 1993 and uses the state lottery to fund college scholarships for students who graduate from a Georgia high school with a 'B' average or better. The Hope Scholarship covers tuition, fees and book expenses for all eligible high-school graduates attending Georgia public post-secondary institutions and a fixed payment comparable to the value of the subsidy received by public school enrollees at private institutions. As of 2002, similar scholarship programs have become available in 11 states and are a substantial source of financial aid for students in these states. For example, in 2001, the Georgia Hope Scholarship dispensed over \$277 million dollars in aid to

nearly 75,000 students. The increasing reliance on these non-need-based programs has further heightened the concern regarding college access of needy students, as prior research demonstrates that it is the academically and financially able student who, having a larger choice set of universities, can take relative advantage of non-need-based aid (e.g., Singell and Stone, 2002). In addition, the Hope Scholarship program places greater requirements on needy students who must apply for federal aid in order to be eligible for Hope.

Despite the size of the Pell program and the significant changes in the environment facing the needy students targeted by these resources, there is a paucity of formal evidence regarding the types of institutions that Pell recipients attend and how the movement towards non-need-based aid has affected their access to a college education (e.g., Balderston, 1997; Clotfelter, 2004). As such, we exploit a unique natural experiment arising from the Georgia merit-based scholarship initiative to examine how an increased emphasis on non-need-based aid affects the access of Pell recipients to a college education. Our empirical analysis uses unpublished data on Pell recipients and revenue at Southern institutions along with detailed data from National Center for Educational Statistics (NCES) and its Integrated Post-secondary Education Data System (IPEDS) for the years 1988 to 1997 to estimate the impact of merit aid on needy students in Georgia and surrounding states following the introduction of the Hope Scholarship. Specifically, a difference in difference approach is used to examine how the number of Pell recipients, along with per student and total Pell awards, change across institutions after the introduction of Hope controlling for time-varying institution and state-specific factors and institution-specific fixed effects.

Our results provide the first formal evidence that the number of Pell recipients increased at all institutions in Georgia after Hope, indicating that broad merit-based scholarship programs

improve college access for needy students. In addition, the average, per-student Pell award is found to be lower at Georgia institutions after Hope versus in other Southern universities, suggesting that the requirement that needy Hope recipients apply for Federal aid draws students of “lesser” need into the Pell program. Moreover, we find that total Pell expenditures increase in Georgia relative to other Southern institutions after Hope, which suggests that broad merit aid programs are effective at leveraging scholarships with greater Federal funding paid to needy students who may have not otherwise attended college. Although the findings indicate that institution-level increases in Pell-student enrollments and Pell aid occur largely at two-year and less-selective four-year institutions, the Hope Scholarship program is not found to crowd needy students out of more selective institutions by encouraging the most financially and academically able students to remain in the state.

1. Background and Contributions

Students who received federal financial aid are relatively financially needy. Specifically, 90 percent of student participants in the two largest federal aid programs, the Stafford Loan and the Pell Grant, have family incomes below \$40,000 (National Center for Education Statistics, Table 314, 1998). In order for a student to receive federal financial aid, a student must complete a Free Application for Federal Aid (FAFSA) form, which permits a calculation of the expected family contribution that determines the level of the Pell grant. The family contribution depends on a variety of factors including family income and wealth, the number of siblings in college, and tuition. There is a minimum and maximum award for qualifying students. For example, in 2001 the minimum Pell award was \$400 and the maximum was \$3750. The Pell award is also capped as a percentage of tuition. Specifically, the Pell grant was capped at 50 percent of tuition between 1973 and 1984, 60 percent of tuition between 1985 and 1993, and at 100 percent of

tuition thereafter. Thus, the Pell grant follows a student to their college of choice and can vary (up to the cap) across schools depending on tuition.

Several studies have examined whether the Pell program improved college access of needy students. For example, Hansen (1983) uses data from the CPS and the NLSY for high- and low-income, college-age persons before and after the introduction of the Pell program in 1973 to estimate a difference-in-difference analysis for students who did and did not qualify for the Pell grant program. His empirical results indicate no significant increase in the relative college attendance of Pell-eligible individuals after the introduction of the Pell program, suggesting that the Pell grant does not significantly impact college access for the marginal, low-income student. Alternatively, our paper provides empirical evidence that the number of Pell students responds to financial factors including merit aid and tuition.

Kane (1995) replicates the Hansen study using data for women only to minimize the potential biases from the Vietnam War on the college attendance of young men and similarly finds that the introduction of the Pell grant program does not significantly affect the college attendance of young, low-income women. Likewise, Kane (1994) uses CPS data for 18-19-year-old black males and finds that the Pell grant program has no significant effect on the college attendance of disadvantaged African-American youth. Thus, the collective empirical evidence suggests that the Pell grant program does not significantly affect the college-going behavior of low-income youth. Analyzing the enrollment of needy students, we are the first to examine whether merit-based scholarship programs work with or against the access objectives of federal need-based aid programs.

There is some empirical evidence that the Pell program improves access of non-traditional students. Specifically, Kane (1995) finds evidence that the Pell program, while not increasing

enrollment at four-year universities, does increase enrollment at public two-year colleges. Moreover, Seftor and Turner (2002) use variation in the Pell eligibility formula for financially independent students in the late 1980s to show that more generous grant aid increases the college-attendance rate of older students. The larger impact of Pell grants on non-traditional students suggests that college choice may be more dependent on explicit costs than for traditional students who may also weight the consumption value of college in the net benefit calculations of a university degree. We build on this research by examining how tuition and other factors affect the college choice of a well-defined group of needy students.

Alternatively, the empirical research on the Georgia Hope Scholarship indicates that merit-based aid significantly increases college attendance. For example, Cornwell, Mustard and Sridhar (2002) uses IPEDS data to show that the Hope Scholarship increases the college enrollment rate of first-time freshman by roughly 7 percent in Georgia relative to the surrounding states that do not have a merit scholarship. Likewise, Dynarski (2000) uses CPS data on 18-19-year-old youth and finds that the Hope Scholarship increases Georgia student's likelihood of attending college by 7 to 9 percent relative to the treatment group in other southern states. We show, in addition, that Hope does not impact the enrollment of needy students equally across the spectrum of institutional quality.

On the other hand, the empirical evidence also suggests that the enrollment impact of the Hope Scholarship is smaller for relatively needy students. For example, Dynarski (2004) finds that when the enrollment impacts of Hope are estimated separately for white and black students, African-American enrollments do not increase, whereas the white-student enrollment increases by 12 percent. Moreover, Cornwell, Mustard and Sridhar (2002) find that enrollment at four-year institutions increases after Hope, but two-year institutions do not experience a significant

increase in enrollment. Thus, the impact of the merit aid program in Georgia appears to be larger among relatively higher income groups and among institutions that attract relatively well-to-do students. Nonetheless, we find an increase in the number of Pell students attending both two-year and four-year colleges and universities in Georgia relative to other southern states, suggesting that the guarantee of aid and the supplementary aid provided by Hope improves access for Pell-eligible students.

Long (2002) suggests that the smaller response among relatively needy students may arise in part because universities raise tuition, fees and/or room and board in Georgia relative to other southern states after the introduction of Hope Scholarships. We show that Hope yields not only institution-specific enrollment effects through changes in the net price of college but also a broader state-wide, fiscal effect. In particular, our empirical results indicate that, whereas the average Pell award per student falls, total Pell revenues increase at all institutions in Georgia. Thus, large merit-based programs may not only retain the best in-state students but can also increase the number of needy students attending college by leveraging scholarship money with greater federal need-based aid.

2. Empirical Methodology

The advent of Georgia's non-needs-based Hope Scholarship increases the likelihood that any individual in-state high school student receives financial aid toward an investment made in higher education within the State of Georgia. In so doing, the Hope Scholarship lowers the expected cost of attending Georgia colleges and universities for an in-state, high-school student,

all else equal.¹ In an empirical analysis of the effects of the scholarship, then, we expect the scholarship to increase the enrollment of Pell recipients in Georgia.²

Two key dimensions of the program are integral to our current analysis and give birth to a significant and possibly unintended consequence. First, the Georgia Hope Scholarship is merit based, unlike the federal Pell program. There is no calculation made of an expected family contribution and no explicit regard for the financial resources of the college-bound student.³ Considered alone, this enables financially able students to receive scholarships who would normally be excluded from aid based on need. Accordingly, while this lowers the cost of attending college for a 3.0-GPA student remaining in Georgia, it does so more for the financially able student *relative* to one with fewer financial resources who is more likely to qualify for other need-based aid programs. The relative generosity of Hope towards the well to do is magnified by the fact that, during the period of our analysis, students who received a Pell grant experience a dollar-for-dollar reduction in their Hope Scholarship.

Second, the Hope Scholarship is specifically targeted toward the upper tail of in-state high school students, those with grade-point averages at or above 3.0. Thus, Hope lowers the relative cost of attending college for the academically able in-state student who remains in Georgia for

¹ Former Education Secretary William Bennett speculated in a NY Timers article in 1987 that the cost of college may not decrease with Pell grants if colleges and universities raise tuition in response to the government provision aid; However, prior evidence with regard to the Bennett hypothesis is mixed (e.g. 2002; Long, 2002; Rizzo and Ehrenberg 2003, Singell and Stone, 2003). We control for tuition in the estimation procedures that follow, but do not look at the tuition response to the Hope Scholarship.

² In subsequent analysis, we adopt total institutional Pell enrollment as a dependent variable. However, we note upfront that the available Pell-data does not allow an analysis of first-time (or freshmen) Pell awards, which may be more directly influenced by the introduction of the Hope Scholarship. See Section 2.4 for some discussion of related sensitivity tests.

³ For a very short time the Georgia Hope Scholarship did have a maximum family income rule. Specifically, in the first year of the program a household income cap of \$66,000 was imposed, which was raised to \$100,000 the following year and eliminated entirely thereafter.

college, having no direct effect on the college costs of those with grade-point averages less than 3.0.⁴

Jointly, these two program characteristics clearly advantage the academically and financially able more than other students. Thus, by changing the distribution of college costs, the Georgia Hope Scholarship may change the distribution of needy students over the spectrum of academic selectivity in Georgia. Specifically, the scholarship may increase the propensity for the most academically able students, who may have otherwise attended out-of-state schools, to remain in-state and for non-needy but academically able students to potentially substitute into higher-cost, selective institutions within Georgia. Nonetheless, the Hope Scholarship may still expand the relative opportunities of needy students if there are significant financial constraints that limit access to college in Georgia for needy students that are lifted as a result of the broad-based nature of the merit aid program. Thus, the empirical analysis examines whether Hope expands both the absolute and relative opportunities of Pell recipients in Georgia.

2.1. Sample data

We draw from two main data sources to test the above predictions: the Integrated Post-secondary Education Data System (IPEDS) and Pell-award data by institution provided to us by the US Department of Education. While the potential observations are the entire population of colleges and universities in the United States, we restrict our analysis to the southern US states that form a reasonable control group against which we measure the effects of Hope on needy students and that follows the existing literature (e.g. Dynarski, 2004) studying the effects of Georgia's Hope Scholarship. Further, we define the sample of institutions as non-profit institutions that offer at least an associate's degree. Subject to these conditions and discarding

⁴ For example, Singell and Stone (2002) found that the introduction of a merit-based scholarship program at a large public university yielded a larger enrollment effect for relatively well-to-do students who could (academically and financially) choose to attend college out of state.

missing observations, the sample size is 8,381 observations over 860 institutions spanning 16 southern states. However, among these observations are 338 in Arkansas, 322 in Mississippi and 717 in Florida, where scholarship programs similar to that of Georgia's were introduced in 1991, 1996, and 1997, respectively. Following Dynarski (2004), we restrict the sample to states not introducing their own merit-based aid programs at any time over the sample period, which excludes these institutions. This yields a final sample size of 7,001 over 717 institutions.⁵ Nonetheless, we also examine the sensitivity of our results to including scholarships programs from these other southern states. Control variables not available in the above data sources are incorporated using US Census data from the Bureau of Economic Analysis. Sample characteristics are reported in Table A2 of Appendix A.

2.2. Empirical evidence

We now turn to consider the two hypotheses suggested above – that the Hope Scholarship will, on average, increase the enrollment of Pell students in Georgia, but do so more at the least academically selective institutions in Georgia. We do so by estimating the log-number of Pell recipients registered annually in each of the institutions in the Pell-IPEDS sample as a function of the status of the Hope Scholarship – whether it was in place or not. We estimate a log

⁵ The original merged data consists of 5,720 institutions over the nine-year period from 1988 to 1997, for a total of 54,971 institution-year observations. Defining the control group for the Georgia Hope Scholarship as the Southern US restricts our sample to 1,834 institutions (17,670 observations) of which 1,054 are non-profit institutions that offer at least an associate's degree, which yields a sample of 10,018. While missing observations on total enrollment were imputed in some cases (109), imputing enrollment was not reasonable in 716 cases. These observations are therefore discarded as are 626 where lagged enrollment was unavailable and 1 observation where in-state tuition was reported as zero. 15 observations are also dropped where imputing tuition was unreasonable. Of the remaining 8,660 observations, the number of Pell recipients enrolled was not reported (in 18 cases) or was reported as zero (in 9 cases). Naturally, these observations are also discarded, as are an additional 34 cases where the reported number of Pell students exceeds the reported enrollment of the institution. Also, in 3 cases, the total value of Pell awards was reported as zero. At this point the data consist of 8,596 observations across 929 institutions. However, as our focus is on the effects of the introduction of the Georgia Hope Scholarship, we permit only those institutions with complete data for at least six years during the 1988-1997 sample period, ensuring each institutions existence both prior to and following the scholarship's introduction. This leaves a sample size of 8,378 observations across 860 institutions, of which 7,001 observations (717 institutions) are in Georgia or in non-merit states.

specification because it permits us to focus on the percentage rather than the level change in the number of Pell students, which might otherwise yield some heteroscedasticity in the error arising from the substantial variation in Pell student and total enrollment across institutions.⁶

Specifically, we first estimate the following institution-level, fixed-effect model:

$$(1) \ln(N_{it}) = \alpha_i + \beta_1 (\text{Hope} \times \text{GA})_{it} + \gamma' X_{it} + \varepsilon_{it}$$

where N_{it} is the number of Pell recipients registered at institution i in year t , $\text{Hope}_t = 1$ for $t \geq 1993$, $\text{GA}_t = 1$ if institution i is in the State of Georgia and X_{it} is a vector of time-variant control variables for an institution and state thought to influence the propensity for Pell students to enroll. In particular, we include a measure of a Pell student's minimum tuition (defined as the school's in-state tuition minus the maximum institution-specific Pell award observed in year t , or the Pell cap in year t , whichever is greater), enrollment net of Pell recipients (lagged) to capture school-size effects, and state unemployment rates and per-capita disposable incomes to proxy for local market conditions. Year effects are also included in all specifications to capture potential trends in Pell enrollments.⁷

The results reported in Column (1) of Table 1 clearly demonstrate that the enrollment of Pell students increases at Georgia colleges and universities with the introduction of the Hope Scholarship. In fact, conditional on all time-invariant institutional characteristics as well as tuition, non-Pell enrollment, trend, area unemployment rates and incomes, Georgia institutions realize an average 33.1 percent increase in Pell enrollments following the introduction of Hope.

⁶ The specifications presented in the paper are also estimated in levels to test the sensitivity of the results to log transformation. For each specification the qualitative conclusions do not change.

⁷ As an alternative to fixed-effects, which controls for all time-invariant institutional characteristics (e.g. advanced-degree granting, higher-quality, two-year college, private, whether the school is historically black) we estimate models with an error structure that allows for a traditional error term unique to each observation and a second error term representing the extent to which the intercept of the i^{th} cross-sectional unit – in our case, institutions – differs from the overall intercept. In each case, however, Hausman tests reject these random effects as the appropriate panel error specification. We provide random effects results in Appendix Table A3.

Contrary to prior literature that shows little or no impact on needy students, this constitutes a substantial enrollment-response to the Hope Scholarship. Moreover, the effect is larger than the approximate 7 to 8 percent recent enrollment effect found for the population of Georgia high school students (Dynarski, 2002; Cornwell, et al, 2002).

While revealing such a pattern is alone interesting, the average effect identified through the estimation of Eq. (1) hides much in the Pell-enrollment response across Georgia schools. In order to expose any systematic enrollment responses in the data across school quality, we relax the restriction on the estimated coefficient of $(Hope \times GA)_{it}$, allowing it to vary across three particular institution-types spanning a quality spectrum – selective four-year institutions, other four-year institutions, and two-year institutions. In particular, we consider the following equation:

$$(2) \ln(N_{it}) = \alpha_i + \beta_1 (Hope \times GA)_{it} + \beta_2 (Hope \times GA \times Upper40)_{it} + \beta_3 (Hope \times GA \times Year2)_{it} + \gamma' X_{it} + \varepsilon_{it}$$

Our measures of selectiveness, $Upper40_{it}$, and $Year2_{it}$, are fundamental to the second hypothesis to be tested. Capturing most-selective institutions within each state, $Upper40_{it}$ equals one if four-year institution i is at or above the sixtieth percentile within the state in any one of the following indices: the percent of incoming freshman with math SAT scores above 500, the percent of incoming freshman with verbal SAT scores above 500, or the percent of incoming freshman with ACT scores above 21. Alternatively, institutions are assigned $Upper40_{it} = 1$ where the entrance requirements are reported as ‘very difficult’ or ‘most difficult’ in Peterson’s 1989 Guide to Four-Year Colleges.⁸ Capturing the least-selective institutions within each state, $Year2_{it}$ equals one if institution i is a two-year college in year t .

⁸ This rule was devised so as to limit the subjectivity of making such a judgment of the data. Appendix Table A2 reports the institutions qualifying as $Upper40_{it} = 1$ according to this rule, by state, for the most recent year of the sample. Results are robust to alternative threshold, as discussed in Section 2.4.

With the specific theoretical prediction that Hope advantages the academically and financially able, the crowding effect across school quality introduces potential ambiguity in the net change in Pell enrollment at *Upper40* institutions. For example, while the lower costs coincident with the Hope Scholarship should induce increased Pell enrollments at the most selective four-year institutions, the added advantage afforded the most academically and financially able could in fact yield a net decrease in Pell enrollments at such institutions. While the net effect on *Upper40* institutions (i.e. $\hat{\beta}_1 + \hat{\beta}_2$) is therefore ambiguous relative to other four-year institutions, the relative favour afforded the more academically and financially able students yields an unambiguous prediction of a smaller response at other four-year institutions (i.e. $\hat{\beta}_2 < 0$). Likewise, assuming that two-year institutions define the least academically selective institutions, theory predicts a strictly positive Pell enrollment effect relative to less-selective institutions (i.e. $\hat{\beta}_3 > 0$). While the sign of $\hat{\beta}_1$ is also ambiguous, as the net effect depends on which effect dominates, it may seem reasonable to expect that this Pell-enrollment response at less academically selective four-year institutions be net positive (i.e. $\hat{\beta}_1 > 0$).

Column (2) of Table 1 reports these estimated coefficients where each of our priors are strongly confirmed. Estimates of Eq. (2) reveal patterns in the data that are consistent with our hypotheses and therefore with Hope shifting the distribution of Pell students away from institutions that cater to the more academically able. Yet, they yield a net effect of the Hope Scholarship on the most selective Georgia schools that is in fact positive. Specifically, there is a statistically-significant 8.2 percent net increase in Pell enrollments at the most-selective four-year schools in Georgia following the introduction of the Hope Scholarship (i.e. $\hat{\beta}_1 + \hat{\beta}_2 > 0$). Also, consistent with theory, this enrollment-response is markedly less than the 26.6 percent

increase realized at other four-year institutions in Georgia (i.e. $\hat{\beta}_2 < 0$). Further, the Pell-enrollment effects at less selective two-year schools are large and positive at 44.9 percent, consistent with increased competition at higher-quality institutions acting to enforce the effects of Hope directly reducing the cost of attending two-year institutions in Georgia (i.e. $\hat{\beta}_3 > 0$ and $\hat{\beta}_1 + \hat{\beta}_3 > 0$).⁹

Thus, conditional on all time invariant institutional characteristics, labor market conditions and enrollment costs, there is a clear change in the distribution of Pell students across institutions in Georgia associated with the introduction of the Hope Scholarship. The greater expansion in the number of Pell recipients at less selective institutions likely reflects the fact that there are greater capacity constraints at more selective institutions that often have an applicant pool that exceeds the number of possible enrollees for a given class. The joint effect of capacity constraints along with a greater incentive for top high-school students to remain in state for school is consistent with the significant shift in the enrollment of Pell recipients towards less academically selective institutions. Thus, the Hope Scholarship appears to improve access of Pell recipients even at the more selective schools, but has the unintended consequence of inducing more of the increased enrollments at less-selective institutions. Moreover, while such crowding is also likely to occur for the population of high-school students, the positive correlation between income and academic outcomes could cause Pell recipients to be crowded out of the better schools. This issue is examined more fully in Section 3.

The results also provide some of the first formal evidence regarding how Pell students sort among the hierarchy of institutions within a state and their responsiveness to the direct and

⁹ The relatively larger effect for two-year versus four-year institutions reflects, in part, that two-year schools have smaller average enrollments than four-year schools. The results from estimating the model in levels predicts that the number of Pell recipients increases by approximately 200 at both two-year and four-year institutions.

indirect costs of college. Specifically, the coefficients on the time-varying institutional and state controls indicate that Pell students are attending larger, less expensive schools in lower-income states with higher unemployment rates. Moreover, the random-effects results reported in Appendix Table A3, for comparison, also suggest that Pell grants permit needy students to move up into more selective four-year public schools. While Hausman tests reject random effects in all specifications, the patterns in Hope’s effect on Pell enrollment across institution quality that control directly for observable characteristics but not for unobserved heterogeneity at the institution level are consistent with those of Table 1.¹⁰

2.3. *The spillover effect of the Hope Scholarship*

While the evidence of a changing distribution of Pell students is significant, the Georgia Hope Scholarship may have also affected the access margin for Pell students in neighboring states. In particular, while we have constructed a reasonable control group for the initial analysis – it likely defines the potential choice set of most of the students in Georgia – we have not yet considered the potential for spillover effects to those from among this control group that are closest to Georgia. Defining $GAborder_i = 1$ for an institution i that is in a state that borders Georgia, Column (3) of Table 1 reports the estimation of Eq. (3) as follows:

$$(3) \ln(N_{it}) = \alpha_i + \beta_1 (Hope \times GA)_{it} + \beta_2 (Hope \times GA \times Upper40)_{it} + \beta_3 (Hope \times GA \times Year2)_{it} + \delta_1 (Hope \times GAborder)_{it} + \delta_2 (Hope \times GAborder \times Upper40)_{it} + \delta_3 (Hope \times GAborder \times Year2)_{it} + \gamma' X_{it} + \varepsilon_{it}$$

Equation (3) modifies Eq. (1) by allowing the effect of the Hope Scholarship to influence not only the Pell enrollments in Georgia, but also the Pell enrollments of institutions in neighboring states. Further, Eq (3) allows these spillover effects to differ across the most selective four-year

¹⁰ The results indicate a price elasticity of enrollment demand of between 1.2 and 2.6 percent, which is larger than that found for broader populations of students who are generally found to have demand elasticities less than 1 (e.g., Leslie and Brinkman, 1987). However, the relatively high elasticity for Pell students is consistent with observation that lower income students tend to be more price responsive to the cost of college (Becker, 1990).

institutions, other four-year institutions, and two-year institutions within these Georgia-bordering states.

The combination of greater retention of Georgia students brought on by the introduction of the Hope Scholarship along with its possible crowding effect may spillover into the number of Pell recipients enrolled at institutions located in bordering states. In particular, the retention effect is likely to be larger at more selective out-of-state institutions where admittance requirements are higher and therefore more likely that their Georgia students would qualify for Hope if they remained in state. Likewise, the crowding out effect is likely to be stronger at less selective institutions with admittance requirements that would tend to not qualify Georgia students for Hope. This prediction is confirmed by Column (3) of Table 1, which suggests that the top institutions within these border-states enroll fewer Pell students after Hope is introduced whereas less-selective institutions enroll more Pell recipients. Specifically, while there is a 6.0 percent net increase in Pell enrollments at more selective Georgia institutions, among such institutions in Georgia-bordering states there is a net decrease in Pell enrollment of 4.7 percent, on average. Thus, Georgia appears to retain more of the relatively able Pell students who qualify for Hope and might also be admitted to an out-of-state institution with some merit aid.

On the other hand, there is a 7 percent increase in Pell recipients enrolled at two-year institutions that border Georgia, suggesting that “academically-weaker” Pell recipients may be forced into lower-cost institutions in neighboring states. The enrollment effect of Hope at two-year institutions is still smaller in bordering states than in Georgia consistent with Hope having a larger affect on Pell enrollments where it directly lowered the costs of college and a smaller but significant effect in neighboring states where students crowded out of Georgia by increased in-state competition may have ultimately enrolled.

2.4. Robustness

Here we consider eight separate tests of the robustness and sensitivity of the above results. For clarity, we consider them in two distinct ways – specification sensitivity (reported in Table 2) and sample sensitivity (reported in Table 3). First, we consider that the effect of Hope may differ at institutions with tuition levels that may or may not leave the maximum available Pell-award binding on the student. For certain low tuition levels Pell truly substitutes for the Hope Scholarship, as Hope awards are reduced dollar-for-dollar with other sources of financial aid during the sample period we study. In particular, this type of direct tradeoff is expected where tuition is sufficiently low that it falls under Pell’s maximum award in a given year. In such cases, the first dollar of a potential Hope Scholarship contributes nothing to the financial ability of the student, as there is no excess tuition above the Pell grant for the average student. In fact, where Pell is not binding, there is only a small textbook subsidy and otherwise no financial gain realized by the student from Hope.

Alternatively, where the cap on Pell aid is binding on a particular student, it is only through Hope that there is a financial gain. That is, only when tuition (and therefore the value of any Hope Scholarship) begins to exceed the student’s Pell award is there a financial reward realized. To test the sensitivity of our results to the non-linearity of the total possible financial aid award, we include a measure of the degree to which Pell’s maximum award is binding at institution i in year t , a function of the prescribed Pell policy in a given year and an institution’s annual tuition. Specifically, we define this measure for each institution in year t as the maximum Pell award observed in the sample in year t (i.e. the potential Pell award) less the maximum available at institution i (indicating that the tuition was sufficiently low that the cap was not binding) or zero,

whichever is greater. Thus, this captures the degree to which Pell was binding on the average student at this institution over and above that resulting from the overall maximum Pell award.

Results of this exercise demonstrate no significant effect of ‘binding status’ on Pell enrollments as seen in Column (1) of Table 2. Further, our earlier results are robust to the inclusion of this measure. The robustness of the results to a binding Pell cap is important because the Pell cap was changed from 60 percent of tuition coverage to 100 percent of tuition coverage in 1993, which corresponds to the introduction of Hope. The generosity of Pell increased at all institutions where the 60 percent cap was binding and may have increased the number of Pell recipients at these schools. Nonetheless, our results suggest that the number of Pell recipients increased relatively more at Georgia schools and particularly at two-year and less selective four-year schools where the cap was less likely to be binding.

As a second sensitivity test we consider the influence of Hope on Georgia and Georgia-bordering institutions according to institution size as our measure of quality. Specifically, the coefficient on *Upper40* may be capturing size effects and/or some capacity constraints that are correlated with size. Column (2) includes these additional measures, which again demonstrates the robustness of our earlier results. There is, however, a significant increase in the log-number of Pell students at large institutions in Georgia (i.e. greater than 10,000 students), on average, which is not seen elsewhere. Thus, Pell recipients appear to be attracted to universities with larger campuses.

Third, we consider our measure of school selectivity, which is key to testing for systematic differences in Pell-enrollment responses across academic selectivity. In the preceding analysis, $Upper40_{it} = 1$ if institution i was at or above the sixtieth percentile (within state) in any one of the following indices at time t : the percent of incoming freshman with math SAT scores above

500, the percent of incoming freshman with verbal SAT scores above 500, or the percent of incoming freshman with ACT scores above 21. To examine sensitivity of the above findings to selectivity threshold, we include a binary variable $Upper20_{it}$ – that equals one for those four-year institutions that are in the 80 percentile in each of the selectivity categories used in $Upper40_{it}$. In short, Column (3) demonstrates that our qualitative results are not sensitive to adjustments to the selectivity threshold, which continues to indicate a change in the distribution of Pell students with the introduction of the Hope Scholarship – relatively fewer Pell students at more selective Georgia schools following Hope.¹¹

The last column in Table 2 examines the timing of Hope’s influence on the number of Pell recipients at a given institution. In particular, only college freshman are eligible for the Hope Scholarship in 1993 when the program was first introduced because the program only applied to newly minted high-school graduates. However, the program effect is likely to grow at least through the first four years because college students who maintained a 3.0 college GPA retained the Hope Scholarship for up to four years. In other words, Hope may appear to yield a larger enrollment effect for Pell recipients over time simply due to a larger proportion of students being eligible for such support. This exogenous timing will tend to bias the coefficient toward zero in prior specifications that allow only for an average effect of Hope over the 1993 through 1997 relative to preceding years.

Thus, in Column (4) in Table 2, we explicitly control for the timing of Hope eligibility by allowing the effect of Hope to differ across time and find the results to be robust to this alternative specification. Specifically, as an alternative to a simple indication of whether merit-aid exist in Georgia or does not exist, Column (4) imposes a linear structure on the variables in

¹¹ In all cases, we assigned $Upper40_{it} = Upper20_{it} = 1$ where the entrance requirements are reported as ‘very difficult’ or ‘most difficult’ in Peterson’s Guide to Four-Year Colleges.

question by setting ‘Merit-aid exists in GA’ equal to ‘1’ in 1993, ‘2’ in 1994, ‘3’ in 1995, and ‘4’ thereafter. In short, the data do not reject this linear trend structure and suggest that the effect of Hope on Pell enrollment is increasing over the first four years as an increasing fraction of institutional enrollments are eligible for, and therefore subject to, the effect of Hope. Thus, there does appear to be a distinction between the stock of students who receive Pell and the flow of new students who receive Pell. The initial increasing stock of Hope recipients, while suggesting that merit aid might also improve retention along the lines found in prior work (e.g., Singell, 2004), the qualitative conclusions are not sensitive to permitting the effect of Hope to vary over time.

Table 3 considers four additional tests of the sensitivity of our results by adjusting the sample on which we estimate Eq. (3). First, following previous literature (e.g., Dynarski, 2004), we initially excluded institutions in Arkansas, Mississippi and Florida from all reported estimation results due to their own merit-based-aid programs being introduced during the sample period. However, as Georgia-border effects are clearly present in the data, it may also be worthwhile to discard the boarder states of Arkansas- and Mississippi and Florida, which are reported in Column (1) of Table 3.¹² These results again indicate that all qualitative relationships are robust to the use of this “cleaner” control group and predict that the Hope Scholarship increases the average number of Pell recipients across all institutions in Georgia, while also initiating a distributional changes in Pell enrollments favoring less-selective, four-year institutions and two-year colleges.¹³

Second, Table 3 reproduces the results of estimating Eq. (3) restricting the sample to all four-year institutions (Column 2) and to public institutions (Column 3). These robustness tests

¹² Recall that Florida is a border state only of Georgia, which is conditioned for in our analysis, and Alabama.

¹³ Further, estimation on a sample that retains institutions in these states for years preceding their merit-aid implementations was carried out and demonstrates the robustness of the reported results.

reveal that point estimates of the effect of $Upper40_{it}$ on the influence of the Hope Scholarship on Pell enrollments are negative, as expected. To consider private institutions alone (not reported) reveals that the significance reported in Table 1 seem driven by and may be ascribed to public institutions.¹⁴ In general, Pell enrollments at private institutions appear less sensitive to changes in financing options, on average, than do Pell enrollments at public institutions.

As a final check of the robustness of our results, we follow Bertrand, Duflo and Mullainathan (2001) and re-estimate Eq. (3) to account for the serial-correlation problems associated with difference-in-difference estimation and the possible biases in estimating the standard error around the effect of the Hope Scholarship on Pell enrollments. In particular, we ignore the time series component in the estimation and when computing the standard errors by averaging the data before and after the introduction of the Hope Scholarship and run the earlier equations on this averaged outcome variable as a panel of length 2. Given the small standard errors across the variables of interest in Table 1, our *a priori* expectation was that no coefficients would lose significance. This is indeed the case and the qualitative results remain.

3. The Proportion of Pell Recipients and the Georgia Hope Scholarship

Although the distribution of Pell recipients changed across the hierarchy of institutions in Georgia as a result of the Hope Scholarship, the results do not necessarily indicate that the relative opportunities of Pell recipients have changed as a result of the rising importance of merit aid. Specifically, the broader population of Hope Scholarship recipients may be subject to the same “crowding forces” as Pell recipients, such as a relatively binding capacity constraint at more selective institutions. Thus, the original specifications used in estimating the log number of

¹⁴ This may not be surprising as the Hope Scholarship was initially targeted toward public institutions, with private institutions being added in time.

Pell recipients (Table 1) are used to estimate the Pell-student proportion of total enrollment.¹⁵ As such, we examine whether the enrollment of Pell students changes relative to that of non-Pell students as a result of the Hope Scholarship and, in particular, whether any change is systematically different across selective four-year institutions, other four-year institutions, and two-year institutions. This analysis allows us to distinguish between a general change in the distribution of Pell enrollment into less selective institutions as a result of Hope from a crowding-out of Pell recipients from more selective schools due a relative expansion of the opportunities of non-Pell recipients.

The results in Column (1) of Table 4 indicate that the relative proportion of Pell recipients increases in Georgia relative to other Southern states as a result of the Hope Scholarship. Thus, Hope appears to improve the relative opportunities of needy students in the state, suggesting that there were significant limits to college access for needy students in Georgia prior to the scholarship program. Nonetheless, the results in Column (2) of Table 4 suggest that the improvement in the relative opportunities for Pell recipients did not change uniformly across the hierarchy of institutions. In particular, the results suggest that the relative proportion of Pell students expanded the most at two-year institutions, expanded significantly less at four-year institutions, and did not change at more selective four-year schools. Thus, contrary to indirect evidence that the opportunities of relatively needy students do not improve after the introduction of Hope (e.g., Dynarski, 2004), our results suggest that Pell recipients relatively benefit from the presence of a broad merit-based aid program at less selective schools in Georgia, whereas their

¹⁵ Using the measured proportion as a dependent variable introduces potential econometric problems as this variable is bounded in the unit interval. Such boundedness implies that the assumption of a normally distributed error term is not tenable. As such, all procedures reported estimate the logistically transformed Pell-student proportion of total enrollment.

opportunities improve no differently than relatively well-to-do students at more selective institutions.

However, the results also suggest that the proportion of Pell students tends to decline at an institution with tuition. This is important because our findings and prior research indicate that the Hope Scholarship clearly increased the demand for college in Georgia, which would put upward pressure on the price. Prior evidence not only indicates that tuition increases at Georgia institutions relative to other Southern states, but that the increases were larger at more selective universities who may have had binding enrollment constraints (Long, 2002). Thus, while the relative opportunities of Pell recipients may not have changed at more selective institutions controlling for tuition, their relative opportunities at more selective schools may have diminished simply due to a price effect resulting from an increase in demand. Nevertheless, these price effects are unlikely to swamp the relative large predicted increase in the proportion of Pell students at two-year and less selective four-year institutions. Thus, the Hope Scholarship appeared to improve overall college access of Pell recipients in the state of Georgia.

4. Pell-Dollar Allocations and the Georgia Hope Scholarship

How the number and proportion of Pell recipients respond to merit aid is compelling from the policy standpoint of understanding college access. Nonetheless, because Hope appears to have changed the margin on which it is worthwhile to attend college (as reflected by the increase in the number of Pell recipients in Georgia), the ex post distribution of need among Pell recipients is also likely to have changed and would be reflected in the dollar values of Pell support. Thus, we apply the model in Section 2 to analyze the average size of annual Pell awards (Table 5) that permit us to examine if the average need has changed in the pool of Pell recipients and the annual Pell revenue collected (Table 6) that permits us to examine the joint enrollment

and level-of-aid effect. In both cases, we modify the right-hand-side tuition control to capture the gross annual in-state tuition as opposed to in-state tuition net of any Pell award.¹⁶

There is a striking regularity in the data with respect to the change in the size of the average Pell award provided by Georgia-institutions following the advent of the Hope Scholarship. The results in Table 5, Column (1), indicate that the average Pell award declines by 7.3 percent after Hope. This result suggests that the requirement that needy students apply for federal aid in order to receive Hope draws “less needy” students into the pool of recipients who might not otherwise have sought federal aid either because of uncertainty regarding the provision of aid or because the level of expected support was insufficient to warrant the effort. However, while the average Pell award paid to Georgia schools decline, the increase in Pell enrollees (Table 1) is sufficiently large so that the total Pell revenue at Georgia schools actually increases by 26.5 percent (Table 6, Column 1). However, columns (2) and (3) of Table 5 reveal that the unconditioned effect of Hope on average Pell revenues is in fact driven solely by the two-year institutions who realize an 18.4 percent decrease in average Pell award.¹⁷

With respect to total Pell revenues, the results reported in Column (2) of Table 6 demonstrate that total Pell revenues reported by Georgia institutions increase by 29.7 percent and 18.0 percent at two-year and less selective four-year schools, on average, but increase by only 7.6 percent at the more selective four-year schools in Georgia. Thus, while average Pell awards decline (at least at two-year institutions), the increased enrollment of Pell recipients more than offsets the decline in the average support such that Pell revenue rises across the full hierarchy of

¹⁶ When, earlier, predicting the enrollment of Pell students we were intent on capturing the potential out-of-pocket tuition *price* faced by such students. Here, tuition may be more appropriately thought of as a school attribute correlated with Pell revenues.

¹⁷ The increase in the Pell cap in 1993 might be expected to increase the average Pell paid in all states, but should not be expected to affect our relative comparisons of the average Pell across states unless Georgia schools are more expensive than those in other states (which they are not). In any case, the direction of the bias would work against our findings of a decrease in the average Pell post Hope.

institutions. Thus, from a fiscal standpoint, Georgia is able to leverage its scholarship dollars with greater federal support. This leveraging effect is, nonetheless, relatively concentrated among less selective institutions where Pell recipients are historically more likely to enroll.

Finally, the results also suggest that there are fiscal effects on bordering institutions from Hope. Specifically, there is a 5.2 percent increase in the flow of Pell dollars to the institutions in the five Georgia-border states, on average. However, the average again hides the apparent asymmetry across school quality, with the more selective four-year schools across the five Georgia-border states border-states realizing a 5.0 percent net outflow of Pell revenue following Georgia's Hope Scholarship and the corresponding two-year schools receiving an additional 11.8 percent in Pell revenue (Column 3). Thus, the crowding effect of Hope at less-selective institutions in Georgia appears to fiscally benefit less selective institutions in bordering states, whereas the retention effect of Hope that permits greater access of needy students to more selective institutions in Georgia fiscally harms more selective institutions that border Georgia.

5. Discussion and Concluding Remarks

A stated goal of U.S. financial policy since the G.I. Bill in the 1950s has been to ensure college access independent of need. Even so, federal support for need-based grants and loans has not kept pace with the rising cost of college over the last several decades and rising competition within higher education has led to a greater reliance by states and universities on merit-based aid to attract and retain the best college students. Consequently, subsidized, need-based aid has become a decreasing share of the financial aid package and there is increasing concern among higher education administrators and policy makers that needy students do not have access to a college education. Nonetheless, few studies have examined whether the

adoption of broad-based merit aid programs work with or against the objectives of college access.

In this paper, we use the unique natural experiment conducted by the introduction of the Georgia Hope Scholarship in 1993, which paid college tuition and books for all Georgia high-school graduates who earned at least a 3.0 GPA, to study how merit aid affects the college access of Pell students in Georgia relative to other Southern states. Specifically, unpublished, institution-level data on the number Pell students and their level of Pell support in Georgia and 10 other Southern states are merged with institution-specific and state-level data drawn primarily from the IPEDS data based available on the National Center for Educational Statistics web site for the years 1988 thorough 1997. These data are used to estimate a difference-in-difference model for the impact of the Georgia Hope Scholarship on the number of Pell recipients and the average and total Pell award in Georgia versus other Southern institutions, controlling for time-varying institutional and state-specific factors and conditioned on institution-level fixed effects.

The results provide some of the first formal evidence that broad-based increases in merit aid can improve the college access of needy students, but also suggest that the institution-specific increases in the number of Pell recipients and total Pell receipts are concentrated among two-year and less-selective four-year institutions. Thus, states may have an incentive to adopt merit aid programs because the positive enrollment effect of the scholarship arises in part because these dollars are leveraged with federal aid dollars, which benefits both the state and its needy students. Nonetheless, the results also suggest that the Hope Scholarship, while achieving its stated intent of retaining the most able students in Georgia, does not harm the relative opportunities of needy students at more selective institutions, suggesting these students are able

to take advantage of the merit aid similar to those students who are more financially and academically able.

Finally, the results suggest that statewide merit programs cannot necessarily be evaluated in isolation. For example, the findings indicate that enrollment of Pell recipients increased not only in Georgia after the introduction of the Hope Scholarship, but also for two-year institutions in surrounding states. Thus, the Hope Scholarship, because it required to needy students to apply for federal aid, may have improved access of needy Georgia students both at home and in low-cost institutions in neighboring states. The importance of these interactive and competing effects from other states is only likely to grow over time because four Southern states (and seven non-Southern states) have adopted similar merit aid programs partly in response to Hope. Thus, this study provides the first step in studying how a state-specific merit aid program may affect the college access of needy students both in state and out of state, but further study is needed to more fully examine the general equilibrium effects of such merit aid programs.

Table 1: Effect of the Georgia Hope Scholarship on Institutional Pell Enrollments – All southern non-merit institutions.

| Independent variable | Log(Number of Pell students) | | |
|---|------------------------------|----------------------|----------------------|
| | (1) | (2) | (3) |
| Merit-aid exists in GA X GA institution | 0.286 (0.013)*** | 0.236 (0.021)*** | 0.233 (0.022)*** |
| Merit-aid exists in GA X GA institution X Institution is in upper 40% within state | | -0.157 (0.038)*** | -0.175 (0.039)*** |
| Merit-aid exists in GA X GA institution X Two-year institution | | 0.135 (0.028)*** | 0.172 (0.029)*** |
| Merit-aid exists in GA X GA-border institution | | | -0.008 (0.015) |
| Merit-aid exists in GA X GA-border institution X Institution is in upper 40% within state | | | -0.040 (0.024) |
| Merit-aid exists in GA X GA-border institution X Two-year institution | | | 0.077 (0.020)*** |
| Log (1 + In-state tuition less maximum Pell award) | -0.026 (0.001)*** | -0.012 (0.002)*** | -0.012 (0.002)*** |
| Log (Lagged enrollment less Pell students) | 0.047 (0.008)*** | 0.025 (0.008)*** | 0.024 (0.008)*** |
| Log (Per-capita disposable income within state) | -1.054 (0.185)*** | -0.739 (0.175)*** | -0.845 (0.186)*** |
| Lagged State unemployment rate | 0.030 (0.004)*** | 0.026 (0.003)*** | 0.025 (0.003)*** |
| Year indicator variables included ^a | Yes | Yes | Yes |
| Year indicator variables X Institution is in upper 40% within state | No | Yes | Yes |
| Year indicator variables X Two-year institution | No | Yes | Yes |
| Constant | 15.586 (1.745)*** | 12.696 (1.651)*** | 13.709 (1.759)*** |
| Observations / Number of institutions | 7001 / 717 | 7001 / 717 | 7001 / 717 |
| R-squared | .45 | .52 | .52 |

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. ^a Alternative specifications reveal a general upward trend in Pell enrollments within the sample of institutions considered.

Table 2: Specification Sensitivity of the Effect of the Georgia Hope Scholarship on Institutional Pell Enrollments.

Coefficients are from the estimation of fixed-effect models controlling for institution specific unobserved heterogeneity.

| Independent Variable | Log(Number of Pell Students) | | | |
|---|--|--|--|---|
| | Controlling for institution-specific Pell cap (1) | Controlling for size of institution (2) | Replace <i>Upper40</i> with <i>Upper20</i> ^a (3) | Linear introduction ^a (4) |
| Merit-aid exists in GA X GA institution | 0.234 (0.022)*** | 0.209 (0.027)*** | 0.199 (0.021)*** | 0.068 (0.007)*** |
| Merit-aid exists in GA X GA institution X Institution is in upper 40% within state | -0.176 (0.039)*** | -0.169 (0.039)*** | -0.101 (0.047)** | -0.046 (0.012)*** |
| Merit-aid exists in GA X GA institution X Two-year institution | 0.171 (0.029)*** | 0.188 (0.030)*** | 0.207 (0.028)*** | 0.060 (0.009)*** |
| Merit-aid exists in GA X GA-border institution | -0.008 (0.015) | 0.029 (0.017)* | -0.015 (0.013) | -0.002 (0.004) |
| Merit-aid exists in GA X GA-border institution X Institution is in upper 40% within state | -0.040 (0.024) | -0.037 (0.024) | -0.031 (0.028) | -0.012 (0.007)* |
| Merit-aid exists in GA X GA-border institution X Two-year institution | 0.075 (0.020)*** | 0.070 (0.020)*** | 0.083 (0.019)*** | 0.023 (0.006)*** |
| Log (1 + Pell available with higher tuition) | 0.003 (0.002) | | | |
| Log (1 + In-state tuition less maximum Pell award) | -0.011 (0.002)*** | -0.010 (0.002)*** | -0.012 (0.002)*** | -0.012 (0.002)*** |
| Log (Lagged enrollment less Pell students) | 0.024 (0.008)*** | 0.023 (0.008)*** | 0.025 (0.008)*** | 0.020 (0.008)** |
| Log (Per-capita disposable income within state) | -0.865 (0.186)*** | -0.826 (0.186)*** | -0.854 (0.186)*** | -1.114 (0.187)*** |
| Lagged State unemployment rate | 0.024 (0.003)*** | 0.024 (0.003)*** | 0.025 (0.003)*** | 0.026 (0.003)*** |
| Merit-aid exists in GA X GA institution X Enrollment <= 2,000 | | 0.004 (0.027) | | |
| Merit-aid exists in GA X GA institution X Enrollment >= 10,000 | | 0.234 (0.053)*** | | |
| Merit-aid exists in GA X GA-border institution X Enrollment <= 2,000 | | -0.059 (0.014)*** | | |
| Merit-aid exists in GA X GA-border institution X Enrollment >= 10,000 | | -0.050 (0.031) | | |
| Year indicator variables included ^c | Yes | Yes | Yes | Yes |
| Year indicator variables X Institution is in upper 40% within state | Yes | Yes | Yes | Yes |
| Year indicator variables X Two-year institution | Yes | Yes | Yes | Yes |
| Constant | 13.884 (1.762)*** | 13.526 (1.755)*** | 13.791 (1.761)*** | 16.267 (1.765)*** |
| Observations / Number of institutions | 7001 / 717 | 7001 / 717 | 7001 / 717 | 7001 / 717 |
| R-squared | .52 | .52 | .52 | .52 |

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.^a As an alternative to a simple indication of whether merit-aid exist in Georgia or does not exist, Column (4) imposes a linear influence by setting 'Merit-aid exists in GA' equal to '1' in 1993, '2' in 1994, '3' in 1995, and '4' thereafter. ^c Alternative specifications reveal a general upward trend in Pell enrollments within the sample of institutions considered.

Table 3: Sample Sensitivity of the Effect of the Georgia Hope Scholarship on Institutional Pell Enrollments.

Coefficients are from the estimation of fixed-effect models controlling for institution specific unobserved heterogeneity.

| Independent variable | Log(Number of Pell students) | | | |
|---|--|-----------------------------|--------------------------|---|
| | Only institutions that do not border other merit states of AR, MS or FL ^a | Only four-year institutions | Only public institutions | Pre Hope Means vs. Post Hope Means (two-year panel) |
| | (1) | (2) | (3) | (4) |
| Merit-aid exists in GA X GA institution | 0.223 (0.024)*** | 0.230 (0.021)*** | 0.260 (0.029)*** | 0.163 (0.048)*** |
| Merit-aid exists in GA X GA institution X Institution is in upper 40% within state | -0.177 (0.042)*** | -0.163 (0.037)*** | -0.223 (0.061)*** | -0.164 (0.084)* |
| Merit-aid exists in GA X GA institution X Two-year institution | 0.252 (0.035)*** | | 0.150 (0.034)*** | 0.204 (0.061)*** |
| Merit-aid exists in GA X GA-border institution | 0.034 (0.021) | -0.017 (0.014) | -0.066 (0.021)*** | -0.067 (0.031)** |
| Merit-aid exists in GA X GA-border institution X Institution is in upper 40% within state | -0.032 (0.033) | -0.017 (0.022) | 0.032 (0.039) | -0.057 (0.051) |
| Merit-aid exists in GA X GA-border institution X Two-year institution | 0.157 (0.030)*** | | 0.136 (0.025)*** | 0.061 (0.042) |
| Log (1 + In-state tuition less maximum Pell award) ^b | -0.016 (0.002)*** | -0.006 (0.002)*** | -0.003 (0.003) | -0.016 (0.003)*** |
| Log (Lagged enrollment less Pell students) ^b | 0.021 (0.011)* | 0.063 (0.013)*** | -0.004 (0.009) | 0.051 (0.030)* |
| Log (Per-capita disposable income within state) ^b | -1.379 (0.255)*** | -1.341 (0.209)*** | 0.156 (0.234) | 1.295 (0.302)*** |
| Lagged State unemployment rate ^b | 0.014 (0.005)*** | 0.018 (0.004)*** | 0.026 (0.004)*** | 0.103 (0.013)*** |
| Year indicator variables included ^c | Yes | Yes | Yes | Yes |
| Year indicator variables X Institution is in upper 40% within state | Yes | Yes | Yes | Yes |
| Year indicator variables X Two-year institution | Yes | No | Yes | Yes |
| Constant | 18.739 (2.413)*** | 18.264 (1.981)*** | 4.741 (2.215)** | -7.417 (3.047)** |
| Observations / Number of institutions | 3803 / 388 | 4144 / 423 | 4260 / 436 | 1422 / 713 |
| R-squared | 0.62 | 0.29 | 0.67 | 0.56 |

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. ^a Florida is also a merit state that borders Georgia. However, Georgia is conditioned for in the analysis and is therefore retained. ^b Equal to pre-Hope or post-Hope average in Column (4). ^c Alternative specifications reveal a general upward trend in Pell enrollments within the sample of institutions considered.

Table 4: Effect of the Georgia Hope Scholarship on the Pell-Proportion of Total Enrollment – All southern non-merit institutions.

Coefficients are from the estimation of fixed-effect models controlling for institution specific unobserved heterogeneity.

| Independent variable | Log $\left(\frac{\text{Number of Pell students}}{\text{Total enrollment}} \right)$ | | |
|---|---|----------------------|----------------------|
| | (1) | (2) | (3) |
| Merit-aid exists in GA X GA institution | 0.256 (0.021)*** | 0.122 (0.035)*** | 0.106 (0.036)*** |
| Merit-aid exists in GA X GA institution X Institution is in upper 40% within state | | -0.126 (0.062)** | -0.124 (0.065)* |
| Merit-aid exists in GA X GA institution X Two-year institution | | 0.290 (0.045)*** | 0.339 (0.048)*** |
| Merit-aid exists in GA X GA-border institution | | | -0.042 (0.024)* |
| Merit-aid exists in GA X GA-border institution X Institution is in upper 40% within state | | | 0.010 (0.040) |
| Merit-aid exists in GA X GA-border institution X Two-year institution | | | 0.107 (0.033)*** |
| Log (1 + In-state tuition less maximum Pell award) | -0.036 (0.002)*** | -0.019 (0.003)*** | -0.019 (0.003)*** |
| Log (Per-capita disposable income within state) | -2.142 (0.294)*** | -1.773 (0.285)*** | -1.825 (0.304)*** |
| Lagged State unemployment rate | 0.042 (0.006)*** | 0.036 (0.005)*** | 0.035 (0.006)*** |
| Year indicator variables included | Yes | Yes | Yes |
| Year indicator variables X Institution is in upper 40% within state | No | Yes | Yes |
| Year indicator variables X Two-year institution | No | Yes | Yes |
| Constant | 19.092 (2.784)*** | 15.541 (2.700)*** | 16.030 (2.881)*** |
| Observations / Number of institutions | 7001 / 717 | 7001 / 717 | 7001 / 717 |
| R-squared | 0.23 | 0.29 | 0.29 |

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Effect of the Georgia Hope Scholarship on Average Pell Award – All southern non-merit institutions.

Coefficients are from the estimation of fixed-effect models controlling for institution specific unobserved heterogeneity.

| Independent variable | Log(Mean Institutional Pell Award) | | |
|---|------------------------------------|----------------------|----------------------|
| | (1) | (2) | (3) |
| Merit-aid exists in GA X GA institution | -0.076 (0.006)*** | 0.013 (0.009) | 0.004 (0.009) |
| Merit-aid exists in GA X GA institution X Institution is in upper 40% within state | | -0.021 (0.016) | -0.015 (0.016) |
| Merit-aid exists in GA X GA institution X Two-year institution | | -0.216 (0.012)*** | -0.183 (0.012)*** |
| Merit-aid exists in GA X GA-border institution | | | -0.024 (0.006)*** |
| Merit-aid exists in GA X GA-border institution X Institution is in upper 40% within state | | | 0.015 (0.010) |
| Merit-aid exists in GA X GA-border institution X Two-year institution | | | 0.069 (0.008)*** |
| Log (1 + In-state tuition) | 0.052 (0.008)*** | 0.027 (0.007)*** | 0.028 (0.007)*** |
| Log (Lagged enrollment less Pell students) | -0.005 (0.004) | -0.016 (0.003)*** | -0.016 (0.003)*** |
| Log (Per-capita disposable income within state) | 0.448 (0.085)*** | 0.513 (0.073)*** | 0.444 (0.078)*** |
| Lagged State unemployment rate | 0.008 (0.002)*** | 0.007 (0.001)*** | 0.006 (0.001)*** |
| Year indicator variables included ^a | Yes | Yes | Yes |
| Year indicator variables X Institution is in upper 40% within state | No | Yes | Yes |
| Year indicator variables X Two-year institution | No | Yes | Yes |
| Constant | -6.728 (0.807)*** | -7.080 (0.693)*** | -6.423 (0.735)*** |
| Observations / Number of institutions | 7001 / 717 | 7001 / 717 | 7001 / 717 |
| R-squared | .45 | .60 | .60 |

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. ^a Alternative specifications reveal a general upward trend in average Pell awards within the sample of institutions considered.

Table 6: Effect of the Georgia Hope Scholarship on Total Pell Revenues – All southern non-merit institutions.

Coefficients are from the estimation of fixed-effect models controlling for institution specific unobserved heterogeneity.

| Independent variable | Log(Total Institutional Pell Revenue) | | |
|---|---------------------------------------|----------------------|----------------------|
| | (1) | (2) | (3) |
| Merit-aid exists in GA X GA institution | 0.238 (0.016)*** | 0.260 (0.023)*** | 0.242 (0.024)*** |
| Merit-aid exists in GA X GA institution X Institution is in upper 40% within state | | -0.187 (0.042)*** | -0.190 (0.043)*** |
| Merit-aid exists in GA X GA institution X Two-year institution | | -0.095 (0.031)*** | -0.020 (0.032) |
| Merit-aid exists in GA X GA-border institution | | | -0.048 (0.016)*** |
| Merit-aid exists in GA X GA-border institution X Institution is in upper 40% within state | | | -0.003 (0.026) |
| Merit-aid exists in GA X GA-border institution X Two-year institution | | | 0.159 (0.022)*** |
| Log (1 + In-state tuition) | 0.097 (0.021)*** | 0.007 (0.019) | 0.008 (0.019) |
| Log (Lagged enrollment less Pell students) | 0.042 (0.010)*** | 0.007 (0.009) | 0.006 (0.009) |
| Log (Per-capita disposable income within state) | -0.555 (0.219)** | -0.189 (0.191) | -0.331 (0.203) |
| Lagged State unemployment rate | 0.032 (0.004)*** | 0.031 (0.004)*** | 0.029 (0.004)*** |
| Year indicator variables included ^a | Yes | Yes | Yes |
| Year indicator variables X Institution is in upper 40% within state | No | Yes | Yes |
| Year indicator variables X Two-year institution | No | Yes | Yes |
| Constant | 7.834 (2.072)*** | 5.275 (1.809)*** | 6.622 (1.919)*** |
| Observations / Number of institutions | 7001 / 717 | 7001 / 717 | 7001 / 717 |
| R-squared | .68 | .76 | .76 |

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. ^a Alternative specifications reveal a general upward trend in total Pell revenues within the sample of institutions considered.

References

- Balderston, F., (1997). "Tuition and Financial Aid in Higher Education: The Case of California" *Economics of Education Review*, 16:337-343.
- Becker, W. E., (1990). "The Demand for Higher Education." in *The Economics of American Universities*, pp 155-188, Eds S. Hoenack & E. Collins. NY: State University of New York Press.
- Bertrand, M., E. Duflo and S. Mullainathan, (2002). "How Much Should We Trust Difference in Difference Estimates?" NBER Working Paper 8841.
- Clotfelter, C. (2004). "The New Merit Aid: Comment" In *College Choices: The Economics of Which College, When College, and How to Pay For It*. Edited by Caroline M. Hoxby. Cambridge, MA: The University of Chicago Press, forthcoming.
- Cornwell, C., D.B. Mustard and D.J. Sridhar, (2002). "The Enrollment Effects of Merit-Based Aid." Working paper, University of Georgia.
- Duffy, E.A. and I. Goldberg, (1998). *Crafting a Class: College Admissions and Financial Aid, 1955-1994*. Princeton: Princeton University Press.
- Dynarski, S.M., (2000). "Hope for Whom? Financial Aid for the Middle Class and Its Impact on College Attendance." *National Tax Journal*, 53:629-61.
- _____ (2002). "The Behavioral and Distributional Implication of Aid for College." *American Economic Review*, 92:2 279-285
- _____ (2003). "Does Aid Matter? Measuring the Effect of Student Aid on College Attendance and Completion." *American Economic Review* 93:279-288.
- _____ (2004). "The New Merit Aid" In *College Choices: The Economics of Which College, When College, and How to Pay For It*. Edited by Caroline M. Hoxby. Cambridge, MA: The University of Chicago Press, forthcoming.
- Ehrenberg, R.G., (2000). *Tuition Rising: Why College Costs So Much* Cambridge: Harvard U. Press.
- Hansen, L., (1983). "Impact of Student Financial Aid on Access." In *The Crisis in Higher Education*, edited by J. Froomkin, 84-96. New York: Academy of Political Science.
- Kane, T., (1994). "College Entry by Blacks Since 1970: The Role of College Costs, Family Background, and the Returns to Education." *Journal of Political Economy*, 102:878-911.

- Leslie, L.L and P.T. Brinkman, (1987) "Student Price Response in Higher Education: the Student Demand Studies." *Journal of Higher Education*, 58, 181-204.
- Li, J., (1999). "Estimating the Effects of Federal Financial Aid on College Tuition; A Study of Pell Grants," Dissertation, Harvard University.
- Long, B.T., (2002). "How do Financial Aid Policies affect Colleges? The Institutional Impact of the Georgia HOPE Scholarship." Working paper, Graduate School of Education, Harvard University.
- _____ (1995). "Rising Public College Tuition and College Entry: How Well Do Public Subsidies Promote Access to College." NBER Working Paper no. 5164.
- McPherson, M.S. (1998). *The Student Aid Game*. Princeton: Princeton University Press.
- _____ and M. Schapiro, (1994). "Merit Aid: Students, Institutions, and Society." Consortium for Policy Research in Education Research Report No. 30. August.
- Rizzo, M.J. and R.G. Ehrenberg, (2003). "Resident and Nonresident Tuition and Enrollment at Flagship State Universities." National Bureau of Economic Research, Cambridge, MA, Working Paper 9516.
- Seftor, N. and S. Turner, (2002). "Back to School: Federal Student Aid Policy and Adult College Enrollment." *Journal of Human Resources*, 37:336-352.
- Singell, L.D., Jr. and J.A. Stone, (2002). "The Good, the Poor, and the Wealthy: Who Responds Most to College Financial Aid?" *Bulletin of Economic Research*, 54:393-407.
- Singell, L.D., Jr. and J.A. Stone, (2003). "For Whom the Pell Tolls: A Test of the Bennett Hypothesis." Working paper, University of Oregon.
- Singell, Larry D., Jr. (2004) "Come and Stay a While: Does Financial Aid Effect Enrollment and Retention at a Large Public University?" *Economics of Education Review*, forthcoming.

Table A1: Institutions in Southern States for which *Upper40* = 1.

Our measure of quality, *Upper40_i*, equals one if institution *i* is above the sixtieth percentile (within State) in any one of the following indices: the percent of incoming freshman with math SAT scores above 500, the percent of incoming freshman with verbal SAT scores above 500, or the percent of incoming freshman with ACT scores above 21. Alternatively, institutions are assigned *Upper40_i* = 1 where the entrance requirements are reported 'very difficult' or 'most difficult' in Peterson's 1989 Guide to Four-Year Colleges.

| | | |
|---|---|---|
| AUBURN UNIVERSITY, AL | METHODIST COLLEGE, NC | UNIVERSITY OF TENNESSEE-MEMPHIS, TN |
| BIRMINGHAM SOUTHERN COLLEGE, AL | NORTH CAROLINA SCH OF THE ARTS, NC | UNIVERSITY OF THE SOUTH, TN |
| HUNTINGDON COLLEGE, AL | NORTH CAROLINA STATE UNIV-RALEIGH, NC | VANDERBILT UNIVERSITY, TN |
| SAMFORD UNIVERSITY, AL | QUEENS COLLEGE INC, NC | AUSTIN COLLEGE, TX |
| SOUTHEASTERN BIBLE COLLEGE, AL | SALEM COLLEGE, NC | BAYLOR UNIVERSITY, TX |
| SPRING HILL COLLEGE, AL | ST ANDREWS PRESBYTERIAN COLLEGE, NC | DALLAS CHRISTIAN COLLEGE, TX |
| UNIVERSITY OF ALABAMA, AL | ST AUGUSTINES COLLEGE, NC | HARDIN SIMMONS UNIVERSITY, TX |
| UNIVERSITY OF ALABAMA IN HUNTSVILLE, AL | UNIVERSITY OF N C-CHAPEL HILL, NC | HOUSTON BAPTIST UNIVERSITY, TX |
| AMERICAN UNIVERSITY, DC | UNIVERSITY OF N C-CHARLOTTE, NC | INCARNATE WORD COLLEGE, TX |
| GEORGE WASHINGTON UNIVERSITY, DC | UNIVERSITY OF N C-GREENSBORO, NC | LETOURNEAU UNIVERSITY, TX |
| GEORGETOWN UNIVERSITY, DC | UNIVERSITY OF N C-WILMINGTON, NC | LETUORNEAU UNIVERSITY, TX |
| UNIVERSITY OF DELAWARE, DE | UNIVERSITY OF NC-ASHEVILLE, NC | RICE UNIVERSITY, TX |
| AGNES SCOTT COLLEGE, GA | WAKE FOREST UNIVERSITY, NC | SCHREINER COLLEGE, TX |
| BERRY COLLEGE, GA | WARREN WILSON COLLEGE INC, NC | SOUTHERN METHODIST UNIVERSITY, TX |
| EMORY UNIVERSITY, GA | BARTLESVILLE WESLEYAN COLLEGE, OK | SOUTHWESTERN UNIVERSITY, TX |
| GEORGIA COLLEGE, GA | OKLAHOMA BAPTIST UNIVERSITY, OK | ST EDWARDS UNIVERSITY, TX |
| GEORGIA INSTITUTE OF TECHNOLOGY, GA | OKLAHOMA CHRISTIAN COLLEGE, OK | ST MARY'S UNIV OF SAN ANTONIO, TX |
| MERCER UNIVERSITY, GA | OKLAHOMA CHRISTIAN UNIV SCI & ARTS, OK | TEXAS A & M UNIVERSITY, TX |
| MERCER UNIVERSITY - MAIN CAMPUS, GA | OKLAHOMA CITY UNIVERSITY, OK | TEXAS CHRISTIAN UNIVERSITY, TX |
| OGLETHORPE UNIVERSITY, GA | OKLAHOMA PANHANDLE STATE UNIVERSITY, OK | TEXAS WESLEYAN UNIVERSITY, TX |
| SAVANNAH CLG OF ART AND DESIGN, GA | OKLAHOMA STATE UNIV-AGRIC/APPL SCI, OK | TRINITY UNIVERSITY, TX |
| SHORTER COLLEGE, GA | SOUTHERN NAZARENE UNIVERSITY, OK | UNIV OF HOUSTON, TX |
| SOUTHERN COLLEGE OF TECHNOLOGY, GA | UNIV OF SCI & ARTS OF OKLAHOMA, OK | UNIVERSITY OF DALLAS, TX |
| SPELMAN COLLEGE, GA | UNIVERSITY OF SCI & ARTS OF OK, OK | UNIVERSITY OF HOUSTON-UNIVERSITY PK, TX |
| UNIVERSITY OF GEORGIA, GA | UNIVERSITY OF SCI & ARTS OF OKLA, OK | UNIVERSITY OF TEXAS-ARLINGTON, TX |
| WESLEYAN COLLEGE, GA | UNIVERSITY OF TULSA, OK | UNIVERSITY OF TEXAS-AUSTIN, TX |
| ASBURY COLLEGE, KY | CITADEL THE MILITARY CLG-SOUTH CARO, SC | UNIVERSITY OF THE INCARNATE WORD, TX |
| BELLARMINE COLLEGE, KY | CLEMSON UNIVERSITY, SC | AVERETT COLLEGE, VA |
| BEREA COLLEGE, KY | COLLEGE OF CHARLESTON, SC | COLLEGE OF WILLIAM & MARY, VA |
| BRESCIA COLLEGE, KY | CONVERSE COLLEGE, SC | EASTERN MENNONITE COLLEGE, VA |
| CENTRE COLLEGE OF KENTUCKY, KY | ERSKINE COLLEGE, SC | EASTERN MENNONITE UNIVERSITY, VA |
| KENTUCKY WESLEYAN COLLEGE, KY | FURMAN UNIVERSITY, SC | GEORGE MASON UNIVERSITY, VA |
| THOMAS MORE COLLEGE, KY | MEDICAL UNIV OF SOUTH CAROLINA, SC | HAMPDEN-SYDNEY COLLEGE, VA |
| TRANSYLVANIA UNIVERSITY, KY | PRESBYTERIAN COLLEGE, SC | HOLLINS COLLEGE, VA |
| CENTENARY COLLEGE OF LOUISIANA, LA | UNIV OF SC COLUMBIA, SC | JAMES MADISON UNIVERSITY, VA |
| LA STATE UNIV MED CENTER, LA | UNIVERSITY OF SOUTH CAROLINA, SC | LYNCHBURG COLLEGE, VA |
| LOUISIANA STATE UNIV-HEALTH SCI CTR, LA | WOFFORD COLLEGE, SC | MARY WASHINGTON COLLEGE, VA |
| LOUISIANA TECH UNIVERSITY, LA | BELMONT COLLEGE, TN | RANDOLPH-MACON COLLEGE, VA |
| LOYOLA UNIVERSITY, LA | BELMONT UNIVERSITY, TN | RANDOLPH-MACON WOMAN'S COLLEGE, VA |
| LOYOLA UNIVERSITY NEW ORLEANS, LA | BRYAN COLLEGE, TN | ROANOKE COLLEGE, VA |
| TULANE UNIVERSITY OF LOUISIANA, LA | BRYAN COLLEGE (WM. JENNINGS), TN | UNIVERSITY OF RICHMOND, VA |
| UNIVERSITY OF NEW ORLEANS, LA | CHRISTIAN BROTHERS COLLEGE, TN | UNIVERSITY OF VIRGINIA, VA |
| APPALACHIAN STATE UNIVERSITY, NC | CHRISTIAN BROTHERS UNIVERSITY, TN | VIRGINIA POLYTECH INST & STATE UNIV, VA |
| CAMPBELL UNIVERSITY, NC | DAVID LIPSCOMB UNIVERSITY, TN | WASHINGTON & LEE UNIVERSITY, VA |
| CATAWBA COLLEGE, NC | KING COLLEGE, INC, TN | BETHANY COLLEGE, WV |
| DAVIDSON COLLEGE, NC | LINCOLN MEMORIAL UNIVERSITY, TN | GLENVILLE STATE COLLEGE, WV |
| DUKE UNIVERSITY, NC | MARYVILLE COLLEGE, TN | SHEPHERD COLLEGE, WV |
| ELON COLLEGE, NC | MILLIGAN COLLEGE, TN | UNIV OF CHARLESTON, WV |
| GUILFORD COLLEGE, NC | RHODES COLLEGE, TN | WEST VIRGINIA UNIVERSITY, WV |
| HIGH POINT COLLEGE, NC | TENNESSEE TECHNOLOGICAL UNIV, TN | WEST VIRGINIA WESLEYAN COLLEGE, WV |
| HIGH POINT UNIVERSITY, NC | UNION UNIVERSITY, TN | WHEELING COLLEGE, WV |
| LENOIR-RHYNE COLLEGE, NC | UNIVERSITY OF TENNESSEE-KNOXVILLE, TN | WHEELING JESUIT COLLEGE, WV |

Table A2: Sample Characteristics – All non-merit southern institutions.

Characteristics are reported for the sample used in the estimation procedures reported in Table 1, Table 2, Table 4 and Table 5.

| | Mean | Standard Deviation | Minimum | Maximum |
|---|-------------|--------------------|-------------|-------------|
| Number of Pell students | 962.4 | 1,155.5 | 2 | 13,041 |
| Georgia indicator | .125 | .331 | 0 | 1 |
| GA-border institution | .392 | .488 | 0 | 1 |
| In-state tuition | \$3,948.88 | \$4,269.81 | \$119.53 | \$27,252.19 |
| Lagged enrollment less Pell students | 2,589.99 | 3,849.18 | 6 | 35,421 |
| Four-year institution offering advanced degrees | .282 | .450 | 0 | 1 |
| Institution is in upper 40% within state | .199 | .400 | 0 | 1 |
| Two-year institution or less | .408 | .491 | 0 | 1 |
| Private (not-for-profit) institution | .392 | .488 | 0 | 1 |
| Historically black institution | .092 | .289 | 0 | 1 |
| State per-capita disposable income | \$18,579.46 | \$4,253.22 | \$10,348.96 | \$34,897.01 |
| Lagged State unemployment rate | 5.997 | 1.478 | 3.2 | 12 |
| Observations | 7,001 | | | |
| Number of institutions | 717 | | | |

Table A3: Random-Effect Models of the Effect of the Georgia Hope Scholarship on Institutional Pell Enrollments, Average Institutional Pell Award Value and Total Institutional Pell Revenue –All southern non-merit institutions.

Coefficients are from the estimation of random-effect models such that the error structure allows for the traditional error term unique to each observation and a second term representing the extent to which the intercept of the i^{th} institution differs from the overall intercept..

| Independent variable | Log(Number of Pell students) | Log(Average Pell award) | Log(Total Pell revenue) |
|---|------------------------------|-------------------------|-------------------------|
| | (1) | (2) | (3) |
| Merit-aid exists in GA X GA institution | 0.215 (0.024)*** | 0.005 (0.010) | 0.231 (0.026)*** |
| Merit-aid exists in GA X GA institution X Institution is in upper 20% within state | -0.169 (0.042)*** | -0.017 (0.017) | -0.187 (0.046)*** |
| Merit-aid exists in GA X GA institution X Two-year institution | 0.201 (0.031)*** | -0.183 (0.013)*** | 0.014 (0.034) |
| Merit-aid exists in GA X GA-border institution | -0.017 (0.016) | -0.027 (0.006)*** | -0.059 (0.017)*** |
| Merit-aid exists in GA X GA-border institution X Institution is in upper 20% within state | -0.031 (0.026) | 0.020 (0.010)* | 0.012 (0.028) |
| Merit-aid exists in GA X GA-border institution X Two-year institution | 0.083 (0.021)*** | 0.071 (0.009)*** | 0.170 (0.023)*** |
| Log (1 + In-state tuition less maximum Pell award) | -0.014 (0.002)*** | | |
| Log (1 + In-state tuition) | | 0.060 (0.006)*** | 0.089 (0.019)*** |
| Log (Lagged enrollment less Pell students) | 0.114 (0.008)*** | -0.004 (0.002)* | 0.108 (0.009)*** |
| Log (Per-capita disposable income within state) | -0.980 (0.197)*** | 0.397 (0.079)*** | -0.530 (0.216)** |
| Lagged State unemployment rate | 0.025 (0.004)*** | 0.006 (0.001)*** | 0.027 (0.004)*** |
| Institution is in upper 40% within state X GA institution | 0.134 (0.196) | 0.037 (0.033) | 0.230 (0.206) |
| Two-year institution or less X GA institution | -0.091 (0.088) | -0.091 (0.022)*** | -0.092 (0.095) |
| GA-border institution | -0.551 (0.205)*** | 0.244 (0.045)*** | -0.310 (0.216) |
| Institution is in upper 40% within state X GA-border institution | -0.083 (0.121) | 0.016 (0.020) | -0.037 (0.127) |
| Two-year institution or less X GA-border institution | -0.030 (0.066) | -0.068 (0.016)*** | -0.043 (0.071) |
| Four-year institution offering advanced degrees | 0.051 (0.013)*** | 0.011 (0.005)** | 0.049 (0.015)*** |
| Institution is in upper 40% within state | 0.338 (0.085)*** | -0.006 (0.016) | 0.344 (0.089)*** |
| Two-year institution or less | -0.362 (0.052)*** | -0.170 (0.013)*** | -0.472 (0.056)*** |
| Private (not-for-profit) institution | -1.093 (0.052)*** | -0.005 (0.013) | -1.166 (0.062)*** |
| Historically black institution | 0.990 (0.078)*** | 0.162 (0.013)*** | 1.192 (0.082)*** |
| Year indicator variables included | Yes | Yes | Yes |
| Year indicator variables X Institution is in upper 40% within state | Yes | Yes | Yes |
| Year indicator variables X Two-year institution | Yes | Yes | Yes |
| State indicator variables included | Yes | Yes | Yes |
| Constant | 15.114 (1.956)*** | -6.458 (0.783)*** | 7.765 (2.139)*** |
| Observations / Number of institutions | 7001 / 717 | 7001 / 717 | 7001 / 717 |

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.