Sibling Spillovers of Merit-Based Scholarships

Bogyung Kim*

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Abstract

I study whether an older sibling's eligibility for Georgia's HOPE and Zell Miller Scholarships affects younger siblings' college enrollment. Using administrative data from a Metro Atlanta school district and regression discontinuity designs at each GPA threshold, I find that an older sibling's HOPE eligibility raises younger siblings' enrollment by 4.6 percentage points overall and by 16 percentage points in low-income households, with large gains at four-year colleges. Zell Miller eligibility, by contrast, leaves overall enrollment unchanged and shifts younger siblings toward part-time enrollment. Accounting for sibling spillovers roughly doubles the social return to HOPE relative to estimates based on recipients alone.

Keywords: Merit-based Scholarship, Sibling Spillovers, College Enrollment

JEL Codes: I22, I23, J08

*Department of Economics, Andrew Young School of Policy Studies, Georgia State University. (Email: bogyungkim.us@gmail.com). I am grateful to Jonathan Smith for his guidance and mentorship. I thank Benjamin Marx, Daniel Kreisman, Tim Sass, and Seth Gershenson, as well as participants at the 2026 Association for Education Finance & Policy annual conference, the 2026 Midwest Economic Association meetings, the 21st Economics Graduate Student Conference at Washington University in St. Louis, and the 2026 Association for Public Policy Analysis & Management Fall Research Conference, for helpful comments. I also thank Annick Simo for helping prepare the data. The views in this paper are my own and do not necessarily reflect those of the anonymous public school district. All remaining errors are my own.

1 Introduction

Public investments in human capital are usually evaluated by their effects on recipients. Financial aid is a leading example. College students received $173 billion in grant aid in 2024–25 alone[1], yet evaluations of aid programs measure returns almost entirely through recipients' own enrollment and degree attainment.[2] Families, however, make educational decisions jointly. Parents divide a limited budget across children, and children learn about college from one another. When aid relaxes the educational budget constraint for one child or teaches a family how the aid system works, the effects may reach siblings who never receive aid. An evaluation that counts only recipients would then misstate the return to public spending on financial aid.

Two features of household decision-making make sibling spillovers plausible. First, college costs fall largely on families. Two-thirds of undergraduates are financially dependent on their parents (Georgia Student Finance Commission, 2024), and aid awarded to one child eases parental financial burdens (Bhargava et al., 2025), freeing resources that could fund another child's enrollment. Second, siblings share information. Younger siblings are more likely to attend the same college or pursue the same field of study as their older siblings (Goodman et al., 2019; Aguirre and Matta, 2021; Altmejd et al., 2021; Avdeev et al., 2024), and an older sibling who applies for aid learns eligibility rules, award amounts, and application timing that the family can pass on. Yet little evidence exists on whether financial aid itself spills over to siblings.

This paper examines whether an older sibling's eligibility for Georgia's merit-aid scholarships, HOPE and Zell Miller, affects a younger sibling's college enrollment. HOPE covers near-full tuition at eligible in-state institutions for students meeting a weighted high school GPA threshold of 3.0, while Zell covers full tuition for students meeting a GPA threshold of 3.7. I use student-level administrative data from a public school district in the Metro Atlanta area matched to National Student Clearinghouse college enrollment records. Using matched pairs of the two oldest siblings from graduating cohorts 2012–2022, I exploit the scholarships' GPA eligibility cutoffs in a regression discontinuity design to estimate the effect of older siblings' marginal scholarship eligibility on younger siblings' college enrollment.

Older siblings' HOPE eligibility increases younger siblings' college enrollment by 4.6 percentage points (5.8 percent) and in-state enrollment by 7.5 percentage points (13.7 percent). The positive enrollment spillover is concentrated among younger siblings from low-income households, defined by eligibility for free or reduced-price meals (FRPM) during K–12, who are 16 percentage points (25.3 percent) more likely to enroll in college. These spillover estimates exceed the

[1] https://research.collegeboard.org/trends/student-aid/highlights

[2] For example, Deming and Dynarski (2010) summarizes studies evaluating federal and state programs, Dynarski and Scott-Clayton (2013) reviews studies on student financial aid programs, and Page and Scott-Clayton (2016) reviews postsecondary education policy in the United States.

direct effect of HOPE eligibility on older siblings' own enrollment (2.7 percentage points overall and 6.4 percentage points in-state (Kim, 2026)), and are large relative to established benchmarks for aid's direct effect on recipients more broadly.[3] Standard evaluations of HOPE count only benefits to direct recipients and thus understate the program's social return. Incorporating younger siblings' additional in-state enrollment doubles HOPE's Marginal Value of Public Funds from 1.66 to 3.32 (Hendren and Sprung-Keyser, 2020).

Relaxed household budget constraints and within-family information transmission may together help explain why the spillover to younger siblings exceeds the direct effect of HOPE eligibility on the older sibling. Spillovers are concentrated among low-income families, a pattern consistent with tuition savings easing binding financial constraints and allowing younger siblings to enroll full-time at four-year colleges. Enrollment gains are larger for younger siblings who were ever eligible for free meals or persistently eligible for FRPM. Information from older siblings about scholarship requirements and college-going may also contribute among low-income families. For younger siblings in information-constrained settings at high schools with low college enrollment rates, younger siblings' probability of qualifying for HOPE increases by 18.3 percentage points and of enrolling at an in-state college by 26 percentage points. The available data cannot fully separate the two channels, but the combined evidence is consistent with both contributing to the observed spillovers.

Spillovers differ markedly under the Zell Miller Scholarship. Zell eligibility has no significant effect on younger siblings' overall college enrollment and instead shifts younger siblings toward part-time enrollment by 4.8 percentage points. Older siblings just below the Zell cutoff remain eligible for HOPE, so the incremental subsidy Zell provides is comparatively small, and the absence of a degree-completion effect among Zell-eligible older siblings (Kim, 2026) may further limit the positive influence to younger siblings. Together, the HOPE and Zell results suggest that both the subsidy's magnitude and the pathways it generates for older siblings shape spillovers to younger siblings.

The paper makes three contributions to the literature on college financial aid, sibling spillovers, and the returns to public investment in higher education. First, I show that financial aid generates positive enrollment spillovers that reach beyond the direct recipient. Prior research on college aid programs has evaluated them almost entirely by the enrollment and attainment of the students who receive them (Deming and Dynarski, 2010; Dynarski and Scott-Clayton, 2013; Page and Scott-Clayton, 2016). Using Georgia's merit-based scholarships, I provide evidence that an older sibling's eligibility increases a younger sibling's college enrollment and shapes college choice, with the largest effects among low-income families. Despite longstanding concerns that merit

[3] A $1,000 reduction in net price is estimated to raise enrollment by 3 to 5 percentage points (Leslie and Brinkman, 1988), and HOPE recipients' own enrollment rises by 4 to 6 percentage points per $1,000 of grant aid (Dynarski, 2000).

aid disproportionately benefits higher-income students (Dynarski, 2000, 2002, 2004), the enrollment gains here are concentrated among low-income households, suggesting that accounting for family spillovers at the eligibility margin can narrow the equity gap.

Second, I show that financial aid creates within-family educational spillovers in higher education. Existing research finds that older siblings shape younger siblings' educational choices through shared information, preferences, and family environments (Aguirre and Matta, 2021; Altmejd et al., 2021; Goodman et al., 2019; Avdeev et al., 2024). I extend this literature by showing that a policy-induced change in one sibling's access to financial aid changes another sibling's educational choices, potentially operating through both household resources and information transmission. The paper is most closely related to Jaramillo-Rojas and Sanchez (2026), who document aspirational spillovers from Colombia's Ser Pilo Paga program, where younger siblings gain even when an older sibling misses the scholarship. I complement their evidence by studying merit-based scholarships in the United States and using a regression discontinuity design around eligibility thresholds to identify spillovers from an older sibling's marginal scholarship eligibility.

Finally, I show that family spillovers matter for evaluating the social returns to public investment in higher education. Incorporating younger siblings' enrollment gains raises HOPE's estimated MVPF from 1.66 to 3.32 per dollar spent. Existing evaluations of financial aid, including MVPF calculations, focus primarily on direct recipients (Hendren and Sprung-Keyser, 2020; Kim, 2026), which may understate the returns to aid if the program creates positive externalities. Accounting for within-family spillovers broadens the scope of benefits captured in policy evaluation and substantially raises the estimated social return to financial aid.

2 Background

2.1 HOPE and Zell Miller Scholarships

Georgia operates two statewide merit-based scholarships without need-based aid: the HOPE (Helping Outstanding Pupils Educationally) Scholarship and the Zell Miller Scholarship.[4] Established in 1993 and funded by lottery revenues, HOPE is among the earliest state-sponsored merit-based financial aid programs in the United States (Doyle, 2006), having awarded more than $15 billion to over 2.1 million students through the 2023–24 academic year.[5] The Zell Miller Scholarship was introduced in 2010–11 as a companion program covering full tuition for higher-achieving students. At the same time, HOPE shifted from covering full tuition to paying a fixed dollar amount per credit hour, which became partial coverage.

[4]Georgia introduced its first statewide need-based scholarship, the DREAMS Scholarship, in Fall 2026. See gafutures.org/dreams.

[5]Georgia Student Finance Commission, 2024.

Both programs are available to Georgia residents who graduate from high school, have resided in Georgia for 12 consecutive months before college enrollment, and enroll in an eligible in-state postsecondary institution. Neither program has an income requirement, making both purely merit-based. The weighted High School HOPE GPA determines academic eligibility. The HOPE GPA is a weighted average of core academic course grades computed by the Georgia Student Finance Commission (GSFC); AP, IB, and dual-enrollment grades of B through D receive an additional 0.5 weight. Students qualify for HOPE with a HOPE GPA of at least 3.0, while Zell requires a GPA of at least 3.7 together with a minimum SAT score of 1200 or an ACT score of 26. Students with a GPA below 3.0 are not eligible for either scholarship, while those between 3.0 and 3.7 remain eligible for HOPE but not Zell. Students can track their HOPE GPA on the GAFutures platform starting in tenth grade. GSFC announces the final HOPE GPA by June 30 following high school graduation. Although GSFC does not announce the final HOPE GPA until high school graduation, students can estimate it during 12th grade using their interim GPA through 11th grade and the official HOPE GPA calculation formula.[6] Beginning with the graduating class of 2016, GSFC introduced a rigor requirement (three credits of advanced coursework for the class of 2016 and four credits from the class of 2017 onward) to limit GPA inflation from lower-difficulty course-taking; 97.9 percent of graduates in the 2016–2022 cohorts satisfied this requirement.

The two scholarships cover tuition at eligible in-state colleges but differ in generosity at four-year public institutions. At four-year public institutions in the University System of Georgia (USG), Zell covers each institution's full tuition regardless of credit hours. HOPE pays a fixed dollar amount per credit hour, so its coverage rate varies across institutions, ranging from 78 to 98 percent of tuition. Appendix Figure A1 illustrates HOPE and Zell award amounts across USG institutions for students attempting 6 credit hours (part-time) and 12 credit hours (full-time). For full-time enrollees, the HOPE–Zell gap is relatively small in most colleges. However, at several higher-tuition institutions, HOPE covers only about 78 percent of tuition. At these institutions, the Zell premium reaches as much as $1,152 per semester, totaling up to $11,520 over a 120-credit degree for a full-time student. The Zell premium is smallest for students taking 15 credits per semester, as the HOPE award increases with the number of credits attempted (see Appendix Figure A2).

At two-year colleges in the Technical College System of Georgia (TCSG) and at the 34 eligible private institutions, HOPE and Zell provide the same award amount. At TCSG colleges, this flat award is approximately $1,600 per semester, which fully covers tuition (TCSG tuition is $107 per credit hour, or approximately $3,200 per year).[7] At eligible private colleges, the flat

[6]For details on the GAFutures platform, see gafutures.org.

[7]Tuition and fee information for TCSG colleges is available at: https://www.tcsg.edu/parent-page/.

award is approximately $3,000 per semester. Both scholarships cover tuition only and do not pay mandatory fees or other educational expenses. Appendix Figure A2 shows tuition plus fees by USG institution; fees range from $320 to $818, with an average of $550 per semester. In addition, both are first-dollar awards and are not reduced by other financial aid sources.

Eligibility extends for 7 years from high school graduation for the graduating cohort of 2011–2018 and for 10 years from high school graduation for the graduating cohort of 2019 or later. Once students complete the Free Application for Federal Student Aid (FAFSA), they are automatically considered for the scholarship; otherwise, they must submit a one-time online application through the Georgia Student Finance Application (GSFAPP). During college, recipients must maintain a cumulative college GPA of 3.0 for HOPE and 3.3 for Zell to remain eligible. The GSFC evaluates GPA at the 30-, 60-, and 90-credit-hour checkpoints, and students can gain, lose, and regain the scholarship. Students who fall below the Zell threshold but maintain a GPA of at least 3.0 remain eligible for HOPE funding. Appendix B provides a full description of the eligibility criteria, renewal requirements, and institution-specific award amounts.

2.2 Conceptual Framework

This section outlines the channels through which an older sibling's scholarship eligibility may affect a younger sibling's college enrollment decision.

Relaxed Family Budget — The first channel eases the household budget constraint once an older sibling becomes eligible for aid. By covering nearly all of the older sibling's tuition costs, the scholarship frees up household resources that would otherwise have funded the older sibling's college attendance. Because financial aid awarded to one child can reduce parents' education-related borrowing (Bhargava et al., 2025), parents can then allocate the resulting savings strategically among their children, particularly when the household budget for educational investment binds. The most direct route is reallocating these savings toward the younger sibling's tuition or other enrollment costs, which should raise the younger sibling's likelihood of enrolling.

Families may also deploy scholarship-freed resources earlier, before the younger sibling's enrollment decision itself becomes relevant. Investing these resources in a higher HOPE GPA, more rigorous coursework, accelerated course-taking, tutoring, or other college-preparatory activities during high school can raise the younger sibling's probability of meeting college or scholarship eligibility thresholds. Unlike the direct reallocation channel above, pre-college investment affects the younger sibling's college enrollment indirectly, though still positively.

Knowledge Transmission — The intrafamily transmission of knowledge about college-going and scholarship eligibility plausibly shapes younger siblings' college decisions. When an older

sibling enrolls through a merit-aid program, younger siblings and parents gain firsthand knowledge of eligibility requirements, eligible institutions, actual grant amounts, and the financial aid process and timing. This information may lower barriers that often discourage first-generation and low-income students from pursuing higher education (Hoxby and Turner, 2013). Parents may also update their beliefs about college feasibility and affordability after observing the older child successfully navigate the process (Gurantz et al., 2020); updated beliefs can in turn make parents more likely to encourage the younger sibling's enrollment. Beyond information about college applications or financial aid, older siblings can share firsthand experience from the specific colleges they attended, including the factors that shaped their own utility there (Altmejd et al., 2021), and such accounts may expand the set of colleges that younger siblings perceive as viable options. Older siblings may also be role models (Zajonc and Markus, 1975; Zajonc, 1976; Zang et al., 2023), raising the younger sibling's educational aspirations and normalizing college attendance as an attainable goal.

Older Sibling's College Enrollment — The last set of mechanisms operates through changes in older siblings' college enrollment induced by their own scholarship eligibility. The income effect arises when an older sibling's college enrollment crowds out resources available to a younger sibling, because college attendance imposes substantial costs beyond tuition, including room and board, fees, and living expenses, that scholarships do not cover. When scholarship eligibility induces a marginal older sibling, who otherwise would not have enrolled, to attend college, the resulting household expenditures can crowd out resources for the younger sibling's own enrollment decision. This channel operates in a negative direction for younger sibling enrollment and is most likely to bind in low-income households, where the budget constraint is already tight.

The sibling discount through federal aid operates in a positive direction. Until the 2023–24 academic year, students with a sibling concurrently enrolled in college had increased federal aid eligibility.[8] The sibling discount may incentivize a younger sibling's enrollment insofar as concurrent enrollment increases the federal aid available to the older sibling, and this channel is likely stronger among sibling pairs with overlapping college enrollment windows. Together, the income effect and the sibling discount capture two countervailing forces that arise when an older sibling's enrollment is itself the margin of response to HOPE.

3 Data

This study uses student-level administrative records from one large public school district in the metropolitan Atlanta area. The district is one of the top five largest districts in Georgia, comprising 106 schools serving more than 88,000 students in Academic Year 2025–26. I link

[8] The sibling discount was removed with the 2024–25 FAFSA simplification.

high school records with matched sibling identifiers to postsecondary enrollment data from the National Student Clearinghouse (NSC).

3.1 High School Enrollment Data

The dataset covers high school graduating cohorts from 2012 through 2022 and includes 69,906 graduates. The data contains detailed information on scholarship eligibility, High School HOPE GPA, academic transcripts, enrollment histories, and student demographics. Academic transcripts include specific courses taken, letter or numeric grades, final high school HOPE GPA, and graduation status. The dataset includes demographic characteristics such as sex, race/ethnicity, English Learner status, disability status, and year-by-year eligibility for free or reduced-price meals, which I use as a proxy for socioeconomic disadvantage.

Academic eligibility for HOPE is based on the school district's official HOPE eligibility designation, which indicates whether a student qualifies and, for those who do not, records the reason for ineligibility, either failure to meet the rigor requirement or failure to meet the HOPE GPA threshold. The data do not directly measure Zell eligibility, which additionally requires a minimum SAT/ACT score. Students with a HOPE GPA below 3.7 are not eligible for Zell even if they meet the minimum SAT/ACT score, while students with a HOPE GPA of at least 3.7 must also meet the minimum SAT/ACT score requirement. I therefore proxy Zell eligibility using the GPA threshold, classifying students with a HOPE GPA of at least 3.7 as Zell-eligible. This proxy may misclassify students who meet the GPA threshold but lack a qualifying test score. This concern appears modest, however, as 98.92% of USG students from 2013–2019 with a HOPE GPA of at least 3.7 who ever attained the required SAT/ACT score received the Zell Miller Scholarship (Song and Rubenstein, 2024).

3.2 Matching Siblings

I identify sibling pairs among all students enrolled in the district between 2012 and 2022. Two students count as siblings if they share the same last name and residential address in a given year. This approach follows the sibling spillover literature using administrative data.[9] I exclude co-residing students with different last names. These students may be cousins, step-siblings, or unrelated co-residents (Hunter et al., 1998; Gottfried and McGene, 2013). I also exclude students with incomplete or ambiguous address information to avoid false positives.[10]

[9]Recent studies of sibling spillovers using administrative data employ similar approaches, including those based on Florida school district data (Heissel, 2017; Karbownik and Özek, 2023), Philadelphia public schools (Gottfried and McGene, 2013), English administrative records (Nicoletti and Rabe, 2019, 2013), and College Board data (Goodman et al., 2015; Gurantz et al., 2020; Goodman et al., 2019).

[10]Some students in apartment complexes lack unit numbers, even though the rest of their address is complete. This lack of unit numbers makes it hard to verify co-residence at the household level. I classify each address as either

Appendix Table A1 presents summary statistics for two samples. The only-child sample includes students not matched to any other student by last name and address. The any-sibling sample includes students matched to one or more other students. Among the 2012–2022 graduating cohort, 50.4 percent of students are matched with at least one sibling. On average, matched households include 2.3 students. The matched-sibling sample yields some false negatives, and it may differ from the unmatched sample in observable characteristics. These differences do not threaten internal validity or bias the estimated treatment effects.

After matching students on name and address, I assign each matched group a family identifier. I then compute birth-month gaps, using students' birth year and month, to measure age differences between siblings. Because I cannot distinguish twins' birth order, I randomly assign older- and younger-sibling flags for twin pairs. Of the 35,209 matched siblings, 1,696 are twins or triplets. I exclude from my main sample any sibling pairs born in the same year and month. As a robustness check, I relax the same-last-name restriction to include co-residing students with different last names. I also run the regression including the twin sample.

3.3 National Student Clearinghouse and Supplemental Data

I link students to NSC postsecondary enrollment records. As of 2012, the NSC covers approximately 93% of U.S. postsecondary institutions and 95% of institutions in Georgia (Dynarski et al., 2015). The NSC provides detailed information on institutions attended, enrollment intensity, enrollment dates, majors for degree recipients, and degree attainment and timing.

The main outcomes include indicators for whether a student enrolls in any postsecondary institution within 16 months of high school graduation[11], whether the student enrolls in a Georgia institution, and whether the student enrolls in a four-year, full-time, or public institution. Because some students attend or transfer across multiple institutions, I focus on the first institution of enrollment after high school graduation. Appendix C provides details on data construction.

The analysis further supplements the NSC records with institution-level data from the Integrated Postsecondary Education Data System (IPEDS) and 2009 Barron's college selectivity classifications to examine the effects of the scholarships on college selectivity and tuition levels.[12] Using IPEDS data, I classify colleges into four selectivity tiers based on the 2015 average combined SAT Math and Evidence-Based Reading/Writing scores of enrolled students, using thresholds ranging from 900 to 1200 and above, following Bueno et al. (2024).[13] These SAT thresholds correspond to

an apartment complex or a single-family residence, and keep only addresses with complete information. About 18.4% of student-year observations are in apartment complexes, and 0.23% have incomplete address components.

[11]This definition follows the Georgia Office of Student Achievement's methodology for calculating college enrollment rates.

[12]Barron's selectivity ratings are available at: https://archive.nytimes.com/www.nytimes.com/interactive/2013/04/04/business/economy/economix-selectivity-table.html

[13]These thresholds correspond to national percentiles: 900 (29th), 1000 (48th), 1100 (69th), and 1200 (81st). See

broad categories of institutional selectivity in Georgia, where most public colleges fall between 900 and 1200 and only a few universities exceed 1200. I also use Barron's college selectivity classifications, defining selective colleges as those rated "Very Competitive Plus" or above (ratings of 1, 2, 3, and 4).

I use IPEDS data on in-state and out-of-state tuition and fees to examine whether younger siblings enroll in higher-cost institutions. I construct annual tuition measures by calculating institutional tuition distributions and defining indicators for institutions at or above the 25th, 50th, and 75th percentiles. Because tuition varies over time, institutions may fall into different categories from year to year. These quantiles are computed separately for all institutions and for Georgia institutions only.

3.4 Main Analysis Sample

I limit the main sibling sample to the first- and second-born children in households with two or three matched siblings.[14] I require both siblings to reach their senior year, so I can observe their post-graduation college-going decisions. I exclude sibling pairs where the younger sibling has not yet reached senior year by the end of the sample period, or where the younger sibling dropped out of high school.

I restrict the older-sibling analysis sample to high school graduates who resided in Georgia for at least 12 consecutive months before college enrollment, consistent with the residency requirements for both HOPE and Zell. Approximately 98% of graduates satisfy this criterion. I further restrict the sample to students who meet the academic rigor requirement, so that variation in scholarship eligibility comes solely from the HOPE GPA. Approximately 97.9% of graduates meet this rigor requirement. Younger siblings are not required to meet the scholarship's residency or rigor requirements.

3.5 Summary Statistics

Column 1 of Table 1 reports summary statistics for baseline characteristics and college enrollment outcomes for the full student sample. Among all graduates, 39 percent of students are Black, 45 percent were ever eligible for free or reduced-price meals (FRPM), and the mean HOPE GPA is 3.052. Compared with statewide averages in Georgia[15], the sample's racial composition,

College Board (https://research.collegeboard.org/reports/sat-suite/understanding-scores/sat).

[14] I focus on the two oldest siblings because identifying spillover effects becomes harder when several older siblings could influence outcomes at once. To preserve statistical power, I include households with up to three children, which make up 97.6% of the full matched-sibling sample.

[15] Student and school demographic data for Georgia are obtained from the Governor's Office of Student Achievement: https://gosa.georgia.gov/report-card-dashboards-data/report-card/contents-report-card/student-and-school-demographics.

share of English Learners, and share of students with disabilities are all similar to statewide figures. However, the proportion of FRPM-eligible students in the sample is lower than the statewide average of 64 percent. Overall, 76 percent of students enroll in college after graduating from high school, exceeding Georgia's statewide rate of 64.4 percent.[16]

Column 2 of Table 1 presents summary statistics for the sibling-pair sample, focusing on first- and second-born children in households with two or three matched siblings. Relative to the full sample, the sibling sample has a higher proportion of Asian and White students and a lower proportion of Black students. About 35.5 percent are ever eligible for FRPM, and the mean HOPE GPA is slightly higher at 3.15. Students in the sibling sample are also more likely to enroll in college (82 percent) and slightly more likely to attend in-state institutions (58.7 percent).

Columns 3 and 4 of Table 1 report summary statistics for older siblings within the optimal bandwidth around the HOPE and Zell cutoffs, respectively. Compared with the HOPE RD sample, students near the Zell cutoff are more likely to be female, Asian, and White, and substantially less likely to be FRPM-eligible. College enrollment rates are high in both RD samples; about 90 percent of those near the HOPE cutoff enroll in college, compared with 95.5 percent near the Zell cutoff. Students near the Zell cutoff are considerably more likely to enroll in selective colleges. Roughly 70 percent attend institutions where the average SAT score exceeds 1200, and 63 percent attend a college rated selective under Barron's classification.

4 Empirical Strategy

Estimating the effects of the HOPE and Zell Miller Scholarships on college outcomes is challenging because scholarship-eligible students are systematically different from scholarship-ineligible students. For example, high-achieving students are more likely to qualify for scholarships and enroll in college, which may reflect differences in parental investment, aspirations, and motivation.

Identifying sibling spillover effects of the scholarships presents additional challenges beyond estimating the direct effects on recipients. Siblings share both observed and unobserved characteristics that influence academic achievement and postsecondary enrollment, including family resources, parental preferences, neighborhood environments, and inherent cognitive skills (Black and Devereux, 2011). Moreover, siblings interact closely with one another, often more so than with their peers at school (Duncan et al., 2001). In educational settings, older siblings may influence younger siblings' academic achievement (Karbownik and Özek, 2023), college and major choice (Aguirre and Matta, 2021; Altmejd et al., 2021), and field of study in higher education (Avdeev et al., 2024). These interactions raise concerns discussed in the peer effects literature,

[16] Governor's Office of Student Achievement, 2024–25.

including the reflection problem (Manski, 1993, 2000), whereby the outcomes of one sibling may simultaneously influence and be influenced by the outcomes of the other.

I use a regression discontinuity design based on the older sibling's scholarship eligibility at the GPA threshold to address these empirical challenges. I compare younger siblings whose matched older siblings narrowly miss the GPA threshold with those whose older siblings narrowly meet it (Imbens and Lemieux, 2008), since these older-sibling groups are comparable except for GPA-based HOPE eligibility. This approach isolates spillover effects from older to younger siblings because younger siblings' treatment variation arises solely from the older sibling's GPA. The RD design also mitigates the reflection problem, as the older sibling's marginal eligibility at the GPA cutoff is determined before and cannot be influenced by the younger sibling's college enrollment decisions.

4.1 Regression Discontinuity Design

I implement a regression discontinuity design to estimate local average treatment effects. The RD design is sharp for HOPE and for Zell with respect to the GPA criterion because students below the relevant GPA cutoff are not academically eligible, while students above the cutoff satisfy the GPA requirement. I estimate reduced-form RD specifications that relate older siblings' scholarship eligibility to younger siblings' college enrollment outcomes.

$$Y^{y}_{istf} = \alpha_0 + \alpha_1 Above^{o}_{istf} + \alpha_2 D^{o}_{istf} + \alpha_3 Above^{o}_{istf} \times D^{o}_{istf} + \Omega X^{y}_{istf} + \psi_s + \delta_t + \epsilon_{istf}, \quad (1)$$

where Y^{y}_{istf} denotes the main outcomes of interest, college enrollment and choice, for younger siblings y in sibling pair f who belong to high school s in graduating cohort t. $Above^{o}_{istf}$ equals one if the older sibling's HOPE GPA is at or above the cutoff (3.0 for HOPE and 3.7 for Zell). α_1 captures the intent-to-treat effect of the older sibling's scholarship eligibility on the younger sibling's college enrollment outcomes. D^{o}_{istf} measures the distance of the older sibling's GPA from the relevant threshold. The interaction term $Above^{o}_{istf} \times D^{o}_{istf}$ allows for different linear trends on either side of the cutoff. X^{y}_{istf} includes the younger sibling's demographic characteristics, including gender, race/ethnicity, free or reduced-price meal eligibility, English learner status, and disability status. The specification includes high school and graduating cohort fixed effects, ψ_s and δ_t, respectively. Standard errors are clustered at the sibling level. I set the RD bandwidth to 0.3 around the HOPE cutoff and 0.25 around the Zell cutoff (Imbens and Kalyanaraman, 2012), based on optimal bandwidth selection using the on-time college enrollment outcome.

4.2 Validity Checks for RD Design

The validity of the RD design relies on the assumption that older siblings on either side of the cutoff are comparable and do not differ systematically, except for treatment assignment. To assess this, I examine covariate balance at both the HOPE and Zell cutoffs by testing whether observable characteristics, including gender, race/ethnicity, FRPM eligibility, English learner status, and disability status, vary smoothly around the thresholds. As shown in Appendix Table A2 and Appendix Table A3, and graphically in Appendix Figure A3 and Appendix Figure A4, most covariates appear balanced at both cutoffs. However, the regression estimate for the female indicator at the HOPE cutoff is marginally significant and nontrivial in magnitude. While this pattern could reflect sorting near the cutoff, it may also arise by chance given the number of covariates examined. To mitigate this concern, all main specifications include controls for these baseline characteristics.

A second assumption of the RD design is that the running variable is continuous at the cutoff. Visual inspection reveals heaping at whole- and half-point GPA values around the HOPE cutoff, while the distribution around the Zell cutoff appears smooth. Appendix Figure A5 Panel A shows heaping at every 0.5 point, including the HOPE cutoff of 3.0. The same pattern appears in the FRPM subgroups shown in Panels B (FRPM-eligible) and C (FRPM non-eligible). Although such heaping could raise concerns about manipulation, it likely reflects the HOPE GPA's mechanical construction, which converts numeric grades into discrete letter grades on a four-point scale and applies a 0.5-point weight to AP, IB, and Dual Enrollment courses. Prior studies have documented similar patterns in both high school and college GPAs (Bettinger et al., 2019; Bhargava et al., 2025; Barreca et al., 2016; Ost et al., 2018). As suggested by Ost et al. (2018), Appendix Figure A6 presents a simulated GPA distribution whose heaping pattern closely resembles the pattern observed in the real GPA distribution. This similarity is consistent with heaping being driven largely by the mechanical construction of GPA rather than by intentional manipulation.

I examine the density of the running variable after excluding observations exactly at the cutoff, following Scott-Clayton and Schudde (2020). After removing students with a HOPE GPA exactly equal to 3.0, the density appears smooth around the threshold, with no statistically significant discontinuity (Appendix Figure A5 Panel E). Both visual inspection and the formal density test show no evidence of bunching around the Zell cutoff (Appendix Figure A7). To further address heaping concerns, I implement a Donut RD design that separately excludes students with a HOPE GPA exactly equal to 3.0 for HOPE and those with a HOPE GPA between 3.69 and 3.71 for Zell (Barreca et al., 2016; Schudde and Scott-Clayton, 2016; Ost et al., 2018). I also estimate specifications that incorporate trends-in-heaps for the HOPE cutoff, following Zimmerman (2014); Barreca et al. (2016), which control for indicators of heaped GPA values and their interactions with a quadratic function of distance from the cutoff.

The continuity assumption also implies that students should not be able to precisely manipulate the running variable around the cutoff. Several institutional features of the HOPE GPA calculation likely limit the scope for such manipulation. The GSFC centrally calculates HOPE GPAs using official transcripts submitted directly by accredited high schools. GSFC updates students' 9th-, 10th-, and 11th-grade HOPE GPAs each fall, and high schools must submit transcript data by September 1. As a result, students enter senior year with a GSFC-verified interim GPA based on completed core coursework, although the official final HOPE GPA is not issued until graduation. Because the HOPE GPA is a credit-weighted average across four years of core coursework, students could, in principle, use their interim GPA and remaining senior-year coursework to back out the grades needed to reach the 3.0 threshold, using the same formula GSFC applies.

In practice, however, students have limited scope to change their cumulative GPA during senior spring. Students take an average of 2.86 core courses during senior spring, accounting for 11 percent of their cumulative core coursework. Thus, by senior spring, students have already completed 89 percent of their cumulative core coursework, leaving little room for one or two additional courses to meaningfully shift their cumulative GPA. In the robustness section, I test whether rigor-course taking varies around the cutoff in each grade, to examine whether students are more or less likely to take additional coursework that could affect their HOPE GPA at the margin.

5 Results

5.1 HOPE Scholarship on Younger Sibling's College Enrollment

The older sibling's HOPE eligibility increases younger siblings' college enrollment by 4.6 percentage points (Column 1, Panel A of Table 2), a 5.8 percent increase relative to the control mean. Panel A of Figure 1 shows a clear upward discontinuity at the 3.0 GPA cutoff, consistent with the RD estimate. The spillover effect exceeds the direct effect of HOPE eligibility on the eligible student's own college enrollment, estimated at 2.7 percentage points (Kim, 2026). The gap suggests that the mechanisms behind sibling spillovers differ from those driving recipients' own enrollment decisions. Several channels likely operate together to produce the larger spillover effect, rather than a single mechanism in isolation, which I present evidence for in the mechanism section.

HOPE eligibility also raises younger siblings' probability of enrolling full-time by 8.0 percentage points, an 11.5 percent increase relative to the control mean (Column 2, Panel A of Table 2); Panel B of Figure 1 shows the same positive discontinuity at the cutoff. HOPE subsidizes tuition in proportion to the number of credit hours attempted, so both full-time and part-time students receive financial aid. The program therefore provides recipients with relatively weak

incentives to switch from part-time to full-time enrollment, and HOPE's direct effect on full-time enrollment is modest, at 2.8 percentage points (Kim, 2026). HOPE's tuition subsidy, by contrast, may ease the family's overall financial constraints relative to a scenario in which the older sibling receives no HOPE funding, enabling the younger sibling to enroll full-time. Younger siblings may also update their expectations about the affordability of full-time attendance after observing their older sibling's experience.

HOPE's spillover effects extend beyond college attendance to younger siblings' institutional choices. Older siblings' HOPE eligibility increases younger siblings' in-state college enrollment by 7.5 percentage points (13.7 percent) and public college enrollment by 5.3 percentage points (7.5 percent) (Columns 4 and 6 of Table 2). Panels C and D of Figure 1 show the corresponding positive discontinuities at in-state and public institutions. One possible explanation is that younger siblings follow their older siblings' college choices. When an older sibling is marginally eligible for HOPE, younger siblings are 4.1 percentage points more likely to enroll at the same college as their older sibling, though the estimate is less precisely measured (Appendix Table A4, Column 1). HOPE eligibility shifts older siblings toward in-state public colleges (Kim, 2026), and younger siblings may subsequently enroll at those same institutions.

The sibling spillover effects differ markedly by family income. Panels B and C of Table 2 present heterogeneous treatment effects by family income, with low-income status proxied by ever having been eligible for Free or Reduced-Price Meals (FRPM) during K–12 enrollment. By construction, low-income students are underrepresented near the merit-based scholarship cutoffs relative to higher-income students. Nevertheless, Panel B of Table 2 shows that older siblings' HOPE benefit is concentrated among younger siblings who are ever FRPM eligible. HOPE eligibility increases college enrollment among low-income younger siblings by 16.0 percentage points (Column 1) and full-time enrollment by 20.1 percentage points (Column 2). HOPE eligibility primarily affects the extensive margin of college attendance among low-income older siblings (Kim, 2026), so an older sibling's transition to college with financial support may positively influence younger siblings' own enrollment decisions. Panels A and B of Figure 2 show the same divergence by income status. Low-income younger siblings are 19.1 percentage points more likely to enroll in in-state and public institutions (Columns 4 and 6 of Table 2), suggesting that low-income younger siblings who enroll choose in-state public colleges. One possible explanation is that low-income younger siblings may themselves be more likely to become HOPE-eligible when an older sibling is marginally eligible for HOPE, although the estimate is less precise (0.078, SE = 0.054; see Panel A, Column 2 of Appendix Table A5). Higher eligibility raises the younger sibling's likelihood of receiving HOPE, which in turn raises the odds of enrolling at a scholarship-eligible college. Panels C and D of Figure 2 show the same pattern for institutional choice. Ever-FRPM younger siblings show clear upward discontinuities in enrollment outcomes at the HOPE cut-

off, while never-FRPM younger siblings show little response, consistent with their already high baseline enrollment rates.

5.2 HOPE Scholarship on Younger Sibling's College Choice by Selectivity

Older siblings' HOPE eligibility does not increase younger siblings' four-year college enrollment, nor does HOPE eligibility increase enrollment in moderately selective institutions where average SAT scores are 900–1100 (Table 3 Panel A). HOPE eligibility does, however, reduce enrollment in highly selective institutions, defined either as colleges with average SAT scores of 1200 or higher or as colleges rated selective under Barron's classification (Columns 6-7 of Table 3). Younger siblings are 7.4 percentage points (32 percent) less likely to enroll in colleges with average SAT scores of 1200 or higher, and 4.2 percentage points (27.5 percent) less likely to enroll in colleges rated selective under Barron's classification. Older siblings eligible for HOPE are more likely to choose lower-cost in-state public institutions and less likely to enroll in highly selective colleges (Kim, 2026), and younger siblings may follow those enrollment decisions. The limited number of highly selective institutions in Georgia may further reinforce the pattern. Consistent with the RD estimates, Figure 3 shows no discernible discontinuity in enrollment at colleges with average SAT 1000+ (Panel B), but a negative discontinuity at colleges with average SAT scores of 1200 or higher and at colleges rated selective under Barron's classification (Panels C-D).

College choice responses are also more pronounced among low-income families. HOPE eligibility shifts younger siblings toward higher-quality postsecondary options. Column 1, Panel B of Table 3 shows that low-income younger siblings are 16.7 percentage points (30.3 percent) more likely to enroll in four-year colleges. HOPE eligibility also increases younger siblings' attendance at moderately selective institutions when an older sibling is marginally eligible, with no effect on highly selective colleges. HOPE eligibility therefore pushes low-income younger siblings toward higher-intensity, higher-quality college options without trading off college selectivity. Higher-income younger siblings, in contrast, are 4.6 percentage points less likely to enroll in four-year colleges and less likely to attend selective institutions overall. Enrollment in highly selective colleges among higher-income younger siblings declines by 9.5 percentage points (29.7 percent). Panel A of Figure 4 shows the divergence by income. Ever-FRPM younger siblings show large positive gains in four-year college enrollment at the cutoff, whereas never-FRPM younger siblings show a modest negative discontinuity. Similar patterns emerge for college selectivity, as shown in Panels B-D of Figure 4; only never-FRPM younger siblings show a negative jump in enrollment at highly selective colleges. One possible explanation for the negative pattern among higher-income families is that HOPE shifts older siblings toward in-state public colleges (Kim, 2026), which may anchor younger siblings' own expectations and narrow the set of institutions under consideration.

5.3 Zell Miller Scholarship on Younger Sibling's College Enrollment

The spillover effects of the Zell Miller Scholarship differ sharply from those of HOPE. Zell does not affect younger siblings' overall college attendance. Column 1, Panel A of Table 4 shows a null effect on overall enrollment, and the Zell control mean, at 92 percent, is already substantially higher than in the HOPE sample. Panel A of Figure 5 shows no visible jump in overall enrollment at the Zell cutoff, consistent with the null result. Zell instead shifts enrollment from full-time to part-time status (Table 4 Columns 2-3), reducing full-time enrollment by 4.5 percentage points (5.2 percent) while increasing part-time enrollment by 4.8 percentage points. Panel B of Figure 5 shows the corresponding downward discontinuity in full-time enrollment at the cutoff. The null-to-negative effects likely reflect the older sibling's own college experience under Zell. Zell-eligible students disproportionately enroll in in-state public colleges without corresponding gains in graduation, and the less favorable outcome may spill over to shape younger siblings' enrollment choices.

The same mechanism appears to extend to younger siblings' choice of where to enroll. The older sibling's Zell eligibility does not lead younger siblings toward in-state options. Column 4 of Table 4 shows a null effect on in-state college enrollment, and Panel C of Figure 5 similarly shows no visible jump in in-state enrollment at the cutoff. The older sibling's limited success completing college under Zell may narrow, rather than expand, younger siblings' in-state options. Younger siblings still shift toward public colleges by 6.0 percentage points when their older sibling is Zell-eligible, suggesting that families may opt for less expensive options while remaining enrolled in college. Panel D of Figure 5 shows the corresponding upward discontinuity in public college enrollment at the cutoff.

Zell's sibling spillover is also concentrated among low-income families, and primarily shifts college choice rather than expanding college access. Table 4 Panel B shows that college enrollment among ever-FRPM younger siblings is not responsive to older siblings' Zell eligibility. Figure 6 Panel A shows that ever-FRPM-eligible younger siblings have a lower rate of college enrollment than never-FRPM younger siblings, but neither group responds to older siblings' marginal Zell eligibility. Rather than expanding access, low-income younger siblings tend to enroll in less expensive college options overall. Table 4 Panel B, Column 3, shows that ever-FRPM younger siblings shift 19.8 percentage points from full-time to part-time enrollment. Younger siblings also shift toward in-state public two-year colleges, mostly TCSG colleges, where sticker tuition is substantially lower than at four-year colleges (Columns 4 and 6 of Table 4 and Column 2 of Table 5). Figure 6 Panels C–D confirm that the enrollment shifts come solely from younger siblings who were ever eligible for FRPM.

5.4 Zell Miller Scholarship on Younger Sibling's College Choice by Selectivity

Older siblings' Zell eligibility does not increase younger siblings' four-year college enrollment, nor does Zell eligibility increase enrollment in moderately selective institutions with average SAT scores between 900 and 1100 (Table 5 Panel A). Zell eligibility does, however, reduce younger siblings' enrollment in highly selective institutions. Younger siblings are 6.0 percentage points (12.8 percent) less likely to enroll in colleges with average SAT scores of 1200 or higher, though the corresponding estimate for Barron's selective colleges (-4.9 percentage points, 12.6 percent) is not statistically significant. Figure 7 shows no discernible discontinuity in enrollment at colleges with average SAT 1000+ (Panel B), but a negative discontinuity at colleges with average SAT scores of 1200 or higher (Panels C-D). The Zell estimates broadly align with the HOPE spillover pattern above. Older siblings' eligibility for either scholarship shifts younger siblings' enrollment away from highly selective institutions, mirroring older siblings' own tendency to choose lower-cost in-state institutions when eligible for merit-based aid (Kim, 2026). Appendix Figure A8 reports the spillover RD estimates for both cutoffs at colleges with average SAT scores of 900+ and 1100+.

Zell eligibility does not increase selective college enrollment among younger siblings in either low- or higher-income families. Among ever-FRPM younger siblings, the estimates for enrollment at colleges with average SAT scores of 900 or higher through 1200 or higher are negative but imprecise (Table 5, Panel B, Columns 3–6), whereas two-year college enrollment rises by 13.8 percentage points (Column 2). Among never-FRPM younger siblings, enrollment at colleges with average SAT scores of 1200 or higher declines by 6.1 percentage points, although the estimate is significant only at the 10 percent level (Panel C, Column 6). Figure 8 shows a similar pattern. Panel B shows lower enrollment in mid-tier selective colleges among ever-FRPM younger siblings, and Panels C–D show lower enrollment in highly selective colleges among never-FRPM younger siblings. Taken together, the point estimates are consistent with a modest shift toward less selective and less expensive options, although the estimates are not precise enough to support firm conclusions. One possible interpretation is that younger siblings or their parents revise their expectations based on the older sibling's college experience. Zell-eligible older siblings are more likely to attend in-state public institutions without corresponding gains in persistence or graduation (Kim, 2026), which may narrow the range of college options that families consider for younger siblings. Appendix Figure A9 reports the spillover RD estimates by FRPM status for both cutoffs at colleges with average SAT scores of 900+ and 1100+.

5.5 Robustness Checks

I conduct additional analyses to assess the robustness of the main findings across alternative specifications. First, I re-estimate the RD model under two alternative specifications. The first excludes student demographic covariates; the second applies a triangular kernel that places greater weight on observations closer to the cutoff. The first and second rows of Appendix Table A6 (HOPE) and Appendix Table A7 (Zell) report these estimates. Both approaches yield point estimates broadly consistent in magnitude with the main results, for both the full younger sibling sample and the family-income subsamples. Next, I address concerns about GPA heaping using a Donut RD design that excludes observations at the exact cutoff, following Barreca et al. (2011, 2016). These estimates are reported in the third row of Appendix Table A6 for HOPE and Appendix Table A7 for Zell, across all college enrollment outcomes. The Donut RD yields point estimates of a similar magnitude to the baseline results. Standard errors are generally comparable to, or slightly larger than, the baseline standard errors, for both the full sample and the subsamples by family income. I also implement the Trends-in-Heaps approach, following Barreca et al. (2016) and Zimmerman (2014), to further examine potential bias from nonrandom heaping at the HOPE cutoff. This specification incorporates indicator variables for heaped GPA values, interacted with a quadratic function of distance from the cutoff. This allows for level shifts at heaped points and flexible slopes near the threshold. As shown in the fourth row of Appendix Table A6, the resulting estimates are broadly similar in magnitude, though less precise for the full sample.

Next, I assess the estimates' sensitivity to alternative bandwidth choices. I re-estimate the models using both narrower and wider bandwidths than the optimal bandwidth, under both local linear and quadratic specifications. As shown in Appendix Figure A10 for HOPE and Appendix Figure A11 for Zell, the local linear estimates remain broadly stable across bandwidth choices, whereas the quadratic estimates show larger standard errors. The overall patterns remain qualitatively similar across specifications. This suggests that the main findings are reasonably robust to alternative bandwidth choices and functional forms. Estimates are also similar in magnitude when the sample includes co-residing students with different last names, includes twin pairs, or controls for the age gap between siblings, although the HOPE estimate including students with different last names is smaller (0.037) and less precise (Appendix Figure A12).

As a falsification check, I estimate the model at every 0.05-point increment from 2.6 to 3.4 for HOPE and from 3.55 to 3.85 for Zell, using placebo cutoffs and holding the bandwidth fixed across specifications. The largest and statistically significant discontinuities occur at the true cutoff, whereas estimates at placebo cutoffs are generally smaller and not statistically significant (see Appendix Figure A13 for HOPE and Appendix Figure A14 for Zell). This pattern is consistent with the estimated effects being driven by the policy-relevant cutoff, rather than by arbitrary features of the GPA distribution.

Finally, I examine whether older siblings near the eligibility threshold adjust their course-taking behavior in ways that could mechanically affect their HOPE GPA. This addresses concerns about potential manipulation around the cutoff.[17] Specifically, I regress the number of AP, IB, Dual Enrollment, and other rigor-related courses taken on marginal eligibility status for students in 10th, 11th, and 12th grades. I do not detect statistically significant differences in course-taking patterns within the main RD sample across grades. This provides limited evidence of systematic manipulation around the HOPE GPA threshold. Corresponding estimates are reported in Appendix Table A8.

6 Mechanisms and Heterogeneous Analysis

6.1 Mechanisms

Which mechanisms could explain the positive enrollment spillovers of an older sibling's scholarship eligibility on a younger sibling? The evidence provides limited support for two alternative explanations, both tied to the older sibling's own college attendance rather than to any broader household response.

The "Income Effect" channel holds that marginal older siblings enroll in college because of their own HOPE eligibility, increasing household spending on the older sibling's tuition and potentially crowding out resources available to younger siblings. This channel is unlikely to be the driving mechanism. If crowding out were important, financially constrained families would be expected to shift toward lower-priced colleges; instead, younger siblings show no such shift, even among low-income households (Appendix Table A9). The "Sibling Discount" channel (under which households receive larger federal financial aid when multiple children are enrolled in college at the same time) would predict larger spillovers among siblings with smaller age gaps, who are more likely to overlap in college enrollment. The data show the opposite pattern: spillover effects are larger among siblings separated by four or more years in overall college enrollment outcome, when overlap in college attendance is less likely (see Panel A of Appendix Figure A15). This channel is therefore unlikely to be the main mechanism.

The evidence points to relaxed household budgets as an important mechanism behind HOPE's positive spillover effects, particularly for financially constrained families. Following Michelmore and Dynarski (2017), I classify FRPM-eligible younger siblings as either persistently eligible throughout high school or eligible only for free (rather than reduced-price) meals. Panel A of Appendix Table A10 shows that spillover effects are largest among students experiencing deeper or

[17] Ideally, one could use the intermediate HOPE GPA as the running variable to assess whether effects persist before senior year. In practice, estimates using intermediate GPA measures are imprecise. This limits their usefulness for this purpose.

more persistent poverty. Consistent with this pattern, the effects are strongest for students attending high-poverty high schools (Panel B of Appendix Table A10). Positive enrollment gains are also larger in three-child households than in two-child households, although these estimates are less precise (Panel A of Appendix Table A11). This pattern is consistent with larger gains from relaxing the household budget constraint when limited resources are stretched across more children.

Budget relaxation, however, does not fully explain the results. Low-income households also tend to have less access to information about college and financial aid. This makes within-family information transmission another plausible mechanism, which I test using heterogeneity in the information environment of the younger sibling's high school. Among low-income students at high schools with high college-going rates and richer college-related information environments, older siblings' HOPE eligibility increases college enrollment without improving HOPE GPA or scholarship eligibility, with noisier estimates (see Panel A of Table 6). Since academic preparation and scholarship eligibility remain unchanged, these results are consistent with students in this environment already having adequate information about college and scholarship requirements, and being constrained mainly by financial resources.

In contrast, among low-income students attending high schools with low college enrollment rates, where access to college-related information is more limited, an older sibling's HOPE eligibility substantially increases younger siblings' own HOPE scholarship eligibility (see Panel B of Table 6). These findings suggest that an older sibling's HOPE eligibility helps convey information about how to raise the HOPE GPA or meet scholarship eligibility criteria, thereby improving younger siblings' own scholarship eligibility. Younger siblings are also 26 percentage points more likely to enroll in scholarship-eligible in-state colleges, consistent with older siblings sharing information about scholarship requirements, application procedures, and the tuition coverage the scholarship actually provides. Although younger siblings are more likely to become HOPE-eligible, they are no more likely to take accelerated coursework that could otherwise raise their odds of college enrollment (Columns 6-8 in Panel B of Table 6).

Overall, household budget relaxation appears to operate broadly among low-income families, while information transmission matters most where the local information environment is weak. Spillover effects are largest in schools with the lowest baseline college-going rates (Appendix Table A12). Positive spillovers specifically on scholarship-eligible college enrollment are concentrated among siblings separated by fewer than four years, who are more likely to exchange up-to-date information and influence one another's college decisions (Whiteman et al., 2011; Avdeev et al., 2024) (see Panel A of Appendix Figure A15).

A distinct information channel appears to operate among high-income households, where financial constraints are less likely to bind. HOPE eligibility reduces college enrollment at selec-

tive institutions among high-income younger siblings but does not affect overall college enrollment. Because HOPE induces some high-achieving older siblings to attend in-state public and less-selective colleges, younger siblings may revise their college aspirations and application decisions based on their older siblings' firsthand experiences. A similar pattern emerges for Zell spillovers. Zell-eligible older siblings' weaker college completion outcomes may also negatively shape younger siblings' college choices, with larger effects on in-state public and part-time college enrollment among financially constrained families, even though these younger siblings continue to enroll in college (see Appendix Table A13).

Finally, I examine whether spillovers depend on the older sibling's college success. Using second-semester persistence as a proxy for early college success, younger siblings still show positive, though considerably smaller, enrollment effects when the older sibling does not persist into the second semester (Appendix Table A14).[18] Compared with older siblings who persisted into their second semester, spillover effects among younger siblings of older siblings who dropped out remain positive, but smaller in magnitude and not statistically significant. This pattern suggests that older siblings' early college persistence matters for younger siblings' college enrollment decisions.

Overall, the budget and information channels are not mutually exclusive. Two main channels likely account for why the indirect spillover to younger siblings exceeds the direct effect on the scholarship-eligible older sibling. Although the available data cannot fully separate relaxed household budgets from within-family information transmission, the combined evidence is consistent with both channels contributing to the observed spillovers.

6.2 Additional Heterogeneity

Appendix Table A15 presents spillover effects by siblings' gender composition. Overall, spillover effects are somewhat larger among mixed-gender sibling pairs than among same-gender

[18] Younger siblings' college enrollment decisions may also be shaped by the older sibling's college outcomes beyond initial enrollment. However, estimating spillover effects as a function of the older sibling's persistence and completion presents identification challenges. The older sibling's college outcomes may be influenced by the younger sibling's college enrollment, particularly in narrower age-gap pairs, where sibling pairs are more likely to be simultaneously college-aged. In addition, the older sibling's persistence is endogenous to scholarship retention, which, in turn, depends on academic performance. For example, households with higher educational aspirations may systematically produce older siblings who both retain their scholarships and persist through college. This would confound any estimated relationship with younger siblings' outcomes. To mitigate these identification challenges, I focus on the older sibling's second-semester persistence during the first year of college as a more cleanly identified measure of early college success. Second-semester persistence is not contingent on scholarship retention policy, since the academic performance checkpoint for renewal occurs at the end of the academic year rather than at the semester level. Moreover, the second semester of the older sibling's first year occurs early enough that the younger sibling is unlikely to have made consequential college-going decisions yet. This mitigates the threat of reverse causality.

pairs.[19] Among mixed-gender pairs, Panel A in Appendix Figure A16 shows the largest effects for older sister–younger brother pairs. This pattern might reflect either stronger information transmission from older sisters or differential parental resource allocation across sons and daughters, although the available data do not allow me to distinguish between these explanations. Spillover effects on college selectivity, however, show no systematic pattern across sibling gender compositions (Panel C in Appendix Figure A16).

Spillover effects also vary across demographic groups. Panel A of Appendix Figure A17 shows that HOPE's positive spillover effects are particularly pronounced among Black and Hispanic younger siblings. These groups have relatively low baseline college enrollment rates. This is consistent with within-family spillovers mattering most when barriers to college attendance are greater. In contrast, Panel B shows that Zell eligibility reduces enrollment in four-year, full-time, and selective colleges among Black and Hispanic students, despite little effect on overall college attendance. This pattern mirrors the broader Zell results. The scholarship appears to primarily shift college choice rather than expand access. Together, HOPE's effects are concentrated among historically underserved populations, while Zell's spillovers mainly shape the types of colleges younger siblings choose to attend.

7 Welfare Analysis

I assess the social return to the HOPE Scholarship using the Marginal Value of Public Funds (MVPF) framework of Hendren and Sprung-Keyser (2020). The MVPF equals beneficiaries' willingness to pay (WTP) for a policy divided by the policy's net cost to the government. A recipient-based MVPF counts only the after-tax earnings gains of scholarship recipients. If an older sibling's eligibility also raises younger siblings' college enrollment, a recipient-based calculation omits part of the program's benefits and part of its fiscal cost.

I extend the recipient-based estimate in Kim (2026) on both sides of the ratio. On the benefit side, I add the younger sibling's expected after-tax earnings gain to the older sibling's WTP. The addition assumes that the older sibling values the younger sibling's gain. On the cost side, I add state appropriations for younger siblings' additional enrollment at in-state colleges, net of the state income tax revenue generated by younger siblings' higher earnings. The scholarship outlay does not change, since HOPE pays only the eligible older sibling.

Let $\hat{\beta}^{y}_{\text{enroll}} = 0.075$ denote the intent-to-treat effect of an older sibling's HOPE eligibility on

[19] The existing sibling spillover literature often finds stronger effects among same-gender siblings, consistent with social learning through closer identification (Nicoletti and Rabe, 2019; Joensen and Nielsen, 2018; Dahl et al., 2024). In the present setting, however, gender differences are difficult to interpret because parental allocation of educational resources may vary by children's gender and interact with household financial constraints (Karbownik and Myck, 2017). Since the estimated spillovers are concentrated among low-income families, these channels cannot be cleanly separated. The results are therefore presented descriptively rather than as evidence for a particular mechanism.

the younger sibling's in-state enrollment (Table 2, Column 4). I then convert the enrollment effect into a degree completion effect by multiplying by the six-year graduation rate at Georgia four-year institutions among the 2018 cohort, 51.8 percent,[20] which gives $\hat{\beta}^{y}_{\text{comp}} = 0.075 \times 0.518 \approx 0.039$. The younger sibling's contributions to WTP and net cost are

$$\Delta\text{WTP}^{y} = \hat{\beta}^{y}_{\text{comp}} \times \text{NPV} \times (1 - \tau_{\text{fed}}) \times (1 - \tau_{\text{state}}), \tag{2}$$

$$\Delta\text{Cost}^{y} = \underbrace{\hat{\beta}^{y}_{\text{enroll}} \times A \times T}_{\text{Additional appropriations}} - \underbrace{\hat{\beta}^{y}_{\text{comp}} \times \text{NPV} \times \tau_{\text{state}}}_{\text{State tax revenue}}, \tag{3}$$

and the extended MVPF is

$$\text{MVPF} = \frac{\text{WTP}^{o} + \Delta\text{WTP}^{y}}{\text{Cost}^{o} + \Delta\text{Cost}^{y}}, \tag{4}$$

where WTP^{o} and Cost^{o} are the older sibling's recipient-based WTP and net cost from Kim (2026). NPV is the present discounted value of the Georgia college wage premium, estimated at $779,580 from the 2017 American Community Survey following the method of Bartik et al. (2016) with a 3 percent discount rate. A is annual state and local appropriations per student ($6,201.40, calculated from the Delta Cost Project), and $T = 4$ is the number of years of enrollment. $\tau_{\text{fed}} = 18.9$ percent and $\tau_{\text{state}} = 4.99$ percent are the federal marginal and Georgia state income tax rates. All values are in 2012 dollars.

Table 7 reports the calculation. The younger sibling adds $23,427 to WTP but only $343 to net cost, because state tax revenue from younger siblings' earnings ($1,517) offsets most of the additional appropriations ($1,860). Under the assumptions above, the MVPF rises from 1.66 to 3.32. Appendix D reports each step in detail.

The main calculation follows Kim (2026) in measuring benefits through in-state degree completion. Under the in-state definition, younger siblings who shift from out-of-state to in-state enrollment (Table 2, Column 5) contribute to both benefits and costs. An alternative definition measures benefits through completion at any four-year college and therefore counts only net new enrollment. Under the alternative definition, pairing the recipient-based estimate with the younger sibling's overall enrollment effect (0.046) raises the MVPF from 0.82 to 1.88 (Appendix Table D2). The two definitions yield different levels, but under both definitions the sibling channel roughly doubles the recipient-based MVPF.

The calculation assumes that marginal sibling enrollees graduate at the statewide rate and earn the average college wage premium. If marginal enrollees complete college at lower rates or earn lower returns, the sibling contribution would be smaller. All estimates are intent-to-treat

[20] Graduation rate within 150 percent of normal time for first-time, full-time bachelor's degree-seeking students at four-year institutions in Georgia. U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Graduation Rates component, accessed via the IPEDS Trend Generator.

effects of older siblings' eligibility, measured per eligible older sibling. Rescaling by the first-stage effect of eligibility on scholarship receipt (approximately 0.67) would raise the extended estimates to 4.11 under the in-state definition and 2.39 under the any four-year definition.

8 Conclusion and Policy Implications

This paper shows that the benefits of merit-based financial aid extend beyond the students who receive it, and that these spillovers depend on scholarship design. Using administrative data linking K-12 records from a large school district in metropolitan Atlanta to National Student Clearinghouse enrollment records, I estimate sibling spillover effects by exploiting the GPA eligibility cutoffs for the HOPE and Zell Miller Scholarships in a regression discontinuity design. An older sibling's HOPE eligibility increases younger siblings' overall college enrollment, showing that the program's benefits extend to other household members. Zell eligibility, by contrast, leaves younger siblings' overall enrollment unchanged and instead shapes their college choice, shifting them toward less costly enrollment options.

For both scholarships, spillover effects concentrate among low-income families, while high-income families' overall enrollment do not respond to aid available to one child. Among low-income households, an older sibling's HOPE eligibility increases younger siblings' enrollment at higher-quality postsecondary options, consistent with relaxed household budget constraints. Exposure to an older sibling's scholarship experience also shapes younger siblings' own likelihood of qualifying for HOPE, particularly where college-related information at school is limited. Zell eligibility, however, shifts low-income younger siblings toward part-time enrollment and lower-cost institutions rather than expanding their access, partially explained by the absence of a completion gain among Zell-eligible older siblings and the relatively small tuition premium Zell offers over HOPE.

Conventional cost-benefit analyses typically consider only the outcomes of direct recipients and therefore may substantially understate the social returns to financial aid. Accounting for spillovers to younger siblings roughly doubles the estimated social return to HOPE relative to recipient-based estimates. Because these spillovers are concentrated among low-income households at the eligibility margin, positive enrollment spillovers also help offset longstanding concerns that HOPE disproportionately benefits higher-income students. More broadly, the findings suggest that financial aid policies can influence educational investment at the household level rather than solely at the individual level, and that a scholarship's design and its effect on recipients' own outcomes shape whether those effects extend to younger siblings. Incorporating family spillovers into policy evaluation therefore provides a more complete assessment of the returns to public investment in higher education.

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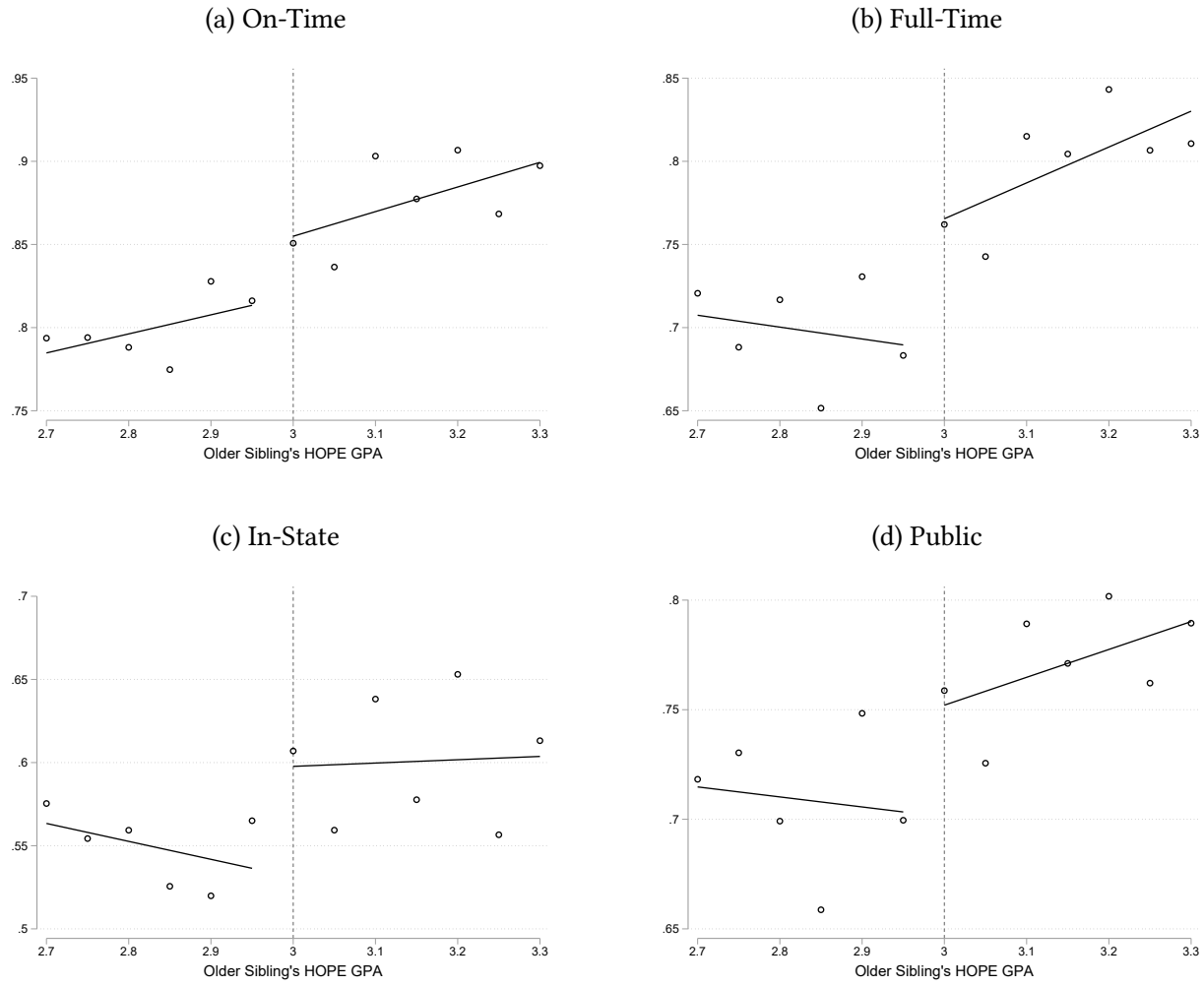
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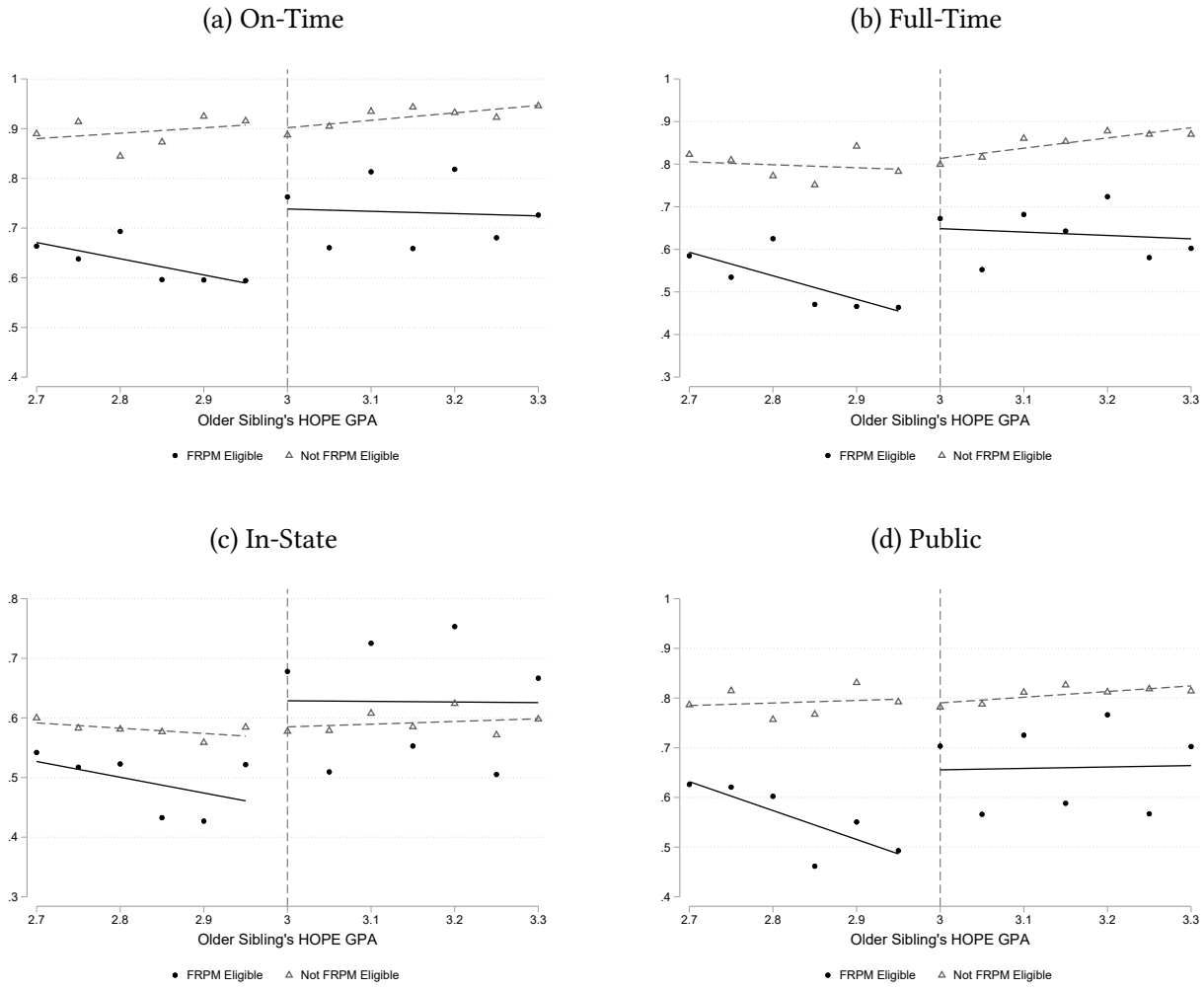
Figures

Figure 1: Sibling Spillover Effects on College Enrollment: HOPE Scholarship



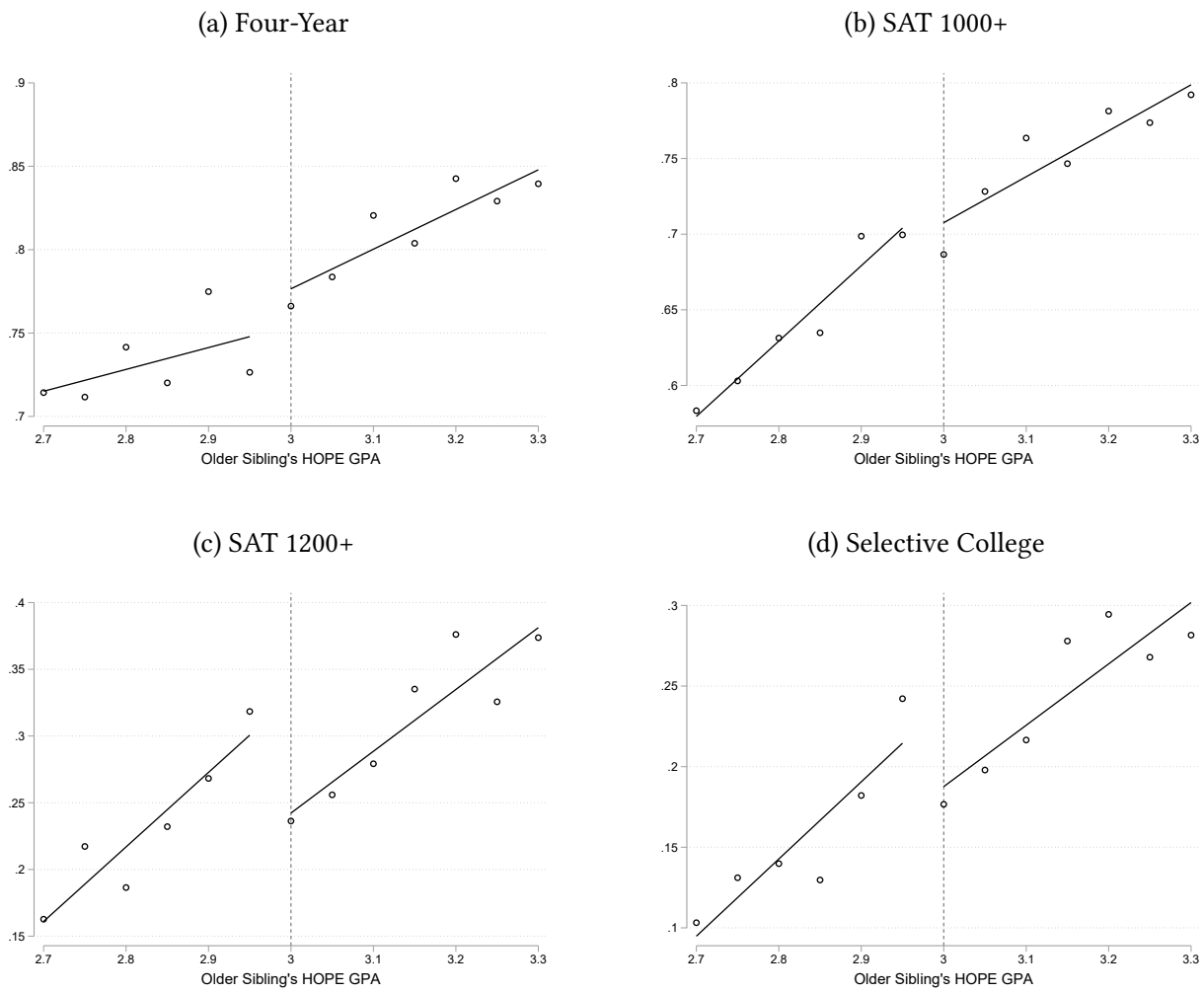
Source: National Student Clearinghouse.
Note: Each panel presents regression discontinuity estimates of the effect of an older sibling's HOPE Scholarship eligibility on younger siblings' college enrollment outcomes. The sibling sample includes the two oldest siblings in households with two or three children, where the older sibling lived in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

Figure 2: Sibling Spillover Effects on College Enrollment by FRPM: HOPE Scholarship



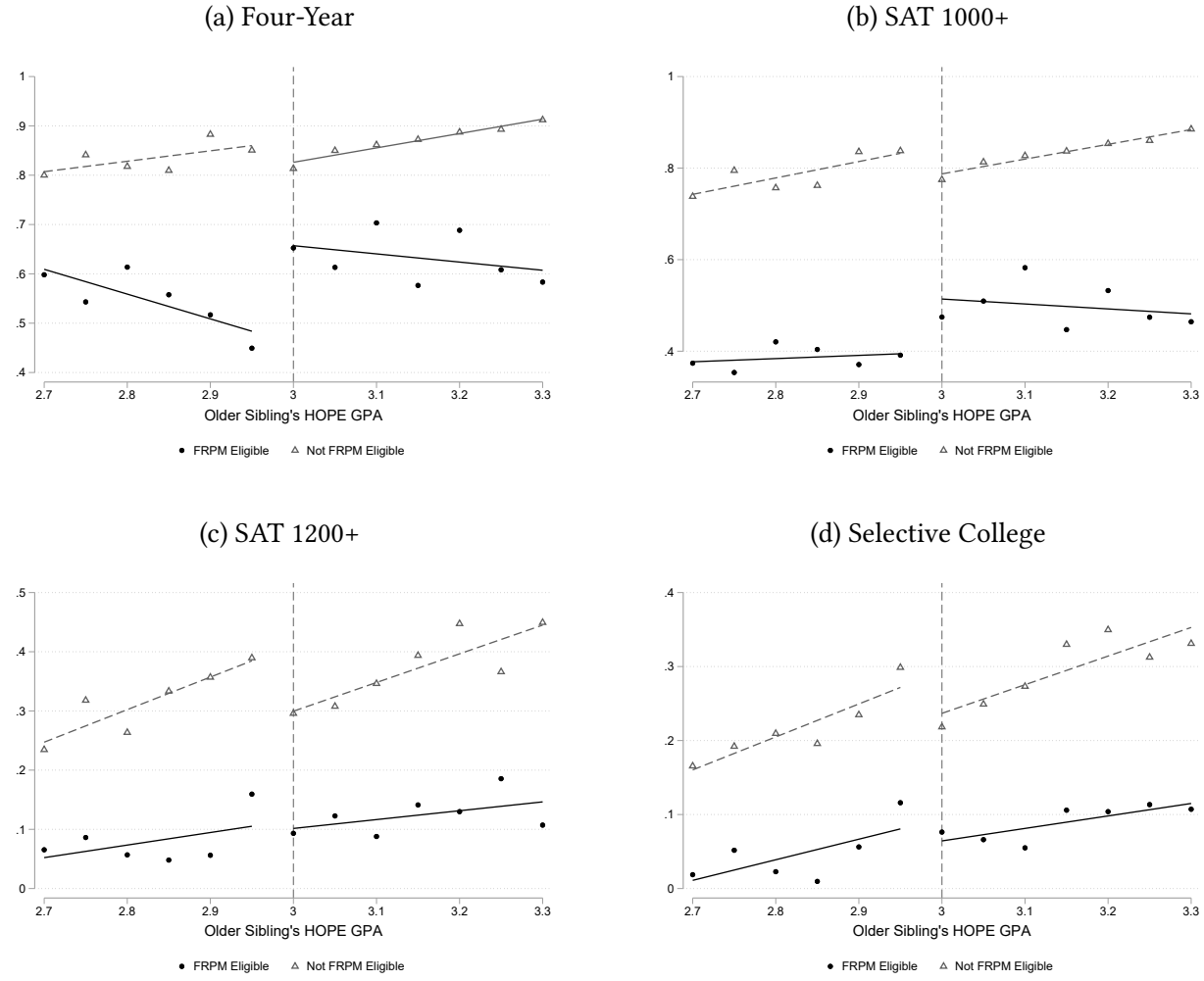
Source: National Student Clearinghouse.
Note: Each panel displays regression discontinuity estimates of the effect of an older sibling's HOPE Scholarship eligibility on younger siblings' college enrollment outcomes, stratified by younger siblings' ever FRPM eligibility. "FRPM Eligible" indicates students who were at any point eligible for free or reduced-price meals during K–12 enrollment, while "Not FRPM Eligible" indicates students who were never eligible. The sibling sample consists of the two oldest siblings in households with two or three children, where the older sibling resided in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

Figure 3: Sibling Spillover Effects on College Choice by Selectivity: HOPE Scholarship



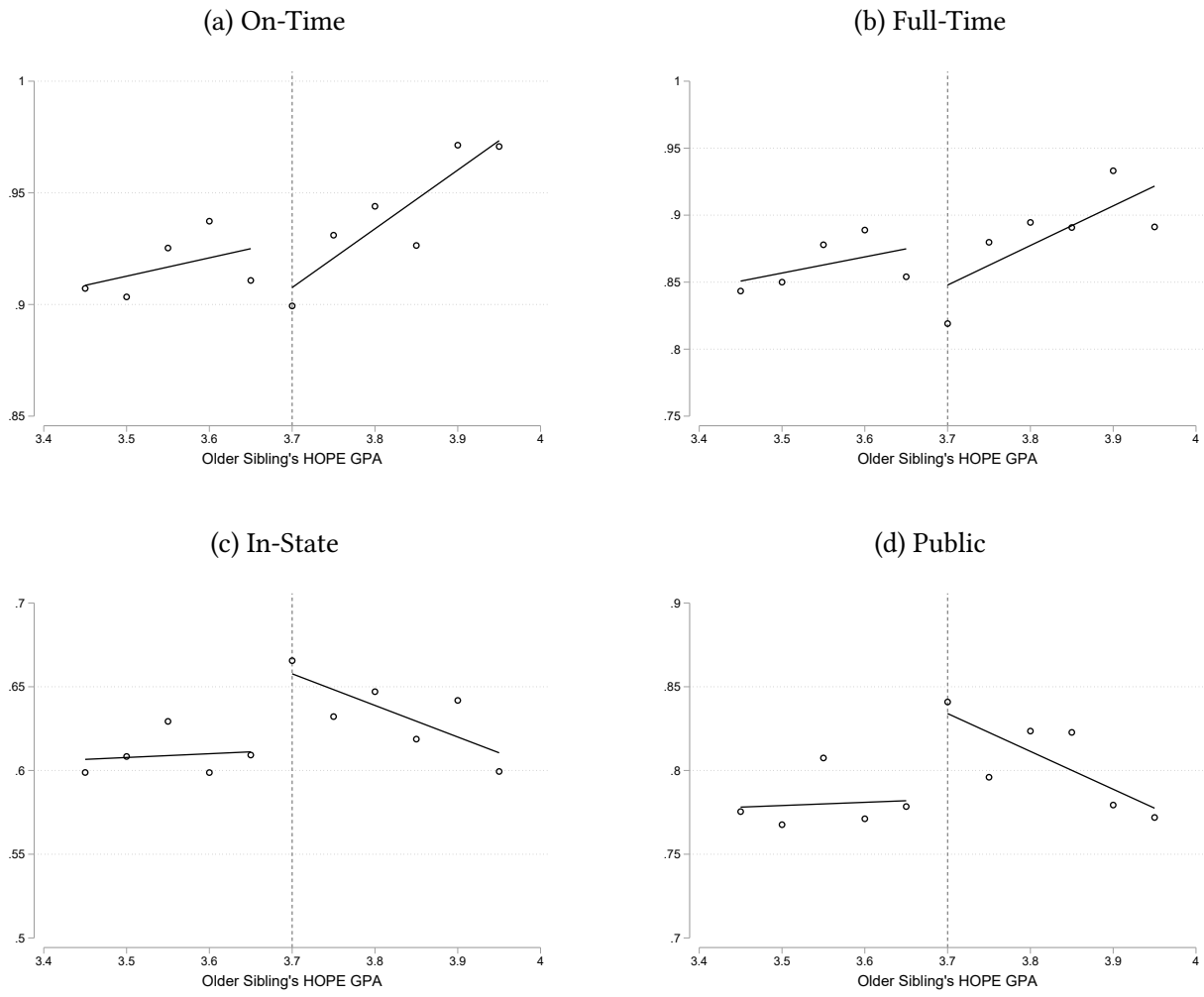
Source: National Student Clearinghouse and Integrated Postsecondary Education Data System (IPEDS).
Note: Each panel presents regression discontinuity estimates of the effect of an older sibling's HOPE Scholarship eligibility on younger siblings' college enrollment outcomes by institutional selectivity. The sibling sample includes the two oldest siblings in households with two or three children, where the older sibling lived in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

Figure 4: Sibling Spillover Effects on College Choice by Selectivity by FRPM: HOPE Scholarship



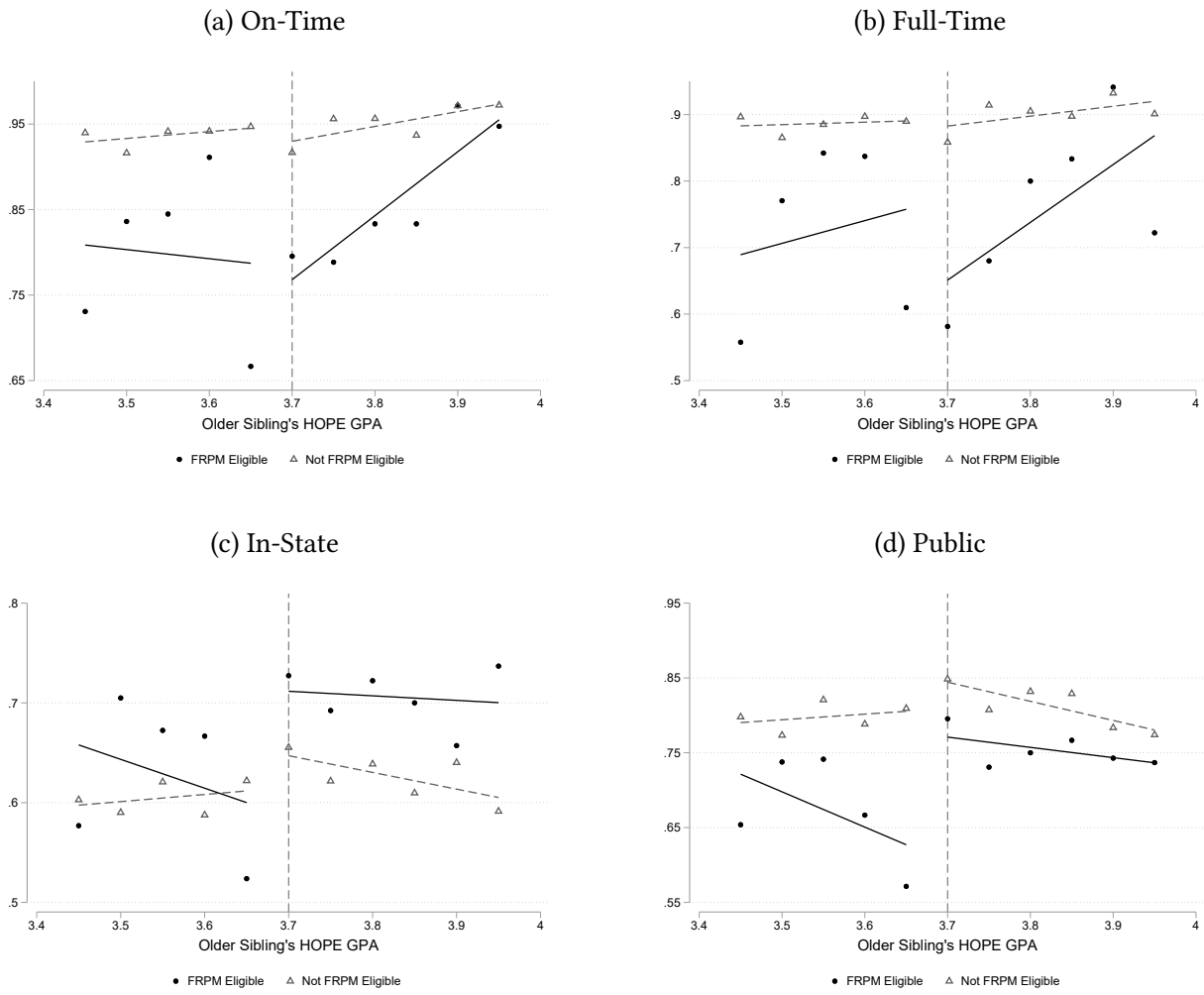
Source: National Student Clearinghouse and Integrated Postsecondary Education Data System (IPEDS).
Note: Each panel presents regression discontinuity estimates of the effect of an older sibling's HOPE Scholarship eligibility on younger siblings' college enrollment outcomes by institutional selectivity, stratified by younger siblings' ever FRPM eligibility. "FRPM Eligible" indicates students who were at any point eligible for free or reduced-price meals during K–12 enrollment, while "Not FRPM Eligible" indicates students who were never eligible. The sibling sample includes the two oldest siblings in households with two or three children, where the older sibling lived in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

Figure 5: Sibling Spillover Effects on College Enrollment: Zell Miller Scholarship



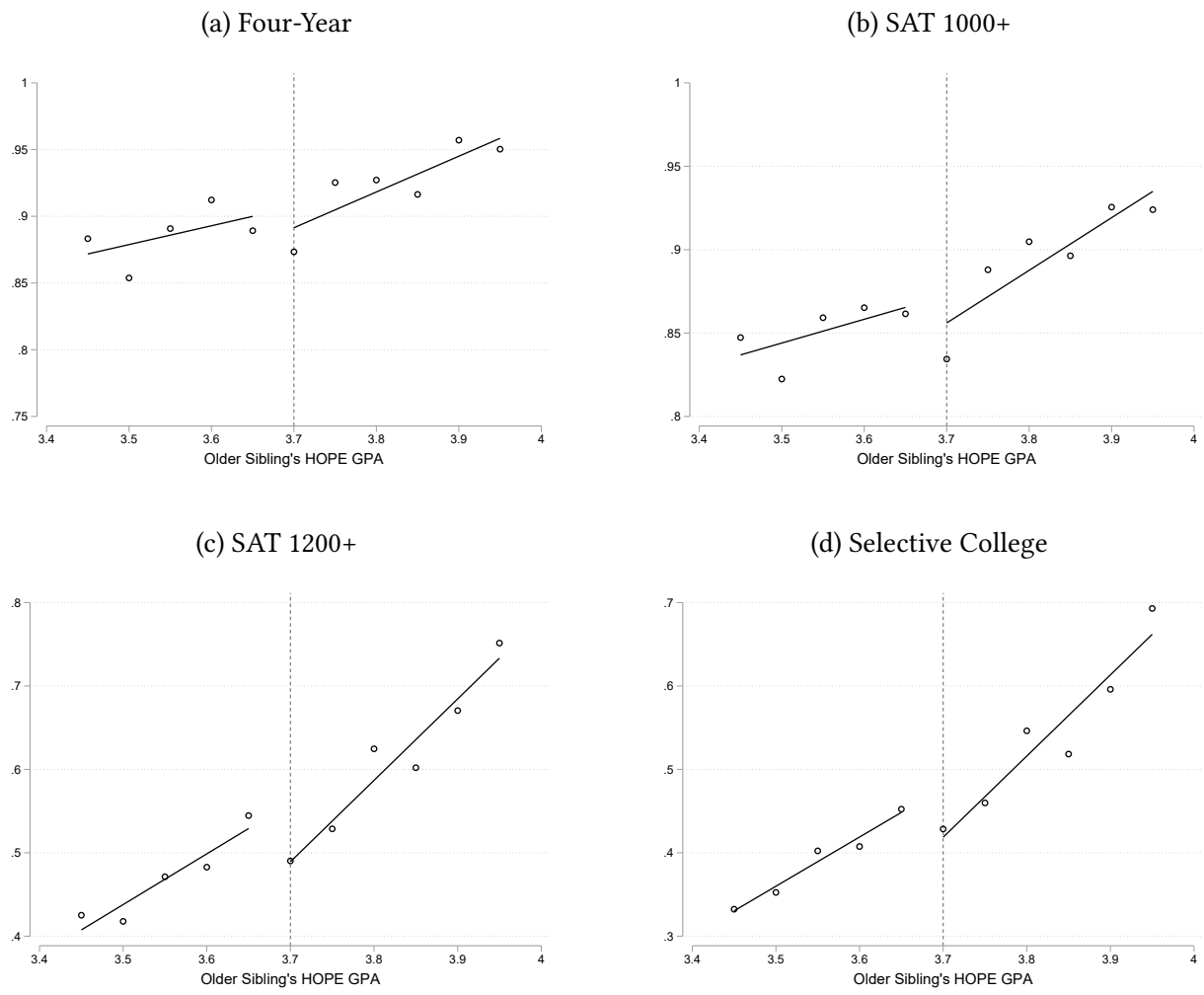
Source: National Student Clearinghouse.
Note: Each panel presents regression discontinuity estimates of the effect of an older sibling's Zell Miller Scholarship eligibility on younger siblings' college enrollment outcomes. The sibling sample includes the two oldest siblings in households with two or three children, where the older sibling lived in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

Figure 6: Sibling Spillover Effects on College Enrollment by FRPM: Zell Miller Scholarship



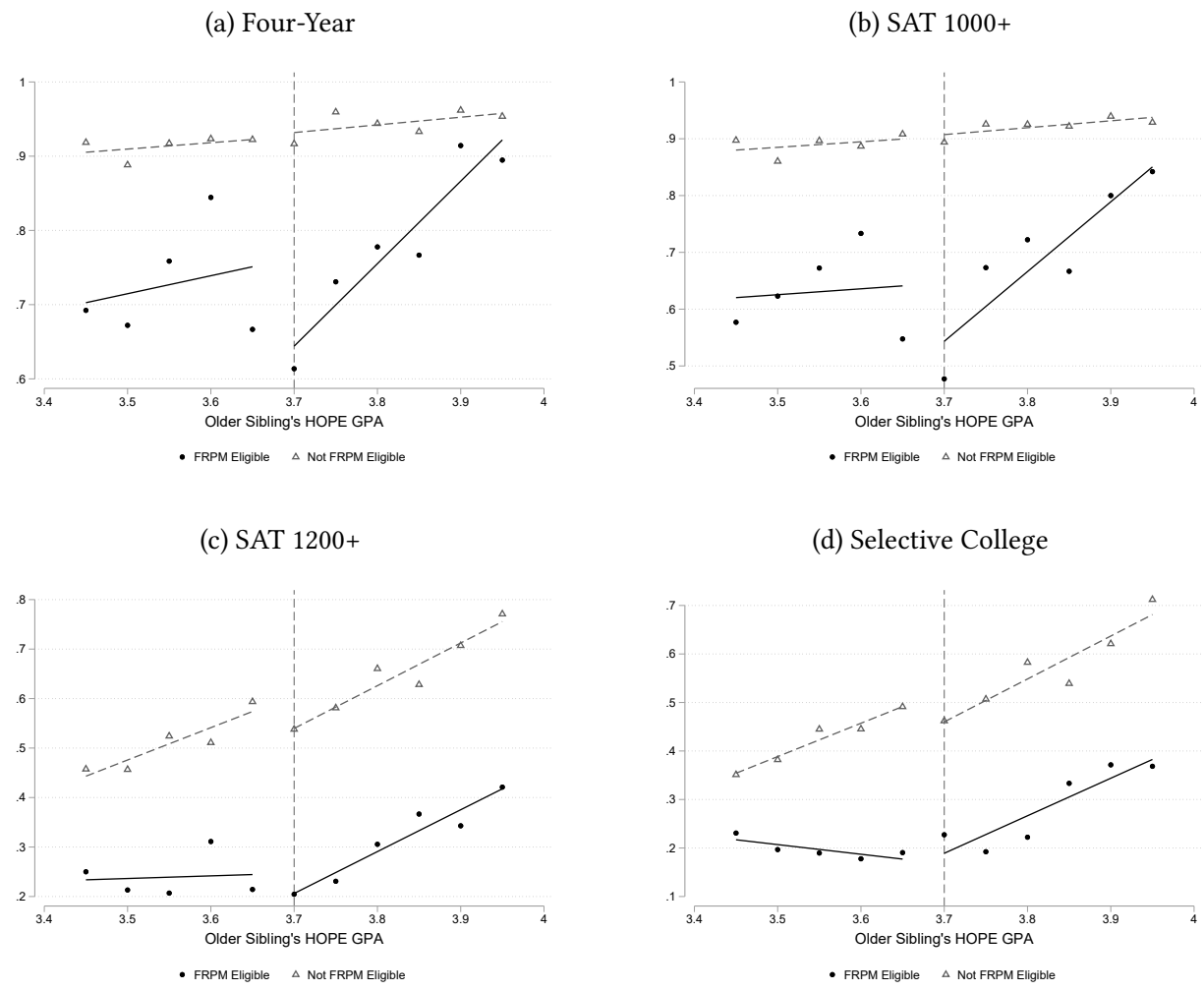
Source: National Student Clearinghouse.
Note: Each panel displays regression discontinuity estimates of the effect of an older sibling's Zell Miller Scholarship eligibility on younger siblings' college enrollment outcomes, stratified by younger siblings' ever FRPM eligibility. "FRPM Eligible" indicates students who were at any point eligible for free or reduced-price meals during K–12 enrollment, while "Not FRPM Eligible" indicates students who were never eligible. The sibling sample consists of the two oldest siblings in households with two or three children, where the older sibling resided in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

Figure 7: Sibling Spillover Effects on College Choice by Selectivity: Zell Miller Scholarship



Source: National Student Clearinghouse and Integrated Postsecondary Education Data System (IPEDS).
Note: Each panel presents regression discontinuity estimates of the effect of an older sibling's Zell Miller Scholarship eligibility on younger siblings' college enrollment outcomes by institutional selectivity. The sibling sample includes the two oldest siblings in households with two or three children, where the older sibling lived in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

Figure 8: Sibling Spillover Effects on College Choice by Selectivity by FRPM: Zell Miller Scholarship



Source: National Student Clearinghouse and Integrated Postsecondary Education Data System (IPEDS).
Note: Each panel presents regression discontinuity estimates of the effect of an older sibling's Zell Miller Scholarship eligibility on younger siblings' college enrollment outcomes by institutional selectivity, stratified by younger siblings' ever FRPM eligibility. "FRPM Eligible" indicates students who were at any point eligible for free or reduced-price meals during K–12 enrollment, while "Not FRPM Eligible" indicates students who were never eligible. The sibling sample includes the two oldest siblings in households with two or three children, where the older sibling lived in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

Tables

Table 1: Summary Statistics for High School Graduates, 2012–2022

	Full Sample		Oldest Two Siblings		HOPE RD		Zell RD	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Baseline Characteristics								
Female	0.518	0.500	0.504	0.500	0.476	0.499	0.583	0.493
Asian	0.114	0.318	0.135	0.341	0.099	0.299	0.248	0.432
Black	0.394	0.489	0.285	0.452	0.254	0.435	0.086	0.280
Hispanic	0.110	0.312	0.102	0.302	0.094	0.292	0.061	0.239
White	0.374	0.484	0.468	0.499	0.545	0.498	0.603	0.489
Other Races	0.039	0.193	0.039	0.194	0.039	0.194	0.037	0.188
Ever Free/Reduced-Price Meal	0.455	0.498	0.355	0.479	0.296	0.457	0.129	0.335
Student with Disability	0.152	0.359	0.162	0.369	0.139	0.346	0.095	0.293
English Learner	0.103	0.303	0.094	0.291	0.084	0.278	0.067	0.250
High School HOPE GPA	3.052	0.599	3.147	0.574	3.026	0.171	3.696	0.146
Number of Children	1.672	0.797	2.178	0.383	2.180	0.385	2.174	0.379
College Enrollment								
Enroll On-Time	0.762	0.426	0.818	0.386	0.904	0.295	0.955	0.207
Enroll In-State	0.557	0.497	0.587	0.492	0.615	0.487	0.674	0.469
Enroll Four-Year	0.687	0.464	0.755	0.430	0.841	0.365	0.952	0.214
Enroll Full-Time	0.674	0.468	0.737	0.440	0.823	0.381	0.916	0.277
Enroll Public	0.668	0.471	0.716	0.451	0.787	0.409	0.800	0.400
College Selectivity								
Enroll Avg SAT 900+	0.620	0.485	0.703	0.457	0.797	0.402	0.940	0.238
Enroll Avg SAT 1000+	0.576	0.494	0.671	0.470	0.765	0.424	0.933	0.251
Enroll Avg SAT 1100+	0.529	0.499	0.630	0.483	0.703	0.457	0.919	0.273
Enroll Avg SAT 1200+	0.255	0.436	0.324	0.468	0.216	0.412	0.704	0.457
Enroll Selective Colleges	0.200	0.400	0.261	0.439	0.131	0.338	0.627	0.484
N	69,906		25,828		3,847		3,339	

Source: National Student Clearinghouse and Integrated Postsecondary Education Data System.
Note: The full sample (Column 1) includes all graduates from public high schools in a Metro Atlanta district across the 2012–2022 cohorts. The "Oldest Two Siblings" sample (Column 2) consists of first- and second-born students among families with one or two siblings enrolled in the same school district. The "HOPE RD" sample (Column 3) is restricted to older siblings who resided in Georgia for at least 12 consecutive months prior to college enrollment, satisfied academic rigor requirements, and fall within a 0.3 GPA bandwidth around the 3.0 HOPE eligibility cutoff. The "Zell RD" sample (Column 4) applies the same residency and academic rigor restrictions, using a 0.25 GPA bandwidth around the 3.7 Zell Miller eligibility cutoff.

Table 2: Sibling Spillovers of HOPE Scholarship on College Enrollment

		Intensity		Georgia		Sector	
	(1) Enroll	(2) Full-Time	(3) Part-Time	(4) In-State	(5) Out-of-State	(6) Public	(7) Private
Panel A: Full Sample							
Older GPA $\geq$ 3.0	0.046**	0.080**	-0.041	0.075***	-0.034	0.053*	-0.013
	(0.023)	(0.032)	(0.029)	(0.027)	(0.022)	(0.029)	(0.021)
$\bar{Y}$	0.799	0.698	0.135	0.548	0.288	0.709	0.127
N	3,847	3,790	3,790	3,847	3,847	3,847	3,847
Panel B: FRPM Sample							
Older GPA $\geq$ 3.0	0.160***	0.201***	-0.050	0.191***	-0.044	0.191***	-0.044
	(0.052)	(0.054)	(0.044)	(0.057)	(0.042)	(0.055)	(0.038)
$\bar{Y}$	0.632	0.527	0.158	0.494	0.194	0.564	0.124
N	1,145	1,129	1,129	1,145	1,145	1,145	1,145
Panel C: Non-FRPM Sample							
Older GPA $\geq$ 3.0	-0.013	0.011	-0.030	0.016	-0.035	-0.023	0.004
	(0.023)	(0.031)	(0.025)	(0.039)	(0.037)	(0.032)	(0.026)
$\bar{Y}$	0.895	0.798	0.122	0.579	0.342	0.793	0.128
N	2,698	2,657	2,657	2,698	2,698	2,698	2,698

Source: National Student Clearinghouse.

Note: This table reports regression discontinuity estimates of the effect of HOPE Scholarship eligibility on younger siblings' college enrollment outcomes. Samples in Columns 2 and 3 are smaller because the National Student Clearinghouse does not report enrollment intensity for some enrollment records. Panel A reports estimates for the full sibling sample; Panels B and C split the sample by younger siblings' ever Free or Reduced-Price Meal (FRPM) eligibility during K–12. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements. Enroll is on-time enrollment within 16 months post high school graduation, while college choice is based on the first institution regardless of timing. $\bar{Y}$ denotes the control mean. Estimates use an optimal bandwidth of 0.3 around the 3.0 GPA cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status) and high school and graduating-cohort fixed effects; Panel A additionally controls for ever FRPM eligibility, which Panels B and C omit by construction. Each column represents a separate regression. Regression samples may be slightly smaller than the counts reported here because the model drops singleton observations within the high school and graduating-cohort fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: Sibling Spillovers of HOPE Scholarship on College Choice by Selectivity

	Sector		College Selectivity				Barron's
	(1) Four-Year	(2) Two-Year	(3) SAT 900+	(4) SAT 1000+	(5) SAT 1100+	(6) SAT 1200+	(7) Selective
Panel A: Full Sample							
Older GPA $\geq$ 3.0	0.025	0.017	0.000	-0.008	-0.017	-0.074***	-0.042*
	(0.025)	(0.020)	(0.026)	(0.026)	(0.027)	(0.027)	(0.025)
$\bar{Y}$	0.732	0.111	0.672	0.642	0.596	0.231	0.153
N	3,847	3,847	3,847	3,847	3,847	3,847	3,847
Panel B: FRPM Sample							
Older GPA $\geq$ 3.0	0.167***	-0.012	0.126**	0.108**	0.105**	-0.022	-0.025
	(0.053)	(0.042)	(0.054)	(0.054)	(0.053)	(0.034)	(0.030)
$\bar{Y}$	0.551	0.145	0.449	0.384	0.332	0.075	0.042
N	1,145	1,145	1,145	1,145	1,145	1,145	1,145
Panel C: Non-FRPM Sample							
Older GPA $\geq$ 3.0	-0.046*	0.027	-0.061**	-0.064**	-0.077**	-0.095**	-0.048
	(0.028)	(0.022)	(0.029)	(0.030)	(0.031)	(0.037)	(0.033)
$\bar{Y}$	0.836	0.092	0.800	0.790	0.747	0.320	0.217
N	2,698	2,698	2,698	2,698	2,698	2,698	2,698

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).

Note: This table reports regression discontinuity estimates of the effect of HOPE Scholarship eligibility on younger siblings' college choice, by institutional selectivity. Panel A reports estimates for the full sibling sample; Panels B and C split the sample by younger siblings' ever Free or Reduced-Price Meal (FRPM) eligibility during K–12. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling resided in Georgia for at least 12 consecutive months prior to college enrollment and met the academic rigor requirements. $\bar{Y}$ denotes the control mean. Estimates are based on the optimal bandwidth calculation of 0.3 around the 3.0 GPA cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status) and high school and graduating-cohort fixed effects; Panel A additionally controls for ever FRPM eligibility, which Panels B and C omit by construction. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Sibling Spillovers of Zell Miller Scholarship on College Enrollment

		Intensity		Georgia		Sector	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Enroll	Full-Time	Part-Time	In-State	Out-of-State	Public	Private
Panel A: Full Sample							
Older GPA $\geq$ 3.7	-0.020	-0.045*	0.048**	0.020	-0.017	0.060**	-0.057**
	(0.018)	(0.023)	(0.019)	(0.033)	(0.032)	(0.027)	(0.024)
$\bar{Y}$	0.918	0.863	0.071	0.609	0.326	0.780	0.154
N	3,337	3,294	3,294	3,337	3,337	3,337	3,337
Panel B: FRPM Sample							
Older GPA $\geq$ 3.7	-0.028	-0.204**	0.198**	0.176*	-0.183**	0.204**	-0.204***
	(0.074)	(0.086)	(0.090)	(0.095)	(0.076)	(0.089)	(0.068)
$\bar{Y}$	0.808	0.732	0.098	0.640	0.192	0.684	0.148
N	439	430	430	439	439	439	439
Panel C: Non-FRPM Sample							
Older GPA $\geq$ 3.7	-0.021	-0.021	0.025	-0.002	0.006	0.043	-0.039
	(0.018)	(0.023)	(0.019)	(0.036)	(0.035)	(0.029)	(0.026)
$\bar{Y}$	0.936	0.886	0.066	0.603	0.349	0.797	0.155
N	2,896	2,862	2,862	2,896	2,896	2,896	2,896

Source: National Student Clearinghouse.

Note: This table reports regression discontinuity estimates of the effect of Zell Miller Scholarship eligibility on younger siblings' college enrollment outcomes. Samples in Columns 2 and 3 are smaller because the National Student Clearinghouse does not report enrollment intensity for some enrollment records. Panel A reports estimates for the full sibling sample; Panels B and C split the sample by younger siblings' ever Free or Reduced-Price Meal (FRPM) eligibility during K–12. Enroll is on-time enrollment within 16 months post high school graduation, while college choice is based on the first institution regardless of timing. $\bar{Y}$ denotes the control mean. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before college enrollment and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculation of 0.25 around the 3.7 GPA cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status) and high school and graduating-cohort fixed effects; Panel A additionally controls for ever FRPM eligibility, which Panels B and C omit by construction. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5: Sibling Spillovers of Zell Miller Scholarship on College Choice by Selectivity

	Sector		College Selectivity				Barron's
	(1) Four-Year	(2) Two-Year	(3) SAT 900+	(4) SAT 1000+	(5) SAT 1100+	(6) SAT 1200+	(7) Selective
Panel A: Full Sample							
Older GPA $\geq$ 3.7	-0.013	0.021	-0.013	-0.018	-0.018	-0.060*	-0.049
	(0.020)	(0.014)	(0.022)	(0.022)	(0.023)	(0.033)	(0.033)
$\bar{Y}$	0.886	0.051	0.863	0.823	0.823	0.468	0.389
N	3,337	3,337	3,337	3,337	3,337	3,337	3,337
Panel B: FRPM Sample							
Older GPA $\geq$ 3.7	-0.119	0.138**	-0.133	-0.137	-0.091	-0.057	-0.001
	(0.082)	(0.060)	(0.088)	(0.088)	(0.088)	(0.080)	(0.076)
$\bar{Y}$	0.732	0.104	0.684	0.636	0.560	0.236	0.196
N	439	439	439	439	439	439	439
Panel C: Non-FRPM Sample							
Older GPA $\geq$ 3.7	0.002	0.002	0.007	-0.000	-0.007	-0.061*	-0.056
	(0.019)	(0.014)	(0.021)	(0.022)	(0.024)	(0.036)	(0.037)
$\bar{Y}$	0.913	0.042	0.894	0.889	0.869	0.508	0.422
N	2,896	2,896	2,896	2,896	2,896	2,896	2,896

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).

Note: This table reports regression discontinuity estimates of the effect of Zell Miller Scholarship eligibility on younger siblings' college choice, by institutional selectivity. Panel A reports estimates for the full sibling sample; Panels B and C split the sample by younger siblings' ever Free or Reduced-Price Meal (FRPM) eligibility during K–12. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months prior to college enrollment and met the academic rigor requirements. $\bar{Y}$ denotes the control mean. Estimates use an optimal bandwidth of 0.25 around the 3.7 GPA cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status) and high school and graduating-cohort fixed effects; Panel A additionally controls for ever FRPM eligibility, which Panels B and C omit by construction. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6: Sibling Spillovers of the HOPE Scholarship on College Outcomes by High School College Enrollment Rate Among FRPM Eligible Siblings

	College Enrollment			HOPE Outcomes		HS Course Taking		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Enroll	In-State	Selective	HOPE GPA	HOPE Eligible	AP	IB	Dual
Panel A: High College Enrollment High School								
Older GPA $\geq$ 3.0	0.090	0.107	-0.061	-0.094	-0.053	0.051	-0.004	-0.003
	(0.079)	(0.094)	(0.066)	(0.098)	(0.092)	(0.072)	(0.026)	(0.045)
$\bar{Y}$	0.771	0.574	0.080	2.870	0.431	0.181	0.016	0.037
N	441	441	441	441	441	441	441	441
Panel B: Low College Enrollment High School								
Older GPA $\geq$ 3.0	0.208***	0.259***	-0.011	0.100	0.183**	-0.101*	0.008	-0.027
	(0.072)	(0.078)	(0.031)	(0.084)	(0.078)	(0.059)	(0.009)	(0.024)
$\bar{Y}$	0.610	0.482	0.027	2.795	0.345	0.256	0.003	0.021
N	607	607	607	607	607	607	607	607

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).

Note: Panel A includes FRPM-eligible younger siblings in the top half of high school college enrollment, and Panel B includes FRPM-eligible younger siblings in the bottom half of high school college enrollment. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling resided in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements, and younger siblings were eligible for free- or reduced-price meals. Estimates are based on optimal bandwidth calculations with a bandwidth of 0.3. Standard errors, reported in parentheses, are clustered at the sibling level. $\bar{Y}$ denotes the control mean. All specifications include younger siblings' demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status), as well as graduating-cohort and high school fixed effects. All columns use a common sample of FRPM-eligible younger siblings with a non-missing high school HOPE GPA (N = 1,048), so the sample might be smaller than the FRPM sample (N = 1,145). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: Marginal Value of Public Funds with Sibling Spillovers

	Recipient Only	Sibling Add-on	With Spillovers
Inputs			
College wage premium (BA–HS)	\$779,580	\$779,580	\$779,580
Effect on in-state enrollment ($\hat{\beta}_{\text{enroll}}$)	0.064	0.075	–
Effect on in-state degree attainment ($\hat{\beta}_{\text{comp}}$)	0.037	0.039	–
State tax rate	4.99%	4.99%	4.99%
Federal marginal tax rate	18.9%	18.9%	18.9%
Willingness to Pay (WTP)			
After-tax earnings gain (older sibling)	\$22,225.55	–	\$22,225.55
After-tax earnings gain (younger sibling)	–	\$23,426.93	\$23,426.93
Total WTP	\$22,225.55	\$23,426.93	\$45,652.48
Net Cost			
Direct cost: HOPE Scholarship (4 years)	\$14,223.00	–	\$14,223.00
Behavioral response cost	−\$980.00	–	−\$980.00
State tax revenue (older sibling)	−\$1,439.34	–	−\$1,439.34
State tax revenue (younger sibling)	–	−\$1,517.14	−\$1,517.14
Appropriations: older sibling enroll	\$1,587.45	–	\$1,587.45
Appropriations: younger sibling enroll	–	\$1,860.42	\$1,860.42
Total net cost	\$13,391.11	\$343.28	\$13,734.39
MVPF	1.66	–	3.32

Source: Recipient-only column from Kim (2026).

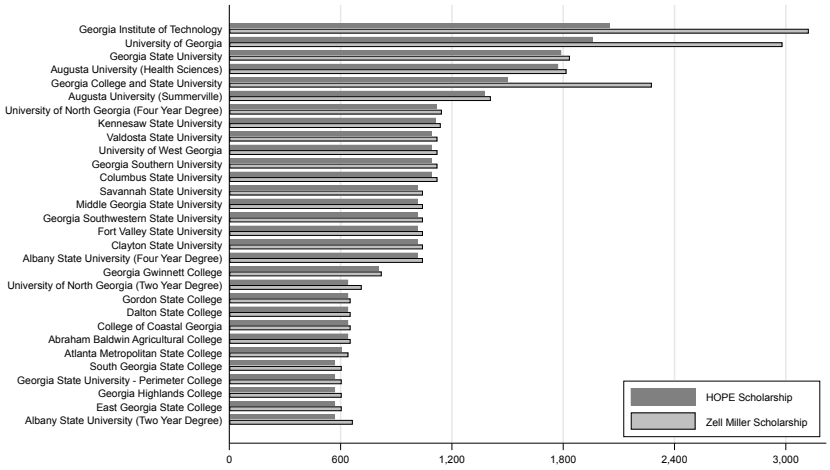
Note: Benefits are measured through in-state degree completion. The younger sibling's degree attainment effect equals the intent-to-treat effect of an older sibling's HOPE eligibility on younger siblings' in-state enrollment (0.075) multiplied by the six-year graduation rate at Georgia four-year institutions (51.8 percent). The older sibling's degree attainment effect (0.037) is estimated directly in Kim (2026), whereas the younger sibling's effect is imputed. After-tax earnings gains equal the degree attainment effect multiplied by the net present value of the Georgia college wage premium, estimated from the 2017 American Community Survey following Bartik et al. (2016) with a 3 percent discount rate, and by $(1-\tau_{\text{fed}})(1-\tau_{\text{state}})$. State tax revenue applies the Georgia tax rate to the pre-tax earnings gain. Appropriations apply per-student state and local appropriations from the Delta Cost Project over four years to the enrollment effect. Behavioral response costs and the federal marginal tax rate follow Hendren and Sprung-Keyser (2020). All values are in 2012 dollars.

Appendices

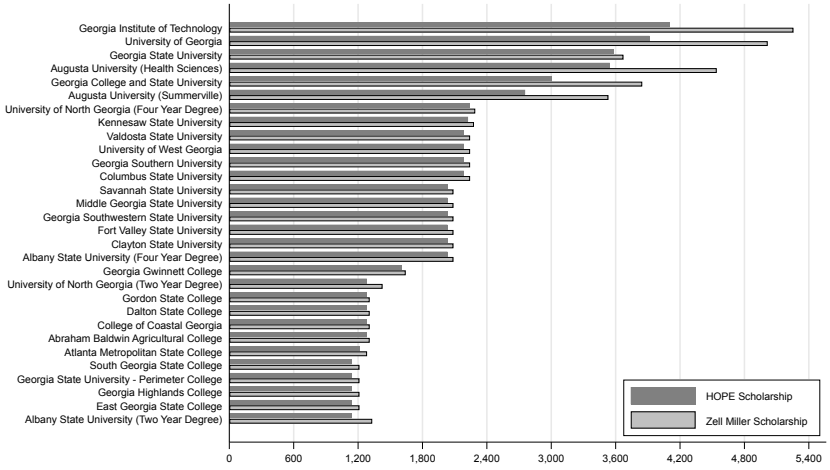
A Supplementary Figures and Tables

Figure A1: Scholarship Award Amounts by Institution in the University System of Georgia

(a) 6 Credit Hours

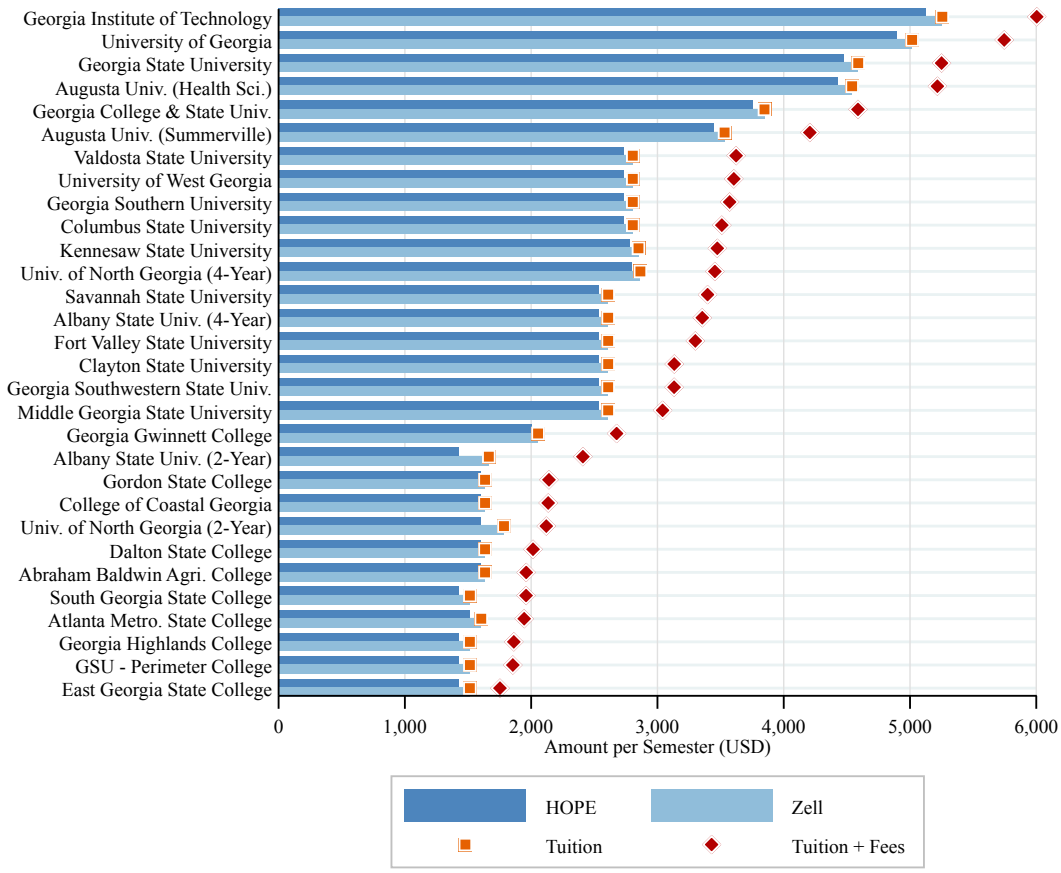


(b) 12 Credit Hours



Source: Georgia Student Finance Commission (2025)
Note: Panel A shows the award amounts at University System of Georgia institutions for students attempting 6 credit hours, and Panel B shows the award amounts for students attempting 12 credit hours in Fiscal Year 2025.

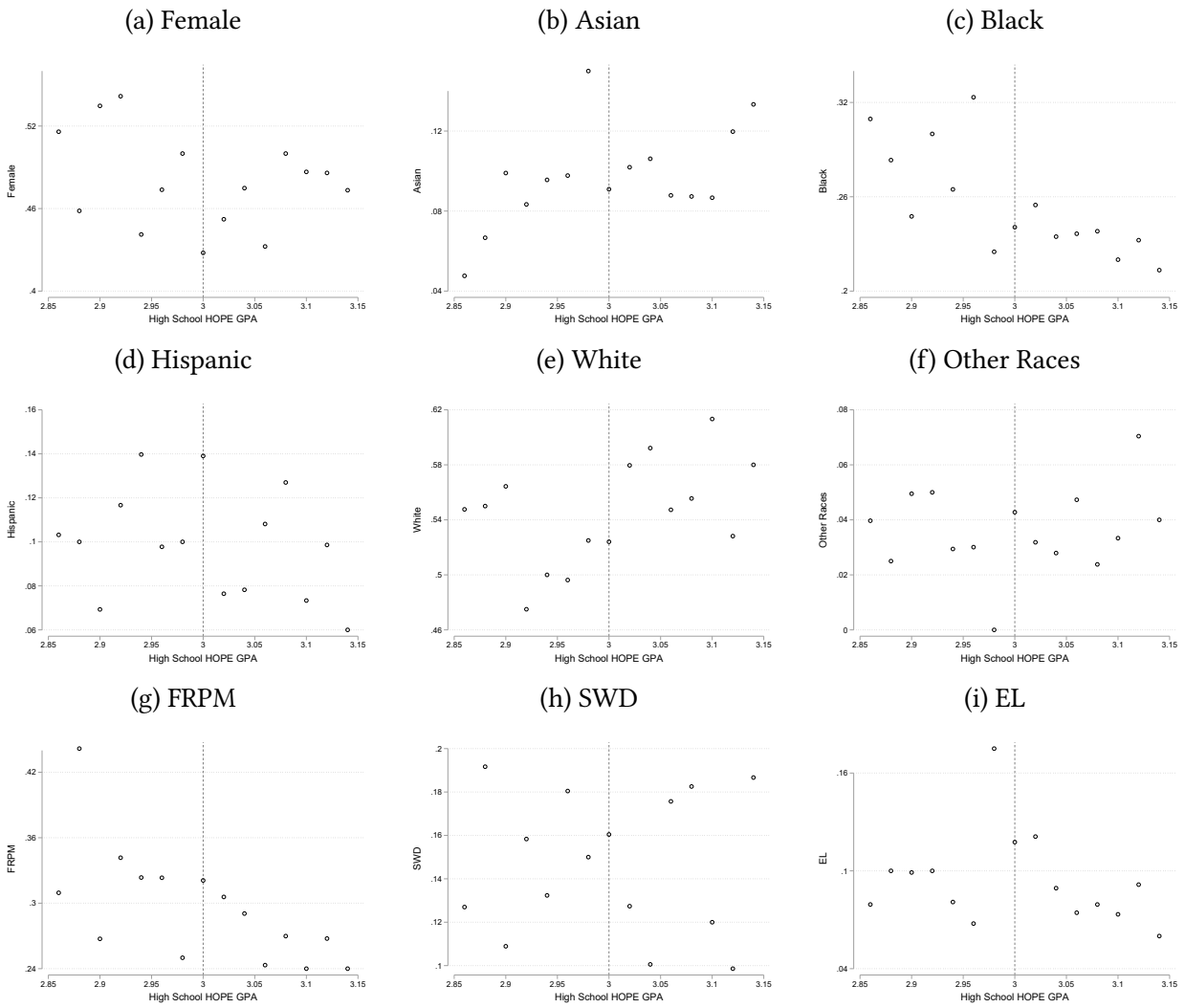
Figure A2: HOPE and Zell Miller Scholarship Amount Differences



Source: Georgia Student Finance Commission (FY 2025) and University System of Georgia (https://www.usg.edu/fiscal-affairs/tuition-and-fees/)

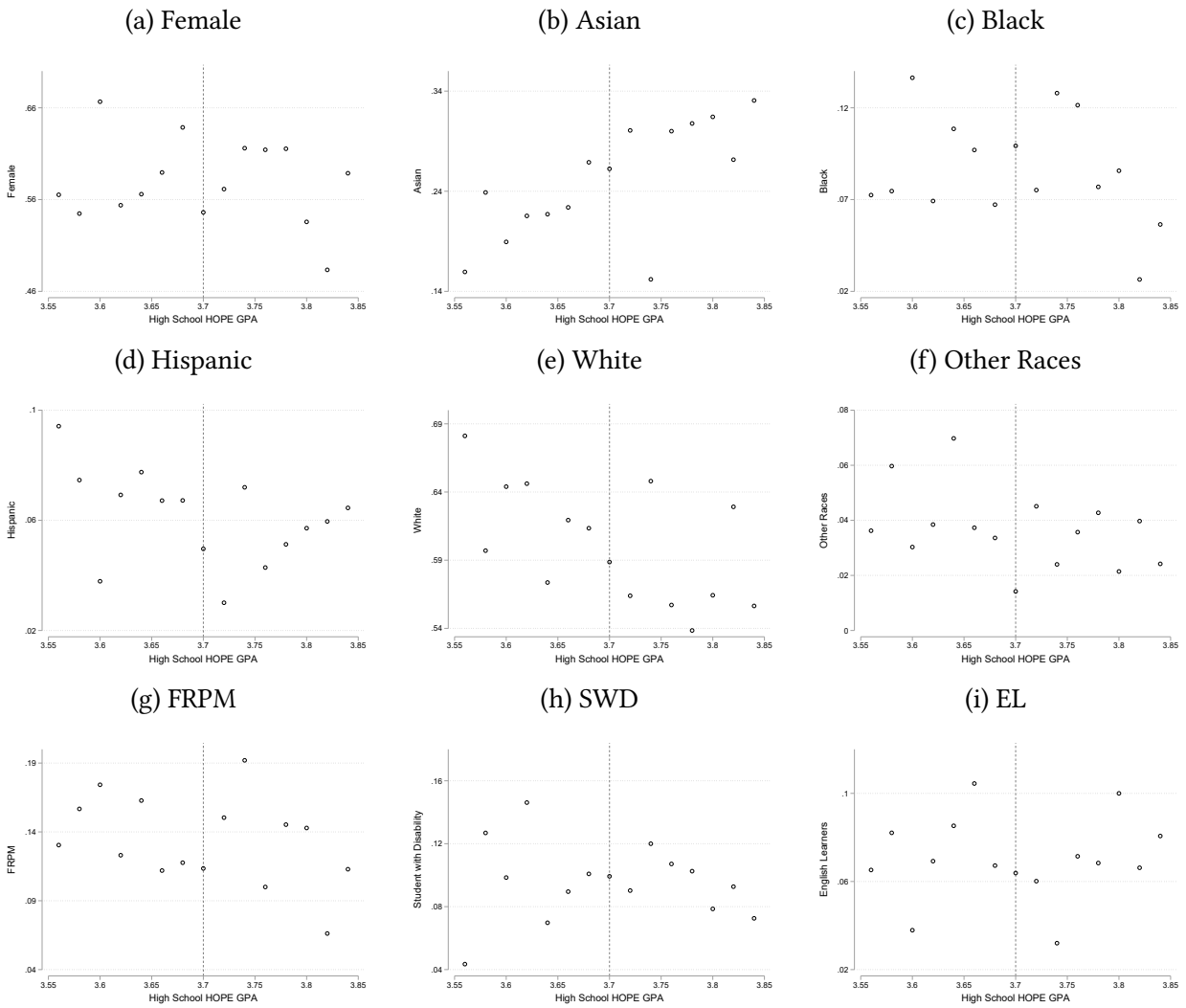
Note: The figure plots scholarship amounts for HOPE Scholarship and Zell Miller Scholarship recipients enrolled in Fall 2025 with 15 credit hours at institutions within the University System of Georgia. "Tuition" includes tuition only, while "Tuition + Fees" includes both tuition and fees for one academic semester in Fall 2025. The Zell Miller award equals tuition, whereas neither scholarship covers fees.

Figure A3: Covariate Balance Check by Older Siblings Demographics for HOPE Cutoff



Note: Each figure shows the share of students in each demographic subgroup by HOPE GPA bins around the 3.0 eligibility cutoff, marked by a vertical dotted line. The sample includes older siblings who graduated from the Metro Atlanta public school district between 2012 and 2022 and were continuously enrolled in high school during the 12 months before enrolling in college.

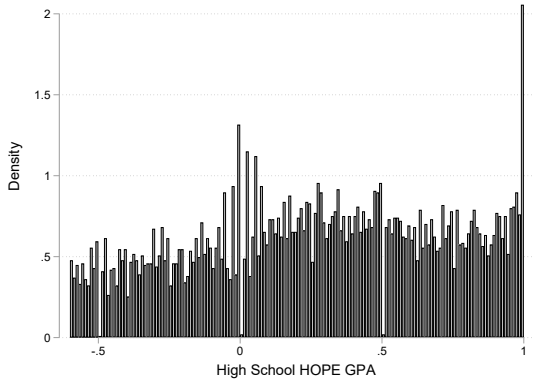
Figure A4: Covariate Balance Check by Older Siblings Demographics for Zell Miller Cutoff



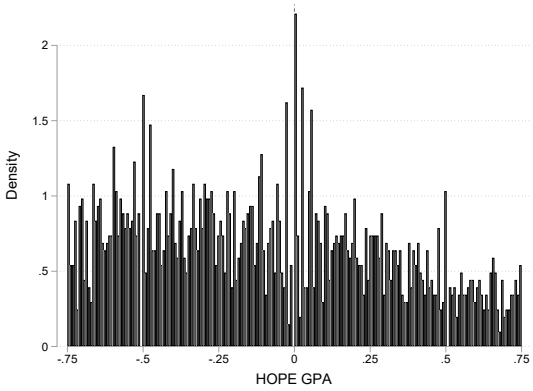
Note: Each figure shows the share of students in each demographic subgroup by HOPE GPA bins around the 3.7 eligibility cutoff, marked by a vertical dotted line. The sample includes older siblings who graduated from the Metro Atlanta public school district between 2012 and 2022 and were continuously enrolled in high school during the 12 months before enrolling in college.

Figure A5: GPA Density Histograms

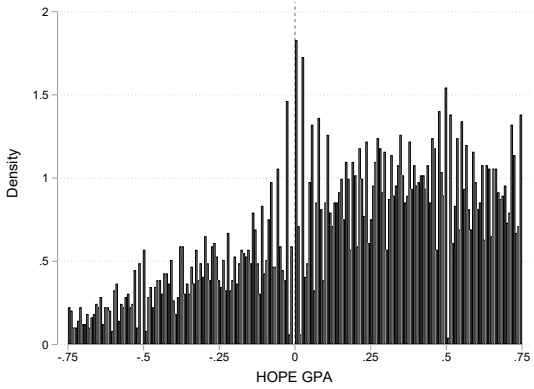
(a) HOPE GPA Density



(b) GPA Density Among FRPM



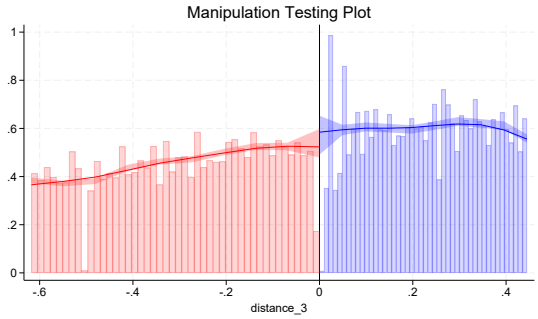
(c) GPA Density Among Non-FRPM



(d) Density Test with 3.0 Cutoff



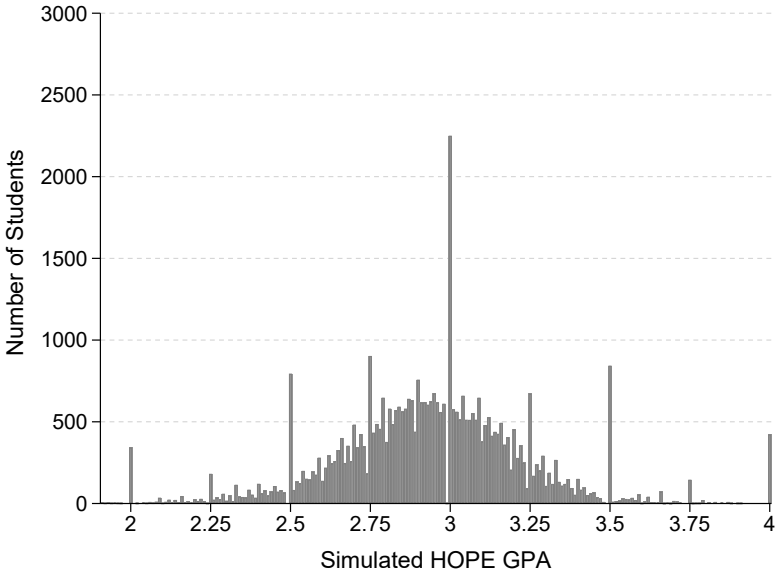
(e) Density Test without 3.0 Cutoff



Note: The graphs display density histograms of students' high school HOPE GPAs around the HOPE cutoff of 3.0 for the full sample (Panel A), students who were ever eligible for Free or Reduced-Price Meals (FRPM) (Panel B), and students who were never eligible for FRPM (Panel C). Panel D presents the density test, including observations at the 3.0 GPA cutoff, following McCrary (2008), while Panel E presents the density test, excluding observations at the cutoff. The sample consists of high school graduates from the 2012–2022 cohorts who resided in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements.

Figure A6: Simulated GPA Density Histograms

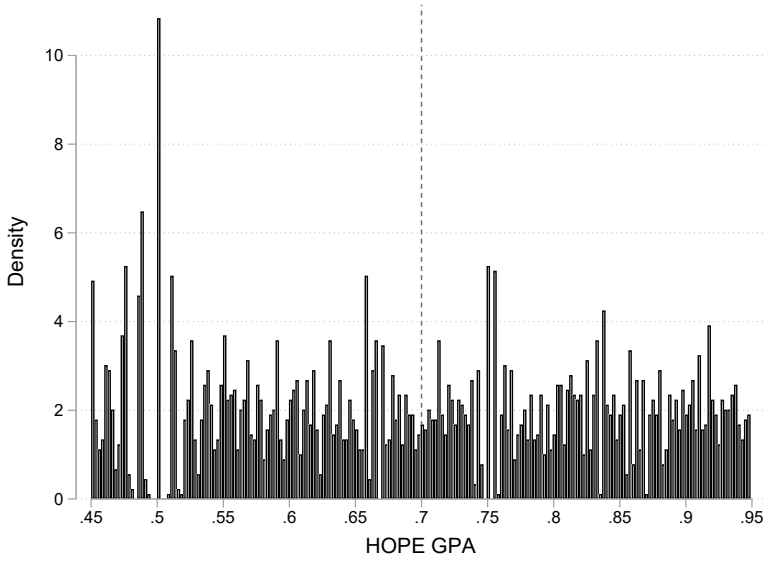
(a) HOPE GPA Density



Note: The figure displays the distribution of simulated high school HOPE GPAs. I pool all core course grades earned over four years of high school by students in the sample and randomly reassign the pooled grades across students. For each student, I then compute the HOPE GPA as the credit-weighted average of the reassigned grades, applying the Georgia Student Finance Commission's conversion of letter grades to a four-point scale and the additional 0.5 weight for AP, IB, and dual enrollment courses. The sample includes high school graduates from the 2012–2022 cohorts who resided in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements.

Figure A7: Zell Miller Scholarship Cutoff Running Variable Density Test

(a) Zell Cutoff



(b) Density Test (McCrary, 2008) at Zell Cutoff

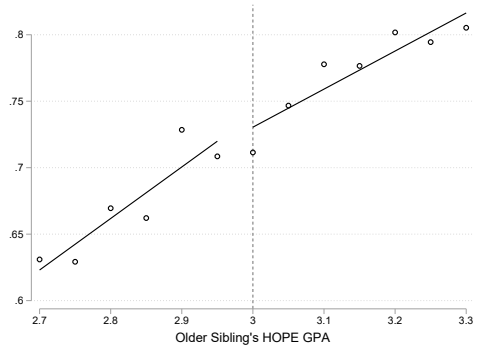


Note: The graphs display density histograms of students' high school HOPE GPAs around the Zell cutoff of 3.7 for the full sample (Panel A). Panel B presents the density test, including observations at the 3.7 GPA cutoff, following McCrary (2008). The sample consists of high school graduates from the 2012–2022 cohorts who resided in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements.

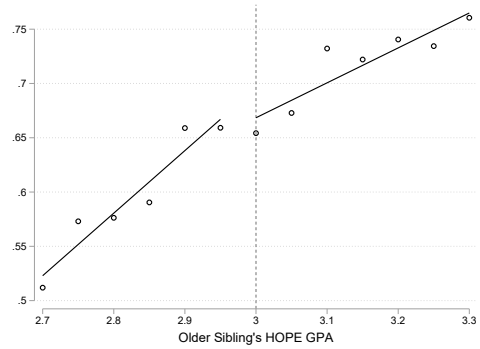
Figure A8: Sibling Spillover Effects on College Choice by Selectivity: HOPE and Zell Miller Scholarships

Panel A: HOPE Scholarship

(a) SAT 900+

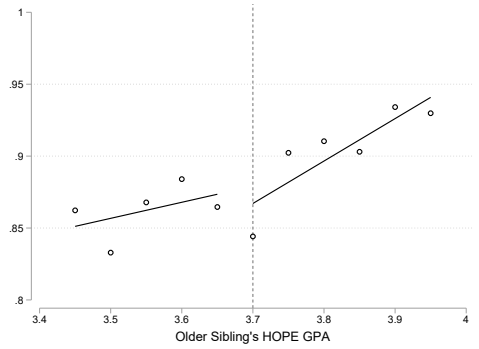


(b) SAT 1100+

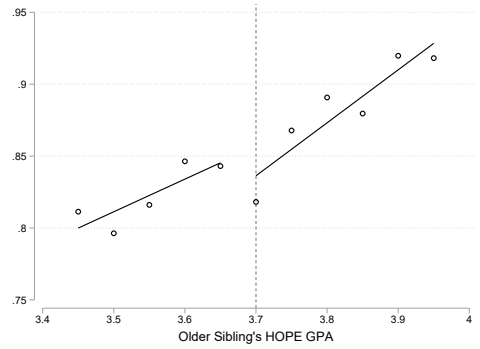


Panel B: Zell Miller Scholarship

(c) SAT 900+



(d) SAT 1100+

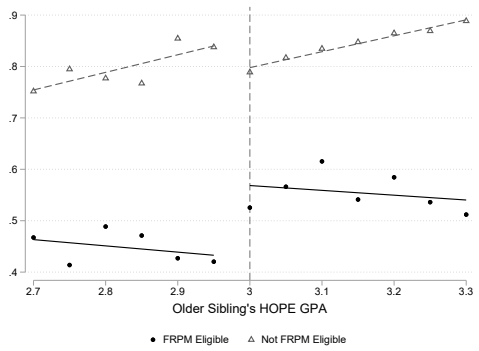


Source: National Student Clearinghouse and Integrated Postsecondary Education Data System (IPEDS).
Note: Each panel presents regression discontinuity estimates of the effect of an older sibling's scholarship eligibility (HOPE in Panel A, Zell Miller in Panel B) on younger siblings' college enrollment outcomes by institutional selectivity. The sibling sample includes the two oldest siblings in households with two or three children, where the older sibling lived in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

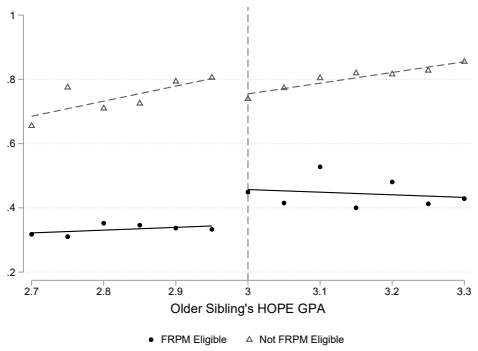
Figure A9: Sibling Spillover Effects on College Choice by Selectivity by FRPM: HOPE and Zell Miller Scholarships

Panel A: HOPE Scholarship

(a) SAT 900+

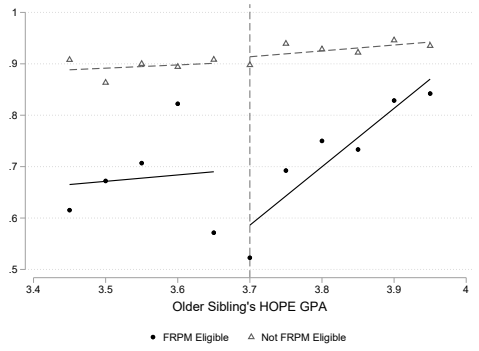


(b) SAT 1100+

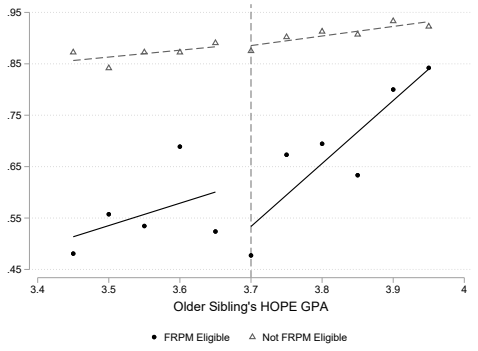


Panel B: Zell Miller Scholarship

(c) SAT 900+



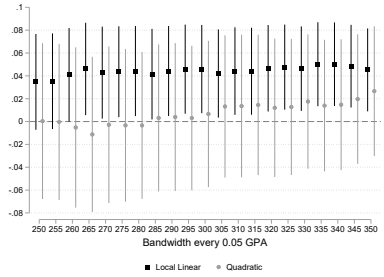
(d) SAT 1100+



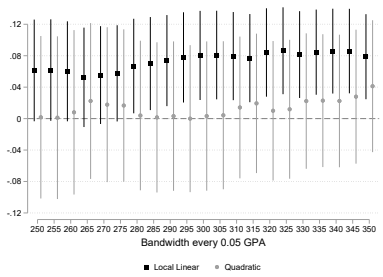
Source: National Student Clearinghouse and Integrated Postsecondary Education Data System (IPEDS).
Note: Each panel presents regression discontinuity estimates of the effect of an older sibling's scholarship eligibility (HOPE in Panel A, Zell Miller in Panel B) on younger siblings' college enrollment outcomes by institutional selectivity, stratified by ever FRPM eligibility. "FRPM Eligible" indicates students who were at any point eligible for free or reduced-price meals during K–12 enrollment, while "Not FRPM Eligible" indicates students who were never eligible. The sibling sample includes the two oldest siblings in households with two or three children, where the older sibling lived in Georgia for at least 12 months before enrolling in college and met the academic rigor requirements.

Figure A10: Different Bandwidth HOPE Cutoff for Younger Sibling's College Enrollment

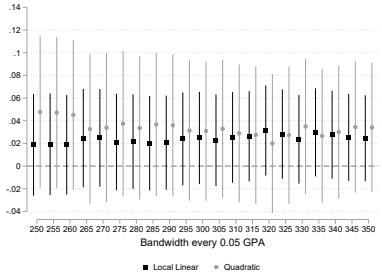
(a) On Time



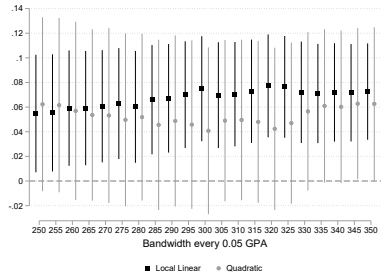
(b) In-State



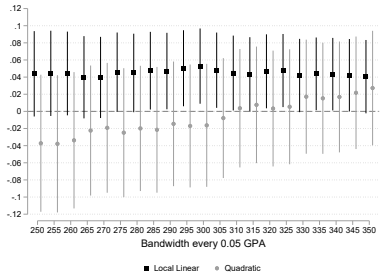
(c) Four-Year



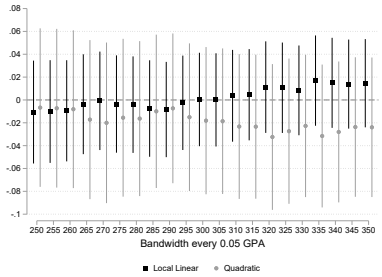
(d) Full-Time



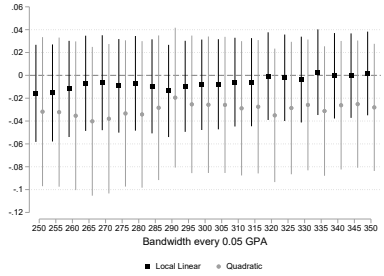
(e) Public



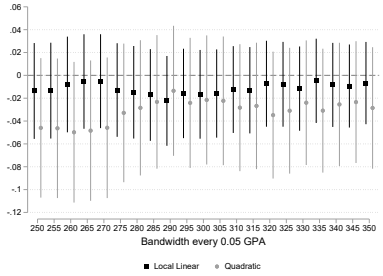
(f) SAT 900+



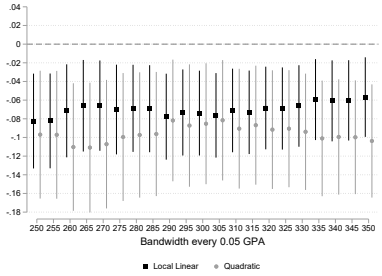
(g) SAT 1000+



(h) SAT 1100+



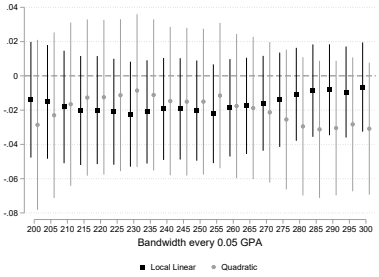
(i) SAT 1200+



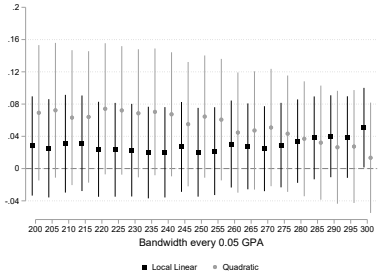
Source: National Student Clearinghouse and Integrated Postsecondary Education Data System (IPEDS).
Note: Each panel presents sensitivity analyses using alternative RD bandwidths, with both local linear and quadratic specifications shown. The figures report point estimates and 95 percent confidence intervals from models estimated over bandwidths ranging from 0.25 to 0.35 GPA in 0.005 increments around the cutoff; "300" indicates the optimal bandwidth of 0.3. The sample includes the two oldest siblings in households with two or three children, in which the older sibling resided in Georgia for at least 12 months before enrolling in college and met academic rigor requirements. All specifications control for student demographics (sex, race/ethnicity, ever eligibility for free or reduced-price meals, English Learner status, and disability status) and include high school and graduating cohort fixed effects. Standard errors are clustered at the sibling-identifier level.

Figure A11: Different Bandwidth Zell Miller Cutoff for Younger Sibling's College Enrollment

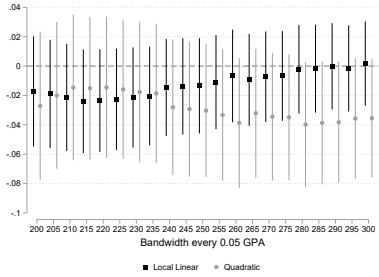
(a) On Time



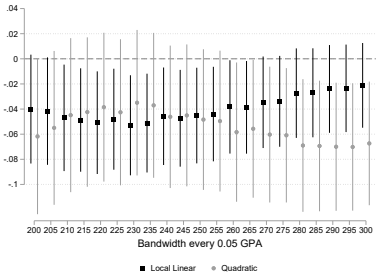
(b) In-State



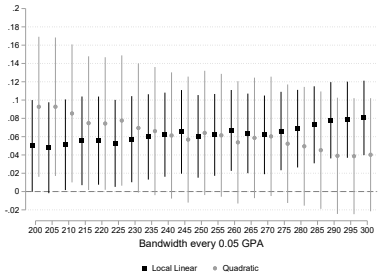
(c) Four-Year



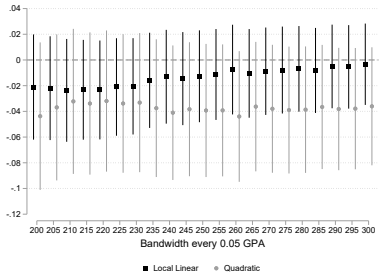
(d) Full-Time



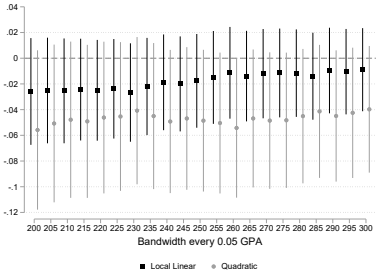
(e) Public



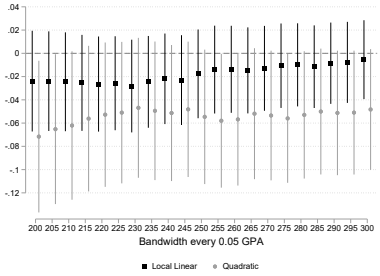
(f) SAT 900+



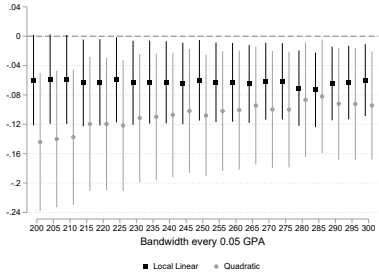
(g) SAT 1000+



(h) SAT 1100+

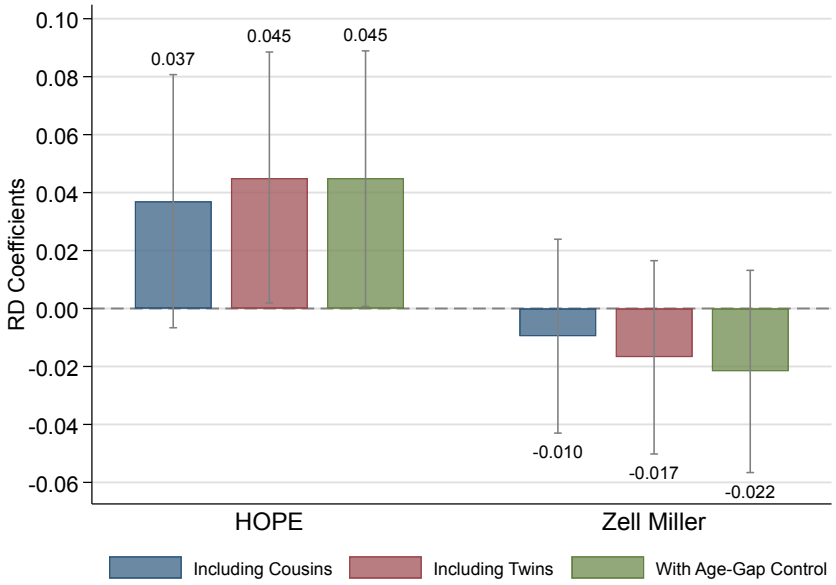


(i) SAT 1200+



Source: National Student Clearinghouse and Integrated Postsecondary Education Data System (IPEDS).
Note: Each panel presents sensitivity analyses using alternative RD bandwidths, with both local linear and quadratic specifications shown. The figures report point estimates and 95 percent confidence intervals from models estimated over bandwidths ranging from 0.2 to 0.3 GPA in 0.005 increments around the cutoff; "250" indicates the optimal bandwidth of 0.25. The sample includes the two oldest siblings in households with two or three children, where the older sibling lived in Georgia for at least 12 months before enrolling in college and met academic rigor requirements. All specifications control for student demographics (sex, race/ethnicity, ever eligibility for free or reduced-price meals, English Learner status, and disability status) and include high school and graduating cohort fixed effects. Standard errors are clustered at the sibling-identifier level.

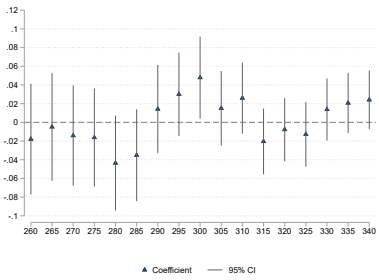
Figure A12: Robustness Check by Different Sample Selection on College Enrollment



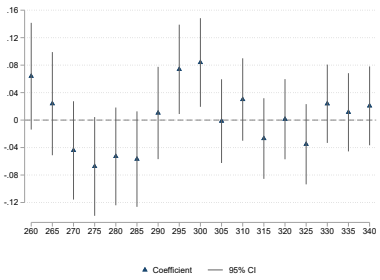
Source: National Student Clearinghouse (NSC).
Note: The figure shows on-time college enrollment regression discontinuity estimates from alternative sibling-sample selections. "Including cousins" adds students who have different last names but live at the same address (N = 3,948 for HOPE; N = 3,495 for Zell). "Including twins" adds sibling pairs born in the same year and month (N = 4,079 for HOPE; N = 3,575 for Zell), and "With age gap control" controls for the age gap between siblings. All specifications include demographic controls (sex, race/ethnicity, ever FRPM, ever English Learner status, and ever disability status) and high school and graduating-cohort fixed effects.

Figure A13: Falsification Test for Random Cutoff - HOPE

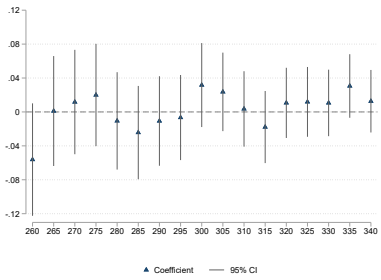
(a) On Time



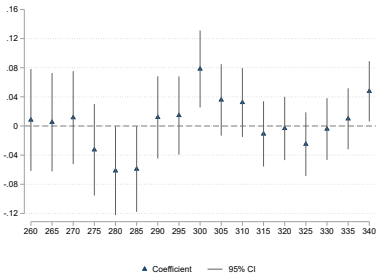
(b) In-State



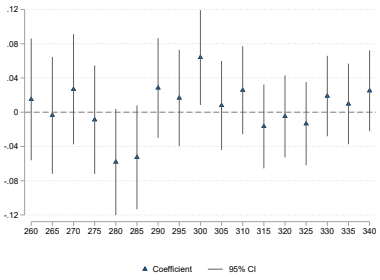
(c) Four-Year



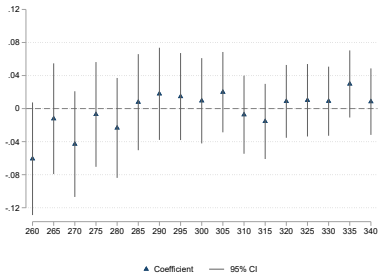
(d) Full-Time



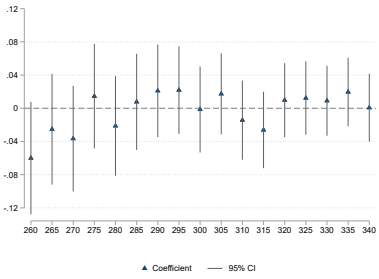
(e) Public



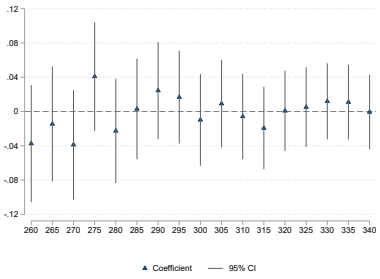
(f) SAT 900+



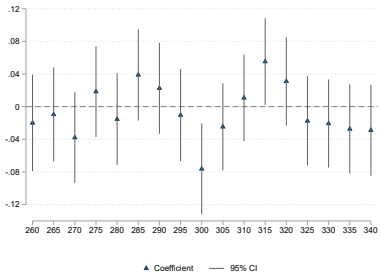
(g) SAT 1000+



(h) SAT 1100+



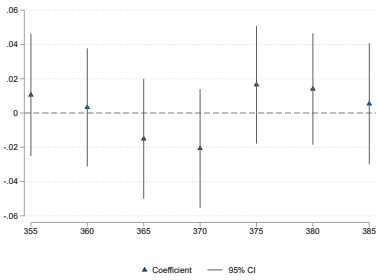
(i) SAT 1200+



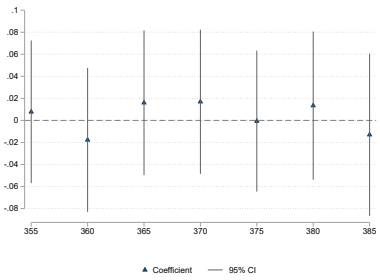
Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: Each coefficient represents the estimated sibling spillover effect at a placebo cutoff. The younger sibling sample includes the oldest two siblings in two- or three-child households, whose older siblings resided in Georgia for at least 12 months before enrolling in college and met academic rigor requirements. College enrollment data come from the National Student Clearinghouse. All models control for student demographics (sex, race/ethnicity, eligibility for free or reduced-price meals, English Learner status, and disability status) and include high school and cohort fixed effects. Standard errors are clustered at the sibling-identifier level.

Figure A14: Falsification Test for Random Cutoff - Zell Miller

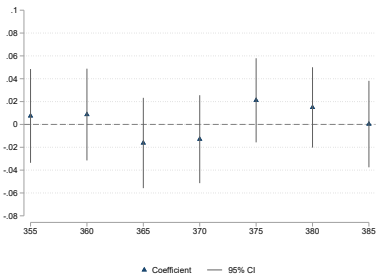
(a) On Time



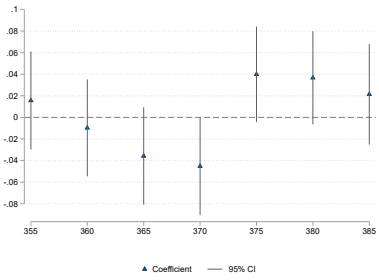
(b) In-State



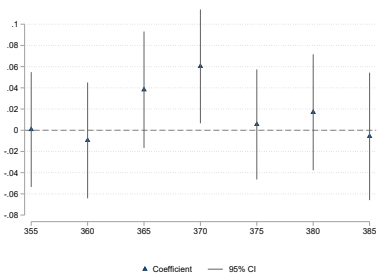
(c) Four-Year



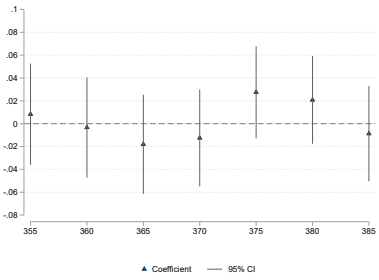
(d) Full-Time



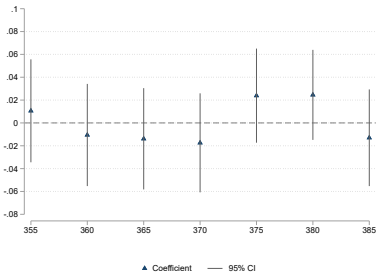
(e) Public



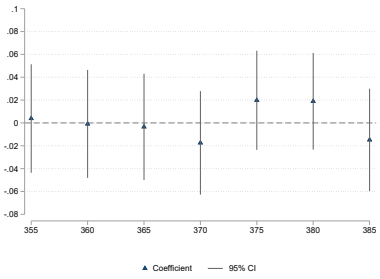
(f) SAT 900+



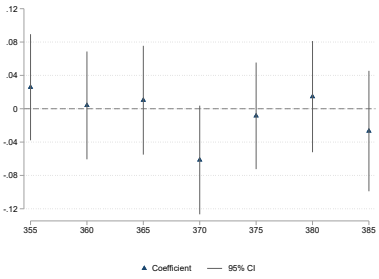
(g) SAT 1000+



(h) SAT 1100+

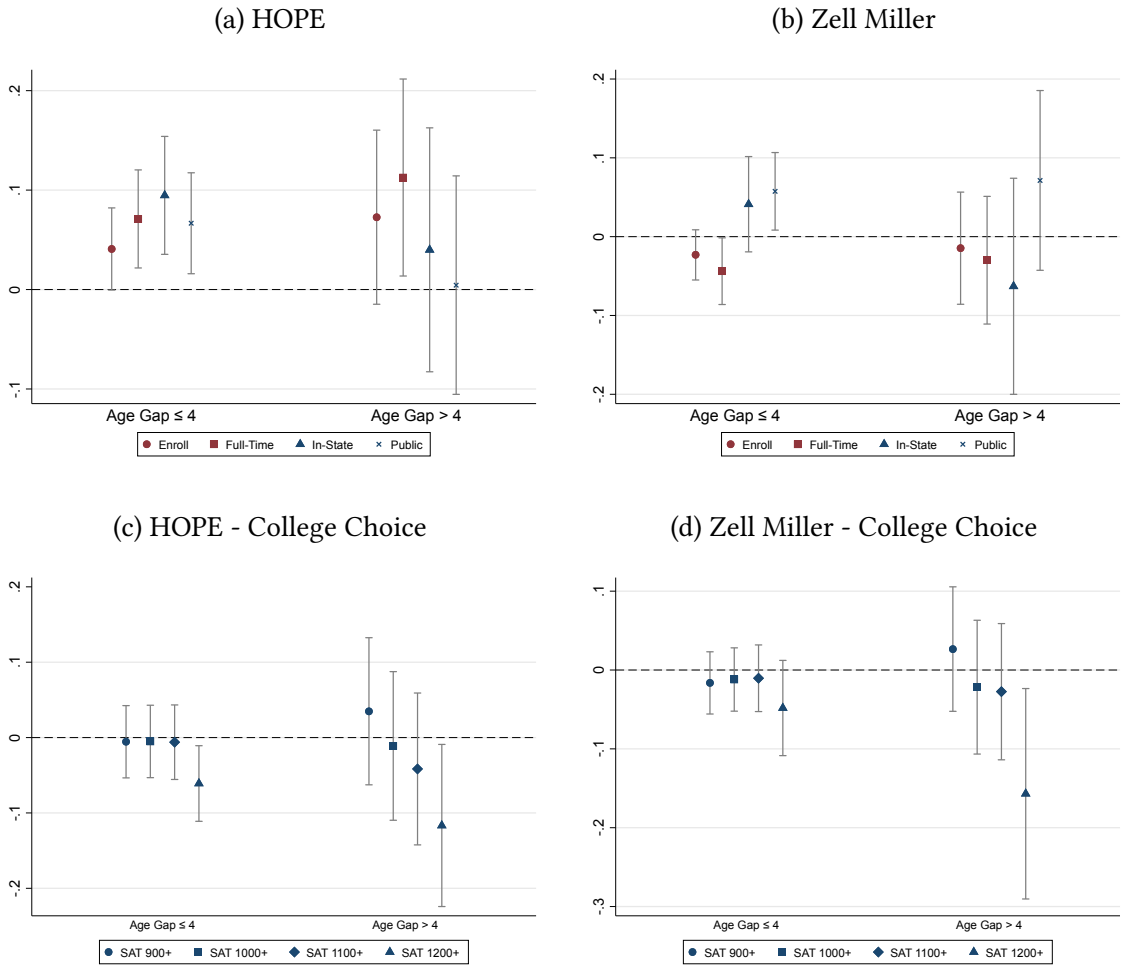


(i) SAT 1200+



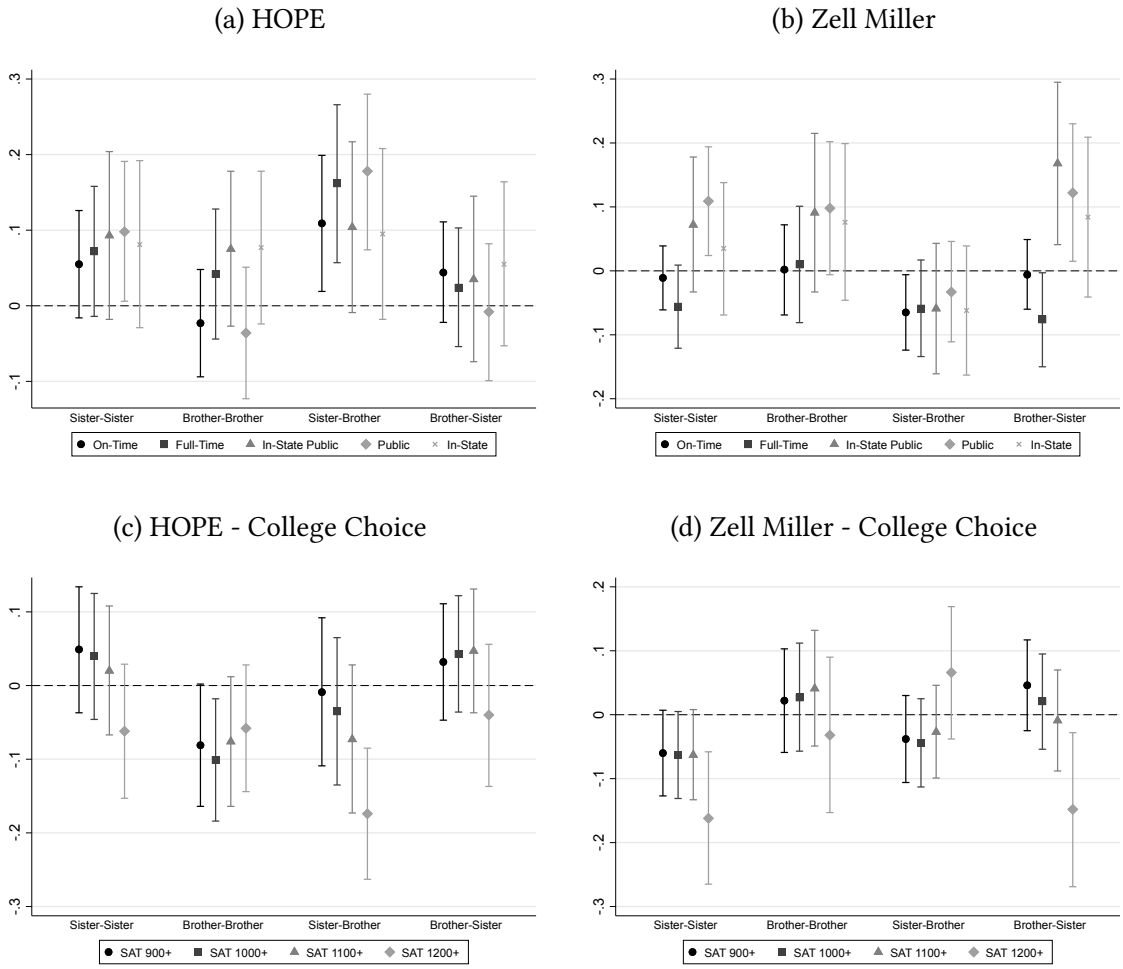
Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: Each coefficient represents the estimated sibling spillover effect at a placebo cutoff. The younger sibling sample includes the oldest two siblings in two- or three-child households, whose older siblings resided in Georgia for at least 12 months before enrolling in college and met academic rigor requirements. College enrollment data come from the National Student Clearinghouse. All models control for student demographics (sex, race/ethnicity, eligibility for free or reduced-price meals, English Learner status, and disability status) and include high school and cohort fixed effects. Standard errors are clustered at the sibling-identifier level.

Figure A15: Heterogeneous Effects of the HOPE and Zell Miller Scholarship on College Enrollment by Age Gap



Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: Each figure reports regression discontinuity coefficients for the effect of scholarship eligibility on younger siblings' college enrollment by siblings' age gap, for HOPE in Panels A and C and Zell in Panels B and D. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling resided in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements. Estimates use optimal bandwidths of 0.3 for HOPE and 0.25 for Zell around each GPA cutoff. Standard errors are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status), as well as high school and graduating-cohort fixed effects.

Figure A16: Heterogeneous Effects of the HOPE and Zell Miller Scholarship on College Enrollment by Sibling Gender Composition



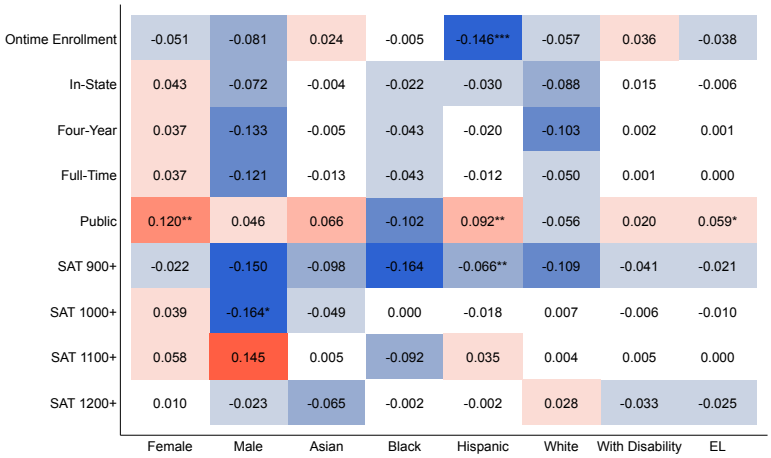
Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: Each figure reports regression discontinuity coefficients for the effect of scholarship eligibility on younger siblings' college enrollment by siblings' gender composition, for HOPE in Panels A and C and Zell in Panels B and D. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling resided in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements. Estimates use optimal bandwidths of 0.3 for HOPE and 0.25 for Zell around each GPA cutoff. Standard errors are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status), as well as high school and graduating-cohort fixed effects.

Figure A17: Heterogeneous Effects of the HOPE and Zell Miller Scholarship by Younger Sibling Demographics

(a) HOPE



(b) Zell Miller



Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: Each figure reports regression discontinuity coefficients for the effect of scholarship eligibility on younger siblings' college enrollment by younger siblings' demographic characteristics, for HOPE in Panel A and Zell in Panel B. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling resided in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements. Estimates use optimal bandwidths of 0.3 for HOPE and 0.25 for Zell around each GPA cutoff. Standard errors are clustered at the sibling level. All specifications include high school and graduating-cohort fixed effects.

Table A1: Summary Statistics for High School Graduates by Household Units, 2012-2022

	Only Child		Any Siblings		Older Siblings		Younger Siblings	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Baseline Characteristics								
Female	0.529	0.499	0.508	0.499	0.496	0.500	0.508	0.500
Asian	0.101	0.302	0.126	0.332	0.167	0.344	0.136	0.343
Black	0.501	0.500	0.288	0.453	0.279	0.448	0.279	0.449
Hispanic	0.118	0.323	0.101	0.301	0.101	0.302	0.100	0.299
White	0.271	0.444	0.476	0.499	0.474	0.499	0.473	0.499
Other Races	0.038	0.192	0.039	0.194	0.039	0.194	0.040	0.195
Ever Free/Reduced-Price Meal	0.552	0.497	0.360	0.480	0.346	0.476	0.350	0.477
Student with Disability	0.136	0.343	0.168	0.374	0.151	0.358	0.174	0.379
English Learner	0.112	0.316	0.093	0.291	0.095	0.294	0.090	0.286
High School HOPE GPA	2.942	0.609	3.153	0.572	3.132	0.571	3.179	0.569
Number of Siblings	1.000	0.000	2.334	0.613	2.178	0.382	2.178	0.382
College Enrollment								
Enroll On-Time	0.706	0.456	0.818	0.386	0.829	0.377	0.810	0.392
Enroll In-State	0.527	0.499	0.586	0.493	0.599	0.490	0.571	0.495
Enroll Four-Year	0.619	0.486	0.754	0.431	0.767	0.423	0.749	0.433
Enroll Full-Time	0.608	0.488	0.739	0.439	0.753	0.431	0.728	0.445
Enroll Public	0.621	0.485	0.715	0.451	0.719	0.449	0.711	0.453
College Selectivity								
Enroll Avg SAT 900+	0.537	0.499	0.702	0.451	0.714	0.452	0.702	0.457
Enroll Avg SAT 1000+	0.481	0.500	0.670	0.470	0.683	0.465	0.672	0.470
Enroll Avg SAT 1100+	0.427	0.495	0.628	0.483	0.637	0.481	0.634	0.482
Enroll Avg SAT 1200+	0.190	0.392	0.320	0.467	0.341	0.474	0.316	0.465
Enroll Selective Colleges	0.142	0.349	0.256	0.437	0.276	0.447	0.255	0.436
N	34,697		35,209		12,631		12,631	

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).

Note: The "Only Child" sample (Column 1) consists of students with no matched siblings in public high schools within a single Metro Atlanta district, covering graduating cohorts from 2012 to 2022. The "Any Siblings" sample (Column 2) includes students who are matched with at least one sibling. The "Older Siblings" sample (Column 3) is restricted to older siblings who graduated, resided in Georgia for at least 12 consecutive months prior to college enrollment, and satisfied the scholarship residency and rigor requirements. The "Younger Siblings" sample (Column 4) includes younger siblings whose older siblings meet these residency and rigor eligibility criteria.

Table A2: Covariate Balance Check by Ever FRPM Status at HOPE Scholarship Cutoff

	(1) Female	(2) Asian	(3) Black	(4) Hispanic	(5) White	(6) Other Races	(7) FRPM Eligible	(8) Student With Disability	(9) English Learners
Panel A: All Older Siblings									
GPA $\geq$ 3.0	-0.065**	-0.003	-0.015	0.008	0.015	-0.000	0.005	-0.012	0.025
	(0.031)	(0.018)	(0.020)	(0.020)	(0.028)	(0.011)	(0.023)	(0.022)	(0.017)
$\bar{Y}$	0.464	0.081	0.317	0.107	0.488	0.036	0.366	0.151	0.097
N	3,847	3,847	3,847	3,847	3,847	3,847	3,847	3,847	3,847
Panel B: FRPM Eligible Older Siblings									
GPA $\geq$ 3.0	-0.049	0.037	-0.016	0.020	-0.020	0.002		0.015	0.078*
	(0.057)	(0.023)	(0.045)	(0.044)	(0.036)	(0.023)		(0.031)	(0.042)
$\bar{Y}$	0.557	0.042	0.630	0.194	0.122	0.042		0.101	0.198
N	1,145	1,145	1,145	1,145	1,145	1,145		1,145	1,145
Panel C: Non-FRPM Eligible Older Siblings									
GPA $\geq$ 3.0	-0.075*	-0.020	-0.017	0.001	0.036	-0.000		-0.018	0.004
	(0.039)	(0.026)	(0.022)	(0.018)	(0.034)	(0.013)		(0.029)	(0.016)
$\bar{Y}$	0.411	0.104	0.136	0.056	0.699	0.033		0.179	0.039
N	2,698	2,698	2,698	2,698	2,698	2,698		2,698	2,698

Note: The sample includes older siblings from households with two or three children who graduated from high school, resided in Georgia for at least 12 consecutive months before college enrollment, and satisfied the scholarship rigor requirements. Panel A reports estimates from regressions of demographic characteristics on an indicator for scholarship eligibility using the full older-sibling RD sample. Panel B restricts the sample to FRPM-eligible siblings, while Panel C restricts to non-FRPM-eligible siblings. The regression uses a bandwidth of 0.3 GPA points around the 3.0 HOPE cutoff, based on the optimal bandwidth procedure. Standard errors (in parentheses) are clustered at the older sibling's high school HOPE GPA level. $\bar{Y}$ denotes the control mean. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A3: Covariate Balance Check by Ever FRPM Status at Zell Miller Scholarship Cutoff

	(1) Female	(2) Asian	(3) Black	(4) Hispanic	(5) White	(6) Other Races	(7) FRPM Eligible	(8) Student With Disability	(9) English Learners
Panel A: All Older Siblings									
GPA $\geq$ 3.7	-0.037	0.023	0.021	-0.018	-0.036	-0.016	0.004	0.007	-0.005
	(0.034)	(0.027)	(0.015)	(0.017)	(0.029)	(0.013)	(0.020)	(0.021)	(0.018)
$\bar{Y}$	0.583	0.208	0.101	0.071	0.617	0.044	0.141	0.104	0.072
N	3,337	3,337	3,337	3,337	3,337	3,337	3,337	3,337	3,337
Panel B: FRPM Eligible Older Siblings									
GPA $\geq$ 3.7	-0.079	0.049	0.017	-0.049	-0.063	0.006		0.027	-0.035
	(0.088)	(0.068)	(0.070)	(0.071)	(0.075)	(0.042)		(0.051)	(0.082)
$\bar{Y}$	0.669	0.180	0.389	0.180	0.255	0.059		0.079	0.234
N	439	439	439	439	439	439		439	439
Panel C: Non-FRPM Eligible Older Siblings									
GPA $\geq$ 3.7	-0.032	0.017	0.024*	-0.012	-0.033	-0.018		0.004	-0.002
	(0.037)	(0.028)	(0.014)	(0.016)	(0.032)	(0.013)		(0.022)	(0.016)
$\bar{Y}$	0.569	0.212	0.053	0.053	0.676	0.042		0.108	0.046
N	2,896	2,896	2,896	2,896	2,896	2,896		2,896	2,896

Note: The sample includes older siblings from households with two or three children who graduated from high school, lived in Georgia for at least 12 consecutive months before college enrollment, and met the scholarship rigor requirements. Panel A reports estimates from regressions of demographic characteristics on an indicator for scholarship eligibility using the full older-sibling RD sample. Panel B restricts the sample to FRPM-eligible siblings, while Panel C restricts to non-FRPM-eligible siblings. The regression uses a bandwidth of 0.25 GPA points around the 3.7 Zell cutoff, based on the optimal bandwidth procedure. Standard errors (in parentheses) are clustered at the older sibling's high school HOPE GPA level. $\bar{Y}$ denotes the control mean. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A4: Sibling Spillovers of HOPE and Zell Miller Scholarship on College and Major Choice

	(1) Same College	(2) Same Major	(3) Same College Same Major
Panel A: HOPE			
Older GPA $\geq$ 3.0	0.041	0.080	0.141**
	(0.034)	(0.077)	(0.067)
$\bar{Y}$	0.329	0.161	0.077
N	3,114	519	464
Panel B: Zell Miller			
Older GPA $\geq$ 3.7	0.022	-0.097	-0.031
	(0.035)	(0.070)	(0.068)
$\bar{Y}$	0.407	0.274	0.148
N	3,000	682	612

Source: National Student Clearinghouse.
Note: This table reports the regression discontinuity estimates of the effects of HOPE and Zell Miller Scholarship eligibility on younger siblings' same college choice outcomes. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before college enrollment and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculations of 0.3 for HOPE and 0.25 for Zell around each GPA cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, ever eligibility for Free or Reduced-Price Meals, and ever disability status), as well as graduating-cohort and college fixed effects. $\bar{Y}$ denotes the control mean. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A5: Sibling Spillover Effects on High School Course Taking by Subgroup

	HOPE GPA	HOPE Eligible	Any AP	Any IB	Any Dual	Max Rigor
Panel A: HOPE						
Older GPA $\geq$ 3.0	-0.016	-0.003	-0.006	-0.002	-0.009	-0.042
	(0.031)	(0.030)	(0.025)	(0.006)	(0.017)	(0.321)
N	3,703	3,847	3,847	3,847	3,847	3,201
Older GPA $\geq$ 3.0 $\times$ FRPM	0.025	0.078	-0.032	0.003	-0.010	-0.316
	(0.063)	(0.054)	(0.043)	(0.011)	(0.023)	(0.653)
N	1,048	1,145	1,145	1,145	1,145	875
Older GPA $\geq$ 3.0 $\times$ Non-FRPM	-0.042	-0.040	0.014	-0.004	-0.011	-0.423
	(0.035)	(0.036)	(0.031)	(0.007)	(0.022)	(0.368)
N	2,653	2,698	2,698	2,698	2,698	2,322
Panel B: Zell Miller						
Older GPA $\geq$ 3.7	-0.043	-0.039*	-0.029	-0.005	-0.014	-0.665**
	(0.027)	(0.023)	(0.026)	(0.007)	(0.020)	(0.309)
N	3,295	3,337	3,337	3,337	3,337	2,769
Older GPA $\geq$ 3.7 $\times$ FRPM	-0.120	-0.064	-0.019	-0.032	-0.005	-0.163
	(0.098)	(0.093)	(0.070)	(0.025)	(0.043)	(0.949)
N	429	439	439	439	439	355
Older GPA $\geq$ 3.7 $\times$ Non-FRPM	-0.030	-0.036	-0.034	-0.000	-0.017	-0.751**
	(0.027)	(0.023)	(0.028)	(0.007)	(0.022)	(0.322)
N	2,864	2,896	2,896	2,896	2,896	2,413

Note: This table reports regression discontinuity estimates of the sibling spillover effects of the scholarship eligibility on younger siblings' high school course-taking outcomes. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements. Estimates use optimal bandwidths of 0.3 for HOPE and 0.25 for Zell Miller around each GPA cutoff. Subgroups are defined by younger siblings' Free or Reduced-Price Meal (FRPM) eligibility status. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, ever eligibility for Free or Reduced-Price Meals, and ever disability status), as well as high school and graduating-cohort fixed effects. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A6: Alternative Specifications for Robustness Test: Sibling Spillovers of HOPE

	On-Time	GA College	Full-Time	Four-Year	Public	SAT 900+	SAT 1000+	SAT 1100+	SAT 1200+
All Younger Siblings									
No Controls	0.041*	0.080**	0.070**	0.018	0.051*	-0.007	-0.015	-0.023	-0.079***
	(0.023)	(0.032)	(0.028)	(0.027)	(0.028)	(0.028)	(0.028)	(0.029)	(0.028)
Triangular	0.030	0.050	0.058**	0.023	0.028	-0.010	-0.020	-0.023	-0.080***
	(0.025)	(0.036)	(0.030)	(0.028)	(0.031)	(0.028)	(0.029)	(0.029)	(0.031)
Donut	0.037	0.066*	0.063**	0.022	0.046	-0.007	-0.010	-0.018	-0.077***
	(0.024)	(0.034)	(0.028)	(0.026)	(0.029)	(0.027)	(0.028)	(0.028)	(0.029)
Trends in Heaps	0.036	0.078**	0.058**	0.016	0.058**	-0.014	-0.016	-0.019	-0.074**
	(0.023)	(0.034)	(0.028)	(0.026)	(0.029)	(0.028)	(0.028)	(0.029)	(0.030)
FRPM Eligible Siblings									
No Controls	0.169***	0.214***	0.209***	0.171***	0.214***	0.134**	0.118**	0.120**	-0.018
	(0.054)	(0.058)	(0.056)	(0.057)	(0.057)	(0.058)	(0.057)	(0.057)	(0.035)
Triangular	0.155***	0.146**	0.199***	0.187***	0.160***	0.113*	0.090	0.088	-0.033
	(0.057)	(0.062)	(0.059)	(0.058)	(0.060)	(0.059)	(0.058)	(0.058)	(0.037)
Donut	0.139**	0.162***	0.176***	0.158***	0.158***	0.117**	0.117**	0.113*	-0.009
	(0.055)	(0.061)	(0.058)	(0.056)	(0.059)	(0.058)	(0.058)	(0.057)	(0.038)
Trends in Heaps	0.114**	0.161***	0.137**	0.121**	0.159***	0.090	0.095	0.100*	-0.016
	(0.055)	(0.062)	(0.058)	(0.058)	(0.060)	(0.059)	(0.059)	(0.058)	(0.039)
Non-FRPM Eligible Siblings									
No Controls	-0.017	0.016	0.005	-0.054*	-0.024	-0.068**	-0.072**	-0.086***	-0.106***
	(0.023)	(0.039)	(0.031)	(0.028)	(0.032)	(0.030)	(0.030)	(0.032)	(0.037)
Triangular	-0.033	-0.004	-0.009	-0.054*	-0.042	-0.070**	-0.073**	-0.077**	-0.093**
	(0.025)	(0.043)	(0.034)	(0.030)	(0.035)	(0.032)	(0.032)	(0.034)	(0.041)
Donut	-0.016	0.009	0.004	-0.047	-0.019	-0.066**	-0.069**	-0.080**	-0.104***
	(0.024)	(0.041)	(0.032)	(0.029)	(0.033)	(0.031)	(0.031)	(0.033)	(0.038)
Trends in Heaps	-0.008	0.028	0.014	-0.037	-0.002	-0.062**	-0.065**	-0.073**	-0.098**
	(0.023)	(0.041)	(0.032)	(0.028)	(0.033)	(0.030)	(0.031)	(0.033)	(0.039)

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: This table reports an alternative specification regression of the effect of HOPE Scholarship eligibility on younger siblings' college enrollment. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling resided in Georgia for at least 12 consecutive months prior to college enrollment and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculations of 0.3 around the HOPE cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include high school and graduating-cohort fixed effects. The donut RD specification excludes observations with a GPA of 3.0. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A7: Alternative Specifications for Robustness Test: Sibling Spillovers of Zell

	(1) On-Time	(2) GA College	(3) Full-Time	(4) Four-Year	(5) Public	(6) SAT 900+	(7) SAT 1000+	(8) SAT 1100+	(9) SAT 1200+
All Younger Siblings									
No Controls	-0.021	0.027	-0.046*	-0.016	0.056**	-0.016	-0.022	-0.023	-0.066*
	(0.018)	(0.034)	(0.024)	(0.020)	(0.028)	(0.022)	(0.023)	(0.024)	(0.034)
Triangular	-0.020	0.033	-0.050*	-0.020	0.064**	-0.023	-0.029	-0.033	-0.078**
	(0.020)	(0.036)	(0.026)	(0.022)	(0.030)	(0.024)	(0.025)	(0.026)	(0.037)
Donut	-0.022	0.001	-0.045	-0.008	0.049	0.001	-0.001	-0.003	-0.047
	(0.021)	(0.039)	(0.027)	(0.023)	(0.032)	(0.025)	(0.026)	(0.027)	(0.039)
FRPM Eligible Siblings									
No Controls	-0.029	0.184*	-0.207**	-0.124	0.206**	-0.139	-0.142	-0.094	-0.064
	(0.077)	(0.094)	(0.088)	(0.085)	(0.090)	(0.090)	(0.090)	(0.088)	(0.081)
Triangular	0.044	0.220**	-0.124	-0.099	0.247**	-0.104	-0.126	-0.113	-0.109
	(0.084)	(0.104)	(0.093)	(0.090)	(0.100)	(0.095)	(0.095)	(0.094)	(0.084)
Donut	-0.091	0.184*	-0.314***	-0.127	0.166	-0.124	-0.106	-0.039	-0.039
	(0.086)	(0.108)	(0.100)	(0.097)	(0.102)	(0.103)	(0.105)	(0.105)	(0.095)
Non-FRPM Eligible Siblings									
No Controls	-0.019	0.004	-0.019	0.002	0.036	0.006	-0.002	-0.009	-0.063*
	(0.018)	(0.036)	(0.024)	(0.019)	(0.029)	(0.022)	(0.022)	(0.024)	(0.037)
Triangular	-0.029	0.008	-0.032	-0.006	0.042	-0.004	-0.012	-0.020	-0.076*
	(0.019)	(0.039)	(0.026)	(0.022)	(0.031)	(0.024)	(0.025)	(0.026)	(0.040)
Donut	-0.017	-0.024	-0.011	0.004	0.031	0.014	0.007	-0.004	-0.052
	(0.020)	(0.042)	(0.027)	(0.021)	(0.034)	(0.024)	(0.025)	(0.027)	(0.043)

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: This table reports an alternative specification regression for a robustness test of the effect of Zell Miller Scholarship eligibility on younger siblings' college enrollment. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling resided in Georgia for at least 12 consecutive months prior to college enrollment and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculations of 0.25 around each Zell cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include high school and graduating-cohort fixed effects. The donut RD specification excludes observations with GPAs between 3.69 and 3.71. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A8: High School Course Taking Behavior by Scholarship Eligibility

	HOPE				Zell Miller			
	(1) Rigor	(2) AP	(3) IB	(4) Dual	(5) Rigor	(6) AP	(7) IB	(8) Dual
Ever During HS		-0.016	-0.001	0.004		-0.001	0.001	0.030
		(0.025)	(0.004)	(0.016)		(0.020)	(0.005)	(0.026)
$\bar{Y}$	1.00	0.62	0.02	0.14	1.00	0.73	0.03	0.35
During 10th	0.001	-0.027	-	-	-0.077	-0.018	-	-
	(0.103)	(0.031)	-	-	(0.117)	(0.042)	-	-
$\bar{Y}$	3.49	0.32	0.00	0.00	5.32	0.57	0.00	0.00
During 11th	-0.162	-0.071	-0.008	-0.012	-0.104	-0.065	0.003	0.045
	(0.115)	(0.072)	(0.015)	(0.012)	(0.129)	(0.105)	(0.023)	(0.034)
$\bar{Y}$	5.50	1.30	0.06	0.02	5.74	2.04	0.09	0.07
During 12th	-0.095	-0.042	-0.029	0.014	-0.054	0.002	0.022	0.057
	(0.099)	(0.084)	(0.020)	(0.049)	(0.147)	(0.114)	(0.029)	(0.086)
$\bar{Y}$	4.53	1.42	0.07	0.37	4.32	1.89	0.11	0.86
N	11,885	11,885	11,885	11,885	6,155	6,155	6,155	6,155

Note: The sample includes high school graduates from the 2012–2017 cohorts who lived in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements, which is not limited to the sibling sample. The regression discontinuity bandwidth is set to the optimal calculation of 0.3 for HOPE and 0.25 for Zell based on the on-time college enrollment outcome variable. All specifications control for student demographics (sex, race/ethnicity, ever eligibility for free or reduced-price meals, English Learner status, and disability status) and include high school and cohort fixed effects. Each column represents a separate regression. Standard errors are clustered at the HOPE GPA level, as shown in parentheses. $\bar{Y}$ denotes the control mean. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Table A9: Younger Siblings' Enrollment by Institution Annual Sticker Tuition Quantile

	All Institutions			In-State Institutions		
	(1) $\geq$ 25th	(2) $\geq$ 50th	(3) $\geq$ 75th	(4) $\geq$ 25th	(5) $\geq$ 50th	(6) $\geq$ 75th
Panel A: HOPE						
Older GPA $\geq$ 3.0	-0.022	-0.022	-0.050*	0.068**	-0.011	0.003
	(0.031)	(0.029)	(0.026)	(0.032)	(0.023)	(0.011)
N	3,847	3,847	3,847	3,847	3,847	3,847
Older GPA $\geq$ 3.0	0.019	-0.021	-0.014	0.189***	-0.015	-0.012
$\times$ FRPM	(0.051)	(0.042)	(0.035)	(0.056)	(0.036)	(0.022)
N	1,145	1,145	1,145	1,145	1,145	1,145
Older GPA $\geq$ 3.0	-0.041	-0.017	-0.058*	0.002	-0.012	0.009
$\times$ Non-FRPM	(0.038)	(0.037)	(0.035)	(0.039)	(0.030)	(0.013)
N	2,698	2,698	2,698	2,698	2,698	2,698
Panel B: Zell Miller						
Older GPA $\geq$ 3.7	-0.048	-0.052	-0.057*	0.007	-0.035	-0.028**
	(0.031)	(0.032)	(0.031)	(0.034)	(0.032)	(0.012)
N	3,337	3,337	3,337	3,337	3,337	3,337
Older GPA $\geq$ 3.7	-0.188**	-0.249***	-0.188**	0.099	-0.040	-0.059*
$\times$ FRPM	(0.092)	(0.079)	(0.073)	(0.100)	(0.073)	(0.034)
N	439	439	439	439	439	439
Older GPA $\geq$ 3.7	-0.032	-0.029	-0.042	-0.004	-0.033	-0.025**
$\times$ Non-FRPM	(0.033)	(0.035)	(0.034)	(0.037)	(0.035)	(0.012)
N	2,896	2,896	2,896	2,896	2,896	2,896

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).

Note: This table reports regression discontinuity estimates of the effect of the scholarship eligibility on younger siblings' college choice by institutional sticker tuition by students' ever Free or Reduced-Price Meal (FRPM) eligibility during K–12. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before college enrollment and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculations of 0.3 for HOPE and 0.25 for Zell around each GPA cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, ever disability status, and ever FRPM status for full sample), as well as high school and graduating-cohort fixed effects. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A10: Sibling Spillovers of the HOPE Scholarship on College Outcomes by Measures of Socioeconomic Status

	(1) Enroll	(2) In-State	(3) Full-Time	(4) Four-Year	(5) Public	(6) SAT 1000+	(7) SAT 1200+
Panel A: By FRPM							
Persistently	0.181***	0.192***	0.218***	0.167***	0.201***	0.103*	-0.021
	(0.055)	(0.061)	(0.057)	(0.056)	(0.059)	(0.057)	(0.035)
N	1,026	1,026	1,013	1,026	1,026	1,026	1,026
Free Only	0.169***	0.200***	0.218***	0.171***	0.200***	0.097*	-0.027
	(0.055)	(0.059)	(0.056)	(0.055)	(0.058)	(0.056)	(0.035)
N	1,061	1,061	1,048	1,061	1,061	1,061	1,061
Panel B: By High School Poverty							
Bottom Tercile	0.012	0.001	0.031	0.009	0.014	-0.014	-0.117***
	(0.027)	(0.047)	(0.036)	(0.034)	(0.039)	(0.036)	(0.044)
N	1,777	1,777	1,749	1,777	1,777	1,777	1,777
Middle Tercile	0.022	0.105*	0.033	-0.026	0.039	-0.046	-0.051
	(0.039)	(0.060)	(0.049)	(0.044)	(0.049)	(0.046)	(0.054)
N	1,227	1,227	1,209	1,227	1,227	1,227	1,227
Top Tercile	0.159**	0.213***	0.242***	0.158**	0.209***	0.072	-0.023
	(0.067)	(0.074)	(0.069)	(0.067)	(0.073)	(0.069)	(0.044)
N	696	696	686	696	696	696	696

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).

Note: This table reports regression discontinuity estimates of the effects of HOPE Scholarship eligibility on younger siblings' college enrollment outcomes, separately by ever FRPM eligibility subgroup (Panel A) and by terciles of the high school-level FRPM student share (Panel B). The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before college enrollment and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculation of 0.3 around the HOPE GPA cutoff of 3.0. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status), as well as high school and graduating-cohort fixed effects. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A11: Sibling Spillovers of HOPE and Zell Miller Scholarship by Subgroup Analysis

	Enroll	In-State	Full-Time	Four-Year	Public	SAT 900+	SAT 1000+	SAT 1100+	SAT 1200+
Panel A: HOPE									
2-Child Household	0.041	0.090**	0.081***	0.030	0.061**	-0.002	-0.015	-0.025	-0.079**
	(0.025)	(0.036)	(0.030)	(0.028)	(0.031)	(0.029)	(0.029)	(0.030)	(0.030)
N	3,152	3,152	3,105	3,152	3,152	3,152	3,152	3,152	3,152
3-Child Household	0.059	0.077	0.051	-0.007	0.011	-0.013	0.001	0.002	-0.057
	(0.054)	(0.077)	(0.063)	(0.060)	(0.066)	(0.063)	(0.064)	(0.068)	(0.065)
N	692	692	682	692	692	692	692	692	692
Panel B: Zell Miller									
2-Child Household	-0.018	0.014	-0.033	-0.007	0.072**	-0.003	-0.010	-0.009	-0.047
	(0.020)	(0.036)	(0.025)	(0.022)	(0.029)	(0.024)	(0.024)	(0.025)	(0.036)
N	2,757	2,757	2,726	2,757	2,757	2,757	2,757	2,757	2,757
3-Child Household	-0.014	0.049	-0.054	-0.044	0.034	-0.047	-0.046	-0.044	-0.091
	(0.041)	(0.090)	(0.058)	(0.047)	(0.077)	(0.055)	(0.055)	(0.060)	(0.088)
N	579	579	567	579	579	579	579	579	579

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: This table reports the regression discontinuity estimates of the effects of the scholarship eligibility on younger siblings' college enrollment by household size. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling resided in Georgia for at least 12 consecutive months prior to college enrollment and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculations of 0.3 for HOPE and 0.25 for Zell around each GPA cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, ever eligibility for Free or Reduced-Price Meals, and ever disability status), as well as high school and graduating-cohort fixed effects. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A12: Sibling Spillovers of the HOPE and Zell Miller Scholarships on College Outcomes by High School College Enrollment Rate

	(1) Enroll	(2) In-State	(3) Public	(4) Full-Time	(5) Four-Year	(6) SAT 1000+	(7) SAT 1200+
Panel A: HOPE							
Top Tercile	0.016	0.000	0.013	0.041	0.020	0.005	-0.095**
	(0.027)	(0.046)	(0.038)	(0.036)	(0.036)	(0.035)	(0.042)
N	1,870	1,870	1,870	1,864	1,870	1,870	1,870
Middle Tercile	0.021	0.110**	0.072	0.014	-0.014	-0.065	-0.058
	(0.037)	(0.053)	(0.045)	(0.044)	(0.041)	(0.044)	(0.047)
N	1,447	1,447	1,447	1,445	1,447	1,447	1,447
Bottom Tercile	0.144*	0.220***	0.174**	0.270***	0.101	0.091	-0.062
	(0.078)	(0.082)	(0.082)	(0.078)	(0.076)	(0.074)	(0.044)
N	528	528	528	525	528	528	528
Panel B: Zell Miller							
Top Tercile	0.007	0.047	0.136***	-0.014	0.018	0.023	-0.009
	(0.020)	(0.043)	(0.035)	(0.027)	(0.023)	(0.026)	(0.043)
N	2,011	2,011	2,011	1,988	2,011	2,011	2,011
Middle Tercile	-0.045	-0.042	-0.046	-0.051	-0.021	-0.028	-0.127**
	(0.029)	(0.059)	(0.047)	(0.042)	(0.034)	(0.040)	(0.060)
N	1,072	1,072	1,072	1,059	1,072	1,072	1,072
Bottom Tercile	-0.097	0.061	-0.065	-0.260**	-0.189*	-0.221*	-0.152
	(0.107)	(0.134)	(0.117)	(0.120)	(0.110)	(0.113)	(0.100)
N	210	210	210	203	210	210	210

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).

Note: This table reports regression discontinuity estimates of the effects of HOPE Scholarship eligibility (Panel A) and Zell Miller Scholarship eligibility (Panel B) on younger siblings' college enrollment outcomes, by terciles of the high school college enrollment rate. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before college enrollment and met the academic rigor requirements. HOPE estimates are based on the optimal bandwidth calculation of 0.3 around the HOPE GPA cutoff of 3.0; Zell Miller estimates are based on the optimal bandwidth calculation of 0.25 around the Zell Miller GPA cutoff of 3.7. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status), as well as high school and graduating-cohort fixed effects. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A13: Sibling Spillovers of the Zell Miller Scholarship on College Outcomes by Measures of Socioeconomic Status

	(1) Enroll	(2) In-State	(3) Public	(4) Full-Time	(5) Four-Year	(6) SAT 1000+	(7) SAT 1200+
Panel A: By FRPM							
Persistently	-0.007	0.279***	0.293***	-0.178*	-0.086	-0.120	-0.103
	(0.083)	(0.105)	(0.101)	(0.098)	(0.093)	(0.098)	(0.085)
N	366	366	366	358	366	366	366
Free Only	-0.021	0.218**	0.234**	-0.223**	-0.111	-0.122	-0.078
	(0.083)	(0.103)	(0.099)	(0.094)	(0.090)	(0.096)	(0.082)
N	376	376	376	368	376	376	376
Panel B: By High School Poverty							
Bottom Tercile	0.000	0.035	0.105***	-0.013	0.009	0.007	-0.054
	(0.020)	(0.042)	(0.034)	(0.026)	(0.023)	(0.026)	(0.043)
N	2,065	2,065	2,065	2,046	2,065	2,065	2,065
Middle Tercile	-0.016	-0.022	0.035	-0.044	0.010	0.020	-0.028
	(0.030)	(0.063)	(0.051)	(0.045)	(0.034)	(0.039)	(0.065)
N	959	959	959	943	959	959	959
Top Tercile	-0.111	0.086	-0.084	-0.259**	-0.175*	-0.236**	-0.126
	(0.095)	(0.119)	(0.107)	(0.105)	(0.095)	(0.104)	(0.095)
N	269	269	269	261	269	269	269

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).

Note: This table reports regression discontinuity estimates of the effects of Zell Miller Scholarship eligibility on younger siblings' college enrollment outcomes, separately by ever FRPM eligibility subgroup (Panel A) and by terciles of the high school-level FRPM student share (Panel B). The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before college enrollment and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculation of 0.25 around the Zell Miller GPA cutoff of 3.7. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, and ever disability status), as well as high school and graduating-cohort fixed effects. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A14: Sibling Spillovers of the Scholarship by Older Sibling's Second-Semester Persistence

	Enroll	In-State	Full-Time	Public	Four-Year	SAT 900+	SAT 1000+	SAT 1100+	SAT 1200+
Panel A: HOPE									
2nd Semester Persisted	0.040*	0.077**	0.079***	0.044	0.016	-0.004	-0.005	-0.018	-0.080***
	(0.023)	(0.034)	(0.028)	(0.029)	(0.026)	(0.028)	(0.028)	(0.029)	(0.030)
N	3,428	3,428	3,373	3,428	3,428	3,428	3,428	3,428	3,428
2nd Semester Drop-out	0.014	0.013	0.013	0.045	0.022	-0.029	-0.052	-0.023	-0.024
	(0.093)	(0.100)	(0.094)	(0.095)	(0.090)	(0.088)	(0.088)	(0.084)	(0.053)
N	417	417	415	417	417	417	417	417	417
Panel B: Zell Miller									
2nd Semester Persisted	-0.033*	0.002	-0.043*	0.044	-0.023	-0.016	-0.021	-0.021	-0.065*
	(0.017)	(0.033)	(0.023)	(0.027)	(0.019)	(0.020)	(0.021)	(0.022)	(0.033)
N	3,239	3,239	3,239	3,239	3,239	3,239	3,239	3,239	3,239
2nd Semester Drop-out	-0.026	0.060	-0.398**	-0.002	-0.190	-0.153	-0.255	-0.297	-0.146
	(0.129)	(0.225)	(0.166)	(0.134)	(0.189)	(0.191)	(0.176)	(0.190)	(0.215)
N	98	98	96	98	98	98	98	98	98

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: This table reports regression discontinuity estimates of the effects of the scholarship eligibility on younger siblings' college enrollment, by older siblings' second-semester dropout status. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before college enrollment and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculations of 0.3 for HOPE and 0.25 for Zell around each GPA cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, ever eligibility for Free or Reduced-Price Meals, and ever disability status), as well as high school and graduating-cohort fixed effects. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A15: Sibling Spillovers of the Scholarship by Gender Composition

	Enroll	In-State	Full-Time	Four-Year	Public	SAT 900+	SAT 1000+	SAT 1100+	SAT 1200+
Panel A: HOPE									
Same Gender	0.014	0.079*	0.052	0.005	0.028	-0.019	-0.034	-0.033	-0.033
	(0.031)	(0.045)	(0.037)	(0.034)	(0.038)	(0.036)	(0.036)	(0.037)	(0.038)
N	1,955	1,955	1,938	1,955	1,955	1,955	1,955	1,955	1,955
Mixed Gender	0.077**	0.081*	0.092**	0.039	0.082**	0.017	0.010	-0.007	-0.106***
	(0.033)	(0.047)	(0.039)	(0.037)	(0.041)	(0.038)	(0.038)	(0.039)	(0.040)
N	1,892	1,892	1,852	1,892	1,892	1,892	1,892	1,892	1,892
Panel B: Zell Miller									
Same Gender	-0.000	0.056	-0.023	-0.024	0.106***	-0.022	-0.020	-0.014	-0.103**
	(0.024)	(0.048)	(0.032)	(0.029)	(0.039)	(0.031)	(0.032)	(0.033)	(0.048)
N	1,663	1,663	1,642	1,663	1,663	1,663	1,663	1,663	1,663
Mixed Gender	-0.040	-0.009	-0.070**	-0.002	0.027	-0.004	-0.017	-0.021	-0.019
	(0.026)	(0.048)	(0.033)	(0.027)	(0.039)	(0.030)	(0.031)	(0.033)	(0.047)
N	1,672	1,672	1,650	1,672	1,672	1,672	1,672	1,672	1,672

Source: National Student Clearinghouse (NSC) and Integrated Postsecondary Education Data System (IPEDS).
Note: This table reports the regression discontinuity estimates of the effects of the scholarship eligibility on younger siblings' college enrollment by sibling gender composition. The sibling sample consists of the two oldest siblings from households with two or three children, where the older sibling lived in Georgia for at least 12 consecutive months before enrolling in college and met the academic rigor requirements. Estimates are based on the optimal bandwidth calculations of 0.3 for HOPE and 0.25 for Zell around each GPA cutoff. Standard errors, reported in parentheses, are clustered at the sibling level. All specifications include demographic controls (sex, race/ethnicity, ever English Learner status, ever eligibility for Free or Reduced-Price Meals, and ever disability status), as well as high school and graduating-cohort fixed effects. Each column represents a separate regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

B Details for HOPE and Zell Miller Scholarships

This appendix provides a comprehensive overview of the eligibility requirements and award structures for the HOPE and Zell Miller Scholarships. Both programs are restricted to students enrolled in institutions within the University System of Georgia (USG), the Technical College System of Georgia (TCSG), and eligible in-state private postsecondary institutions as defined by the Georgia Student Finance Commission (GSFC).

Eligibility and Residency

Both scholarships require Georgia residency; students must have resided in Georgia for at least 12 consecutive months before college enrollment and must graduate from an eligible Georgia high school. The High School HOPE GPA and the completion of a rigorous curriculum determine initial academic eligibility. As summarized in Table B1, the HOPE Scholarship requires a minimum HOPE GPA of 3.0 in high school. The Zell Miller Scholarship has more stringent requirements, including a minimum HOPE GPA of 3.7 and a qualifying standardized test score (at least 1200 on the SAT Math/ERW or 26 on the ACT). Neither program imposes an income requirement; both operate as purely merit-based forms of financial aid.

Rigor Requirement

Starting with the graduating class of 2016, Georgia implemented a rigor requirement to discourage students from selecting easier coursework to inflate their HOPE GPA. Seniors graduating after May 2016 were required to complete at least 3 credits in advanced academic courses; those graduating after May 2017 were required to complete at least 4 credits. Eligible rigor courses include AP, IB, and dual enrollment courses, as well as designated advanced courses in core subjects.[21]

Maintenance Requirements

Continued receipt of both scholarships depends on satisfactory academic progress. HOPE recipients must maintain a cumulative college GPA of at least 3.0, while Zell Miller recipients must maintain a cumulative GPA of at least 3.3. Compliance is evaluated at credit-hour checkpoints of 30, 60, and 90 attempted hours and at the conclusion of each spring semester. Students who fall below the Zell Miller maintenance threshold but remain above 3.0 may revert to HOPE funding. While students can lose scholarships at these checkpoints, they may regain eligibility

[21] The full list of rigor courses as of school year 2024–25 is available at: https://www.gafutures.org/media/apofcfmn/rigor-list-september-2025.pdf.

at subsequent 30-hour intervals if their GPA returns to the required level (Ribar and Rubenstein, 2021). Eligibility for both programs expires after a fixed time window: students who first received either scholarship between summer 2011 and spring 2019 faced a seven-year limit, while those who first received either scholarship in summer 2019 or later face a ten-year limit.

Table B1: Eligibility and Maintenance Requirements: HOPE vs. Zell Miller

Requirement	**HOPE Scholarship**	**Zell Miller Scholarship**
GA Residency	12 months prior to enrollment	12 months prior to enrollment
HOPE GPA	Minimum 3.0	Minimum 3.7
Standardized Test	None required	1200 SAT (ERW + Math) or 26 ACT
Academic Rigor	4 credits from approved rigor list	4 credits from approved rigor list
Maintenance GPA	Minimum 3.0 college GPA	Minimum 3.3 college GPA
Checkpoints	End of Spring; 30, 60, 90 attempted hours	End of Spring; 30, 60, 90 attempted hours

Source: Georgia Student Finance Commission (GSFC).

Award Structure

Both scholarships are applied as first-dollar awards, covering tuition before other grants or scholarships, and both exclude mandatory fees. Award amounts scale with credit hours and vary significantly by institutional type. At USG institutions, award amounts vary by institution. The HOPE Scholarship typically covers 78 to 98 percent of tuition for students enrolled in 15 credit hours, whereas the Zell Miller Scholarship covers 100 percent of tuition regardless of credit-hour load. In contrast, for TCSG and private institutions, both programs provide fixed-dollar awards that scale with enrollment intensity but remain uniform across all participating schools. For students at private institutions such as Emory University, both awards represent only a small fraction of total tuition costs. The difference between the two awards varies by institution. Currently, 12 of the 30 USG institutions maintain distinct award tiers for the two programs. For a student enrolled in 12 credit hours, this disparity ranges from a minimum of $24 to a maximum of $1,152 per semester, with a system-wide average difference of $173 per semester.

C Additional Details on Data Construction

High School Administrative Records

This appendix provides more details on data and variable constructions. The main dataset used in this study is based on administrative records from an anonymous public school district in Atlanta, Georgia, covering graduating cohorts from 2012 to 2022. Using school enrollment data, I define graduation status based on the exit date and withdrawal codes recorded during students' final year of high school (12th grade). Students who withdraw from the school system in 12th grade with the withdrawal reason coded as "High school graduation" and a non-missing withdrawal date are classified as high school graduates. Based on this definition, 89.56 percent of 12th-grade students are identified as graduating from high school.

Eligibility for the HOPE Scholarship requires students to have resided in Georgia for at least 12 consecutive months before college enrollment. I construct the residency eligibility indicator using entry codes and entry dates from the school enrollment data. Students who enter the school system during the 12th-grade school year after September 1 with entry reasons coded as "Entered from another state or U.S. territory," "Entered from another country," or "Entered from another state or country" are classified as not meeting the residency requirement for the scholarship. Information on eligibility for rigor requirements, final HOPE GPA, and final HOPE eligibility status is obtained directly from administrative records provided by the school district.

Student demographic characteristics are defined using the first available record in the student-year panel dataset. Student-year panel data is available from the 2003-04 through the 2023–24 school years. Race and ethnicity are categorized into five mutually exclusive groups: Black, White, Hispanic, Asian, and Other (Other includes American Indian, Pacific Islander, and students reporting multiple races). The free or reduced-price meal (FRPM) indicator identifies students who were eligible for the program in any observed school year. Disability status and English learner status are defined as indicators for students who were ever identified as participating in a special education program or classified as having limited English proficiency during the observation period.

Sibling Matching

Sibling identifiers are constructed from administrative records provided by a school district covering school years 2012–2022. I link student records across years using a unique student identifier and residential address information. Four household linkage measures are available, differing in the strictness of the matching criteria.

The primary sibling identifier links students who share the same last name and residential address, including apartment unit number when applicable. Three alternative identifiers relax

these criteria by allowing missing apartment unit numbers, ignoring unit numbers within apartment complexes, or matching students with different last names residing at the same address. The latter identifier primarily captures extended-family households and is used only for robustness analyses.

The analysis sample consists of high school graduates from the 2012–2022 cohorts who can be linked to the cleaned sibling file. Students are grouped by primary household identifier, and household size is calculated as the number of linked siblings. Within each household, I rank siblings by date of birth to determine birth order. I compute the age gap between adjacent siblings from birth year and month. I exclude sibling pairs with implausibly small positive age gaps (less than 9 months) from age-gap analyses, and I classify siblings who share the same birth year and month as twins.

The main analysis focuses on households with two or three siblings and examines spillover effects from the oldest sibling to the second-born sibling. Accordingly, I define outcome variables only for second-born siblings in households linked through the primary sibling identifier.

NSC Data Details

The National Student Clearinghouse reports enrollment coverage of approximately 93 percent nationwide and 95 percent in Georgia as of 2012 (Dynarski et al., 2015). Coverage is particularly high for institution types most relevant for this study: more than 99 percent for public four-year colleges and approximately 96 percent for public two-year colleges. Because most students in this sample enroll in these institution types (91 percent in four-year institutions and 86.2 percent in public colleges), the likelihood of missing enrollment records is minimal. As a result, NSC coverage is unlikely to pose a significant concern for this analysis.

The NSC data include multiple records per student because enrollment information is reported at the term level, and additional records may appear when students transfer institutions or change enrollment intensity. To construct the analysis dataset, I collapse the NSC records into a student–institution-level dataset. I assign institution characteristics based on the first record associated with each student–institution pair.

Outcome Variable Construction

I define on-time college enrollment for students matched to the NSC data who enroll in any postsecondary institution in the United States. Using the college start date and high school graduation date, I construct indicators for enrollment within specific time windows after high school graduation. Overall, 83.78 percent of the full graduating student sample ever enroll in college after high school graduation; 80.21 percent enroll within 16 months, and 77.82 percent enroll

within 12 months. Indicators for enrollment in in-state, four-year, full-time, public institutions, as well as enrollment by institutional selectivity, are defined by the first institution attended after high school graduation, regardless of timing.

Persistence measures are constructed based on college enrollment timing. I define two semesters per academic year: fall and spring. Students who are enrolled in October are classified as enrolled in the fall semester, while those enrolled in March are classified as enrolled in the spring semester. Using this classification, I count the number of consecutive semesters a student remains enrolled at the same institution. Second-semester persistence is defined as enrollment for more than one consecutive semester. Because students may begin college in either the fall or spring semester, second-semester persistence means appearing in the following spring term for students who initially enroll in the fall, or in the following fall term for students who initially enroll in the spring.

D Cost-Benefit Analysis

Appendix D describes the framework and inputs, reproduces the recipient-based calculation from Kim (2026), derives the younger sibling's contributions to WTP and net cost, and reports an alternative benefit definition and the units of the estimates. Superscripts o and y denote the older sibling (the scholarship-eligible student) and the younger sibling, respectively. All dollar values are in 2012 dollars.

D.1 Framework

Following Hendren and Sprung-Keyser (2020), the MVPF equals beneficiaries' willingness to pay for a policy divided by the policy's net cost to the government,

$$\text{MVPF} = \frac{\text{WTP}}{\text{Net Cost}}. \tag{5}$$

For marginal students, WTP equals the expected increase in lifetime earnings induced by the program, net of federal and state income taxes.[22] I measure net cost from the perspective of the State of Georgia. Net cost includes the scholarship outlay, the fiscal consequences of students' behavioral responses, additional state appropriations for induced enrollment, and the offsetting state income tax revenue from higher earnings. Federal tax revenue from higher earnings does not enter net cost, so the calculation does not credit the state with fiscal externalities that accrue to the federal government.

The extended calculation adds the younger sibling's earnings gain to the numerator and the fiscal consequences of the younger sibling's induced enrollment to the denominator,

$$\text{MVPF} = \frac{\text{WTP}^o + \Delta\text{WTP}^y}{\text{Cost}^o + \Delta\text{Cost}^y}. \tag{6}$$

Adding ΔWTP^y to the numerator assumes that the older sibling's household values the younger sibling's earnings gain. The scholarship outlay in the denominator does not change, since HOPE pays only the eligible older sibling.

D.2 Inputs

College wage premium. NPV denotes the present discounted value of the lifetime earnings difference between bachelor's degree holders and high school graduates. I estimate a Georgia-specific premium from the 2017 American Community Survey, following the age range, discount-

[22] The approach assumes that marginal students are fully informed about the returns to education and excludes non-pecuniary benefits (e.g., job amenities, health, civic engagement) from WTP. Including non-pecuniary benefits would increase the MVPF.

ing convention, and education group definitions of Bartik et al. (2016). The resulting premium is $779,580 at a 3 percent discount rate. The calculation assumes that marginal enrollees, including marginal sibling enrollees, earn the average college wage premium in Georgia. If siblings of HOPE recipients differ systematically in their returns to college (e.g., because of parental education or income), the sibling contribution would differ accordingly.

Tax rates. WTP applies a federal marginal income tax rate of $\tau_{\text{fed}} = 18.9$ percent, following Hendren and Sprung-Keyser (2020), and the Georgia state income tax rate of $\tau_{\text{state}} = 4.99$ percent. The after-tax retention factor equals $(1 - \tau_{\text{fed}})(1 - \tau_{\text{state}}) = 0.811 \times 0.9501 = 0.7705$.

Graduation rate. I convert the younger sibling's enrollment effect into a degree completion effect using the six-year graduation rate at four-year institutions in Georgia, $g = 0.518$.[23] The conversion assumes that marginal sibling enrollees complete college at the statewide rate. If marginal enrollees complete at lower rates than the average student, the calculation overstates the sibling contribution to WTP.

Appropriations. Annual state and local appropriations per full-time equivalent student at public institutions equal $A = \$6{,}201.40$, calculated from the Delta Cost Project, and apply over $T = 4$ years of enrollment. The calculation assumes constant returns to scale in university provision, so that average appropriations per student approximate the marginal cost of an additional enrollee. Appropriations are not discounted across the four enrollment years. Appropriations apply to the enrollment effect, because public expenditures accrue upon enrollment regardless of completion, whereas WTP and state tax revenue apply to the completion effect.

D.3 Recipient-Based Baseline

Table D1 reproduces the recipient-based calculation from Kim (2026). The older sibling's WTP equals

$$\text{WTP}^o = \hat{\beta}^o_{\text{comp}} \times \text{NPV} \times (1 - \tau_{\text{fed}})(1 - \tau_{\text{state}}), \tag{7}$$

where $\hat{\beta}^o_{\text{comp}}$ is the effect of HOPE on the recipient's bachelor's degree attainment. The older sibling's net cost equals

$$\text{Cost}^o = \underbrace{S}_{\text{Scholarship}} + \underbrace{B}_{\text{Behavioral response}} \underbrace{- \hat{\beta}^o_{\text{comp}} \times \text{NPV} \times \tau_{\text{state}}}_{\text{State tax revenue}} + \underbrace{\hat{\beta}^o_{\text{enroll}} \times A \times T}_{\text{Additional appropriations}}, \tag{8}$$

where $S = \$14{,}223$ is the average scholarship paid per recipient over four years and $B = -\$980$ is the behavioral response cost net of private tuition, following Hendren and Sprung-Keyser

[23] Graduation rate within 150 percent of normal time for first-time, full-time bachelor's degree-seeking students at four-year institutions in Georgia, 2018 cohort. U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Graduation Rates component, accessed via the IPEDS Trend Generator.

(2020).

Under the in-state definition, $\hat{\beta}^{o}_{\text{comp}} = 0.037$ gives a pre-tax earnings gain of $0.037 \times \$779{,}580 = \$28{,}844.46$ and an after-tax gain of \$22,225.55. State tax revenue equals $\$28{,}844.46 \times 0.0499 = \$1{,}439.34$, and appropriations for the recipient's induced in-state enrollment ($\hat{\beta}^{o}_{\text{enroll}} \approx 0.064$) equal \$1,587.45. Net cost equals $\$14{,}223 - \$980 - \$1{,}439.34 + \$1{,}587.45 = \$13{,}391.11$, and the recipient-based MVPF equals $\$22{,}225.55/\$13{,}391.11 = 1.66$.

Under the any four-year definition, $\hat{\beta}^{o}_{\text{comp}} = 0.018$ gives a pre-tax earnings gain of \$14,032.44 and an after-tax gain of \$10,812.43. State tax revenue equals \$700.22, and appropriations for the recipient's induced overall enrollment ($\hat{\beta}^{o}_{\text{enroll}} = 0.027$) equal $0.027 \times \$6{,}201.40 \times 4 = \$669.75$. Net cost equals $\$14{,}223 - \$980 - \$700.22 + \$669.75 = \$13{,}212.53$, and the recipient-based MVPF equals $\$10{,}812.43/\$13{,}212.53 = 0.82$.

D.4 Younger-Sibling Contributions

The younger sibling's completion effect equals the ITT effect of the older sibling's eligibility on the younger sibling's in-state enrollment, $\hat{\beta}^{y}_{\text{enroll}} = 0.075$ (Table 2, Column 4), multiplied by the graduation rate,

$$\hat{\beta}^{y}_{\text{comp}} = \hat{\beta}^{y}_{\text{enroll}} \times g = 0.075 \times 0.518 = 0.03885,$$

which I round to 0.039. The younger sibling's pre-tax earnings gain equals $0.039 \times \$779{,}580 = \$30{,}403.62$, and applying the after-tax retention factor gives

$$\Delta\text{WTP}^{y} = \$30{,}403.62 \times (1 - 0.189) \times (1 - 0.0499) = \$23{,}426.93.$$

Total WTP equals $\$22{,}225.55 + \$23{,}426.93 = \$45{,}652.48$.

The younger sibling's enrollment creates no additional scholarship cost. The state instead incurs additional appropriations for the younger sibling's induced enrollment,

$$\hat{\beta}^{y}_{\text{enroll}} \times A \times T = 0.075 \times \$6{,}201.40 \times 4 = \$1{,}860.42,$$

and gains state income tax revenue from the younger sibling's higher earnings,

$$\hat{\beta}^{y}_{\text{comp}} \times \text{NPV} \times \tau_{\text{state}} = 0.039 \times \$779{,}580 \times 0.0499 = \$1{,}517.14.$$

The younger sibling's net cost equals $\Delta\text{Cost}^{y} = \$1{,}860.42 - \$1{,}517.14 = \$343.28$, and total net

cost equals $\$13{,}391.11 + \$343.28 = \$13{,}734.39$. Combining the components,

$$\text{MVPF} = \frac{\$45{,}652.48}{\$13{,}734.39} = 3.32,$$

compared with 1.66 for the recipient-based estimate. The younger sibling adds $23,426.93 to WTP but only $343.28 to net cost, because state tax revenue from younger siblings' earnings offsets most of the additional appropriations. Table 7 in the main text summarizes the calculation.

D.5 Alternative Benefit Definition

The main calculation follows Kim (2026) in measuring benefits through in-state degree completion. Under the in-state definition, younger siblings who shift from out-of-state to in-state enrollment (Table 2, Column 5) contribute to both WTP and net cost. The alternative definition measures benefits through completion at any four-year college and counts only net new enrollment. The alternative pairs the recipient-based estimate under the any four-year definition with the effect of the older sibling's eligibility on the younger sibling's overall enrollment, $\hat{\beta}^{y}_{\text{enroll}} = 0.046$ (Table 2, Column 1). The completion effect equals $0.046 \times 0.518 \approx 0.024$, which yields a pre-tax earnings gain of $18,709.92, $\Delta\text{WTP}^{y} = \$14{,}416.58$, additional appropriations of $0.046 \times \$6{,}201.40 \times 4 = \$1{,}141.06$, state tax revenue of $933.63, and $\Delta\text{Cost}^{y} = \$207.43$. The extended MVPF under the alternative definition equals $\$25{,}229.01/\$13{,}419.96 = 1.88$, compared with 0.82 for the recipient-based estimate.[24] Table D2 compares the two definitions. The levels differ, but under both definitions the sibling channel roughly doubles the recipient-based MVPF.

D.6 Units of the Estimates

The recipient-based estimates in Kim (2026) measure the effects of HOPE eligibility at the 3.0 cutoff, as do the sibling spillover estimates in Table 2. Both sets of estimates are therefore intent-to-treat effects per eligible older sibling, and the extended MVPF combines components measured in the same units. In the older-sibling RD sample, eligibility raises the probability of scholarship receipt by approximately 0.67 at the cutoff. Dividing every component of WTP and net cost by the first stage would express the calculation per recipient but would leave the MVPF unchanged, since the MVPF is a ratio. The extended estimates of 3.32 under the in-state definition and 1.88 under the any four-year definition therefore apply per eligible student and per recipient alike.

[24] The overall enrollment effect includes enrollment at two-year and out-of-state institutions. Applying the four-year graduation rate to the overall effect therefore approximates the any four-year completion effect. Applying Georgia appropriations to the overall effect overstates the appropriations cost for younger siblings who enroll out of state, which lowers the alternative MVPF.

Table D1: Recipient-Based MVPF Calculation

	Any Four-Year	In-State Four-Year
Inputs		
College wage premium (BA–HS)	\$779,580	\$779,580
Effect on degree attainment ($\hat{\beta}^{o}_{\text{comp}}$)	0.018	0.037
Effect on enrollment ($\hat{\beta}^{o}_{\text{enroll}}$)	0.027	0.064
State tax rate	4.99%	4.99%
Federal marginal tax rate	18.9%	18.9%
Willingness to Pay		
After-tax lifetime earnings gain (WTP^{o})	\$10,812.43	\$22,225.55
Net Cost		
Direct cost: average scholarship (4 years)	\$14,223.00	\$14,223.00
Behavioral response cost (net of private tuition)	−\$980.00	−\$980.00
State tax revenue	−\$700.22	−\$1,439.34
Appropriations: induced enrollment	\$669.75	\$1,587.45
Total net cost (Cost^{o})	\$13,212.53	\$13,391.11
MVPF	0.82	1.66

Source: Kim (2026).

Note: WTP equals after-tax lifetime earnings gains, using a federal marginal tax rate of 18.9% and a Georgia state tax rate of 4.99%. The Georgia college wage premium is estimated from the 2017 American Community Survey following Bartik et al. (2016), with a 3% discount rate. State tax revenue applies the Georgia tax rate to the pre-tax earnings gain implied by each column's degree attainment effect. Appropriations apply per-student state and local appropriations from the Delta Cost Project over four years to each column's enrollment effect. Behavioral response costs and the federal marginal tax rate follow Hendren and Sprung-Keyser (2020). All values are in 2012 dollars.

Table D2: Extended MVPF under Alternative Benefit Definitions

	In-State Completion (Main)	Any Four-Year Completion (Alternative)
Effects		
Older sibling degree attainment ($\hat{\beta}^{o}_{\text{comp}}$)	0.037	0.018
Younger sibling enrollment, ITT ($\hat{\beta}^{y}_{\text{enroll}}$)	0.075	0.046
Younger sibling completion ($\hat{\beta}^{y}_{\text{comp}}$)	0.039	0.024
Willingness to Pay		
Older sibling (WTP^{o})	\$22,225.55	\$10,812.43
Younger sibling (ΔWTP^{y})	\$23,426.93	\$14,416.58
Total WTP	\$45,652.48	\$25,229.01
Net Cost		
Older sibling (Cost^{o})	\$13,391.11	\$13,212.53
Appropriations: younger sibling enrollment	\$1,860.42	\$1,141.06
State tax revenue: younger sibling	−\$1,517.14	−\$933.63
Younger sibling (ΔCost^{y})	\$343.28	\$207.43
Total net cost	\$13,734.39	\$13,419.96
MVPF, recipient only	1.66	0.82
MVPF, with sibling spillovers (ITT)	3.32	1.88

Note: Recipient-only estimates reproduce Table D1. The younger sibling's completion effect equals the ITT enrollment effect multiplied by the six-year graduation rate at Georgia four-year institutions (51.8%), rounded to three decimals. The in-state column uses the effect on younger siblings' in-state enrollment (Table 2, Column 4); the any four-year column uses the effect on overall enrollment (Column 1). All values are in 2012 dollars.