Supplmental Online Appendices for "Nonresident Tuition and Human Capital Flows: Evidence from a Lottery"

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A Pre-Analysis Plan Appendix

A.1 Summary Statistics

The variables included in this project are (1) an indicator for being raised by a single parent, (2) a head count of a student's household size, (3) an indicator for no data on household size, (4) self-reported family income, (5) an indicator for having reported family income, (6) an indicator for being a first generation college student, (7) estimated age at college entry, (8) an indicator for no age data, (9) a student's best SAT or ACT equivalent score, (10) an indicator for no standardized test score, (11) a student's weighted high school GPA, (12) a student's overall admission score, (13) a financial aid application indicator, (14) an indicator for honors admission, (15) an indicator for receiving a separate merit scholarship offer, (16) an indicator for self-identifying as female, (17) a categorical variable for father's education, (18) a categorical variable for mother's education, (19) a categorical variable for the school/department of the major the student listed as their first preference, (20) a categorical variable for home country or region of a student's mailing address, (21) an overall academic rating of the student from the research university, (22) a holistic score, (23) a student's expected family contribution (EFC) value, (24) an indicator for no EFC data, and (25) a categorical variable for ethnic identity.[22] After completion of the project, the target university was able to provide records of students' American citizenship and permanent residency at the time of college application.[23]

[22] In the pre-analysis plan, I had pre-registered that variable number 11 was an unweighted GPA, but the target university instead provided weighted GPA. Variable 13 was intended to be an indicator for having filed a Free Application for Federal Student Aid (FAFSA), but the target university instead provided an indicator for applying for any form of financial aid.

[23] When the pre-analysis plan for the project was submitted, the target university had been using a noisy indicator it had retained for American citizenship. That indicator was not included in the PAP because of concerns about accuracy. After the project was completed, the target university discovered an another set of records for students in the 2011-2012 application cycle with detailed records on citizenship and provided an indicator of American citizenship or residency. Because this was not a pre-registered variable, I denote each place in the manuscript where the variable is used.

Table A.1: Full Sample Summary Statistics

	Mean	Min	Max
Raised by Single Parent	.1222806	0	1
Household Size	3.762191	2	12
No Household Size	.0705176	0	1
Family Income	194196	0	999999
No Income Report	.1327832	0	1
First Generation	.1965491	0	1
Age at Entry	18.80683	16.35089	22.07042
No Age Data	.0157539	0	1
Best SAT/ACT	1850.048	1040	2400
No SAT Score	.0255064	0	1
GPA	3.866174	1.72	4.38
Admission Score	244.4756	164	300
Financial Aid Application	.2348087	0	1
Honors Student	.0435109	0	1
Merit Scholarship	.012003	0	1
Female	.5536384	0	1
Expect Family Contribution	22371.02	0	99999
Origin: Americas	.0270068	0	1
Origin: China	.4553638	0	1
Origin: Europe or Africa	.0067517	0	1
Origin: Korea	.0802701	0	1
Origin: Other Asia or Oceania	.0892723	0	1
Origin: US, Same Region	.2370593	0	1
Origin: US, Other Region	.1042761	0	1

Note: Family income and expected family contribution are measured in dollars and are top-coded at values of 999,999 dollars per year and 99,999 dollars respectively. These values represent students with family incomes and expected familiy contributions above the respective ceilings rather than students with missing data.

A.2 Pre-specified Balance Tests

Table A.2: Association between Tuition Waiver Size and Pre-Treatment Demographics

Outcome	(1)
Raised by Single Parent	0.0113
	(0.0120)
Household Size	-0.0149
	(0.0386)
No Household Size Data	-0.0064
	(0.0093)
Reported Family Income	-1.80e+04**
	(7398.2816)
No Reported Income	0.0113
	(0.0130)
First Generation Student	-0.0218
	(0.0149)
Age at College Entry	0.0297
	(0.0242)
No Age Reported	-0.0000
	(0.0040)
Best SAT Score	0.4631
	(8.1583)
No SAT Score	0.0050
	(0.0056)
Sample Size	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table A.3: Association between Tuition Waiver Size and Pre-Treatment Demographics

Outcome	(1)
Weighted GPA	0.0099
	(0.0089)
Admission Score	-0.0463
	(0.8269)
FAFSA Indicator	-0.0028
	(0.0157)
Honors Student	0.0050
	(0.0075)
Merit Scholarship	-0.0013
	(0.0042)
Female	0.0056
	(0.0188)
Sample Size	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table A.4: Association between Tuition Waiver Size and Pre-Treatment Demographics

Outcome	(1)
dad==2-Year College Graduate	-0.0115
	(0.0083)
dad==4-Year College Graduate	0.0021
	(0.0184)
dad==High School Graduate	0.0088
	(0.0100)
dad==NULL	-0.0090
	(0.0086)
dad==No High School	-0.0051
	(0.0047)
dad==Postgraduate Study	0.0148
	(0.0177)
dad==Some College	0.0037
	(0.0097)
dad==Some High School	-0.0038
	(0.0060)
Sample Size	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table A.5: Association between Tuition Waiver Size and Pre-Treatment Demographics

Outcome	(1)
mom==2-Year College Graduate	0.0075
	(0.0105)
mom==4-Year College Graduate	-0.0005
	(0.0187)
mom==High School Graduate	0.0011
	(0.0124)
mom==NULL	-0.0026
	(0.0086)
mom==No High School	-0.0064
	(0.0052)
mom==Postgraduate Study	0.0175
	(0.0151)
mom==Some College	-0.0064
	(0.0107)
mom==Some High School	-0.0102*
	(0.0053)
Sample Size	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table A.6: Association between Tuition Waiver Size and Pre-Treatment Demographics

Outcome	(1)
major==Interdisciplinary	0.0013
	(0.0022)
major==None	0.0263
	(0.0160)
major==Life Science	-0.0090
	(0.0118)
major==Arts	0.0012
	(0.0065)
major==Humanities	0.0025
	(0.0078)
major==Physical Science	-0.0116
	(0.0118)
major==Social Science	-0.0244
	(0.0151)
major==Engineering	0.0151
	(0.0124)
major==Management Science	-0.0001
	(0.0087)
major==Nursing Science	-0.0013
	(0.0013)
major==Pharmacy Science	-0.0026
	(0.0044)
major==Computer Science	-0.0051
	(0.0079)
major==Public Health	0.0025
	(0.0031)
major==Other	0.0050
	(0.0059)
Sample Size	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table A.7: Association between Tuition Waiver Size and Pre-Treatment Demographics

Outcome	(1)
home==Americas	-0.0038
	(0.0065)
home==China	-0.0057
	(0.0189)
home==Europe or Africa	-0.0013
	(0.0028)
home==Korea	-0.0039
	(0.0100)
home==Other Asia or Oceania	0.0050
	(0.0111)
home==US - Far	0.0010
	(0.0159)
home==US - Near	0.0087
	(0.0116)
Sample Size	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table A.8: Association between Tuition Waiver Size and Pre-Treatment Demographics

Outcome	(1)
ethnic==African-American or Black	-0.0076
	(0.0047)
ethnic==American Indian	-0.0013
	(0.0013)
ethnic==Caucasian or White	0.0252*
	(0.0129)
ethnic==Chicano/Mexican-American	0.0025
	(0.0044)
ethnic==Chinese/Chinese-American	-0.0083
	(0.0189)
ethnic==Declined To State	-0.0013
	(0.0072)
ethnic==East Indian/Pakistani	-0.0013
	(0.0078)
ethnic==Japanese/Japanese-Americn	-0.0000
	(0.0044)
ethnic==Korean	-0.0065
	(0.0129)
ethnic==Latino/Oth Span-American	0.0012
	(0.0049)
ethnic==Other Asian	-0.0064
	(0.0052)
ethnic==Philipino or Filipino	0.0012
	(0.0058)
ethnic==Polynesian	-0.0025
	(0.0018)
ethnic==Vietnamese	0.0051
	(0.0050)
Sample Size	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table A.9: Association between Tuition Waiver Size and Predicted Outcomes

Outcome	(1)
A. Enrollment	
Target University	-0.0008
	(0.0084)
Any Target State College	-0.0001
	(0.0068)
Any US College	0.0053
	(0.0066)
B. Migration	
Registered in Target State	0.0077*
	(0.0045)
Registered in United States	0.0100
	(0.0110)
C. Target State Labor Market	
Executives in Target State	0.0029
	(0.0121)
Innovators in Target State	0.0056
	(0.0127)
Entrepeneurs in Target State	0.0031
	(0.0048)
Salary in Target State	1.04e+04**
	(4653.0823)
D. US Labor Market	
Executives in United States	-0.0107
	(0.0206)
Innovators in United States	-0.0013
	(0.0205)
Entrepeneurs in United States	0.0032
	(0.0087)
Salary in United States	6196.4450
	(9606.4742)
Sample Size	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

A.3 Deviations from the Pre-Analysis Plan

I note the following deviations from the pre-analysis plan:

- I did not receive data on medium-run outcomes like college graduation and academic performance. Hence, these outcomes were not examined in the manuscript.
- Some variables had somewhat different definitions than was initially anticipated. For example, I received weighted rather than unweighted GPA. These differences are noted in Section 3.1 of the paper.
- I received a variable that was not pre-registered: a binary indicator for American citizenship or residency at the time of college application. I note that this variable was not included in the PAP each time I reference a result including it in the manuscript. In line with editor comments, I now test for heterogeneity using this variable.
- Estimates are per 10,000 dollars of nonresident tuition rather than per 1,000 dollars to make results more easily interpretable.
- The assumed state-level tax rate on earnings was reduced from 25 percent to 5 percent in Section 5. The 25 percent rate in the PAP was intended to reflect the rough rate of federal tax revenue as a share of GDP, but was inadvertently also listed at the state level. In most American states, tax revenue is roughly 5 percent of Gross State Product. This switch makes my results more conservative. Table 9 now includes both state and federal tax revenue estimates per editor comments.
- Specifications that look at each treatment arm separately were suggested by a referee.
- Estimates of effects on college enrollment decomposed by sector was suggested by a referee.
- In line with referee and editor comments I have added Tables 2, 3, 7, 8, B.2, B.3, D.1, D.2, C.6, C.8, C.12, C.7, C.9, C.13, C.10, C.11, 2, D.3, D.4, D.5.

A.4 Pre-specified Variable Definitions

This paper uses the following definitions for labor market outcomes that rely on Revelio Labs' records on the universe of LinkedIn profiles:

- LinkedIn Location: This is defined as the metropolitan area listed on LinkedIn profiles. This variable is set to the country listed on the profile if the metropolitan area is missing. These data come from Revelio Labs and manually collected LinkedIn records.

- LinkedIn Earnings: This is defined as the imputed earnings based on work history and job title from Revelio Labs dataset. In cases where this is absent, we will link job titles to the most similar BLS occupation code and its annual mean wages. These data will come from Revelio Labs and manually collected records. I assume students work for 20 years at a constant level of earnings in their recorded place of residence beginning 8 years after college application to be conservative. Earnings will be imputed for people without LinkedIn job titles by assuming an annual mean earnings level equal to the sample average estimated mean annual wage for students whose occupational titles are observed.

  In practice I use the following formula to calculate this, assuming earnings persist for 20 years after the initial year: $\text{NPV}_i = \sum_{t=8}^{28} \frac{\hat{w}_i}{(1+0.05)^t}$.

- LinkedIn Entrepreneurship: This is defined as having a relevant term in *any* part of the LinkedIn profile. The relevant terms are: Entrepreneur, Founder, Co-founder, Creator, Startup, Owner, CEO, Venture, Investor, or Strategist.

- LinkedIn Innovation: This is defined as having a relevant term in *any* part of the LinkedIn profile. The relevant terms are: Inventor, Patent, Innovation, Innovator, Developer, Development, Research, Scientist, Engineer, Technology/Technologist, Design, Data, Idea, or Lab/Laboratory.

- LinkedIn Executive Experience: This is defined as having a relevant term in *any* part of the LinkedIn profile. The relevant terms are: Chief, Officer, President, Director, Board, Executive, Chair/Chairman, Manager/Management/Managing, Partner, Head, Lead, or Senior.

B Extensions and Mechanisms

B.1 Decomposition of Enrollment by Sector

Table B.1: Enrollment Effects of Nonresident Tuition Waivers per 10,000 Dollars

Outcome	(1)	(2)
A. Enrollment by Institution Types		
No US College	-0.0156	-0.0110
	(0.0175)	(0.0173)
Non-AAU US Campus	-0.0103	-0.0149
	(0.0116)	(0.0108)
Public AAU Campus	0.0374**	0.0411**
	(0.0189)	(0.0190)
Private AAU Campus	-0.0115	-0.0152
	(0.0096)	(0.0097)
Controls	No	Yes
Sample Size	1,333	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

B.2 Retention of Inframarginal Students

Table B.2: Migration Effects of Nonresident Tuition Waivers per 10,000 Dollars

Outcome	(1)
A. Registered in State after 12 Years	
Registered in Target State	0.0329***
	(0.0108)
B. Expected from Enrollment Increase	
In-Sample Data	0.0026***
	(0.0010)
Literature (Midpoint)	0.0074***
	(0.0028)
Literature (Max)	0.0144***
	(0.0055)
Controls	No
Sample Size	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. Registration refers to appearing in the voter registration rolls of the corresponding location, which requires American citizenship and covers roughly three quarters of all American citizens. "In-Sample Data" refers to a calculation of the rate of migration attributable to the rise in enrollment in the target state using in-sample data on transition rates from in-state enrollment to target state migration from the 20,000 dollar treatment arm. "Literature (Midpoint)" refers to a calculation of the rate of migration attributable to the rise in enrollment in the target state using the midpoint among papers cited in (Beine et al., 2023). "Literature (Max)" refers to a calculation of the rate of migration attributable to the rise in enrollment in the target state using the maximum among papers cited in (Beine et al., 2023).

Table B.3: Association between Transition Rate and Tuition Waivers per 10,000 Dollars

Outcome	(1)
A. Registered in Target State after 12 Years	
	[Baseline: 0.0919]
Registered in Target State	0.0567***
	(0.0193)
Controls	No
Sample Size	608

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. "Transition Rates" refer to the share of students who migrate to the target state conditional on having enrolled at a college or university in the target state in 2012. The sample is restricted to students who enrolled in the target state in the Fall Term of 2012.

B.3 Estimates by Treatment Arm

While the primary analysis estimates treatment effects linearly across waiver size, disaggregating the effects by treatment arm reveals meaningful heterogeneity that informs both mechanisms and external validity. Tables B.4 through B.8 report separate estimates for the 20,000 dollar, 30,000 dollar, and 40,000 dollar treatment arms.

Table B.4 presents short-run enrollment outcomes. Effects on enrollment at the target university and other institutions within the state are larger when comparing the 30,000 dollar and 40,000 dollar arms than when comparing the 20,000 dollar and 30,000 dollar arms. This pattern suggests a convex demand curve, with student enrollment more responsive on a per-dollar basis at lower net prices. In contrast, when examining enrollment at any college or university within the United States, the effects are larger between the 20,000 dollar and 30,000 dollar treatment arms, with negligible or even negative effects from increasing the waiver from 30,000 dollars to 40,000 dollars. This could reflect differences in students' counterfactual options at higher willingness to pay levels or behavioral effects of large tuition discounts altering students' perceptions of campus quality (e.g., Veblen effects). The correspondence of these patterns with later residence outcomes reduces the likelihood that they are attributable solely to estimation noise.

Table B.5 presents effects on long-run in-state residence. Migration to the target state increases with the size of the waiver, but while the 40,000 dollar treatment arm yields the largest effect in magnitude, the marginal gain from 30,000 to 40,000 dollars is smaller than the gain from 20,000 to 30,000 dollars, suggesting possible diminishing returns. Residence anywhere in the United States follows an identical pattern to college enrollment in the United States twelve years earlier, again suggesting that students on the margin of migrating to the United States have a much higher willingness to pay.

Tables B.6 and B.7 report effects on labor market outcomes in the target state and the United States as a whole. The largest increases in executive and innovator migration to the target states occur in the 30,000 dollar treatment arm, with smaller, but still statistically significant, effects at 40,000 dollars. These patterns are consistent with concave externalities: the students most likely to generate long-run labor market spillovers appear to be those with relatively high willingness to pay and are most responsive at intermediate levels of tuition relief. Across all treatment arms, labor market outcomes in the United States remain null, consistent with the results from the linear specification.

Table B.8 presents results for the net present value of labor market earnings. In the target state, the increase in long-run earnings is substantially larger for students in the 30,000 dollar treatment arm than for those in the 40,000 dollar arm, despite both being statistically significant. This again points to diminishing marginal returns and suggests that

the long-run externalities are driven more by the retention of students already inclined to enroll than by expansion at the margin. While the linear specification showed no significant earnings gains in the United States overall, disaggregating by treatment arm reveals that the 30,000 dollar group does exhibit meaningful increases in national labor market earnings. These patterns align closely with earlier results for U.S. college enrollment and migration, reinforcing the idea that the students on the margin of remaining in the U.S. labor market have particularly high willingness to pay.

Taken together, these results suggest that the long-run effects of tuition waivers on migration and fiscal externalities are not simply a function of increased enrollment. Instead, they appear to operate through the retention of students who would have enrolled regardless but might otherwise have left the state after graduation. The results also imply that moving from no waiver to a 20,000 dollar waiver would likely generate even larger returns on a per-dollar basis than those observed in the experimental arms. By contrast, additional waivers beyond 30,000 dollars exhibit diminishing or flat marginal returns. These patterns point to the existence of an optimal level of nonresident supplemental tuition that maximizes the net public benefit from skilled migration while minimizing the institutional cost of foregone tuition revenue.

Table B.4: Enrollment Effects of Nonresident Tuition Waivers by Treatment Arm

	(1) Target U	(2) Target U	(3) State	(4) State	(5) USA	(6) USA
30,000 Dollars	0.0180	0.0289	0.0315	0.0429	0.0563*	0.0457
	(0.0253)	(0.0216)	(0.0333)	(0.0324)	(0.0306)	(0.0299)
40,000 Dollars	0.0558**	0.0611***	0.0867***	0.0927***	0.0277	0.0198
	(0.0263)	(0.0229)	(0.0333)	(0.0335)	(0.0310)	(0.0307)
Controls	No	Yes	No	Yes	No	Yes
Sample Size	1,333	1,333	1,333	1,333	1,333	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table B.5: Migration Effects of Nonresident Tuition Waivers by Treatment Arm

	(1) State	(2) State	(3) USA	(4) USA
30,000 Dollars	0.0450**	0.0317*	0.0653**	0.0384*
	(0.0185)	(0.0182)	(0.0283)	(0.0218)
40,000 Dollars	0.0583***	0.0477**	0.0378	0.0216
	(0.0191)	(0.0187)	(0.0278)	(0.0217)
Controls	No	Yes	No	Yes
Sample Size	1,333	1,333	1,333	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table B.6: Effect on Target State Migration of Nonresident Tuition Waivers by Arm

	(1) Executive	(2) Excutive	(3) Entrepeneur	(4) Entrepeneur	(5) Innovator	(6) Innovator
30,000 Dollars	0.1341***	0.1687***	0.0263	0.0276	0.1464***	0.1725***
	(0.0452)	(0.0487)	(0.0179)	(0.0196)	(0.0481)	(0.0531)
40,000 Dollars	0.1031**	0.1175***	0.0154	0.0118	0.0896**	0.0950**
	(0.0419)	(0.0423)	(0.0146)	(0.0135)	(0.0437)	(0.0437)
Controls	No	Yes	No	Yes	No	Yes
Sample Size	1,333	1,333	1,333	1,333	1,333	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table B.7: Effect on United States Migration of Nonresident Tuition Waivers by Arm

	(1) Executive	(2) Excutive	(3) Entrepeneur	(4) Entrepeneur	(5) Innovator	(6) Innovator
30,000 Dollars	-0.0505	-0.0309	-0.0046	0.0014	0.0175	0.0463
	(0.0617)	(0.0586)	(0.0296)	(0.0327)	(0.0621)	(0.0618)
40,000 Dollars	-0.0875	-0.0844	0.0042	-0.0021	-0.0124	-0.0138
	(0.0595)	(0.0581)	(0.0298)	(0.0298)	(0.0603)	(0.0582)
Controls	No	Yes	No	Yes	No	Yes
Sample Size	1,333	1,333	1,333	1,333	1,333	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table B.8: Profit and Earnings Effects of Nonresident Tuition Waivers by Treatment Arm

	(1) Profit	(2) Profit	(3) State	(4) State	(5) USA	(6) USA
30,000 Dollars	-827.72	-400.27	85092.25***	72641.24***	65446.29**	44041.75**
	(970.27)	(818.07)	(24867.37)	(24328.56)	(26334.43)	(21607.69)
40,000 Dollars	-1480.80*	-1264.00	60590.59***	45267.44**	26001.31	16277.31
	(893.89)	(777.16)	(20744.35)	(21775.59)	(24695.45)	(21125.85)
Controls	No	Yes	No	Yes	No	Yes
Sample Size	1,333	1,333	1,333	1,333	1,333	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. Profit refers to the university's revenue less instructional expenditures. Columns titled State and USA refer to the present value of earnings in the respective locations.

C Heterogeneous Treatment Effects

C.1 Pre-Specified HTE

Heterogeneous treatment effects in this appendix are tested along two pre-specified dimensions: country of home address and STEM major intent at the time of college application. I begin by generating tables with identical outcomes and specifications to Table 9 that estimate effects separately for (1) all nonresident students with a primary home address in China, Taiwan, or Hong Kong in Table C.1. These students are close to half the full sample (45 percent). Next, I turn to all nonresident students with a primary home address outside of the United States (66 percent of the sample) in Table C.2, and all nonresident students with a primary home address in the United States (33 percent of the sample) in Table C.3. I caution that primary home address in this case does not align perfectly with citizenship nor with domestic out-of-state or foreign student status.

Across these tables I note that point estimates suggest more mobility between states for nonresident students with a domestic home address and more mobility between countries for nonresidents with an international address, especially among students with a home address in China. However, given that I cannot reject the null hypothesis that these results are the same across groups, I interpret these findings to imply that my results are relatively similar regardless of a student's place of origin.[24]

With regard to STEM major intent, I split the sample into STEM and non-STEM major groups based on whether their first preference major at the research university is a CIP-designated STEM major by the US Department of Homeland Security. This is a useful measure of STEM status because the ease of immigration and labor market participation laws in the United States is relaxed for students completing a CIP designated STEM major (Amuedo-Dorantes et al., 2020; Beine et al., 2023).

Results are shown for STEM students in Table C.4 and Non-STEM students in Table C.5. Consistent with the theoretical prediction that STEM students are more mobile because of the greater ease of immigration under US law and consistent with higher expected earnings for STEM workers, results are stronger among students with STEM major intent. Every 10,000 dollars in tuition waiver offers to students intending to major in STEM costs the target university 760 dollars in short-run profit but returns 59,800 dollars in discounted earnings to the state in which the target university resides. This finding suggest that streamlining

[24] In a test of heterogeneous treatment effects that uses a variable that was not anticipated and included in the PAP, I find that there are significantly (t-statistic 2.31) larger effects on earnings within the target state's labor market from students who were citizens or American legal permanent residents at the time of college application.

immigration laws and reducing nonresident tuition can be complementary policies. Places seeking to attract skilled workers can reduce both the financial and bureacratic barriers to immigration simultaneously, raising longer-run migration at comparatively low short-run costs.

Table C.1: Effects of Tuition Waivers per 10,000 Dollars among Chinese Residents

Outcome	(1)	(2)
A. NPV of Profit for Target University		
NPV of Profit	-1724**	-1996***
	(811)	(726)
B. NPV of Earnings in the Target State		
Salary in Target State	24155	30938*
	(15839)	(17448)
C. NPV of Earnings in the United States		
Salary in United States	15964	28969**
	(10901)	(12508)
Controls	No	Yes
Sample Size	607	607

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table C.2: Effects of Tuition Waivers per 10,000 Dollars among International Nonresidents

Outcome	(1)	(2)
A. NPV of Profit for Target University		
NPV of Profit	-1212*	-1222**
	(653)	(564)
B. NPV of Earnings in the Target State		
Salary in Target State	17543	14847
	(13044)	(13961)
C. NPV of Earnings in the United States		
Salary in United States	13824	20242**
	(9183)	(9821)
Controls	No	Yes
Sample Size	878	878

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table C.3: Effects of Tuition Waivers per 10,000 Dollars among Domestic Nonresidents

Outcome	(1)	(2)
A. NPV of Profit for Target University		
NPV of Profit	7	346
	(748)	(735)
B. NPV of Earnings in the Target State		
Salary in Target State	63207***	36070
	(22887)	(26959)
C. NPV of Earnings in the United States		
Salary in United States	3154	-15866
	(30451)	(33480)
Controls	No	Yes
Sample Size	455	455

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table C.4: Effects of Tuition Waivers per 10,000 Dollars among STEM Majors

Outcome	(1)	(2)
A. NPV of Profit for Target University		
NPV of Profit	-762	-545
	(747)	(648)
B. NPV of Earnings in the Target State		
Salary in Target State	59795***	40739*
	(20429)	(23485)
C. NPV of Earnings in the United States		
Salary in United States	28421	19378
	(24719)	(22854)
Controls	No	Yes
Sample Size	540	540

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table C.5: Effects of Tuition Waivers per 10,000 Dollars among Non-STEM Majors

Outcome	(1)	(2)
A. NPV of Profit for Target University		
NPV of Profit	-935	-1110*
	(678)	(604)
B. NPV of Earnings in the Target State		
Salary in Target State	17717	18135
	(13983)	(14939)
C. NPV of Earnings in the United States		
Salary in United States	7228	10039
	(16125)	(13437)
Controls	No	Yes
Sample Size	793	793

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

C.2 HTE Enabled by Additional Data

Tables C.6 through C.13 illustrate heterogeneous treatment effects for each of the main outcomes of interest with the sample split between nonresident students who were or were not American nationals at the time of college application. American nationals are defined as being anyone who was either a citizen or a legal permanent resident when they applied to the target university. The distinction between the two dimensions of place of residence and nationality is nontrivial both in terms of numbers and policy implications. For example, 14 percent of "out-of-state" students are neither American citizens nor green card holders, meaning that they are essentially international students whose families recently relocated to the United States. Likewise, 11 percent of "international" students are Americans citizens who were raised/living abroad and are returning to the United States for college.

The effects of tuition waivers on enrollment and eventual migration to the target state are driven overwhelmingly, if not entirely, by nonresident students who were citizens or legal permanent residents at the time of college application (American nationals who are nonresidents). American national nonresidents are more sensitive to small changes in prices when deciding where to enroll and their transition rate (migration rate conditional on enrolling) is also far more sensitive to prices.

A clear policy implication from this result is that the general policy of charging identical nonresident supplemental fees to American nationals and non-American nonresidents is unlikely to be welfare maximizing. Adding another degree of price discrimination between these two groups could recover greater profits for universities to cross-subsidize local residents while simultaneously improving the skills available in the local labor market and/or the budget balance of the state government relative to status quo policy.

Table C.6: Effects of Tuition Waivers on American Nonresidents per 10,000 Dollars

Outcome	(1)	(2)
A. Enrollment at Target University		
		[Baseline: 0.1161]
Target University	0.0383*	0.0600***
	(0.0227)	(0.0206)
B. Enrollment Anywhere in the Target State		
		[Baseline: 0.3419]
Any Target State College	0.0786**	0.0806**
	(0.0311)	(0.0336)
C. Enrollment Anywhere in the United States		
		[Baseline: 0.8774]
Any US College	0.0084	-0.0039
	(0.0204)	(0.0223)
Controls	No	Yes
Sample Size	488	488

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. "American Nonresidents" refers to the subsample of students who were American nationals, either citizens or permanent residents, but were not in-state students at the time of college application. "Baseline" refers to the mean value of the outcome variable for the smallest tuition waiver treatment arm ($20,000).

Table C.7: Effects of Tuition Waivers on Non-American Nonresidents per 10,000 Dollars

Outcome	(1)	(2)
A. Enrollment at Target University		
	[Baseline: 0.1869]	
Target University	0.0283	0.0228
	(0.0192)	(0.0168)
B. Enrollment Anywhere in the Target State		
	[Baseline: 0.4567]	
Any Target State College	0.0333	0.0363
	(0.0235)	(0.0242)
C. Enrollment Anywhere in the United States		
	[Baseline: 0.5709]	
Any US College	0.0180	0.0159
	(0.0232)	(0.0241)
Controls	No	Yes
Sample Size	845	845

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. "Non-American Nonresidents" refers to the subsample of students who were not American nationals, either citizens or permanent residents, and were not in-state students at the time of college application. "Baseline" refers to the mean value of the outcome variable for the smallest tuition waiver treatment arm ($20,000).

Table C.8: Effects of Tuition Waivers on American Nonresidents per 10,000 Dollars

Outcome	(1)	(2)
A. Registered in Target State after 12 Years		
	[Baseline: 0.1548]	
Registered in Target State	0.0911***	0.0769***
	(0.0266)	(0.0296)
B. Registered in the United States after 12 Years		
	[Baseline: 0.5548]	
Registered in United States	0.0438	0.0184
	(0.0313)	(0.0349)
Controls	No	Yes
Sample Size	488	488

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. "American Nonresidents" refers to the subsample of students who were American nationals, either citizens or permanent residents, but were not in-state students at the time of college application. "Baseline" refers to the mean value of the outcome variable for the smallest tuition waiver treatment arm ($20,000).

Table C.9: Effects of Tuition Waivers on Non-American Nonresidents per 10,000 Dollars

Outcome	(1)	(2)
A. Registered in Target State after 12 Years		
	[Baseline: 0.0104]	
Registered in Target State	0.0000	0.0030
	(0.0048)	(0.0040)
B. Registered in the United States after 12 Years		
	[Baseline: 0.0104]	
Registered in United States	0.0059	0.0087*
	(0.0058)	(0.0052)
Controls	No	Yes
Sample Size	845	845

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. "Non-American Nonresidents" refers to the subsample of students who were not American nationals, either citizens or permanent residents, and were not in-state students at the time of college application. "Baseline" refers to the mean value of the outcome variable for the smallest tuition waiver treatment arm ($20,000).

Table C.10: Effects of Tuition Waivers on American Nonresidents per 10,000 Dollars

Outcome	(1)	(2)
A. Located in Target State after 12 Years		
		[Baseline: 0.1871]
In Target State, 2024	0.0872***	0.0681**
	(0.0277)	(0.0310)
B. Located in the United States after 12 Years		
		[Baseline: 0.6516]
In America, 2024	0.0215	-0.0063
	(0.0300)	(0.0322)
Controls	No	Yes
Sample Size	488	488

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. "American Nonresidents" refers to the subsample of students who were American nationals, either citizens or permanent residents, but were not in-state students at the time of college application. "Baseline" refers to the mean value of the outcome variable for the smallest tuition waiver treatment arm ($20,000). "Located In-State" refers to being recorded in the target state in 2024 using a combination of voter registration records and data scraped from the universe of LinkedIn profiles. "Located in America" refers to being recorded in the United States in 2024 using a combination of voter registration records and data scraped from the universe of LinkedIn profiles.

Table C.11: Effects of Tuition Waivers on Non-American Nonresidents per 10,000 Dollars

Outcome	(1)	(2)
A. Located in Target State after 12 Years		
		[Baseline: 0.0484]
In Target State, 2024	0.0041	0.0034
	(0.0105)	(0.0103)
B. Located in the United States after 12 Years		
		[Baseline: 0.1453]
In America, 2024	-0.0014	0.0023
	(0.0165)	(0.0171)
Controls	No	Yes
Sample Size	845	845

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. "Non-American Nonresidents" refers to the subsample of students who were not American nationals, either citizens or permanent residents, and were not in-state students at the time of college application. "Baseline" refers to the mean value of the outcome variable for the smallest tuition waiver treatment arm ($20,000). "Located In-State" refers to being recorded in the target state in 2024 using a combination of voter registration records and data scraped from the universe of LinkedIn profiles. "Located in America" refers to being recorded in the United States in 2024 using a combination of voter registration records and data scraped from the universe of LinkedIn profiles.

Table C.12: Effects of Tuition Waivers on American Nonresidents per 10,000 Dollars

Outcome	(1)	(2)
A. NPV of Profit for Target University		
NPV of Profit	-205	502
	(758)	(669)
B. NPV of Earnings in the Target State		
Salary in Target State	73821***	52546*
	(24485)	(29022)
C. NPV of Tax Revenue in the Target State		
Target State Tax Revenue	3691***	2627*
	(1224)	(1451)
D. NPV of Earnings in the United States		
Salary in United States	26451	7140
	(29360)	(34185)
E. NPV of Tax Revenue in the United States		
United States Tax Revenue	6613	1785
	(7340)	(8546)
Controls	No	Yes
Sample Size	488	488

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. "American Nonresidents" refers to the subsample of students who were American nationals, either citizens or permanent residents, but were not in-state students at the time of college application. Profit refers to the difference between net tuition paid by the student and estimated instrucitonal expenditures. Salary refers refers to an indicator for location interacted with estimated taxable earnings from Revelio Labs using job titles, work history, and employer, with imputed values for missing observations following this paper's pre-analysis plan. All values are discounted at a 5 percent annual rate consistent with this paper's pre-analysis plan.

Table C.13: Effects of Tuition Waivers on Non-American Nonresidents per 10,000 Dollars

Outcome	(1)	(2)
A. NPV of Profit for Target University		
NPV of Profit	-1161*	-1336**
	(657)	(581)
B. NPV of Earnings in the Target State		
Salary in Target State	11679	12078
	(11163)	(12520)
C. NPV of Tax Revenue in the Target State		
Target State Tax Revenue	584	604
	(558)	(626)
D. NPV of Earnings in the United States		
Salary in United States	5622	9244
	(5739)	(6579)
E. NPV of Tax Revenue in the United States		
United States Tax Revenue	1406	2311
	(1435)	(1645)
Controls	No	Yes
Sample Size	845	845

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. "Non-American Nonresidents" refers to the subsample of students who were not American nationals, either citizens or permanent residents, and were not in-state students at the time of college application. Profit refers to the difference between net tuition paid by the student and estimated instrucitonal expenditures. Salary refers refers to an indicator for location interacted with estimated taxable earnings from Revelio Labs using job titles, work history, and employer, with imputed values for missing observations following this paper's pre-analysis plan. All values are discounted at a 5 percent annual rate consistent with this paper's pre-analysis plan.

D Robustness Checks

Table D.1: Effects of Nonresident Tuition Waivers per 10,000 Dollars

Outcome	(1)	(2)
A. Full Sample Outcomes (N=1,333)		
Registered in Target State	0.0329***	0.0268**
	(0.0108)	(0.0105)
Salary in Target State	34151***	25302**
	(11718)	(12314)
B. Subsample with Income <$250K (N=1,073)		
Registered in Target State	0.0310**	0.0268**
	(0.0127)	(0.0124)
Salary in Target State	33087**	28485**
	(13519)	(14103)
Controls	No	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. Registration refers to appearing in the voter registration rolls of the corresponding location, which requires American citizenship and covers roughly three quarters of all American citizens.

Table D.2: Effects of Nonresident Tuition Waivers per 10,000 Dollars

Outcome	(1)	(2)
A. Linear Control for Income		
Registered in Target State	0.0329***	0.0268**
	(0.0108)	(0.0105)
Salary in Target State	34151***	25302**
	(11718)	(12314)
B. Quadratic Control for Income		
Registered in Target State	0.0329***	0.0268**
	(0.0108)	(0.0105)
Salary in Target State	34151***	25250**
	(11718)	(12297)
Controls	No	Yes
Sample Size	1,333	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. Registration refers to appearing in the voter registration rolls of the corresponding location, which requires American citizenship and covers roughly three quarters of all American citizens.

Table D.3: Effects of Nonresident Tuition Waivers per 10,000 Dollars

Outcome	(1)	(2)
A. NPV of Profit for Target University		
NPV of Profit	-835*	-714
	(504)	(438)
B. NPV of Earnings and Tax Revenue in Target State		
75% of Salary in Target State	25614***	18976**
	(8788)	(9235)
75% of Tax in Target State	1281***	949**
	(439)	(462)
Controls	No	Yes
Sample Size	1,333	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. Profit refers to the difference between net tuition paid by the student and estimated instrucitonal expenditures. Salary refers refers to an indicator for location interacted with estimated taxable earnings from Revelio Labs using job titles, work history, and employer, with imputed values for missing observations following this paper's pre-analysis plan. All values are discounted at a 5 percent annual rate consistent with this paper's pre-analysis plan.

Table D.4: Effects of Nonresident Tuition Waivers per 10,000 Dollars

Outcome	(1)	(2)
A. Public Profile on LinkedIn		
On LinkedIn	-0.0118	-0.0096
	(0.0175)	(0.0178)
Controls	No	Yes
Sample Size	1,333	1,333

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses.

Table D.5: Effects of Nonresident Tuition Waivers per 10,000 Dollars

Outcome	(1)	(2)
A. NPV of Earnings in the Target State		
Salary in Target State	63028**	57882*
	(28772)	(32486)
B. NPV of Tax Revenue in the Target State		
Target State Tax Revenue	3151**	2894*
	(1439)	(1624)
C. NPV of Earnings in the United States		
Salary in United States	19584	35441
	(29756)	(27129)
D. NPV of Tax Revenue in the United States		
United States Tax Revenue	4896	8860
	(7439)	(6782)
Controls	No	Yes
Sample Size	397	397

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Heteroskedasticity robust standard errors in parentheses. Profit refers to the difference between net tuition paid by the student and estimated instrucitonal expenditures. Salary refers refers to an indicator for location interacted with estimated taxable earnings from Revelio Labs using job titles, work history, and employer, with imputed values for missing observations following this paper's pre-analysis plan. All values are discounted at a 5 percent annual rate consistent with this paper's pre-analysis plan.