Do High School Graduates Attend College In-State or Out-of-State? Role of Individual-Level and State-Level Factors

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Research Questions

- **What is the role of academic ability/achievement in high school in influencing a high school graduate's decision to out-migrate for college?**

   Does there exist a "brain-drain" at the state-level?

- **What is the impact of state public policies - state appropriations, tuition pricing and state financed financial aid - on the decision to attend college in-state vs. out-of-state?**

   How many more students does an additional $1000 of per capita state spending on higher ed. retain? Does it retain the high or the low ability students?

   What is the effect of different types of state financial aid - need-based and non-need based aid - on the decision to attend college in-state vs. out-of-state? Does the effect differ by students' academic ability?

   How many more students does a $1000 drop in college tuition level in a given state retain? College prices (both in-state and out-of-state) are evaluated using several different approaches.
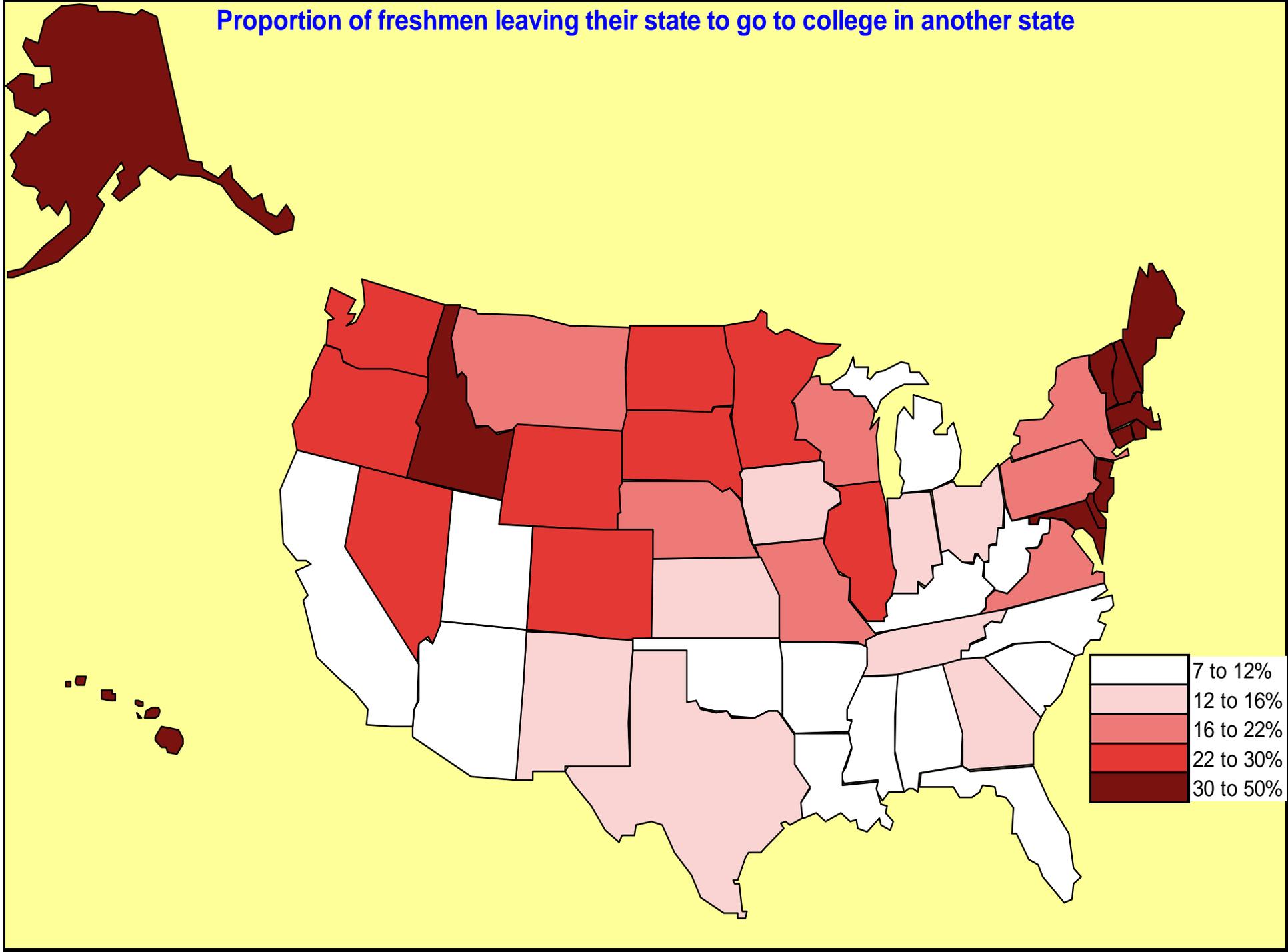
Motivation

Large number of high school graduates leave their home state to attend colleges in other states.

NCES(2011) reported that >390,000 high school graduates (18% of freshman students) attended an out-of-state college in fall 2010.

The number has increased steadily over time - 55% more freshmen attended an out-of-state college in fall 2010 than in fall 1992.

The aggregate figure in fall 2010 masks significant variation in out-of-state enrollment among individual states.

Proportion of freshmen leaving their state to go to college in another state

Legend:
- 7 to 12%
- 12 to 16%
- 16 to 22%
- 22 to 30%
- 30 to 50%

Motivation

Interstate migration of college-bound students is of interest for both **university officials** and **state policymakers**.

- Public **institutions** have a financial incentive to favor out-of-state over in-state students since out-of-state students pay higher tuition.
    - Particularly relevant in today's times - most universities facing a continuing decline in state funding for higher education. More out-of-state students make up for lost revenue and subsidize the education costs of other students.

- Out-of-state students create regional diversity, expose resident students to diverse ideas and cultures and raises the academic reputation of the institution.

Motivation

- **State legislatures** also likely to be concerned about college student migration because it has a direct impact on students' probability of joining the work force in their home state after graduating from college.

   Policies like HOPE in Georgia have been implemented to retain the state's top high school students to attend college in-state.

   Rationale: These students contribute to the home state economy through their spending while studying. After graduating, at least some of them will be retained in the home state workforce.

   Thus, the state could enjoy at least some of the returns from their investments in higher education.

Contributions

This research will:

- Fill a void in the literature by examining the choice between an in-state versus an out-of-state institution
  - Previous research focuses on the extensive margin of college enrollment or the choices between a 2-year and a 4-year college or a public and a private institution.

- Assist policymakers in assessing the differential impact of alternative state policy measures for students from different ability groups.

- Make use of a micro data set that surveys a recent cohort of high school graduates.

Preview of the Results

- An increase in the need-based and non-need based aid spending reduces the probability of out-migrating for college, specially for high ability students.

- A reduction in the cost of attending an in-state public college and an increase in the cost of attending an out-of-state public college reduces the likelihood of out-migrating for college.

- High academic ability students are more likely to leave their home state to attend college out-of-state, supporting the notion that states facing out-migration experience a 'brain-drain'.

Outline

Theoretical Framework

The Data

Research Design

Empirical model

Key Variable definitions

Results

Impact of academic ability/achievement in high school

Impact of other student-level factors

Impact of state policy measures

Conclusion

Theoretical Framework

This study falls under "**student college choice**" research.

College choice models incorporate aspects of both **economic** and **sociological** perspectives.

Economic approach

Is primarily based on Becker's (1964) human capital investment theory.

Theory views college choice as an investment in human capital, with associated costs and benefits over time.

Student will migrate to a state to attend college if the present value of the expected benefits exceeds the added costs of migration, given personal tastes and preferences.

Costs - out-of-state tuition, travel costs and psychic costs
Benefits - monetary benefits and non-monetary benefits

Theoretical Framework

Sociological approach

Emphasizes role of student's cultural capital & habitus.

Cultural capital: cultural knowledge and social networks acquired primarily from one's parents and defines one's social class.
- e.g. parental knowledge about college going process and information about college costs and financial aid availability

Habitus: internal system of beliefs and perceptions that shapes an individual's expectations, attitudes, and aspirations.

Students from different socioeconomic backgrounds have unequal social networks and cultural capital derived from their parents.

Leads to differences in college choices by students across varying income groups.

The Data

Make use of **Educational Longitudinal Study** (ELS: 2002).

Collected by the U.S. Department of Education's National Center for Education Statistics.

The ELS surveys a cohort of U.S. high school students from the time they were in the tenth grade in 2002 through 2006.

Information on colleges applied to and attended by ELS participants is obtained through linking the ELS data with the **Integrated Postsecondary Education Data System** (IPEDS).

The Data

State-level data:

Tuition prices & annual state appropriations - **Digest of Education Statistics**

Financial aid - **National Association of State Student Grant and Aid Programs**

College Selectivity - **Barron's Guide to American Colleges**, 2005

Unemployment rate, median earnings - **Current Population Survey**

Sample selection:

Limited to students who graduate with a high school diploma or GED in 2004

Exclude students who attended high schools in DC

Exclude students who attended private for-profit institutions

Final sample size: 9870 high school graduates

The Model

In-state vs. out-of-state college enrollment decision is only observed for a nonrandom subsample of students who enroll in college.

Thus, a probit model with sample selection is estimated.

Two sequential decisions:

Selection :

$Z_{1ij} = \beta_1 X_{1ij} + \mu_{1ij}$

$C_{ij} = \begin{cases} 1 \text{ if individual } i \text{ from state } j \text{ enrolls in college (i.e. } Z_{1ij} > 0) \\ \\ 0 \text{ if individual } i \text{ does not enroll in college} \quad \text{(i.e. } Z_{1ij} \leq 0) \end{cases}$

Outcome :

$Z_{2ij} = \beta_2 X_{2ij} + \mu_{2ij}$

$OS_{ij} = \begin{cases} 1 \text{ if individual } i \text{ enrolls in an out-of-state college (i.e. } Z_{2ij} > 0 \text{ and } C_{ij} = 1) \\ \\ 0 \text{ if individual } i \text{ enrolls in an in-state college} \quad \text{(i.e. } Z_{2ij} \leq 0 \text{ and } C_{ij} = 1) \\ \\ \text{unobserved} \quad \text{(i.e. } C_{ij} = 0) \end{cases}$

(μ_{1ij}, μ_{2ij}) BVN $(0,0,1,1\rho)$

Research Design

Advantage of specification: accounts for potential correlation between the college enrollment and college location decisions, corrects for potential sample selection bias.

Probability weights are applied in all regressions to generalize results and correct standard errors.

Main outcome of interest: **out-of-state versus in-state enrollment at four-year institutes .**

   Rationale - vast majority of student migration happens at 4-year institutions, because students attending two-year institutions do so overwhelmingly in-state.

Key Variable Descriptions

Dependent Variable

Selection equation: C=1 if the 2004 high school graduate had enrolled in a 4-year college by the end of the study period in 2006, and 0 otherwise

Outcome equation: OS=1 if the 4-year college enrollee attended a 4-year out-of-state institution and 0 otherwise.

Key Independent Variables

Individual-level variables

Academic ability: standardized composite test score on the reading and math sections of tests conducted by NCES in 2002. Partitioned into quartiles**.**

Family income: total parental income from all sources in 2001. Partitioned into quartiles.

Parental involvement: frequency of discussions between parents and students on various high school issues.

 Factor analysis used to construct a single measure from eight components.

College proximity: distance from an individual's high school location to the nearest four-year university

 "great-circle distance" ("as the crow flies")

Key Variable Descriptions

State-level variables – measured as of 2004

State spending on higher education: measured per traditional college-age (18 to 24 year old) population in the individual's home state.

Financial aid: state need-based grant aid per college-age population and non-need-based grant aid per college-age population in the individual's home state.

Selectivity of higher ed. in home state: measured by the Barron's index of college selectivity for the flagship institution in the home state.

> Selectivity of flagship schools ranged from "Competitive" to "Most Competitive"

Wtd. avg. selectivity of higher ed. in other 49 states: weighted average of Barron's index for flagship institutions in the other 49 states.

> Wts-inverted dist. between home state and the other states

State seating capacity: the number of enrollment slots or seats per college-age student in the individual's home state .

College Price Measures

A.   **College prices based on market basket of all four-year institutions in the U.S**.

Cost of attending an in-state public college: average resident tuition at all public 4-year institutions in the individual's home state.

Cost of attending an out-of-state public college: weighted average of non-resident tuition at 4-year public colleges in the other 49 states.

    Wts-inverted dist. between home state and the other states

Advantage: relatively straightforward and easy to calculate.

Disadvantage: all students from a particular state are assumed to face the same price irrespective of their interest in schools or ability.

B.   College prices vary depending on student ability

B1. Potential ability signaled by the choice of schools applied to:

Dale and Krueger (2011) - Adjust for unobserved student ability by controlling for the average SAT score of the colleges that students applied to in their estimates of labor market return to college quality.

For each individual *i,* I calculate the average Barron's index of college selectivity of all four-year institutions that the student applied to as a signal of the individual's potential ability.

All colleges in the sample falling under that particular category of the Barron's index are appropriate and potentially accessible to individual *i*.

Cost of attending an in-state public college: average resident tuition at all public four-year institutions falling under the associated Barron's category in the individual's home state.

Cost of attending an out-of-state public college: weighted average of non-resident tuition at four-year public colleges falling under the associated Barron's category in the other 49 states.

B2. Student ability measured by high school GPA and high school quality:

Cost of attending an in-state public college:

Restrict sample to those who attended a 4-year public college in their home state and run the following regression:

$$P_i = \beta_0 + \beta_1 GPA_i + \beta_2 GPA^2_i + \beta_3 hsquality_i + \beta_4 hsprivate_i + \beta_5 S_i + \varepsilon_i$$

Predict cost of attending a 4-year in-state public college for everybody in sample using estimated OLS coefficients.

Cost of attending an out-of-state public college:

Estimate the equation for the sample that attends a 4-year public college outside their home state.

Obtain predicted cost of attending an out-of-state public college for everyone in the sample.

Advantage: Allows for within state variation based on student ability.

Distribution of Postsecondary Choices

	Non-attend	In-state	Out-of-state
Overall average	**50.6%**	**36.3%**	**13.1%**
Sample size	**4514**	**3901**	**1455**
STUDENT-LEVEL VARIABLES			
Lowest income quartile	68.0	26.4	5.6
Second income quartile	53.6	36.1	10.4
Third income quartile	37.9	44.8	17.3
Top income quartile	25.0	45.0	30.1
Lowest test score quartile	80.5	15.4	4.0
Second test score quartile	59.7	31.7	8.6
Third test score quartile	40.0	45.9	14.1
Top test score quartile	19.9	53.6	26.5
STATE-LEVEL VARIABLES			
Home state spending on higher ed.	6158	6295	6201
	(1025.83)	(1072.42)	(1035.15)
Home state need-based grant aid	155	174	163
	(112.84)	(122.16)	(126.48)
Home state non need-based grant aid	59	74	66
	(111.80)	(125.91)	(117.37)
Home state selectivity of higher ed	3.57	3.62	3.44
	(1.00)	(0.96)	(0.91)
Wtd. avg. selectivity of higher ed. in other 49 states	2.93	2.95	2.97
	(0.13)	(0.12)	(0.12)

Standard errors in parentheses.

College price measures (2004 $)	Non-attend	In-state	Out-of-state
Coll. prices based on mkt. basket of all 4yr. colleges			
Cost of public coll. in home state	5141	5230	5515
	(1534)	(1625)	(1701)
Cost of pub.coll. out-of-state	13023	13131	13268
	(612)	(630)	(741)
Coll. prices vary based on ability **Ability measured by hs GPA and hs qual.**			
Cost of public coll. in home state	4860	5271	5673
	(1574)	(1658)	(1713)
Cost of pub.coll. out-of-state	12732	13807	14439
	(2517)	(2353)	(2222)
Ability signalled by coll. appln. *			
cost of public coll. in home state		4434	4647
		(1769)	(2129)
cost of pub.coll. out-of-state		12616	13505
		(1723)	(1715)
		(2771)	(3284)

Standard errors in parentheses.

*This measure is not available for those who did not enroll in college since the majority of those who did not attend a 4-year college never actually applied,.

Out-of-state Enrollment by Test Scores and Family Income Quartile

	Composite test score quartiles			
	Bottom	Second	Third	Top
Enrollment in 4 yr. out-of-state college (%)				
Lowest income quartile	2.6	6.1	9.3	13.9
Second income quartile	4.3	7.2	12.6	22.1
Third income quartile	8.4	11.6	19.0	28.4
Highest income quartile	12.3	24.1	30.7	42.2

Impact of Ability on the Probability of Enrolling in an Out-of-state College

	no controls	control for demographics	control for demographics high school characteristics	control for demographics, high school characteristics & state-level variables	control for demographics, high school characteristics, state-level variables & family income	control for demographics, high school characteristics, state-level variables, family income & parental educ
Composite test score						
Top quartile (omitted)	--	--	--	--	--	--
Third quartile	-10.6%***	-10.7%***	-10.0%***	-9.7%***	-8.0%***	-7.2%***
Second quartile	-12.3%***	-12.3%***	-11.1%***	-11.1%***	-8.8%***	-7.4%***
Bottom quartile	**-11.4%***	-11.9%***	-9.3%***	-8.9%***	-5.8%**	**-4.2%***

Table reports ME for the probability of attending an out-of-state college conditional on enrolling in a four-year college

The ME are calculated at the average X. Significance levels: *:10%, **: 5%, ***: 1%.

Predicted Probability of Enrolling in an Out-of-state College

	Ability (test score)		
	Bottom quartile	**Top quartile**	**Change (marginal effect)**
Class of 2004			
High income	0.314*** (0.040)	0.357*** (0.031)	0.043
Average	0.213*** (0.024)	0.259*** (0.023)	0.046
Low income	0.186*** (0.026)	0.249*** (0.0403)	0.063

Table reports predicted probabilities of enrolling in an out-of-state institution conditional on attending a four-year college.
Significance levels: *:10%, **: 5%, ***: 1%

Other Student-level Determinants of Interest

	Probit with sample sel		Probit
	Stage 1:Pr(C=1)	Stage 2: Pr(OS=1/C=1)	
Black	21%***	7.1%***	8.4%***
Asian	16%***	-12.1%***	-12.5%***
Hipanic	2%	-5.1%**	-5.2%*
Private h.s.	13%***	8.0%***	9.7%***
Midwest	1%	-10.9%**	-11.0%***
South	2%	-12.0%**	-12.9%**
West	5%	-10.6%*	-10.3%**
Bottom income quartile	-15.4%***	-11.8%***	-13.2%***
Second income quartile	-13.0%***	-10.5%***	-12.1%***
Third income quartile	-6.9%**	-8.2%***	-9.3%***
Parents: hs or less	-21.4%***	-8.5%***	-10.1%***
Parents: some college	-17.2%***	-9.0%***	-10.7%***
Parents: college graduate	-5.4%**	-4.8%***	-5.7%***
Expect to receive BA or more	21.6%***		
Cost of 2 yr. pub. coll.	0.001%*		
Share of pub. coll. in home state	1.9%*		
Share of pvt. coll. in home state	-3.2%***		

ρ = 0.3***

LR test of indep. eqns. (ρ = 0):   chi2(1) =   8.46   Prob > chi2 = 0.003

 Significance levels: *:10%, **: 5%, ***: 1%

Marginal Effects of State Policy Measures

College prices vary based on ability (hs GPA & hs. qual)					
Cost of public coll. in home state	0.0019% **	0.0020% **	0.0017% *	0.0016% *	0.0017% *
Cost of pub.coll. out-of-state	0.0002%	-0.0001% *	-0.0003% *	-0.0002% *	-0.0002% *
Cost of pvt. coll. in home state	-0.0001%	0.0001% *	0.0002% *	0.0002% *	0.0003% *
Cost of pvt. coll. out-of-state	0.0003% *	0.0004% **	0.0005% **	0.0005% **	0.0005% **
Selectivity of higher ed. in home state		-2.9% ***	-3.7% ***	-3.0% **	
Wtd. avg. selectivity of higher ed. in other 49 states		0.7% ***	0.8% ***	0.7% **	
Selectivity of higher ed. in home state x low test score					-2.4% *
Selectivity of higher ed. in home state x high test score					-3.5% *
Wtd. avg. selectivity of higher ed. in other 49 states x low test score					-0.01%
Wtd. avg. selectivity of higher ed. in other 49 states x high test score					0.37% ***
State spending on higher ed.			-0.0012%	-0.0008%	-0.0008%
State seating capacity			-15.7%	-19.9%	-20.4%
Need-based aid				-0.011% *	
Non-need-based aid				-0.006% **	
Need-based aid x low test score					-0.006%
Need-based aid x high test score					-0.015% **
Non-need-based aid x low test score					0.010% *
Non-need-based aid x high test score					-0.011% *

Table reports ME for the probability of attending an out-of-state college conditional on enrolling in a four-year college
Significance levels: *:10%, **: 5%, ***: 1%

Marginal Effects of State Policy Measures

College prices vary based on ability (coll. appln.)

Cost of public coll. in home state	0.0013% *	0.00129% *
Cost of pub.coll. out-of-state	-0.0008%	-0.00072%
Cost of pvt. coll. in home state	-0.0003%	-0.00032%
Cost of pvt. coll. out-of-state	0.0018% ***	0.00176% ***
Selectivity of higher ed. in home state	-1.8% ***	
Wtd. avg. selectivity of higher ed. in other 49 states	0.3% ***	
Selectivity of higher ed. in home state x low test score		-1.6% *
Selectivity of higher ed. in home state x high test score		-1.9% **
Wtd. avg. selectivityof higher ed. in other 49 states xlow test score		0.0%
Wtd. avg. selectivity of higher ed. in other 49 states x high test score		0.3% **
State spending on higher ed. per coll-age student	-0.0001%	-0.0001%
State seating capacity	-16.3% *	-16.5% *
Need-based aid per coll-age student	-0.008% **	
Non-need-based aid per coll-age student	-0.005% *	
Need-based aid x low test score		-0.004%
Need-based aid x high test score		-0.009% *
Non-need-based aid x low test score		0.011%
Non-need-based aid x high test score		-0.012% **

Table reports ME for the probability of attending an out-of-state college conditional on enrolling in a four-year college
Significance levels: *:10%, **: 5%, ***: 1%

Summary of Results

Policy measure	$\triangle$Pr(OS=1)	$\triangle$Total students retained	$\triangle$High abil. Students retained
College prices vary based on ability (hs GPA & hs. qual)			
$1000 drop in the cost of pub. college in home state	-1.7	89	33
$1000 increase in the cost of pub. college out-of-state	-0.2	12	4
$1000 increase in need-based aid per college-age student	-11	295	183
$1000 increase in non need-based aid per college-age student	-6	158	94
College prices vary based on ability (hs GPA & hs. qual)			
$1000 drop in the cost of pub. college in home state	-1.3	69	32
$1000 increase in the cost of pub. college out-of-state	insig	–	–
$1000 increase in need-based aid per college-age student	-8	254	135
$1000 increase in non need-based aid per college-age student	-5	127	78

Conclusion

- An increase in the need-based and non-need based aid spending reduces the probability of out-migrating for college, specially for high ability students.

- A reduction in the cost of attending an in-state public college and an increase in the cost of attending an out-of-state public college reduces the likelihood of out-migrating for college.

- High academic ability students are more likely to leave their home state to attend college out-of-state, supporting the notion that states facing out-migration experience a 'brain-drain'.