DO HIGH SCHOOL GRADUATES ATTEND COLLEGE IN-STATE OR OUT-OF-STATE?
Role of Individual-Level and State-Level Factors

Ritu Sapra

Rutgers University

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Executive Summary

Interstate migration of college-bound students is a subject of great interest for both university officials and state policymakers. Postsecondary institutions, through tuition pricing and financial aid policies, have attempted to attract talented high school graduates from various geographic regions to create regional diversity and expose resident students to diverse ideas (Mixon and Hsing 1994; Heller 2002; Baryla and Dotterweich 2006). Also, given that out-of-state students pay higher tuition at public institutions, they have a financial incentive to favor out-of-state over in-state students (Groen 2004). This is especially relevant today, when most universities are facing a continuing decline in state funding for higher education. State legislatures, on the other hand, should be concerned about the economics of 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 (Orsuwan and Heck 2009). Research suggests that those who attend college in-state are more likely to remain in their home state post college graduation than out-of-state students who migrated in for college (Kodrzyck 2001; Perry 2001; Groen 2004; Gottlieb and Joseph 2006).

With this in mind, I analyze the factors that determine a high school graduate's decision to attend college in-state or out-of-state. Specifically, I examine the impact of academic ability/achievement in high school on the probability of out-migrating for college, decomposing the impact into the indirect effects of differences in family background (family income and parental education) and the direct effect of ability. This study also examines the impact of various measures of state public policies on an individual's decision to attend college in-state versus out-of-state, after controlling for student-level variables and other state characteristics. This research looks at the role of three kinds of state public policies: (i) direct appropriations to higher education institutions, (ii) financial aid to students, and (iii) college prices. Since past studies have considered state differences in tuition charges as the only source of variation in college costs, an important issue in individual-level studies is that these prices are not specific to an individual's ability. Given this caveat and caution, one of the main challenges of this paper is determining the appropriate college price/tuition level for each student that not only varies by home state of the individual but also by student ability. This requires a measure of ability. For this I draw on Dale and Krueger's 2011 paper on the labor market returns to college quality in which students reveal their potential ability, motivation and ambition by their college application behavior. More specifically, Dale and Krueger adjust for unobserved student ability by controlling for the average SAT score of the colleges that students applied to. This paper employs a similar approach to measure student ability and evaluate college prices specific to each individual's ability.

The model estimated in this paper specifies that the potential college student makes two sequential decisions: (1) whether to enroll in a postsecondary institution or not (2) if so, whether to enroll in an institution in one's home state (in-state) or move out-of-state to attend college. Since the outcome of interest: a high school graduate's decision to enroll in an in-state versus an out-of-state institution, is only observed for a select nonrandom sub-sample of students who enroll in college, a probit model with sample selection is estimated. The advantage of this specification is that it accounts for potential correlation between the college enrollment and college location decisions. To analyze the interstate

migration of the 2004 cohort of high school graduates I use the Educational Longitudinal Study (ELS: 2002) data set, collected by the National Center for Education Statistics.

The findings of this paper show that higher academic ability students (as judged by standardized composite test scores) are more likely to leave their home states to attend out-of-state colleges. Further, past research shows that once a state resident migrates to another state to attend college, they are less likely to return to their home upon graduation. These two findings taken together suggest that academically talented high school graduates leaving their home states for college are also less likely to return to join their state's workforce after graduating from college. Thus, states that have a high rate of out-migration of its high school graduates without a corresponding in-migration of talent are experiencing a 'brain-drain', since they tend to lose their best and brightest students to other states. Such states are also likely to experience a decline in quality, over time, of its human resource assets available for participation in the knowledge economy and ultimately face a diminished intellectual and skilled workforce (Tornatzky et al. 2001). The results also demonstrate that high school graduates who plan to major in engineering/computer science are less likely to stay home for college. This means that these majors are also less likely than other majors to be working in their home state after college graduation. Thus, states facing net out-migration of high school graduates for college are likely to pay a price down the road in terms of a smaller engineering and computer science labor force.

Evidence presented in the paper also suggests that an increase in state financial aid, especially need-based grant aid seems to be the most cost effective policy for recruiting high school graduates to attend college in their home states (both high ability and engineering/computer science students). A reduction in the price of attending an in-state public college is another policy lever available to state legislators. However, this policy doesn't appear to be as cost-effective for states as increasing state grant aid, so that for the same amount of money, a decrease in in-state public college costs retains much fewer students.

The results presented indicate that another ingredient in successfully retaining high school students to attend college in-state is the selectivity/quality of higher education in the student's home state. This is particularly true for retaining high ability students.

The study's findings also suggest that students from different income groups respond differently to various state policy measures in their college location choice decision. Upper income students do not seem to respond to changes in public college costs. However, lower-income students, for whom college costs are more of a binding constraint, reduce their probability of out-migrating in response to a drop in public college costs in their home states. Also, while the availability of state need-based grants encourages students from poor families (who are more likely to receive such aid) to attend postsecondary institutions in their home states, it does not seem to have an impact in retaining students from more affluent backgrounds. Increases in state non-need based aid seem to help in retaining students from both income groups. These findings suggest that if the goal of states is to promote underrepresented students' (i.e. financially disadvantaged students') college enrollment at in-state colleges and create more diverse classes, then states should focus on providing adequate financial aid to these students, especially need-based aid.

1. INTRODUCTION

Following high school, many students move to attend college, often in another state. The National Center for Education Statistics (2011) reported that over 390,000 high school graduates (18% of freshman students) moved across state lines to enroll in college in fall of 2010. However, this aggregate figure masks significant variation in out-of-state enrollment among individual states, ranging from only 7% of Mississippi's freshman students to more than 45% of freshman students from Vermont, New Hampshire and Connecticut (see Figure 1). Moreover, the number of students migrating out of state has increased steadily, with 55% more freshmen attending an out-of-state college in fall 2010 than in fall 1992. This interstate migration of college-bound students is a subject of great interest for both university officials and state policymakers.

Postsecondary institutions, through tuition pricing and financial aid policies, have attempted to attract talented high school graduates from various geographic regions to create regional diversity, expose resident students to diverse ideas and cultures and raise the academic reputation of the institution (Mixon and Hsing 1994; Heller 2002; Baryla and Dotterweich 2006). Further, universities have an interest in maximizing revenue from tuition. And given that out-of-state students pay higher tuition at public institutions, they have a financial incentive to favor out-of-state over in-state students (Groen 2004). This is especially relevant today, when most universities are facing a continuing decline in state funding for higher education. On average, state fiscal support for higher education fell by about 2 percent from 2009 to 2011 fiscal years, according to the Grapevine Project (Illinois State University's annual survey of state financing of higher education).[1] In such a situation, attracting more out-of-state students can help make up for lost revenue and subsidize the education costs of other students.

State legislatures should also be concerned about the economics of 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 (Orsuwan and Heck 2009). Research suggests that those who attend college in-state are more likely to remain in their home state post college graduation than out-of-state students who migrated in for college (Kodrzyck 2001; Perry 2001; Groen 2004; Gottlieb and Joseph 2006). However, there is a perception in many states that academically talented high school graduates leave their home state for college and do not return (Schmidt 1998). State policymakers seek to stem this brain drain and retain the state's top high school students to attend college in-state (e.g. HOPE Scholarship Program in Georgia). Some states have also developed programs to attract college freshman from other states (e.g. Campus Philly). The rationale behind these efforts is that these college students will then contribute to the home state economy through their tuition and daily living costs while studying, and then, after graduating from college, at least some of them will be retained in the home state workforce. In this way, the state could enjoy at least some of the returns from their investments in higher education, either by taxing their former graduates or by higher regional economic growth due to positive externalities generated internally (Groen 2004).

[1] According to the same report, thirty two states reported declines in state appropriations from FY 2010 to FY 2011, with six states recording double digit percentage losses (Kelderman 2011).

With this in mind, I analyze the factors that determine a high school graduate's decision to attend college in-state or out-of-state. Specifically, I examine the impact of academic ability/achievement in high school on the probability of out-migrating for college, decomposing the impact into the indirect effects of differences in family background (family income and parental education) and the direct effect of ability. Identifying the impact of student ability on emigration propensity for college, after taking into account differences in family background, is the starting point for determining whether 'brain-drain' is a legitimate concern for state policymakers. If it turns out that among those with similar family background characteristics, ability has a positive impact on the probability of attending college out-of-state, then this would support the notion that states which are net exporters of high school graduates for college are experiencing a 'brain-drain' since they tend to lose their best and brightest homegrown college-bound students to other states.

This study also examines the impact of various measures of state public policies on an individual's decision to attend college in-state versus out-of-state, after controlling for student-level variables and other state characteristics. This research looks at the role of three kinds of state public policies: (i) direct appropriations to higher education institutions, (ii) college prices (evaluated using several different approaches) and (iii) financial aid to students.

The recent economic downturn has resulted in very large state budget shortfalls which in turn has forced many states to lower the appropriations towards postsecondary institutes. These budget challenges have been particularly troubling for public institutions which rely heavily on state funding. As a result, tuition prices have been rising rapidly.[2] To combat rising tuition costs, states have implemented various financial aid policies to promote college access and yield their desired student population. Financial aid as a policy initiative has evolved over time. Since the early 1990's, the focus has shifted from a need-based criteria to a merit-based criteria (Dynarski 2000). The main objective, cited by policymakers, for this shift to merit-based aid is the need to stem the migration of top high school graduates to out-of-state colleges (Heller 2006).[3] The statewide shift in financial aid policy away from need-based support to merit-based aid should have negative implications for the decision of low-income and lower ability students to enroll in college. Thus, this study will also examine whether and how state policies differentially affect high school graduates' decision to attend college in-state or out-of-state depending on their academic ability, income and college major.

Most of the research on students' college choice decisions focuses on only the extensive margin of college enrollment or the choices between a two-year and a four-year college or a public and a private institution. This study fills a void in the literature by examining the interstate migration of high school graduates. Its findings may assist policymakers in assessing the differential impact of alternative state policy measures on the college choice decisions of students from different ability groups. Thus, this research will provide deeper insights into the ability and income gaps in college choice decisions and

[2] From 2005-06 to 2011-12, the average public four-year college tuition increased by about 31 percent, after adjusting for inflation (College Board 2011).

[3] Pioneered by the State of Georgia (which introduced its HOPE Scholarship Program in 1993), these scholarships can be used only at in-state colleges. Fourteen other states have implemented similar statewide merit-based scholarship programs since then (Orsuwan and Heck 2009).

the effectiveness of state policy interventions in reducing such gaps. For this purpose, I make use of a relatively new micro data set (Education Longitudinal Study) that surveys a recent cohort of high school graduates (2004 cohort). To the best of my knowledge, this is the first paper to use this data set for such an analysis.

The rest of the paper is organized as follows: The next section provides a conceptual framework for understanding college location choices. Section 3 elaborates on the research design used. Section 4 describes the dataset and variables used. Section 5 gives the results. The last section includes a discussion of the empirical results and contains some concluding remarks.

2. CONCEPTUAL FRAMEWORK

2.1. College choice

Most of the research on the college choice behavior of high school graduates views the college decision as a process involving a number of broad stages. The choice process begins in high school when students form aspirations to continue their formal education beyond high school and attend college (*predisposition*). They next search for information about colleges and develop a choice set of colleges to apply to for admission (*search*). In the final stage, students apply to these selected colleges, compare alternatives among their admission offers and choose to enroll in a particular college (*choice*) The student's decision at each phase of the college choice process is influenced by individual characteristics like academic achievement in high school, socioeconomic background (usually measured by means of family income and parental education), as well as state and institutional policies. Most studies in this area have centered on the final stage of the process - the actual choice stage, modeling the decision as either a binary between college and the labor market or a multinomial choice involving a wider set of alternatives (including the choice between a two-year college, a four-year college and the labor market or between a private institution, a public institution and the labor market).[4]

2.2. College location choice

This paper also focuses on the final stage of the process, examining an important aspect of students' college choice decision - location. I investigate the factors that determine whether high school graduates choose to attend college in their home state or out-migrate to a different state for higher education. And since most of the college student migration happens at four-year institutions, this study is limited to only analyzing the migration behavior of freshmen enrolling in four-year colleges.[5]

[4] There is an extensive literature in this area. Some examples include Becker (1990), Kane (1994), Rouse (1994), Behrman et al. (1995), Cameron and Heckman (1997), Ellwood and Kane (2000), Carneiro and Heckman (2002), Nguyen and Taylor (2003), Sa, Florax and Rietveld (2004), Kane (2006), Belley and Lochner (2007), Lovenheim and Reynolds (2011) and Dale and Krueger (2011).

[5] Previous literature indicates that students enrolling in two-year colleges are much more likely than those enrolling in four-year institutions to attend college in their home state. This is not surprising since the purpose of community colleges is not to recruit nationally but to serve the local population. Further, most two-year institutions do not have residence halls and students who choose two-year colleges are often making their decision based on their need to be near their

Further, I make the assumption that supply is infinitely elastic i.e. supply is completely responsive to demand changes in higher education. Given that 82% of students from the high school class of 2004 in my data sample report being accepted at either all or all but one college applied to, this seems to be a reasonable assumption. Thus, like most studies, I focus on the demand side of the equilibrium but not the supply side.

To study cross-state migration for four-year college attendance, this paper includes both individual-level and state-level factors as controls to account for students' behavior and constraints from each phase of the college choice process. Becker's (1964) human capital investment theory views college choice as an investment in human capital, with associated costs and returns over time. A prospective student will migrate to a state to attend college if the present value of the expected benefits from attending that out-of-state institution and moving to that location exceeds the added costs of migration (e.g. out-of-state tuition, travel costs and psychic costs of being away from home), given the individual's personal tastes and preferences (Becker 1964; Tuckman 1970; McHugh and Morgan 1984; Perna and Titis 2004). For a forward-looking agent, the benefits of moving to attend college in a given state could include both non-monetary benefits associated with the state (e.g. warm climate, better recreation facilities, independent living etc.), which are enjoyed while the student remains in school, and the potential monetary benefits of locating in a state that offers better economic opportunities, (usually coming in the form of higher future wages and salaries), should the student choose to remain in the college state upon graduation (McHugh and Morgan 1984; Mixon and Hsing 1994; Mak and Moncur 2003). Thus, a traditional economic perspective posits that college location choice is influenced by anticipated benefits and costs, financial resources, academic ability, perceived labor market opportunities, personal preferences and tastes, and uncertainty (Becker 1962; Perna and Titus 2004).

College student migration might also be explained by a consumption theory of demand. High school graduates may choose to attend a college outside their home state and be willing to bear the additional costs of moving for the high current consumption benefits associated with that college like location, climate, the local amenities (such as art galleries, recreational facilities etc.), courses or student culture. Human capital theory is consistent with this consumption view of college student migration (Tuckman 1970; Mixon and Hsing 1994; Sa, Florax and Rietveld 2004).

In addition to the human capital investment and consumption motives, a high school graduate's college behavior is limited by choices of higher education institutions, as reflected in their admission decisions. Access to high quality colleges is restricted to the more skilled and intellectual students. Thus, postsecondary institutions serve as a screening or filtering device and are selective in offering admission. Some research models the behaviors of institutions (e.g. Kane 1998; Rigol 2003; Long 2004; Clinedinst and Hawkins 2009); those that don't model it explicitly must include controls for the attributes likely to be considered by college admission officers in deciding whether to accept students or not. One of the most important factors used to screen applicants is high school performance. Thus, test scores are an essential control.

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families or their need to work full-time, all of which requires them to enroll in an in-state college (Rouse 1994; Zhang 2010).

Family income is also important empirically in the college location decision, and may reflect elements of the mechanisms described above. The human capital theory in the literature views college location choice as a long-term investment in human capital. With perfect capital markets, students should be able to borrow at their internal rate of return to the investment and, thus, changes in family resources should not really affect such long-term investment decisions. However, since students can't offer their future earnings as collateral to private lenders, they may not be able to borrow at the theorized interest rate, creating the possibility for a binding liquidity constraint that affects college location choice (Ellwood and Kane 2000; Lovenheim and Reynolds 2012). In addition to this credit constraint, financially disadvantaged students may also face information barriers, as children from less affluent backgrounds in low-informational settings lack networks to provide information about colleges in different locations and the different kinds of financial aid available (Avery and Hoxby 2004; Dynarski and Scott-Clayton 2006). For these reasons, family income is considered to have an important effect on college location choice in my model. However, past research on students' college choice behavior suggests that family income may be subject to measurement error which could bias its impact. Thus, most of the previous studies include parental education in their empirical models since parental education is correlated to family income and is likely to be more accurately measured (Ellwood and Kane 2000). I follow a similar strategy and control for parental education.

As an important source of social capital, I expect parental involvement in the college choice process to also influence students' in-state versus out-of-state college location decision. In fact, past research suggests that parent-student interactions about various educational issues provide necessary social capital in the form of resources to help students plan, prepare for and access college (Perna 2000; Perna and Titus 2004). In addition, I control for distance to a nearest college to measure proximity from one's home to a closest postsecondary institution, which may indicate the availability of postsecondary educational opportunity in one's residence. Further, I consider whether foreign-born high school graduates differ from native-born in terms of their migration behavior. However, it is important to note, right at the outset, that this paper does not speak to foreign students moving to the U.S. for college. This is because the data used here only includes those foreign-born students who arrived in the U.S. by the tenth grade.

Finally, I control for an indicator of whether a college enrollee planned to choose engineering or computer science as a major. The main rationale for focusing on engineering and computer science students' interstate migration decisions for college is that these are the two highest paying fields in the U.S. (National Association of Colleges and Employers 2013). State policymakers would, thus, like to retain these students to attend college in-state and then later join the home state workforce so that they could contribute to the local economy through their higher taxes. Further, individuals from these two fields are likely to determine the capacity of a state's workforce to respond to the engineering and technological needs of the marketplace in today's knowledge-based economy (Tornatzky et al. 2001).

Since individual students are nested within states, their college choice decisions may also be subject to the state's public policies. The direct cost of attending a higher education institution, as measured by a state's tuition policy, is one such policy measure to consider. While some studies (McHugh and Morgan 1984; Baryla and Dotterweich 2001; Perna and Titus 2004; Smith and Wall 2006) find that tuition rates do not significantly influence migration decisions of college-bound students, other research suggests that cost does make a difference in the college location choice and that states with high resident tuition policies have higher out-migration rates (Tuckman 1970; Mixon 1992; Mak and Moncur 2003). Although most of the previous literature has considered state differences in tuition charges as the only source of variation in college costs, an important issue in individual-level studies is that these prices are not specific to an individual's ability. Given this caveat and caution, one of the main challenges of this paper is determining the appropriate college price/tuition level for each student that not only varies by home state of the individual but also by student ability. This requires a measure of ability. For this I draw on Dale and Krueger's 2011 paper on the labor market returns to college quality in which students reveal their potential ability, motivation and ambition by their college application behavior. More specifically, Dale and Krueger adjust for unobserved student ability by controlling for the average SAT score of the colleges that students applied to. This paper employs a similar approach to measure student ability and evaluate college prices specific to each individual's ability. The technical details of how I constructed college prices will be discussed in detail later.

Actual college costs depend critically on financial aid. If costs pose an obstacle to college going and constrain students' choices, financial aid is supposed to reduce the problem and increase students' college choices. There is an extensive literature on the impact of state financial aid on college student migration. Tuckman (1970) presented the first findings in this context and concluded that home state financial aid seemed to be unimportant in determining student out-migration. However, at the time of Tuckman's study, the nature of financial aid was very different from what it is today. More recent research shows that among various forms of student financial aid, merit-based scholarship programs are most instrumental in retaining high school graduates at in-state institutions (Mak and Moncur 2003; Dynarski 2004; Orsuwan and Heck 2009; Zhang and Ness 2010). Studies looking at the impact of Georgia's HOPE program found that the percentage of students out- migrating from Georgia to attend college in another state declined significantly after the implementation of HOPE (Dynarski 2004; Cornwell et al. 2006). Binder et al. (2002) provided evidence to show that New Mexico's Lottery Success Scholarship program increased the enrollment of local high school graduates within the state. In total, these findings demonstrate that a state's financial aid policy is important in influencing migration for college and, hence, I include it as a control in my empirical model.

In addition to state financial aid and tuition that directly impact students' college affordability, state appropriations for higher education is considered in the empirical model in order to control for other potential enrollment effects attributable to states' investment in institutions. This paper also includes a covariate that measures variability in states' capacities to retain students. Most past studies have used the actual count of schools to capture this effect (Tuckman 1970; Mixon and Hsing 1994; Mak and Moncur 2003). However, given that the sizes of institutions vary from state to state, the number of schools in a state may not provide much insight into the capacity of a state to retain or attract students. Thus, this paper makes use of a more effective measure for capacity, which will be discussed in detail in the data section.

I also control for the selectivity or quality of higher education in given state. Past studies have found mixed evidence, with some suggesting that migrants are attracted to states with high quality institutions (Mixon 1992; Baryla and Dottenveich 2001) and others, like McHugh and Morgan (1984), finding that students tend to migrate to states where a greater proportion of colleges have low admission standards. Since college-going students are a diverse group with different academic abilities, it could be that high ability students are attracted to quality, while low ability students are drawn to states that have less selective institutions. Thus, this paper examines the impact of quality of higher education in the individual's home state by academic background of the students.

An important point to note is that even after controlling for the above state-level variables, there could be unmeasured state-specific differences in the propensity to out-migrate for college. However, including state dummies will make it impossible to identify the main effects of state-level policy measures in a cross-section of graduates. Thus, my empirical model includes dummy variables indicating the geographic region of the student's high school to account for potential cross-region differences in the emigration propensity for college.

3. RESEARCH DESIGN

Building upon the key insights from literature, the model estimated in this paper specifies that the potential college student makes two sequential decisions: (1) whether to enroll in a postsecondary institution or not and (2) if so, whether to enroll in an institution in one's home state (in-state) or move out-of-state to attend college. The model can thus be defined as:

Selection equation:

$$C_{ij} = \begin{cases} 1 \text{ if individual } i \text{ from state } j \text{ enrolls in college (i.e. } C^*_{ij} = \beta_1 X_{1ij} + \mu_{1ij} \geq 0) \\ 0 \text{ if individual } i \text{ does not enroll in college (i.e. } C^*_{ij} < 0) \end{cases}$$

Outcome equation:

$$OS_{ij} = \begin{cases} 1 \text{ if individual } i \text{ enrolls in an out-of-state college (i.e. } OS^*_{ij} = \beta_2 X_{2ij} + \mu_{2ij} \geq 0 \text{ and } C_{ij} = 1) \\ 0 \text{ if individual } i \text{ enrolls in an in-state college (i.e. } OS^*_{ij} < 0 \text{ and } C_{ij} = 1) \\ \text{not observed (i.e. } C_{ij} = 0) \end{cases}$$

(μ_{1ij}, μ_{2ij}) BVN(0,0,1,1ρ)

where C^*_{ij} and OS^*_{ij} are the latent variables determining enrollment in college and in-state versus out-of-state attendance decisions, respectively. Consistent with the conceptual framework outlined earlier, .X_{1ij} and X_{2ij} are vectors of student-level variables (indexed by *i*) and state-level variables (indexed by *j*) related to students' human capital investment and consumption motives and institutions' admission decisions. Since the outcome of interest: a high school graduate's decision to enroll in an in-state versus an out-of-state institution, is only observed for a select nonrandom sub-sample of students who enroll in college, a probit model with sample selection is estimated. The advantage of this specification is that it accounts for potential correlation between the college enrollment and college location decisions and, thus, corrects for potential sample selection bias that could result from separately estimating the two equations. The model assumes that the error terms μ_{1ij} and μ_{2ij} are distributed bivariate normal (BVN) with ρ representing the correlation coefficient between the two. The appropriateness of these assumptions is addressed later in the results section.

The log-likelihood function for N students, as specified by Meng and Schmidt (1985) is:

$$LnL(\beta_{1,} \beta_{2,} \rho) = \sum_{i=1}^{N} C_{ij}OS_{ij}\ln\Phi(\beta_1X_{1ij,} \beta_2X_{2ij}; \rho) + C_{ij}(1\text{-}OS_{ij})\ln[F(\beta_1X_{1ij})\text{-}\Phi(\beta_1X_{1ij,} \beta_2X_{2ij}; \rho)] + (1\text{-} C_{ij})\ln[1\text{-} F(\beta_1X_{1ij})] \quad (1)$$

where Φ and F respectively denote the bivariate standard normal cumulative density function and the univariate standard normal cumulative density function for the errors in (1). The parameters of the probit model with sample selection are estimated by maximizing this log-likelihood function.

As discussed in detail in the data section, the Education Longitudinal Study used in this study was obtained through a complex survey design. Thus, probability weights are applied in all regressions used in this paper to account for unequal probability of selection and produce results that can be generalized to the nationally representative population of high school graduates of 2004 (Dowd and Duggan 2001; Ingels et al. 2007). The Taylor series linearization method is used to compute sample variances.[6] The resulting variance estimates of the regression coefficients are adjusted for the design effects resulting from stratification.[7] In the linearization method, the regression coefficient estimates are linearized using a Taylor series expansion. The variance of the estimate is then approximated by the variance of the first-order or linear part of the Taylor series expansion (Charleston et al. 2003).

4. DATA, SAMPLE DEFINITION AND DESCRIPTIVE STATISTICS

4.1. Data

To analyze the interstate migration of the 2004 cohort of high school graduates I use the Educational Longitudinal Study (ELS: 2002) data set. These data are collected by the National Center for Education Statistics (NCES), U.S. Department of Education. The ELS collects information on a nationally representative cohort of about 16,000 high school students in the U.S. from the time they

[6] Statistical methods for the computation of sampling variances of non-linear statistics (like ratio estimates and regression coefficients) in the case of complex survey data include Taylor series linearization and Replication - Balanced Repeated Replication, and the Jackknife Replication (Charleston et al. 2003). Replication techniques require more extensive computation than the Taylor series linearization method and are, thus, more computer-intensive. Replication techniques are computer-intensive, mainly because they require the computation of a set of replicate weights, which are the analysis weights, re-calculated for each of the replicates selected so that each replicate appropriately represents the same population as the full sample (Yansaneh 2003).

[7] Design affect is defined as the ratio of the sampling variance of the statistic under the actual sampling design divided by the variance that would be expected for a simple random sample of the same size.

were in the tenth grade in 2002 through 2006 (two years after their scheduled 2004 high school graduation). I obtained this data set from the NCES under a restricted license after meeting stringent security requirements.

The sampling design of the ELS survey consists of a stratified two-stage sample selection process. In the first stage, all high schools in the U.S. were stratified based on combinations of school type, geographic region, urbanization and minority composition and a sample of schools (752) was drawn with probabilities inversely proportional to school size. In the second stage, approximately 26 students were randomly sampled within each school and several additional students were oversampled from Hispanic and Asian populations to obtain adequate subsamples from these groups. [8]

ELS includes information on students' high school state and college state (for those who enrolled in a postsecondary institution) using which I define individuals who went to college "in-state" as those for whom both high school and college are located in the same state. In addition, since the ELS collects data from multiple data sources (e.g., student interviews, parent interviews, high school transcripts, standardized tests), it includes detailed information on an individual's socio-demographics, family background, high school performance, providing sufficient controls for the mechanisms discussed earlier.

In order to identify the specific colleges that ELS participants applied to and attended, I obtained college identifiers from ELS. I then matched these school identifiers to the Integrated Postsecondary Education Data System (IPEDS), also collected by the NCES. In this way I obtained detailed institutional information such as college names, zip codes, tuition, college quality, faculty and student characteristics.

I collected state-level data on average tuition prices and annual state appropriations from the Digest of Education Statistics (NCES 2005), financial aid information (both need and non-need based aid) from the annual survey report of the National Association of State Student Grant and Aid Programs (NASSGAP 2004), selectivity of postsecondary institutions from the Barron's Guide to American Colleges (Barron's College Division 2005), and other state characteristics like unemployment rate, median earnings from the Current Population Survey (U.S. Bureau of the Census 2005).

4.2. Sample definition

To focus on the college decision, the study sample for ELS is restricted to students who graduate with a high school diploma or GED in 2004 (17% of sample dropped). I also exclude students who attended high schools in the District of Columbia (less than 0.3% dropped) because DC is not comparable to a state (e.g. the absence of public two-year institutions in DC). I excluded cases with key missing variables i.e. individuals with missing information on whether enrolled in college or not by end of study period in 2006 and cases who were college enrollees but had missing information on in-state versus out-of-state attendance were dropped (about 16% dropped). Further, high school graduates who

[8] For more information on the ELS sample see *Education Longitudinal Study of 2002: Base-Year to Second Follow-up Data File Documentation* (Ingels et al. 2007).

attended private for-profit institutions are excluded (only 310 high school graduates i.e. about 3%). These restrictions yield a study sample of 9870 high school graduates in 50 states.[9]

4.3. *Variable description and descriptive statistics*

As discussed earlier in section 2 of the paper, the vast majority of student migration happens at four-year institutions. Because outcome (out-of-state versus in-state enrollment) will only be observed for those enrolled in a four-year college, there is concern about selection. Accordingly, the dependent variable for the selection equation takes a value of 1 if the 2004 high school graduate had enrolled in a four-year college by the end of the study period in 2006 (49% or 5360 students in my data sample), and 0 if the individual had not (includes both - those who enrolled in a two-year college and those who did not enroll in college at all). The dependent variable for the outcome equation takes a value of 1 if the four-year college enrollee had enrolled in an out-of-state institution and 0 if he/she had enrolled in an in-state institution. This study focuses on the location of the first postsecondary institution attended by the student (excluding summer schools). Within the sample of four-year college enrollees in my data, 3900 (73 %) chose to enroll in an in-state college, while 1460 (27%) chose to enroll in an out-of-state college.

Table 1 presents the distribution of the 2004 high school graduates across all the student-level independent variables used in my analysis. To analyze the impact of ability and achievement in high school on college student migration, I make use of the standardized composite test scores on the reading and mathematics sections of tests conducted by NCES as part of the ELS data collection in 2002. As is common in the literature (e.g. Kinsler and Pavan 2011), I partition the distribution of test scores into quartiles. A second measure of achievement in high school used is the GPA for all 12th grade courses. This is dichotomized into high GPA (>2.5) and low GPA(≤2.5). As Table 1 shows, as we move from the lowest to the highest test score quartile, the proportion of high school graduates enrolling in four-year college, both in-state and out-of-state, increased. About 27% of high school graduates in the top test score quartile chose to attend a four-year out-of-state college as compared with 4% in the lowest quartile. The percentage of high school graduates attending an in-state college also increased, albeit by a smaller factor (from 15% to 54%), as we move from the bottom to top test score quartile. In contrast, as we move from the lowest to the highest quartile, the proportion of high school graduates who did not enroll in a four-year college decreased from 81% to 20%.

Table 1 also shows that approximately 31% of college enrollees who reported plans to choose engineering or computer science majors attended an out-of-state college as compared with 27% of those who planned to pursue other majors. In contrast, 69% of college-going individuals with plans to pursue these two fields chose an in-state college, compared with 73% of those who planned to major in other fields.

I also divide the distribution of total family income into quartiles.[10] Dividing into quartiles helps reduce the bias due to measurement error that may be present in family income data and also helps in

[9] All unweighted sample size numbers in this paper are rounded to the nearest 10 in compliance with the Institute of Education Sciences policy.

determining nonlinearities in the impact of income on college location choice (Kinsler and Pavan 2011). [11] As Table 1 shows, among students in the lowest income quartile 68% attended no four-year college, while only 25% of students in the top quartile did not attend a four-year college. By contrast, in-state attendance among youth from the richest families (45%) was almost twice that of in-state enrollment among students from the poorest families (26%), while out-of-state enrollment increased by an even larger amount - students in top quartile had an out-of-state enrollment (30%) which was as much as 5 times as that of out-of-state enrollment among students in the lowest quartile (6%).

I define parental education as the maximum education received by a parent in the household. Three dummies were included: high school graduate or less, some college and college graduate. The reference category is graduate degree. Table 1 reports that in-state attendance and out-of-state attendance both increased (27% to 46% and 5% to 27% respectively), as parental education increased, while the proportion of students who did not enroll in college decreased (from 68% to 26%).

Foreign-born students in my sample are divided into two categories – those who moved to the U.S. closer to high school graduation and those who moved sometime back to the U.S. with their parents to settle. The first type are defined as those foreign-born students who moved to the U.S. within three years of the time they started tenth grade in the U.S. The second type are defined as those who had been in the U.S. longer. As Table 1 shows, in-state attendance was highest amongst foreign-born students who moved to the U.S. closer to high school graduation (41%), as compared to both foreign-born students who had moved sometime back to the U.S. with their parents to settle (32%) and U.S. born students (37%). On the other hand, foreign-born students who had moved to the U.S. closer to high school graduation had the lowest out-of-state attendance (6%) relative to the other type of foreign students and their domestic counterparts (10% and 14% respectively).

The ELS data have several different variables that reflect how often parents and students interact on various issues. Following Perna & Titus (2004), I construct a single measure of parental involvement from eight of these variables using factor analysis.[12] Table 1 shows that both in-state attendance and out-of-state attendance increased (26% to 39% and 7% to 15% respectively), as parental involvement increased, while the proportion of students who did not enroll in college decreased (from 68% to 47%).

The distance from an individual's high school location to the nearest four-year university is calculated by first computing the distance from the high school a student attended to all four-year degree granting institutions and then obtaining the minimum distance value. The list of four-year degree granting institutions available for the year 2004 and their zip codes is obtained from the IPEDS survey data. The ELS has information on an individual's high school zip code. After obtaining the geographic co-

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[10] Family income, as well as any other monetary measures used throughout the paper have been converted to 2004 dollars using the CPI-U.

[11] The four income groups in 2004 dollars are: $0- $37,330, $37,330- $80,000, $80,000 - $106,660 and >$106,660.

[12] The eight components are: frequency of discussions between parents and children about high school course selections, school activities, course topics, grades, SAT or ACT preparation, plans for applying to college, current events and troubling things. The alpha reliability coefficient for this factor is 0.9.

ordinates (latitude and longitude) for all the four-year institutions and the students' high schools, I calculated the minimum "great-circle distance" ("as the crow flies") between each student's high school and the nearest four-year postsecondary institution (the earth is assumed to be a perfect sphere with a radius of 3963 miles). As indicated by Table 1, students who attended an in-state college face the lowest average distance to the nearest four-year college (8 miles).

5. DEFINING STATE POLICY MEASURES

All state-level variables are measured as of 2004, the year of high school graduation for the sample. Although some students enroll in 2005 or 2006, the 2004 state-level variables are highly correlated with both 2005 and 2006 measures (over 0.9). Thus, including 2004, 2005 and 2006 state-level variables simultaneously in the regression models would introduce multi-collinearity, which would lead to large standard errors and reduced stability of the estimated coefficients. State-level measures are produced to capture college prices, both in-state and for other states, and policy measures for the state of residence.

5.1. Calculating college prices

As mentioned in section 2 of this paper, one of the main challenges is determining the appropriate home state and out-of-state college price/tuition level for each student. I consider two approaches, both of which are outlined below.

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

In the first approach, the cost of attending an in-state public college for each student is measured by the average resident tuition at all public four-year institutions in the individual's home state, weighted by the fall 2003 full-time-equivalent (FTE) enrollment of undergraduates in each college. In order to construct the summary measure of out-of-state tuition across the other 49 states, I, first, compute non-resident public tuition in each state as the average of non-resident tuition at all public four-year institutions in that state, weighted by the fall 2003 enrollment of first-time freshmen from out-of-state in each institute. Next, I sum these across the 49 states (all states but the student's home state) using two alternative aggregates:

(i) I compute the weighted average of non-resident tuition in the other 49 states and the set of 49 weights for students from a particular home state is determined by the proportion of students from that state out-migrating to each of the other 49 states for college. For example, of the New Jersey students who out-migrate to attend college, 39% enroll in a college in Pennsylvania and about 20% enroll in New York colleges. Thus, for a student from New Jersey, a weight of 0.39 is assigned to the average non-resident tuition in Pennsylvania and 0.2 to non-resident tuition in New York, etc.

(ii) As an alternative aggregation approach, I weight the non-resident tuition in each of the other 49 states by the inverse of the distance between that state and the individual's home state and then compute the weighted average of non-resident tuition in the other 49 states.[13]

Similarly, I include the average tuition (weighted by FTE enrollment) at all private four-year colleges in the individual's home state as the cost of attending an in-state private college and the constructed weighted average of tuition at four-year private colleges in the other 49 states as the cost of attending a four-year private college out-of-state (weights calculated according to both the above mentioned approaches).

Table 2 presents summary statistics of all state-level variables across the different postsecondary choices (non-enrollment, in-state and out-of-state enrollment). The table shows that when prices are calculated according to the market based approach, the average cost of attending a public college in one's home state varies between $5,141 and $5,515 (in 2004 dollars), depending on the college choice. The average cost of attending an out-of-state public college ranges between $13,023 and $13,602. On the other hand, the average in-state cost of attending a private college varies between $17,746 and $18,512, while the average out-of-state private college cost varies between $16,400 and $18,358.

While it is relatively straightforward to calculate prices according to the market based approach, the disadvantage is that all students from a particular state are assumed to face the same price irrespective of their interest in schools or ability i.e. the prices are not specific to an individual's ability. The next approach corrects for this drawback.

B. College prices vary depending on student ability

B1. Student ability measured by high school GPA and high school quality:

This approach allows college prices to vary based on ability, where ability is measured by high school GPA and quality of high school attended by the student.[14] In order to calculate the cost of attending a four-year in-state public college, I first restrict my sample to those who attended a four-year public college in their home state and run the following regression for the restricted sample.

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

[13] The distance between any two states is defined as the distance between the population centroids of the states.

[14] As a simpler variant, I also tried an approach that allowed college prices to vary depending on just high school GPA. For each student i, I obtain the particular category his high school GPA falls under. I next obtain the list of colleges attended by those students in the analysis sample falling under the same category of GPA. This approach assumes that all these colleges are appropriate and potentially accessible to individual i. Thus, the cost of attending an in-state public college for student i is calculated as the average resident tuition at all the relevant public four-year institutions in the individual's home state. For individual i, the cost of attending a four-year public college out-of-state is measured by constructing the weighted average of non-resident tuition at the relevant four-year public colleges in the other 49 states (weights calculated as inverted distance measures). The limitation of this approach is that all students from a particular state and falling under a specific category of GPA are assumed to face the same set of college prices irrespective of the quality of high school attended.

P_i is the price of college attended for individual *i* (i.e. resident tuition at the public college attended by individual *i*), *GPA* is the high school GPA and *hsquality* is a measure of quality of the high school attended by individual *i*. I use percentage of 2003 high school graduates who attended a four-year college as a measure of high school quality. *hsprivate* is an indicator for whether the high school attended is private or public and S_i is a vector of dummy variables indicating individual *i's* home state.

I then use the OLS coefficient estimates obtained to get the predicted cost of attending a four-year in-state public college for everybody in sample. To calculate the cost of attending a public college out-of-state, I estimate equation (2) for the sample that attends a four-year public college outside their home state and then obtain the predicted cost of attending an out-of-state public college for everyone in the sample. Similarly, I get the cost of attending a four-year private college in the individual's home state and out-of-state.

Table 2 shows that when prices are calculated according to this approach, the average cost of attending a public college in one's home state varies between \$4,860 and \$5,673, depending on the college alternative. The average cost of attending an out-of-state public college ranges between \$12,732 and \$14,439. On the other hand, the average in-state cost of attending a private college varies between \$16,200 and \$19,565, while the average out-of-state private college cost varies between \$16,844 and \$21,608. Another important point to note from Table 2 is that making price depend on ability increases the average public and private college costs (in the home state and out-of-state) and increases the variance, suggesting that these measures better fit real prices faced by students

In the next variant of college prices, I use the student's application behavior to provide a signal of the individual's potential ability.

B2. Potential ability signaled by the choice of schools applied to:

Following Dale and Krueger (2011), for each individual *i*, I calculate the average Barron's index of college selectivity of all four-year institutions the student applied to. This provides a signal of the individual's potential ability. Assuming that all colleges in the data sample falling under that particular category of the Barron's index are appropriate and potentially accessible to individual *i*, the cost of attending an in-state public college for student *i* is then measured by the average resident tuition at all public four-year institutions falling under the associated Barron's category in the individual's home state. The cost of attending a four-year public college out-of-state is measured by constructing the weighted average of non-resident tuition at four-year public colleges falling under the associated Barron's category in the other 49 states. I weight the tuition in each of the other 49 states by the inverse of the distance between that state and the individual's home state. Similarly, I calculate the cost of attending a four-year private college in the individual's home state and out-of-state.

Table 2 shows that when prices are calculated according to this approach, the average cost of attending a public college in one's home state varies between \$4,434 and \$4,647, depending on the college alternative. The average cost of attending an out-of-state public college ranges between \$12,616 and \$13,505. On the other hand, the average in-state cost of attending a private college varies between

$16,588 and $18,715, while the average out-of-state private college cost varies between $17,384 and $19,105.

The main advantage of this approach is that it allows college costs to vary depending on the individual's ability. However, a potential limitation of using average selectivity of colleges applied to as a signal of ability is that all students in the sample might not have similar application strategies. It is possible that low income students apply to fewer schools and, thus, a lower average Barron's index of colleges applied to could be a reflection of financial constraints that limit the college application choice rather than a signal of poor ability. However, the fact that there is a very low correlation of about 0.2 between students' family income and number of colleges applied to in the ELS data sample indicates that this might not be a big problem.

Both measures that account for ability (approach B1 and B2) have the advantage of within state variation. In other words, even students from the same state could face the different college prices if they have different academic abilities. In fact, approach B1 assigns a different price to every single individual based on his/her GPA and high school quality. The correlation between these different college price measures can be found in Appendix Table A. The main thing that jumps out from this table is that the approach that allows college prices to vary based on student ability (approach B) is very different from the market basket approach (approach A). This is evident from the fact that prices based on the market basket of all four-year colleges are only weakly correlated with prices that account for ability. For instance, if we look at the cost of attending an in-state public college, calculated according to different approaches, we find that correlation between the market basket measure and the measure that accounts for ability ranges between 0.5-0.6 depending on whether ability is signaled by students' college application behavior (approach B1) or by their high school quality and GPA (approach B2). Similarly, looking at the cost of attending an out-of-state public college, we find a very low correlation of about 0.2 between approach A and approach B. The second important thing that emerges from Table A is that within the approach that allows college prices to vary based on ability, there is also a weak correlation between the measure which uses college application behavior as a signal of ability and the measure which uses high school GPA and quality as an indicator of ability. For example, if we look at the cost of attending a public college in one's home state, there is a low correlation of 0.6 between the two measures that use different indicators of ability. An even lower correlation of 0.2 is present between these two measures, when we look at cost of attending a public college outside one's home state. This suggests that results based on each of these approaches of measuring college prices (approach A, approach B1 or approach B2) should be very different.

Comparing college prices across the three postsecondary choices, Table 2 demonstrates that, irrespective of the approach used to measure college prices, students who decided to stay back in their home state for college came from states with lower average public college resident tuition and private college tuition, as compared with students who moved away from their home state for college. For instance, when prices are calculated based on the market basket approach, in-state college attendees faced an average public college resident tuition cost of $5230 (2004 dollars), which is about $285 less than what out-of-state college attendees faced. Students who attended an in-state college also faced a lower average private college tuition cost in their home states ($18,052) as compared to students who chose to move out-of-state for college ($18,512). Interestingly, out-of-state college attendees also faced the highest cost of attending an out-of-state college. This is once again true across all price measures. Looking at the market basket approach of measuring college prices, the average cost of attending an out-of-state public college (weights calculated as inverted distance measures) is $13,268 for students who chose to move out of their home state for college, which is about $137 more than the out-of-state cost faced by in-state college attendees. The difference ($340) is even larger when we compare the average cost of attending an out-of-state private college for out-of-state college enrollees ($16,930) and in-state college enrollees ($16,590).

5.2. Other state policy measures

I use several variables to control for other features of state policy that may be important for student college choice. Total state spending on higher education per traditional college-age (18 to 24 year old) population in the individual's home state for the year 2004 is straightforward. To measure state financial aid, I include the amount of state need-based and also non-need-based grant aid per college-age person. Following the usual practice in cross-sectional studies on college choice (e.g. Ellwood and Kane 2000; Perna and Titus 2004), I do not include federal grant aid programs (e.g. federal Pell Grant), since federal programs are available to all students in the country and, thus, such variation is not helpful in examining the impact of college costs on student's college location decisions in the cross-section. Further, I include the number of enrollment slots or seats per college-age student in the individual's home state as a measure of state capacity.

Selectivity of higher education in the individual's home state is measured by the Barron's index of college selectivity for the flagship institution in the home state. Because there were only one or two colleges in some categories of the Barron's index, I represent the index with an admittedly crude continuous variable. The selectivity of flagship schools ranged from "Competitive" (coded a 2 on my continuous measure) to "Most Competitive" (coded a 5 on my continuous measure). As a second measure of quality of education in the individual's home state, I also constructed a composite college quality measure for the flagship institution in the home state.[15] This measure of quality is highly correlated (0.8) to the measure based on Barron's selectivity index and the results using both are qualitatively and quantitatively similar. As with college price measures, I construct an out-of-state selectivity aggregate by taking the weighted average of Barron's index for flagship institutions in the other 49 states. The correlation between these different state policy measures can be found in Appendix Table B.

Table 2 shows that students who attended an in-state college came from states with highest average state spending on higher education per college-age student ($6,295 compared to $6,201 and $6,158 for out-of-state college enrollees and non-enrollees, respectively). Similarly, average need-based aid per

[15] This composite measure is based on 6 equally weighted and standardized measures of college quality. Following Lovenheim and Reynolds (2012), the 6 quality measures used are: flagship school's graduation rate, instructional expenditures per full-time equivalent enrollment, faculty- student ratio, tuition and fees, 25th and 75th percentile of SAT Math scores of the entering freshmen class.

college-age student was highest in home states of in-state college attendees ($174 compared to $163 for out-of-state college attendees and $155 for non-attendees). The same holds true for non-need-based grant aid. In-state college attendees came from states with an average non-need-based aid of $74 per college-age person, compared to $66 for out-of-state college attendees and $59 for non-attendees. Further, in-state attendees lived in states with the most selective flagship institutions, while students who chose to move out of their home state for college lived in states with the least selective flagship colleges. Moreover, out-of-state attendees had the highest weighted average selectivity measure in all states but their home state (i.e. the highest out-of-state selectivity measure).

6. RESULTS

6.1. Impact of academic ability/achievement in high school

Table 1 is a simple one-way tabulation of out-of-state attendance rates by academic ability/ achievement in high school (as measured by test scores) and, also, by family income and parental education, among other variables. However, the impact of student academic ability on the probability of enrolling in an out-of-state college cannot be studied in isolation and is likely to be confounded by differences in family background variables like family income. It could be that higher ability students are also from higher income families and, thus, are not only better informed about opportunities for college outside their home state but are also better able to afford an out-of-state college. So it is quite possible that differences in family background account for much of the difference in out-of-state attendance rates between students in the low and high test score quartiles. In order to study this proposition in greater detail, I compare the four year college out-of-state attendance rates by test score quartiles for college enrollees with similar family income.

I first present a simple cross-tabulation. For students in each family income quartile, Table 3 shows how the percentage of students enrolling in a four-year out-of-state college varies by test score quartile. In addition to the reading and math composite test score quartiles, I also use math test scores in the table (used by studies on college enrollment and college-choice like Ellwood and Kane (2000) and Kinsler and Pavan (2011)), to see if there is a significant difference in the impact between composite and math test scores.

Within each test score quartile, family income is found to be strongly correlated to out-of-state enrollment. For instance, within the bottom test score quartile, out-of-state enrollment rate rises from 3% to 12% as family income quartile rises from the lowest to the highest. For college enrollees in the top test score quartile, out-of-state attendance rate rises from 14% to as much as 42% when one compares students in the lowest income quartile to those in the highest. However, as important as family income is in explaining out-of-state enrollment, Table 3 illustrates that even when income is kept constant, test scores remain a powerful predictor as well. If a student is in the lowest family income quartile, the odds of attending an out-of-state college increased from 3% to 14% as test score quartile rose from lowest to highest. Results are even more dramatic among students from the highest income families - about 12% of college enrollees in the bottom test score quartile move out-of-state for college, while as many as 42% of those in the top test score quartile do so.

Similar results are obtained when I use math test scores as a measure of achievement in high school. As the bottom panel of Table 3 demonstrates, family income continues to play a powerful role in the probability of enrolling in an out-of-state college. But even within income categories, significant differences in out-of-state attendance rates remain by math test scores. For instance, even among students from the richest homes, it is striking that for those in the lowest math test score category, only one student in nine attends an out-of-state college, while for students in the top math test score quartile with the same family income, as many as one in three attends an out-of-state college.

Thus, a preliminary analysis reveals that as important as family income is in explaining out-of-state enrollment, the impact of test scores, at a given income, remains powerful as well. But this is just a simple two-way table and does not take into account that, in addition to family income, academic ability is likely correlated with a host of other factors (like parental education) that also affect the probability of attending an out-of-state college.

Next, I address this issue with the aid of multivariate analyses that examines the relationship between college location choice and ability (test cores) conditioning on family income and many other explanatory variables. As discussed earlier, since the outcome of interest (in-state vs. out-of-state enrollment) is only observed for those who enroll in college, I use probit with sample selection models for the remainder of the paper. I, also, tried estimating a multinomial logit model to test the appropriateness of an alternative discrete choice specification. However, the Hausman and McFadden (1984) specification test for assessing the validity of the Independence of Irrelevant Alternatives (IIA) property in the multinomial logit model strongly rejects the null hypothesis of IIA. Thus, the probit with sample selection model is the more appropriate specification, since by assuming that the two enrollment decisions (college vs. non-attendance and in-state vs. out-of-state enrollment) are made sequentially, it does not rely on the IIA property.[16]

In Tables 4 through 8, I report the marginal effects for the probability of attending an out-of-state college conditional on enrolling in a four-year college, at the mean of all variables. All regressions are clustered at the primary sampling unit level (high school level) and the reported significance levels are based on first-order Taylor series standard error estimates that are adjusted for design effects resulting from stratification.

In Table 4, I begin with a model that includes only ability (test score) quartiles. This gives the raw impact of academic ability on the probability of attending an out-of-state college conditional on enrolling in college. I gradually add other variables to see how much of the apparent effect of ability remains after inclusion of the different control variables. The detailed table reporting marginal effects for the full list of control can be found in Appendix Table C. Each figure in Table 4 shows the difference in probability of out-of-state enrollment (conditional on attending a four-year college) for persons from the top test score quartile (reference group) and each of the other groups. The top panel

[16] The Hasuman and McFadden IIA test is based on dropping a category from the estimation and observing whether the estimated coefficients change between the unrestricted model (includes all alternatives) and restricted model (excludes any one alternative). The test statistic based on dropping the in-state college enrollment alternative is 2.54, with a p-value of 0. Therefore, we can reject the null of IIA at all significance levels.

of Table 4 reports the marginal effects of ability measured by composite test scores, while the bottom panel reports similar marginal effects of ability measured by math test scores. The main finding of the table is that students in the top test score quartile are significantly more likely to leave their home state to attend an out-of-state college, as compared to students in lower quartiles. Further, the table shows that while the gap in out-of-state enrollment rates between the top and lower test score quartiles declines as more explanatory variables are controlled for, differences by test scores still remain. The top panel shows that, in the unconditional model, students with the highest test scores are 11-12% points more likely to out-migrate for college than those in the lower categories. In the remaining columns, as I control for GPA, demographics, high school characteristics and state dummies, the results remain more or less the same. But when I control for family income and parental education, the gaps decline significantly (4-7% points). For example, the out-of-state enrollment gap between the highest and lowest ability quartile falls from about 11% points to approximately 4% points (but still significant) as we move from column (1) to column (7). Thus, about 36% (= 4/11 * 100) of the apparent effect of test scores remains even after the inclusion of all controls, while little less than 64% (= 7/11 * 100) of the raw impact of test scores is associated with other factors. Similar results are obtained when I use math test scores as the measure of achievement in high school (bottom panel of Table 4).

Taken together, the evidence in Table 4 suggests that ability is important in determining who moves out-of-state for college and students with the top test scores are more likely to leave their home states. What these simple ability gradients miss, however, are any changes across the joint ability-income distribution that may be masked by examining ability separately. Thus, in Table 5, in addition to all the controls included in the last column of Table (4), I also include a series of ability-income interaction terms.[17] This will allow the effect of student ability to vary across the income distribution.[18] Although the nonlinearity of the probit with sample selection specification will allow the impact of differences in test scores to vary across the family income distribution, including the direct interaction terms allows for additional flexibility.

Table 5 indicates that test scores have a significant effect on the in-state versus out-of-state decision of the 2004 high school graduate. However, since the table includes interaction terms between ability and income, it is hard to obtain marginal effects of ability directly from Table 5. To provide some greater context, Table 6 shows the predicted probabilities of enrolling in an out-of-state institution conditional on attending a four-year college for students in each of the four income quartiles, as we vary ability. Other variables used to predict the probability of enrollment are held constant at their mean values. Predicted probabilities are generated using the probit with sample selection model results from Table 5. Table 6 illustrates that, regardless of family income, the top test score quartile students are

[17] I include 3 test score quartile dummies, 3 income quartile dummies and 9 interaction terms between these test score and income dummies (omitted group is top test score-top income quartile category).

[18] In all of the subsequent analysis, I use composite test scores, rather than math scores, as the measure of student academic ability. This is because, as Table 4 shows, the results using composite test scores and math test scores are very similar.

significantly more likely to out-migrate from their home state for college, as compared to those in the bottom quartile. For college attendees in the highest income quartile, the probability of attending an out-of-state college changes from 0.324 to 0.359 as test scores change from the bottom to the top quartile. This equates to a marginal effect of 3.5% points, which is both economically and statistically significant. One might think that for students from lower income families, credit constraints would diminish the positive impact of academic ability on emigration propensity for college. However, strikingly, for college attendees in the lower three income quartiles, the positive impact of academic ability on the likelihood of out-migrating for college is actually larger (marginal effect is a statistically significant 3.7% points, 5.7% points and 6.9% points for students from the third income quartile, second income quartile and bottom income quartile, respectively).

6.2. Other student-level determinants of out-migration for college

Looking at the outcome equation results from the complete probit with sample selection model of Table 5 (column (2)), I find that, in addition to test scores, parents educational attainment, family income, immigrant status, college major plans, type of high school (private/public), race, and students' home state are all strong predictors of out-migration for college. The results demonstrate that students whose parents have a graduate degree are significantly more likely to attend an out-of-state college relative to children of less educated parents. For instance, children of parents with graduate degrees are 8.5% points more likely to attend an out-of-state college compared to children whose parents are high school graduates or less. As far as the impact of family income is concerned, this depends on which test score quartile we are considering (since the model has ability-income interaction terms). For college enrollees with the lowest test scores, the probability of enrolling in an out-of-state college increases by a statistically significant 15.3% points as family income increases from the lowest to the highest quartile. For students' with top test scores, the probability of out-migrating for college rises by 11.9% points, for a similar jump in family income. Looking at the impact of immigrant status, while foreign-born students who moved to the U.S. closer to high school graduation are found to be significantly less likely than natives to attend an out-of-state college (marginal effect is -14.1% points), foreign-born students who had been in the U.S. longer are revealed to be no different statistically from their U.S. born counterparts in terms of their propensity to out-migrate for college. Also, college enrollees who plan to pursue engineering and computer science as majors are significantly more likely (1.6% point) to be enrolled in a college outside their home state than students who plan to choose other majors. Students from private high schools are 8% points more likely to leave their home states to attend college in other states

Examining the impact of race, Asians and Hispanics are significantly less likely (12% points and 5% points, respectively) to attend an out-of-state college compared to white students. However, surprisingly, blacks are significantly more likely (7% points) to attend an out-of-state college than white students. To further explore this perplexing result, I first estimated a model including only race dummies as explanatory variables to observe the raw impact of the black dummy on out-of-state enrollment probability. I find that in this unconditional model, the marginal effect of the black dummy is negative (-2% points) i.e. black students are less likely to out-migrate for college compared to white students but the difference is statistically insignificant. The out-of-state enrollment rate gap between black and white students remains insignificant as I add other controls in the model. However, once I control for test scores and family income, the marginal effect of the black dummy becomes significant and positive i.e. after accounting for differences in ability and income, black students are revealed to have a higher likelihood of out-migrating for college than whites. This is probably because black students in my data sample have lower test scores and family incomes (82% of black high school graduates fall in the bottom two test score quartiles, while the corresponding figure for white students is 40%; almost 50% of black students come from the poorest homes compared to only 19% of white students). This is likely what holds black students back, counteracting any natural tendency that they might have to be more mobile than white students, since including test scores and family income in the model makes the marginal effect of the black dummy significant and flips the direction from negative to positive.

In order to examine which states have a higher tendency to lose its college-bound students to other states, I examine the marginal effects of state dummies.[19] I find that the marginal effects of all 49 state dummies are negative (and all but 6 are statistically significant) when compared to the reference group of New Hampshire, indicating that students from New Hampshire are significantly more likely to leave their state to attend an out-of-state college as compared to students from other states. A more in-depth examination reveals that students from states in the Northeast region have the highest probability of out-migrating for college, with most states in the region having an out-of-state enrollment rate of at least 30% (students from New Hampshire have the highest emigration propensity for college at 56% and the average for states in the region is 36%). In the West, while students from some states like Utah and California have a low probability of attending an out-of-state college (9% and 15%, respectively), students from states like Alaska, Hawaii, Colorado and New Mexico have a 34% or higher chance of relocating for college. On average states in this region have an out-of-state enrollment rate of 27%. Students from the Midwest region have an average out-of-state enrollment rate of about 23%. Students from the South are the least likely to attend an out-of-state college, with out-of-state enrollment rates ranging from 9% in Mississippi and Alabama to 18% in Kentucky (average for the region is 13%).

6.3. Probit model versus Probit with sample selection model

In addition to outcome equation results from the probit with sample selection model (column (2)), Table 5 also presents the marginal effects for a regular probit model (column (3)). A likelihood ratio test rejects the null hypothesis that ρ (the correlation coefficient between the error terms in the selection and outcome equations) is 0 at the 1% level.[20] This provides evidence in favor of joint normality between the error terms from the initial college enrollment (selection) and the subsequent college location (outcome) decisions and points to a selection bias in the model. Since ρ is positive

[19] Since the model includes 49 state dummies, Table 5 does not report their marginal effects. Results can be obtained from the author upon request.

[20] For the likelihood ratio test, the restricted model is the one for which $\rho=0$ i.e. probit equations are estimated separately for the two decisions (college attendance and in-state vs. out-of-state enrollment). Thus, the log-likelihood for the restricted model is equal to the sum of the log likelihood of the probit model for the outcome and the selection model. The unrestricted model is the one for which $\rho\neq0$ and the bivariate probit with sample selection model is estimated (Hilmer, 2001). The likelihood ratio test statistic is $\chi^2(1)= 8.46$ and p-value= 0.0036. Thus, I reject the null that $\rho=0$.

(0.3) and statistically significant, the regular probit model (where the selection bias is not considered) overestimates the impact of variables that positively affect the college attendance selection decision, and underestimates the impact of variables that negatively affect the selection decision. This suggests that the probit with sample selection model is indeed the appropriate specification.

An important point to note is that identification of the probit with sample selection model is achieved through non-linearity of the model and the presence of at least one variable that affect only the four-year college attendance decision (selection) but not the in-state versus out-of-state enrollment decision (outcome). Preliminary analysis suggests that students' postsecondary aspirations affect the four-year college attendance/non-attendance decision but not the college location decision and, thus, I identify the model by excluding this variable from the latter estimation (this instrument is listed with an empty cells in the outcome equation of Table 5).[21]

6.4. Impact of state policy measures

Next, I investigate the influence of various state policy measures, including the impact of college prices (calculated according to the different approaches discussed in section 5.1), on students' college location decision. Since different policy measures are correlated with each other (see Appendix Table B), I add various policy measures to the model incrementally to better understand their impact. In Table 7, I begin with a model that only includes college costs, calculated according to the market basket approach (approach A), in addition to the various student-level controls[22] (column (0)). I find that when college prices are calculated according to this approach, cost of attending college (in the home state and out-of-state) has no statistically significant impact on students' out-of-state enrollment probability. Thus, the approach that allows college prices to vary based on ability (approach B), where student ability is signaled either by high school quality and GPA (approach B1) or by college application behavior (approach B2) seems to be the preferred method for computing college costs. Accordingly, in Table 7 and Table 8, I make use of college prices calculated based on these two approaches.

In column (1) of Table 7, I estimate a model that only includes college costs, calculated according to approach B1 (prices vary based on student ability measured by high school quality and GPA), in

[21] Since selection models are closely related to instrumental variable (IV) models, I also estimated a linear two-stage least squares IV model where the same exogenous instrument is used to predict the selection but not the outcome. The results, which are not shown here, were similar to the results obtained using the probit with sample selection model. The reason for estimating the two-stage least squares model is that we can test the validity of the instrument used. In the model, the F statistic (F(1,9788)) for the significance of the instrument in the first-stage regression is 205.1 and highly statistically significant (p-value=0), indicating that I do not have the problem of weak instruments (Note that Stock, Wright, and Yogo (2002) indicate that the F statistic should be greater than 10 for inference based on the 2SLS estimator to be reliable when there is one endogenous regressor).

[22] All regressions in the previous section include state dummies to control for state-specific differences in the propensity to out-migrate for college. However, since the aim in this section is to examine the impact of policy measures, which are entered on the state-level, we cannot include state dummies. Instead, we include dummy variables indicating the census region of the student's high school to account for potential cross-region differences in the emigration propensity for college

addition to the various student-level controls. I include college costs at public and private institutions, both in the individual's home state and out-of-state. Following the literature, I focus on the impact of cost at public colleges in the individual's home state and out-of-state since public college costs are what presumably represent the relevant price for those making college attendance decisions (Ellwood and Kane 2000). Column (1) shows that, as expected, the marginal effect of the cost of attending a public college in one's home state on the out-of-state enrollment probability is positive and statistically significant. What is surprising though is that the marginal effect of the cost of attending a public college outside one's home state is also positive, although it is statistically insignificant. In the next column, I control for selectivity of higher education in the student's home state and a weighted average selectivity measure for the other 49 states (out-of-state selectivity aggregate). The cost of attending a public college in one's home state remains significant and becomes even more positively related to out-migration. Strikingly, the cost of attending a public college out-of-state now becomes statistically significant and the direction of the impact is reversed (i.e. the out-of-state public college cost measure now has the expected negative sign). This leads me to believe that college prices are mismeasured in more selective public colleges. As can be seen from Appendix Table B, the more selective is higher education in one's home state, the higher is the cost of attending college in the home state. The same positive correlation holds true for the selectivity aggregate in the other 49 states and out-of-state cost measures. And since home state selectivity of higher education has a negative influence on the likelihood of leaving one's home state for college, the impact of the in-state cost of public college cost is underestimated when the selectivity measures are not controlled for. On the other hand, since the out-of-state selectivity measure of higher education has a positive influence on the likelihood of out-migrating for college, the impact of the cost of attending a public college out-of-state is overestimated when the selectivity measures are not controlled for.

In the remaining columns of Table 7 (column (3), (4) and (5)), I control for all other policy variables - state spending on higher education, state seating capacity, state need-based and non-need based grant aid. All the public cost measures remain statistically significant and the direction of the impact remains the same. As column (5) shows, all else held constant, a $1000 drop in the cost of attending a public college in one's home state reduces the likelihood of out-migrating for college by a significant 1.6% points. Also, all else equal, a $1000 increase in the cost of attending a public college outside one's home state reduces the odds of out-migrating from the state by 0.2% points. In order to assess the differential impact of public college prices on students from different academic abilities, different fields of study and different income groups, in column (6) I interact public college prices with indicators for students in the bottom two test score quartiles and in the top two test score quartiles, in column (7) I interact these price measures with indicators for engineering/ computer science major plans and all other majors and, finally, in column (8) I interact public college costs with dummies for those in the low income group (bottom two income quartiles) and high income group (top two quartiles). Column (6) results show that a $1000 drop in in-state public college costs significantly reduces the likelihood of out-migrating for college for both low and high ability students (2.3% pts. and 1.4% pts. respectively). Column (7) shows that a similar drop in the cost of attending a public college in one's home state has no statistically significant impact on retaining students who plan to choose engineering and computer science as majors but it does reduce the probability of students planning to choose other majors from enrolling in an out-of-state college by a significant 1.6% points. Column (8) results demonstrate that, while upper-income students are not sensitive to changes in in-state public college prices (marginal effect is statistically insignificant), lower-income students reduce their probability of out-migrating by a significant 1.9% points when public college costs in the home state drops by $1000. In other words, a back-of-the-envelope calculation reveals that a $1000 drop in in-state public college costs translates to approximately 89 additional students staying back in their home states for college, out of which 33 are high ability students and 52 are low income students. Also, a $1000 rise in out-of-state public college cost has a statistically significant impact in retaining in the home state only high ability students (marginal effect = -0.2% pts.), students with non-engineering and non-computer science major plans (marginal effect = -0.5% pts.) and low income students (marginal effect = -0.4% pts.). This effectively means that for every $1000 increase in the cost of attending a public college outside one's home state about 12 more students are retained in their home states for college, out of which 4 are high ability students and 9 are low income students.

Table 7 also shows that college enrollees are attracted to states with more selective postsecondary institutions. While the likelihood of out-migrating from the home state for college decreases as higher education becomes more selective in the individual's home state (marginal effect= -3% points, significant), the probability of attending a college outside the home state increases as the weighted average selectivity of higher education in the other 49 states increases (marginal effect= 0.7% points, significant). Column (6) shows that these results seem to be driven by those in the high end of the ability distribution.[23]

State spending and state seating capacity seem to have no statistically significant impact on the probability of enrolling in an out-of-state college after taking into account all student-level and state-level variables. On the other hand, column (5) shows that a $1000 increase in state need-based aid per college-age student reduces the probability of leaving the home state for college by a statistically significant 11% points. As per column (6), a rise in need-based aid has a significant negative impact only for high ability students (-15% pts.), while column (7) shows that need-based aid has a significant negative impact for both students with engineering/ computer science major plans as well as students with other major plans (-6% pts. and -2% pts.). The last column shows that need-based grant aid has a statistically significant influence on the college location decisions of only low income students (-12% pts.). This means that for an additional $1000 that states spend per college-age student on need-based grant aid, states retain approximately 295 more students for college, out of which 183 are high ability students, 213 are students with plans to major in engineering/computer science and 164 are low income students.

A similar increase in state non-need based grant aid per college-age student reduces the likelihood of out-migrating from one's home state for college by a significant 6% points. Also, as column (6) and (7) show, non-need based aid plays a significant role in influencing the college location decisions of only high ability students (marginal effect = -11% pts.) and students with plans to choose

[23] I also estimated the model using the second measure of quality of higher education, described in section 5.2. The results (not shown here) were very similar to those obtained using the barron's index of selectivity.

engineering/computer science in college (marginal effect = -4% pts.). Further, column (8) shows that a $1000 increase in non-need based aid retains students from both low income and high income groups in the home state for college (marginal effect = -0.5% pts. for both groups). Thus, a $1000 increase in per capita state non-need based aid spending results in an additional 158 students attending colleges in their home states, out of which 94 are high ability students, 65 are students with plans to major in engineering/computer science and 75 are low income students.

In Table 8, I make use of college costs that also vary according to student ability, but here ability is signaled by student's college application behavior (i.e. approach B2). Column (1) shows that the cost of attending public college in one's home state remains a statistically significant and positive determinant of the probability of out-migrating for college, conditional on student-level controls and other state-level policy measures. A $1000 drop in the in-state public college cost reduces the likelihood of out-migrating for college by 1.3% points. As per column (2), in-state public college costs have a significant and positive impact on emigration propensity for college for both low and high ability students (1.5% pts. and 1.4% pts. respectively). However, column (3) shows that a decrease in in-state public college costs plays a statistically significant role in retaining in the home state only students with non-engineering and non-computer science major plans (marginal effect = 1.3 % pts.). Also, the last column shows that, as with the previous price measures, only low income students are responsive to changes in in-state public college prices (marginal effect = 0.9% pts.). Thus, a $1000 drop in in-state public college costs amounts to approximately 69 additional students staying back in their home states for college, out of which 32 are high ability students and 46 are low income students. However, unlike before, the impact of the cost of attending a public college out-of-state is statistically insignificant. As before, selectivity of higher education in one's home state has a significant and negative impact on the odds of attending an out-of-state college, while the weighted average selectivity in the other 49 states has a significant and positive impact.

Column (1) shows that a $1000 increase in state need-based aid per college-age student reduces the probability of leaving the home state for college by a statistically significant 8% points. The next column shows that a rise in need-based aid has a significant negative impact only for high ability students (-9% pts.). On the other hand, column (3) suggests that need aid has a significant negative impact for students who plan to major in engineering/ computer science in college as well as students with plans to pursue other majors (-6% pts and -1% pts.). The last column indicates that need-based aid impacts the emigration propensity for only low income students (-10% pts.). This means that for a $1000 increase in state need-based grant aid spending per college-age student, an additional 254 students attend colleges in their home states, out of which 135 are high ability students, 202 are students who plan to major in engineering/computer science and 159 are students from the lowest two income quartiles.

A similar increase in state non-need based grant aid reduces the likelihood of out-migrating from one's home state for college by a significant 5% points. Also, as the last three columns show, while non-need based aid plays a significant role in influencing the college location decisions of only high ability students (marginal effect = -12% pts.) and only students with engineering/computer science major plans (marginal effect = -4% pts.), it has a significant negative impact for students from both low income and high income categories (-4% pts and -6% pts, respectively). Thus, a $1000 increase in per capita state non-need based aid spending translates to additional 127 students being retained for college, out of which 78 are high ability students, 42 are students who plan to choose engineering/computer science as majors and 51 are low income students.

7. CONCLUSION

The findings of this paper show that higher academic ability students (as judged by standardized composite test scores) are more likely to leave their home states to attend out-of-state colleges. Further, past research shows that once a state resident migrates to another state to attend college, they are less likely to return to their home upon graduation. These two findings taken together suggest that academically talented high school graduates leaving their home states for college are also less likely to return to join their state's workforce after graduating from college. Thus, states that have a high rate of out-migration of its high school graduates without a corresponding in-migration of talent are experiencing a 'brain-drain', since they tend to lose their best and brightest students to other states. Such states are also likely to experience a decline in quality, over time, of its human resource assets available for participation in the knowledge economy and ultimately face a diminished intellectual and skilled workforce (Tornatzky et al. 2001). This has the potential to adversely affect the state's economy in the long term. Over time, as a state's skilled labor pool decreases, businesses in the state may lose productivity and profitability, decreasing their contributions in state taxes and ultimately, they may relocate to other states in search of a more favorable labor pool (Dean, Hunt and Smith 2006). Moreover, given that college graduates earn significantly more than those without a college education[24], states experiencing a brain-drain are likely to face a loss of tax revenues from state income taxes. For example, past research shows that New Jersey, one of the highest exporters of college students, loses about $1.8 billion annually due to college student migration (Prospero 2001).

The results also demonstrate that high school graduates who plan to major in engineering/computer science are less likely to stay home for college. This means that these majors are also less likely than other majors to be working in their home state after college graduation. Thus, states facing net out-migration of high school graduates for college are likely to pay a price down the road in terms of a smaller engineering and computer science labor force. This ought to be a cause of concern to state policymakers who would want to retain students from these two top paying fields so that they contribute to the home state economy through their higher taxes and their ability to exploit new knowledge and technology more effectively.

Evidence presented in this paper indicates that there are several policies that states could implement to maximize the attraction of high school graduates and encourage in-state college attendance, especially for high ability and engineering/computer science students. Table 9 summarizes the impact of state policies discussed in the results section and compares various policy measures in terms of their cost

[24] Economists estimate that college graduates earn over a half million dollars more in their lifetime, present value, than those without a postsecondary degree (Reseck et al. 2000)

effectiveness in retaining students for college. As the table shows, an increase in state need-based grant aid seems to be the most cost effective policy for recruiting high school graduates to attend college in their home states (both high ability and engineering/computer science students). The results also indicate that an increase in state non-need based grant aid is another important vehicle by which states can replenish the pool of high school graduates attending college in-state. Interestingly, while need-based grant aid seems to play a statistically significant role in influencing the college location decisions of students from all majors (albeit the impact on students with plans to major in engineering/computer science is larger), non-need based aid seems to have a statistically significant impact in retaining only students with plans to pursue engineering/computer science as majors. This suggests that if the goal of states is to retain students from non-engineering and non-computer science fields as well then they might be well served by focusing primarily on increasing need-based grant aid. However, if the goal is to recruit engineering/computer science students, to aid in the state's technological development, then increasing both types of grant aid would be beneficial. Table 9 also shows that a reduction in the price of attending an in-state public college is another policy lever available to state legislators. However, as indicated by the much smaller magnitude of marginal effect, this policy doesn't appear to be as cost-effective for states as increasing state grant aid, so that for the same amount of money, a decrease in in-state public college costs retains much fewer students. Further, changes in public college costs seem to have no statistically significant influence in retaining engineering/computer science students.

The results presented indicate that another ingredient in successfully retaining high school students to attend college in-state is the selectivity/quality of higher education in the student's home state. This is particularly true for retaining high ability students. Thus, higher education institutions in the U.S. need to focus resources on improving academic standards, course structure, faculty quality and overall selectivity in order to attract the best and brightest. This is more critical than ever for states that are plagued by a particularly high rate of net out-migration.

The study's findings also suggest that students from different income groups respond differently to various state policy measures in their college location choice decision. Upper income students do not seem to respond to changes in public college costs. However, lower-income students, for whom college costs are more of a binding constraint, reduce their probability of out-migrating in response to a drop in public college costs in their home states. Also, while the availability of state need-based grants encourages students from poor families (who are more likely to receive such aid) to attend postsecondary institutions in their home states, it does not seem to have an impact in retaining students from more affluent backgrounds. Increases in state non-need based aid seem to help in retaining students from both income groups (although the marginal effect of need-based aid is higher than non-need based for the low income group). These findings suggest that if the goal of states is to promote underrepresented students' (i.e. financially disadvantaged students') college enrollment at in-state colleges and create more diverse classes, then states should focus on providing adequate financial aid to these students, especially need-based aid. A reduction in in-state public college costs would also help in meeting this goal, but would be less cost less effective than increasing state financial aid (see Table 9).

Another conclusion from the presented results pertains to the emigration propensity for college of foreign-born high school graduates. Foreign students who moved sometime back to the U.S. with their parents to settle are found to be no different than natives in terms of their likelihood to attend an out-of-state college. This is not entirely surprising since, by the time students in my study sample graduate from high school (2004), this category of immigrant students had been in the country for a sufficiently long period. This is probably why they are closer to natives in terms of their migration behavior for college. However, strikingly, foreign-born students who moved to the U.S. closer to high school graduation are found to be more likely than natives to attend an in-state college (i.e. attend college in the state where they ultimately graduated from high school in the U.S.). One possible explanation is that foreign students who moved to the U.S. closer to high school graduation are likely to have moved to the U.S. for college. Thus, in all probability, these individuals would have moved to the U.S. state where they would ultimately want to attend college. Moreover, having moved to the U.S. fairly recently, this group of foreign students are likely to be less familiar with different locations within the U.S. as compared to natives or even foreign-students who had moved earlier with their parents to settle. That might make this category less inclined to move out-of-state for college so soon after making one major move (when they left their home country to come to the U.S.). This finding has implications for state policymakers. Tornatzky et al. (2001) show that foreign-born graduates are more likely than domestic-born graduates to stay and work in the place where they earned their most recent degree. This, along with the findings of my paper, suggests that foreign-born students who move to the U.S. closer to high school graduation are more likely to be retained in their high school state for college and then in the state's workforce after graduation. The policy implication of this is that states and higher education institutions should make special efforts to assimilate and integrate this category of foreign students into their states and colleges.

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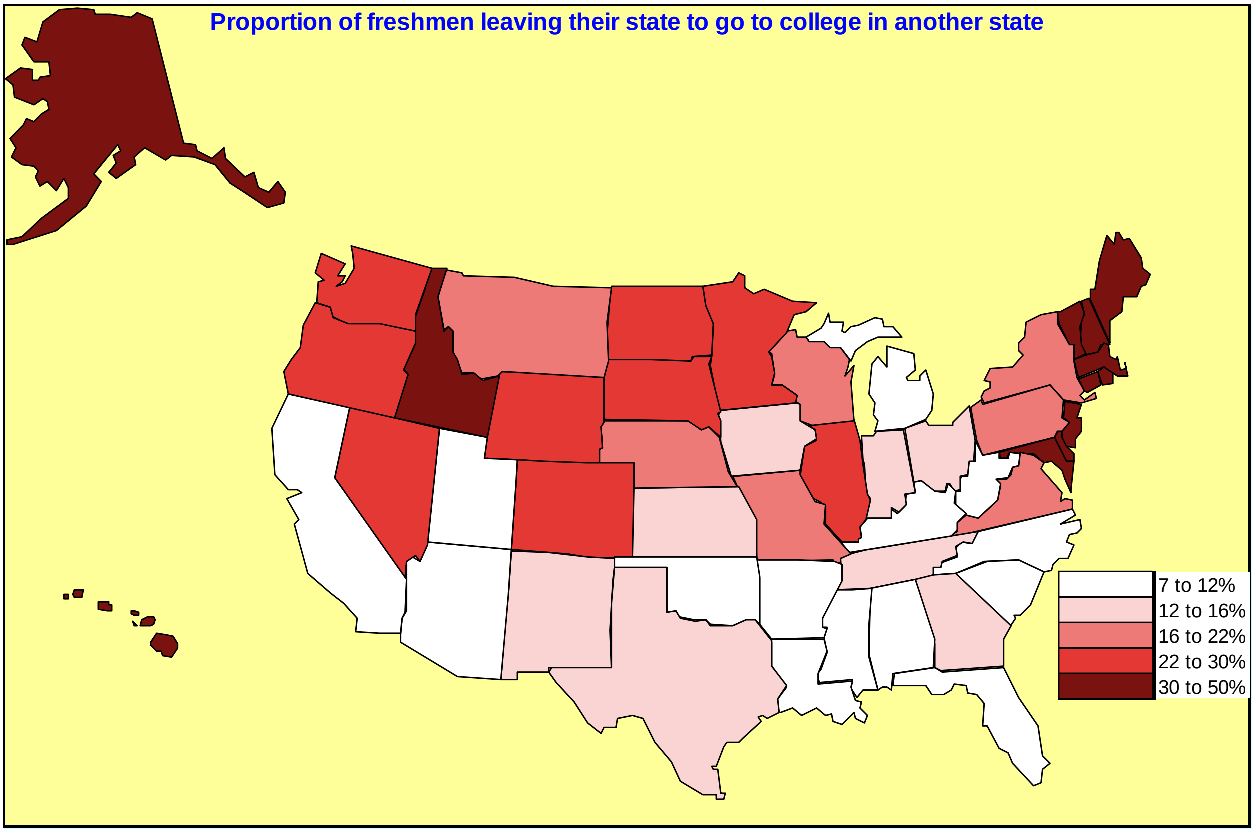
Figure 1



Source: Digest of Education Statistics, 2011.

Table 1: Distribution of postsecondary choices for 2004 high school graduates across all student-level variables

	Non-attend*	In-state	Out-of-state
Overall average	**50.6%**	**36.3%**	**13.1%**
Sample size	**4514**	**3901**	**1455**
STUDENT-LEVEL VARIABLES			
Individual and family background			
Gender			
Female	49.0	37.6	13.4
Male	54.1	33.7	12.2
Race			
White	42.5	40.5	17.0
Black	56.6	32.2	11.2
Asian	38.5	50.7	10.9
Hipanic	70.0	25.6	4.4
Other	53.7	31.8	14.4
Real family income			
Top income quartile	25.0	45.0	30.1
Third income quartile	37.9	44.8	17.3
Second income quartile	53.6	36.1	10.4
Lowest income quartile	68.0	26.4	5.6
Family composition			
Both parent family	40.4	42.7	17.0
Single parent family	57.8	31.8	10.4
Parent plus partner family	62.5	29.1	8.4
Only guardian family	70.6	22.2	7.2
Highest parental educ			
Graduate degree	26.4	46.3	27.3
College graduate	39.1	44.2	16.8
Some college	59.1	32.7	8.2
HS graduate or less	67.8	27.1	5.1
High school performance			
Composite test scores			
Top test score quartile	19.9	53.6	26.5
Third test score quartile	40.0	45.9	14.1
Second test score quartile	59.7	31.7	8.6
Lowest test score quartile	80.5	15.4	4.0
High school GPA (4 pt. scale)	2.7	3.2	3.3

Note: All sample statistics are calculated using sample weights.

* Non- attendance refers to those who did not enroll in a 4 yr. college; in-state refers to those who attended a 4 yr. institution in their home state; out-of-state refers to those who attended a 4 yr. out-of-state institution.

Table 1. contd.

	Non-attend	In-state	Out-of-state
Public/private h.s.			
Private h.s.	25.7	45.3	29.1
Public h.s.	53.9	34.8	11.3
High school urbanicity			
Urban	38.0	43.7	18.3
Suburban	52.8	34.2	13.0
Rural	56.5	33.5	10.0
High school region			
Northeast	42.3	36.5	21.1
Midwest	48.7	37.9	13.5
South	52.4	37.8	9.8
West	61.1	29.2	9.7
Social capital			
Frequency of discussions between parents and students (constructed)			
Sometime/often	47.0	38.5	14.5
Never	67.7	25.6	6.7
Immigrant status			
U.S. born	48.7	37.3	14.0
Foreign-born moved to U.S. sometime back with parents to settle	57.4	32.4	10.2
Foreign-born moved to U.S. closer to hs. gradn.	53.4	41.1	5.5
College major plans*			
Engineering/comp. sc. major		69.1	30.9
Other major		73.1	26.9
Postsecondary aspirations			
Expect to receive BA or more	43.2	41.6	15.2
Expect to receive less that a BA	80.5	15.0	4.5
College proximity			
Distance from high school location to nearest 4 yr. degree granting college (miles)	14.1	7.5	8.9
Home state labor mkt. conditions			
(*indirect opportunity cost of college attendance)*			
Unemployment rate for college-age students (%)	9.6	9.5	9.2
Median earnings for college-age students (2004 $)	25007	25002	25600

Note: All sample statistics are calculated using sample weights.

* This variable is only defined for college enrollees

Table 2: Summary statistics of all state-level variables

	Non-attend	In-state	Out-of-state
College price measures(2004 $)			
A. 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 (Wts-% of students out-migrating from home state to the other states for college)	13272	13366	13602
	(1025)	(1104)	(1069)
Cost of pub.coll. out-of-state (Wts-inverted dist. between home state and the other states)	13023	13131	13268
	(612)	(630)	(741)
Cost of pvt. coll. in home state	17746	18052	18512
	(3756)	(3565)	(3701)
Cost of pvt.coll. out-of-state (Wts-% of students out-migrating from home state to the other states for college)	17760	17864	18358
	(1700)	(1768)	(1984)
Cost of pvt.coll. out-of-state (Wts-inverted dist. between home state and the other states)	16400	16590	16930
	(1312)	(1291)	(1422)
B. Coll. prices vary based on ability			
B1. 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)
Cost of pvt. coll. in home state	16200	18466	19565
	(4120)	(3971)	(3898)
Cost of pvt.coll. out-of-state	16844	20256	21608
	(4480)	(4578)	(4251)
B2. Ability signalled by coll. appln. behavior*			
Cost of public coll. in home state		4434	4647
		(1769)	(2129)
Cost of pub.coll. out-of-state (Wts-inverted dist. between home state and the other states)		12616	13505
		(1723)	(1715)
Cost of pvt. coll. in home state		16588	18715
		(6165)	(7170)
Cost of pvt.coll. out-of-state (Wts-inverted dist. between home state and the other states)		17384	19105
		(2771)	(3284)

Note: All sample statistics are calculated using sample weights. Standard errors are reported in parenthesis.

* College prices constructed according to this approach can only be computed for those who applied to four-year colleges and since the majority of those who did not attend a four-year college never actually applied to one, this measure is not available for those who did not enroll in college.

Table 2. contd.

	Non-attend	In-state	Out-of-state
State spending (2004 $)			
Home state spending on higher ed.per college-age student	6158	6295	6201
	(1026)	(1072)	(1035)
Home state need-based grant aid per college-age student	155	174	163
	(113)	(122)	(127)
Home state non need-based grant aid per college-age student	59	74	66
	(112)	(126)	(117)
Selectivity of higher ed. measure			
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
Wts-inverted dist. between home state and the other states	(0.13)	(0.12)	(0.12)
State seating capacity			
Number of enrollment slots per college-age student	0.35	0.37	0.37
	(0.08)	(0.07)	(0.07)

Note: All sample statistics are calculated using sample weights. Standard errors are reported in parenthesis.

Table 3: Students in Class of 2004 enrolling in a four-year out-of-state college, by test scores and family income quartile

	Composite test score quartiles			
	Bottom	Second	Third	Top
Enrollment in 4 yr. out-of-state college (%)				
Highest income quartile	**12.3**	**24.1**	**30.7**	**42.2**
Third income quartile	**8.4**	**11.6**	**19.0**	**28.4**
Second income quartile	**4.3**	**7.2**	**12.6**	**22.1**
Lowest income quartile	**2.6**	**6.1**	**9.3**	**13.9**
	Math test score quartile			
	Bottom	Second	Third	Top
Enrollment in 4 yr. out-of-state college (%)				
Highest income quartile	**11.6**	**20.0**	**32.1**	**38.5**
Third income quartile	**7.3**	**12.4**	**15.6**	**26.2**
Second income quartile	**4.3**	**6.3**	**10.5**	**19.8**
Lowest income quartile	**2.3**	**5.3**	**7.7**	**11.5**

Source: Based on authors' tabulations of 9870 observations from the 2002 ELS

All proportions are weighted with sampling weights.

Table 4: Impact of ability on the probability of attending an out-of-state college conditional on enrolling in a 4-year college (marginal effects), Class of 2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Composite test score							
Third quartile	-10.6%***	-10.9%***	-10.7%***	-10.0%***	-9.7%***	-8.0%***	-7.2%***
Second quartile	-12.3%***	-12.7%***	-12.3%***	-11.1%***	-11.1%***	-8.8%***	-7.4%***
Bottom quartile	-11.4%***	-11.8%***	-11.9%***	-9.3%***	-8.9%***	-5.8%**	-4.2%*
Math test score							
Third quartile	-9.0%***	-9.0%***	-9.0%***	-8.3%***	-7.6%***	-6.7%***	-5.7% ***
Second quartile	-9.6% ***	-9.7% ***	-9.3% ***	-7.8% ***	-7.1% ***	-5.6% **	-4.1% *
Bottom quartile	-9.6% ***	-9.7% ***	-9.8% ***	-7.8% ***	-7.6% ***	-4.9% *	-3.1%*
Controls							
GPA	No	Yes	Yes	Yes	Yes	Yes	Yes
Demographics	No	No	Yes	Yes	Yes	Yes	Yes
High school characteristics	No	No	No	Yes	Yes	Yes	Yes
State dummies	No	No	No	No	Yes	Yes	Yes
Family income	No	No	No	No	No	Yes	Yes
Parental education	No	No	No	No	No	No	Yes

Notes: The marginal effects are calculated at the average X. Each figure shows the difference in probability of out-of-state enrollment conditional on attending a 4-yr. college for persons from the top test score quartile (reference group) and each of the other groups.
All regressions are clustered at the primary sampling unit level (high school level). ***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.
The detailed table reporting marginal effects for the full list of control can be found in Appendix Table C
Sample size: 9870

Table 5: Marginal effects for both a regular probit model and a probit model with sample selection, Class of 2004

	Probit with sample selection		Probit
	Sel. eqn.	Outcome eqn.	
	Pr(C=1)	Pr(OS=1/C=1)	
	(1)	(2)	(3)
Third test score quartile	-16.3% ***	-6.0% ***	-8.3% *
Second test score quartile	-29.7% ***	-6.7% ***	-9.9% *
Bottom test score quartile	-57.3% ***	-3.5% *	-5.6% *
Third income quartile	-3.9% **	-7.7% **	-8.8% ***
Second income quartile	-9.5% ***	-9.5% **	-9.8% ***
Bottom income quartile	-16.0% ***	-11.9% **	-12.2% *
Third test score quart. x third income quart.	-7.1%	0.1%	-0.3%
Third test score quart. x second income quart.	-4.6% *	-2.7% *	-3.2%
Third test score quart. x bottom income quart.	-2.9%	-4.4% *	-4.5% *
Second test score quart. x third income quart.	-5.9% *	0.8%	0.6%
Second test score quart. x second income quart.	-6.5%	-2.5%	-2.6%
Second test score quart. x bottom income quart.	-0.2%	0.8%	0.6%
Bottom test score quart. x third income quart.	-3.4%	-0.4% *	-0.6% *
Bottom test score quart. x second income quart.	5.8% *	-4.7% *	-4.5%
Bottom test score quart. x bottom income quart.	8.6%	-7.8% *	-7.4%
High GPA	27% ***	0.1%	0.8%
Plans to choose engineering/computer sc. as majors		1.6% *	1.9% *
Foreign-born moved to U.S.closer to high school gradn.	6.3% *	-14.1% *	-13.2% *
Foreign-born moved to U.S. with parents to settle	-3.9%	2.5%	2.1%
Parental educ.: College graduate	-5.6% **	-4.8% ***	-5.1% ***
Parental educ. :some college	-17.6% ***	-9.0% ***	-10.4% ***
Parental educ. : hs or less	-22.1% ***	-8.5% ***	-9.1% ***
Female	3.9% **	0.8%	1.0%
Black	20.4% ***	7.1% ***	9.5% ***
Asian	15.5% ***	-12.1% ***	-11.5% ***
Hipanic	4.6%	-5.1% **	-5.0% *
Other	6.7% *	2.1%	2.6%

Notes: The table reports the marginal effects for the probability of attending an out-of-state college, conditional on enrolling in 4-yr. college. The marginal effects are calculated at the average X. All regressions are clustered at the primary sampling unit level (high school level).
***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.
Sample size: 9870

Table 5: contd.

	Probit with sample sel		Probit
	Sel. eqn.	Outcome eqn.	
	Pr(C=1)	Pr(OS=1/C=1)	
	(1)	(2)	(3)
Single parent family	-1.9%	1.8%	1.8%
Parent plus partner family	-8.5% ***	0.3%	-0.7%
Only guardian family	-8.0%	2.1%	2.1%
Discuss with parents	9.3% ***	2.1%	2.4%
Private h.s.	12.1% ***	8.0% ***	11.4% ***
Rural	-7.9% ***	-0.4%	-1.2%
Suburban	-8.8% ***	-0.5%	-0.5%
Distance	-0.32% ***	0.03%	0.02%
State dummies	Y	Y	Y
Expect to receive BA or more	21.6% ***		

rho = 0.32***
LR test of indep. eqns. (rho = 0): chi2(1) = 8.46 Prob > chi2 = 0.0036

Notes: The table reports the marginal effects for the probability of attending an out-of-state college, conditional on enrolling in a 4-yr. college. The marginal effects are calculated at the average X. All regressions are clustered at the primary sampling unit level (high school level).
***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.
Sample size: 9870

Table 6: Predicted probability of attending an out-of-state college conditional on enrolling in a 4-year college, Class of 2004

	Ability (test score)		
Class of 2004	**Bottom quartile**	**Top quartile**	**Change (marginal effect)**
Top income quartile	0.324*	0.359***	0.035*
Third income quartile	0.249 *	0.286***	0.037*
Second income quartile	0.186**	0.243***	0.057**
Bottom income quartile	0.171**	0.240***	0.069**

Predicted probabilities are generated using the probit with sample selection model results from table 5.

Predicted probabilities are calculated at the average of all controls other than test score and income.

***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.

Table 7: Marginal effects from a probit with sample selection model of the effect of state policy changes on the probability of enrolling in an out-of-state college, conditional on attending a 4-yr. coll. College prices vary based on ability

	(0) mkt. basket approach (A)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
B1. Ability measured by hs GPA and hs qual.									
Cost of public coll. in home state	0.0005%	0.0019% **	0.0020% **	0.0018% **	0.0017% *	0.0016% *			
Cost of pub.coll. out-of-state	-0.0032%	0.0002%	-0.0001% *	-0.0002% *	-0.0003% *	-0.0002% *			
Cost of public coll. in home state x high test score							0.0014% *		
Cost of public coll. in home state x low test score							0.0023% *		
Cost of pub. coll. out-of-state x high test score							-0.0002% *		
Cost of pub. coll. out-of-state x low test score							-0.0004%		
Cost of public coll. in home state x eng./comp. sc. major								-0.0010%	
Cost of public coll. in home state x other majors								0.0016% *	
Cost of pub. coll. out-of-state x eng./comp. sc. major								0.0011%	
Cost of pub. coll. out-of-state x other majors								-0.0005% *	
Cost of public coll. in home state x high income									0.0013%
Cost of public coll. in home state x low income									0.0019% *
Cost of pub. coll. out-of-state x high income									-0.0001%
Cost of pub. coll. out-of-state x low income									-0.0004% *
Cost of pvt. coll. in home state	-0.0001%	-0.0001%	0.0001% *	0.0002% *	0.0002% *	0.0002% *	0.0003% *	0.0003% *	0.0002%
Cost of pvt. coll. out-of-state	0.0026%	0.0003% *	0.0004% **	0.0004% **	0.0005% **	0.0005% **	0.0005% **	0.0005% **	0.0005% **
Selectivity of higher ed. in home state			-2.9% ***	-3.3% ***	-3.7% ***	-3.0% **		-3.0% **	-2.9% **
Wtd. avg. selectivity of higher ed. in other 49 states			0.7% ***	0.8% ***	0.8% ***	0.7% **		0.7% **	0.7% **
Selectivity of higher ed. in home state x high test score							-3.4% *		
Selectivity of higher ed. in home state x low test score							-2.6% *		
Wtd. avg. selectivity of higher ed. in other 49 states x high test score							0.4% **		
Wtd. avg. selectivityof higher ed. in other 49 states x low test score							-0.01%		
State spending on higher ed. per coll-age student				-0.0013%	-0.0012%	-0.0008%	-0.0008%	-0.0009%	-0.0008%
State seating capacity					-15.7%	-19.9%	-20.6%	-18.0%	-20.0%
Need-based aid per coll-age student						-0.011% *			
Non-need-based aid per coll-age student						-0.006% **			

Notes: All regressions include student-level controls related to high school performance, demographics, high school characteristics, family income and parental education. The marginal effects are calculated at the average X. All regressions are clustered at the primary sampling unit level (high school level). ***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.
Sample size: 9870

Table 7: contd.

	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Need-based aid x high test score							-0.015% *		
Need-based aid x low test score							-0.008%		
Non-need-based aid x high test score							-0.011% *		
Non-need-based aid x low test score							0.010%		
Need-based aid x eng./comp. sc. major								-0.006% **	
Need-based aid x other majors								-0.002% *	
Non-need-based aid x eng./comp. sc. major								-0.004% *	
Non-need-based aid x other majors								-0.006%	
Need-based aid x high income									-0.009%
Need-based aid x low income									-0.012% **
Non-need-based aid x high income									-0.005% *
Non-need-based aid x low income									-0.005% *

Notes: All regressions include student-level controls related to high school performance, demographics, high school characteristics, family income and parental education.
The marginal effects are calculated at the average X. All regressions are clustered at the primary sampling unit level (high school level).
***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.
Sample size: 9870

Table 8: Marginal effects from a probit with sample selection model of the effect of state policy changes on the probability of enrolling in an out-of-state college, conditi
College prices vary based on ability

	(1)		(2)		(3)		(4)	
B2. Ability indicated by coll. appln. behavior								
Cost of public coll. in home state	0.0013%	*						
Cost of pub.coll. out-of-state	-0.0008%							
Cost of public coll. in home state x high test score			0.0014%	*				
Cost of public coll. in home state x low test score			0.0015%	*				
Cost of pub. coll. out-of-state x high test score			-0.0001%					
Cost of pub. coll. out-of-state x low test score			-0.0006%					
Cost of public coll. in home state x eng./comp. sc. major					-0.0001%			
Cost of public coll. in home state x other majors					0.0013%	*		
Cost of pub. coll. out-of-state x eng./comp. sc. major					0.0004%			
Cost of pub. coll. out-of-state x other majors					-0.0005%			
Cost of public coll. in home state x high income							0.0005%	
Cost of public coll. in home state x low income							0.0009%	*
Cost of pub. coll. out-of-state x high income							0.0002%	
Cost of pub. coll. out-of-state x low income							-0.0002%	
Cost of pvt. coll. in home state	-0.0003%		-0.0003%		-0.0003%		-0.0003%	
Cost of pvt. coll. out-of-state	0.0018%	***	0.0019%	***	0.0019%	***	0.0018%	***
Selectivity of higher ed. in home state	-1.8%	***			-2.0%	**	-1.8%	**
Wtd. avg. selectivity of higher ed. in other 49 states	0.3%	***			0.3%	*	0.4%	**
Selectivity of higher ed. in home state x high test score			-1.9%	**				
Selectivity of higher ed. in home state x low test score			-1.6%	*				
Wtd. avg. selectivity of higher ed. in other 49 states x high test score			0.3%	**				
Wtd. avg. selectivityof higher ed. in other 49 states x low test score			0.0%					
State spending on higher ed. per coll-age student	-0.0001%		-0.0002%		-0.0002%		-0.0001%	
State seating capacity	-16.3%	*	-16.7%	*	-16.2%	*	-16.9%	*
Need-based aid per coll-age student	-0.008%	**						
Non-need-based aid per coll-age student	-0.005%	*						

Notes: All regressions include student-level controls related to high school performance, demographics, high school characteristics, family income and parental education.
The marginal effects are calculated at the average X. All regressions are clustered at the primary sampling unit level (high school level).
***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.
Sample size: 9870

Table 8: contd.

	(1)	(2)	(3)	(4)
Need-based aid x high test score		-0.009% *		
Need-based aid x low test score		-0.004%		
Non-need-based aid x high test score		-0.012% **		
Non-need-based aid x low test score		0.011%		
Need-based aid x eng./comp. sc. major			-0.006% **	
Need-based aid x other majors			-0.001% *	
Non-need-based aid x eng./comp. sc. major			-0.004% *	
Non-need-based aid x other majors			-0.007%	
Need-based aid x high income				-0.006%
Need-based aid x low income				-0.010% *
Non-need-based aid x high income				-0.006% *
Non-need-based aid x low income				-0.004% *

Notes: All regressions include student-level controls related to high school performance, demographics, high school characteristics, family income and parental education.
The marginal effects are calculated at the average X. All regressions are clustered at the primary sampling unit level (high school level).
***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.
Sample size: 9870

Table 9: Cost-effectiveness of various state policy measures

Policy measure	△Pr(OS=1/C=1) (% pts.)	△Total students retained	△High abil. students retained	△ Eng./comp. sc. majors retained	△ Low inc. students retained
College prices vary based on ability (hs GPA & hs. qual)					
$1000 drop in the cost of pub. college in home state	-1.6	89	33	stat. insig	52
$1000 increase in the cost of pub. college out-of-state	-0.2	12	4	stat. insig	9
$1000 increase in need-based aid per college-age student	-11	295	183	213	164
$1000 increase in non need-based aid per college-age student	-6	158	94	65	75
College prices vary based on ability (coll. appln.)					
$1000 drop in the cost of pub. college in home state	-1.3	69	32	stat. insig	46
$1000 increase in the cost of pub. college out-of-state	stat. insig	stat. insig	stat. insig	stat. insig	stat. insig
$1000 increase in need-based aid per college-age student	-8	254	135	202	159
$1000 increase in non need-based aid per college-age student	-5	127	78	42	51

Appendix

Table A: Correlation between college prices calculated according to different approaches

Cost of attending an in-state public college	A. market basket approach	B. based on student ability	
		Ability measured by high school GPA and high school quality	Ability signaled by college application behavior
A. Prices based on mkt. basket of all 4 yr. colleges	1.00		
B. Prices vary based on student ability			
B1. Ability measured by high school GPA and high school quality	0.57	1.00	
B2. Ability signaled by college application behavior	0.45	0.60	1.00
Cost of attending an in-state private college			
A. Prices based on mkt. basket of all 4 yr. colleges	1.00		
B. Prices vary based on student ability			
B1. Ability measured by high school GPA and high school quality	0.52	1.00	
B2. Ability signaled by college application behavior	0.38	0.46	1.00

Cost of attending public college out-of-state	A		B	
	Wts-% of students out-migrating from home state to the other states for college	Wts-inverted dist. between home state and the other states	Ability measured by high school GPA and high school quality	Ability signaled by college application behavior
A. Prices based on mkt. basket of all 4 yr. colleges				
Wts-% of students out-migrating from home state to the other states for college	1.00			
Wts-inverted dist. between home state and the other states	0.60	1.00		
B. Prices vary based on student ability				
B1. Ability measured by high school GPA and high school quality	0.19	0.20	1.00	
B2. Ability signaled by college application behavior	0.18	0.24	0.24	1.00
Cost of attending private college out-of-state				
A. Prices based on mkt. basket of all 4 yr. colleges				
Wts-% of students out-migrating from home state to the other states for college	1.00			
Wts-inverted dist. between home state and the other states	0.71	1.00		
B. Prices vary based on student ability				
B1. Ability measured by high school GPA and high school quality	0.29	0.16	1.00	
B2. Ability signaled by college application behavior	0.31	0.27	0.39	1.00

Table B: Correlation between the different state policy measures

	state spending	need-based grant	non-need-based grant	home state sel. of higher ed.	out-of-state sel.	seating capacity	in-state pub. coll. cost	out-of-state pub. coll. cost	in-state pvt. coll. cost
Home state spending on higher ed.per college-age student (2004 $)	1.00								
Home state need-based grant aid per college-age student (2004 $)	0.29	1.00							
Home state non-need-based grant aid per college-age student (2004 $)	0.14	-0.40	1.00						
Home state selectivity of higher ed	0.45	0.41	-0.14	1.00					
Wtd. avg. selectivity of higher ed. in other 49 states	-0.12	0.20	0.32	-0.21	1.00				
Wts-inverted dist. between home state and the other states									
State seating capacity	0.21	0.14	-0.09	-0.54	0.42	1.00			
College prices based on ability									
Ability measured by hs GPA and hs qual.									
cost of public coll. in home state	-0.21	0.43	-0.26	0.30	0.41	-0.31	1.00		
cost of pub.coll. out-of-state	0.12	0.08	-0.06	-0.15	0.48	0.07	0.24	1.00	
cost of pvt. coll. in home state	0.44	0.51	-0.09	0.32	0.15	-0.23	0.50	0.23	1.00
cost of pvt. coll. out-of-state	0.00	0.16	-0.10	0.15	0.11	0.07	0.20	0.38	0.53

Table C: Marginal effects on the probability of attending an out-of-state college conditional on enrolling in a 4-yr. college, Class of 2004 (Table 4 details)

	1	2	3	4	5	6	7
Third test score quartile	-10.6% ***	-10.9% ***	-10.7% ***	-10.0% ***	-9.7% ***	-8.0% ***	-7.2% ***
Second test score quartile	-12.3% ***	-12.7% ***	-12.3% ***	-11.1% ***	-11.1% ***	-8.8% ***	-7.4% ***
Bottom test score quartile	-11.4% ***	-11.8% ***	-11.9% ***	-9.3% ***	-8.9% ***	-5.8% ***	-4.2% *
High GPA		1.2%	1.1%	2.0%	1.1%	0.8%	0.2%
Demographics							
Female			0.6%	0.5%	0.4%	0.6%	0.6%
Black			3.2%	7.2% **	6.9% **	8.5% ***	8.4% ***
Asian			-10.2% ***	-12.2% ***	-13.2% ***	-12.1% ***	-13.9% ***
Hipanic			-11.4% ***	-11.8% ***	-11.3% ***	-8.8% **	-8.2% **
Other			4.9%	6.1%	5.0%	6.1%	6.2%
Single parent family			-1.8%	-1.1%	-1.1%	3.0%	2.2%
Parent plus partner family			-4.8% **	-3.9%	-3.4%	-1.8%	-0.4%
Only guardian family			-1.5%	-1.3%	-1.1%	2.6%	2.8%
High school characteristics							
Private h.s.				11.2% ***	10.7% ***	8.5% ***	7.9% ***
Rural				-2.8%	-3.6%	-2.0%	-1.3%
suburban				0.0%	-1.3%	-1.4%	-1.3%

Notes: The marginal effects are calculated at the average X. All regressions are clustered at the primary sampling unit level (high school level).

***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.

Sample size: 9870

Table C: contd.

	1	2	3	4	5	6	7
Midwest				-12.7% ***			
South				-22.7% ***			
West				-9.6%			
Distance of high school from nearest college				0.01%	0.01%	0.01%	0.03%
Discuss with parents				3.8% **	3.4% *	2.5%	2.5%
State dummies					Y	Y	Y
Family income							
Third income quartile						-9.2% ***	-7.5% ***
Second income quartile						-12.9% ***	-9.8% ***
Bottom income quartile						15.0% ***	-10.5% ***
Parental education							
College graduate							-4.8% ***
parents:some college							-9.1% ***
parents: hs or less							-8.6% ***

Notes: The marginal effects are calculated at the average X. All regressions are clustered at the primary sampling unit level (high school level).

***denotes significance at 1%; ** denotes 5% significance level; * denotes 10% significance.

Sample size: 9870