# The Determinants of Out-Migration among In-State College Students in the United States


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**Abstract**

Using national data, this study examined out-migration behavior of college graduates who attended in-state institutions in the United States. Unlike previous studies on the issue of student migration, in which researchers used a single equation approach, the present study employed a multi-level technique to assess effects of factors from individual, institutional, and state levels on post-graduation migration. The study findings suggest that grant recipients, students who applied for multiple institutions, and college graduates from highly selective institutions are more likely to leave their native states, while Hispanics, college graduates from doctoral institutions, and students who reside in states with higher gross domestic product are more likely to remain in their native states.

## Introduction

As a nation, college-educated individuals have much to contribute to our democratic society. Higher education is known to influence one's cognitive skills and intellectual growth, as well as moral development (Pascarella & Terenzini, 1991). Public universities strive to educate state residents in order to enrich civic development within a state. Benefits from higher education are also manifested in monetary forms. The monetary benefit of college education is particularly attractive to both private individuals and government agencies, which is commonly measured by one's earnings (Leslie & Brinkman, 1993).

According to the U.S. Census Bureau (2002), individuals with a bachelor's degree are estimated to earn 2.1 million dollars over their lifetime, which is about twice as much as individuals with a high school diploma. Thus, increasing the number of college-educated individuals enriches the nation's economical condition through collecting higher federal and state income taxes from these individuals. Furthermore, an increase in the number of college-educated workers provides other social benefits. Moretti (2004) suggests that high school graduates' wages are raised by 1.6% when the labor force increases the supply of college-educated workers by 1%.

While the federal government in America generally subsidizes students to attain an education, state governments are responsible for operational budgets for their public institutions. States' strong support for higher education is evidenced in a steady increase in the higher education expenditure across our country. Since 1999 (except for year 2004 when -2.1% was recorded), total state appropriations for high education has been increasing faster than inflation rates in most of states (Evangelauf, 2008). During year 2006-2007, states invested an average appropriation of $6,773 for each full-time student (U.S. Census, 2009). However, such large

public investment on higher education is justified when in-state college graduates decide to remain in their native states to contribute state's economic development.

From the state's perspective, out-migration is defined when college graduates move to another state, while in-migration is referred to as a state receiving college graduates from another state. The difference between the number of in-migrants and out-migrants is known as net migration, and net migration rates significantly vary across U.S. regions and states. Between 1995 and 2000, the West region had an 86.1% increase of single, college-educated adults between the ages of 25 to 39 years, while the Northwest region lost 39.0% of the same population (U.S. Census, 2003). Therefore, a negative net migration rate raises a serious concern among state policymakers who expect economical returns from large state investments on higher education.

Due to out-migration, evidence offered by Strathman (1994) further suggests that college-educated adults leaving the state after graduation led to reducing appropriations for higher education by state legislatures. He estimated that a one percent increase in out-migration was associated with an approximate 100-dollar reduction in state appropriations per student. However, Strathman found that in-migration did not show any significant increase on state appropriation.

Given the importance of retaining in-state college graduates, the present study particularly focuses on out-migration behavior and risk characteristics of in-state college graduates who are likely to migrate to another state. In-state college graduates are defined as those who attended a college in the same state where they graduated from high school. Previous studies on migration behaviors typically employed a single- or multiple-equation approach, which failed to take the nested nature of study data into account. In the current study, factors known to influence the

migration decisions are separated at three levels, individual, institutional, and state. Using a national data sample of college graduates, the present study applies a multi-level logit regression technique to estimate effects of the factors on out-migration behavior at each level.

**Conceptual framework**

While a large number of studies have examined migration behaviors from different perspectives, many of theese studies have explored geographic mobility of college students from the perspective of economic and non-economic conditions of a state (Graves, 1983; Greenwood, 1985; Porell, 1982). Economic conditions are typically measured by unemployment, job growth rates, or gross state product. Non-economic conditions are associated with amenities such as climate, lower crime rates, and seacoast locations. Thus, college-educated individuals evaluate economic and non-economic conditions of their native states and the likelihood of their out-migration decreases when these conditions are more favorable than other states. Using a nationally representative sample of about 1,000 college graduates from the National Longitudinal Survey of Youth, Kodrzychi (2001) investigated the migration trend, taking a number of factors into account. For example, a higher employment growth rate had a positive effect on retaining college-graduates in a state of their college graduation, while a higher unemployment rate presented a significant effect on out-migration behavior. Surprisingly, statistical significance for employment growth and unemployment rates diminished after inclusion of variables associated with amenities in the analysis.

States with larger population were more successful in retaining college-educated workers (Kodrzychi, 2001). The state population size was also found to have a positive effect on reducing out-migration in the study by Tornatzky, Gray, Tarant, and Zimmer (2001). However, increasing

population size is too broad to be used as a policy implication to reduce the number of out-migrants. It is reasonable to assume that a state's productivity changes when the state expands its workforce. Thus, elaboration of factors that are closely associated with increased population is necessary to develop more appropriate measures in the study of out-migration.

Kodrzychi (2001) also examined the effects of various state amenities on out-migration behavior, such as average maximum wind speed, average number of clear days, and a state being on a seacoast. College-educated workers who graduated from college in a seacoast state were less likely to leave their seacoast state. Interestingly, average maximum wind speed had a significant effect on out-migration. Tornatzky, Gray, Tarant, and Zimmer (2001) found a better health care system reduced the likelihood of out-migration. While a number of amenities factors were found to influence one's migration decision, the definition of amenities is mainly subject to individuals' preferences. In addition to possibly a large scope of different amenities that exist among individuals, it is reasonable to believe that some find certain amenities attractive, while others may find otherwise. For example, seacoast states may not be an ideal location for someone who enjoys winter sports. Thus, it is rather challenging not only to select amenities for analysis, but also to assess effects of certain amenities on migration when individual preferences for such amenities vary.

Groen (2004) investigated the relationship between graduating from a college and working in the state using institutional as well as individual characteristics. Two datasets, Mellon Foundation's College and Beyond and National Longitudinal Study of the High School Class of 1972 were used in his study to achieve more robust estimates. He found that students who graduated from public universities were more likely to remain in their home states than those who graduated from private universities.

Certain types of state merit-based financial aids promote students to attend in-state intuitions (e.g., Cornwell, Mustard, & Sridhar, 2006). However, Groen (2004) suggested that such state-sponsored scholarships attract talented students to attend in-state institutions, while they have little effect on retaining these students within a state after they graduate from college.

Migration behaviors have also been explored as a function of individual characteristics. Kodrzychi (2001) included gender in her study but it did not show any statistical significance. However, the findings by Groen (2004) indicated that males were more likely to migrate. Similarly, Parsad and Gray (2005) investigated out-migration behavior among engineering and science major graduates. Male graduates with a master's degree in engineering or science were 31% more likely to move than their female counterparts. Kodrzychi (2001) found that Caucasian students were more likely to move to another state after college graduation, and Parsad and Gray (2005) also found a similar finding in their study. The effect of marital status on migration has been discussed in previous studies (Groen, 2004; Parsad & Gray, 2005). Parsad and Gray (2005) suggested that single, bachelor's degree students were 47% more likely to out-migrate than married students with a bachelor's degree.

## Data and analytical approach

### *Data Sources*

The sample data used in this study were drawn from the National Educational Longitudinal Study (NELS: 88/2000) and Postsecondary Education Transcript Study: 2000 (PETS: 2000), provided by National Center for Education Statistics (NCES). The PETS: 2000 dataset is supplemental data that include detailed information on academic performance of the NELS survey participants as well as institutions where they attended. Given the nature of the analytical

techniques used in the study, institutions where there were less than four respondents were deleted. States that had less than ten participants were also deleted from the sample. These deleted states comprised Alaska, Delaware, Hawaii, New Hampshire, South Dakota, Wyoming, and District of Columbia. The total sample size resulted in 2,504, which included survey respondents who attended and graduated from the institutions located in the same state in which they graduated high school. Subjects who experienced other types of migration such as students who attended an out-of-state institution and remained out-state were omitted. The study data also contained their residency state in year 2000 to determine out-of-state residence status. Kodrzychi (2001) found that approximately 30% of college graduates moved to a state where they did not attend high school one year after college graduation. Overall, 23.3% of college-educated workers in the current sample moved to another state after graduating from college.

*Explanatory variables*

A descriptive summary of all the explanatory variables are listed in Table 1. The study sample was consisted of 56.8% females and 12.2%, 5.3%, 7.9%, and 74.6% were Asian, Black, Hispanic, and Caucasian college graduates, respectively. Native American respondents were excluded due to their smaller representation in the sample (< 1%). Twenty-seven percent of the sample included subjects in which both parents were college graduates, while in 41% of the sample, neither parent had graduated from college. Other individual characteristics, such as gender, race and parental education were also included to assess their effects on migration behavior. The sample respondents were categorized in eight academic programs based on their college majors. These programs were Business (18.0%), Education (9.3%), Engineering (7.5%), Mathematics and Computer Science (3.6%), Life Science (9.9%), Health Science (9.1%), Social Science (30.8%), and Liberal Arts (11.7%).

Insert Table 1 here

The NELS dataset lacks specifications for financial aid such as merit- or need-based aid. Therefore, effects of detailed financial aid types on postgraduate migration behavior were not addressed in this study. Instead, dichotomous variables indicating whether the respondents received grants or loans at the institutions from which they graduated were included in the analysis. A group of non-aid recipients was used as a reference group for each financial aid type.

Students who moved between birth and entering high school were 17% more likely to move across states again (Kodrzychi, 2001). Thus, some college students with prior moving experiences are already more resilient to the idea of moving at the time of matriculation to college than students who were born and grew up in the same state. Groen (2004) encountered a similar problem related to endogeneity in his interstate migration study. He used a number of college admission applications as a proxy to mitigate the selection problem. This study followed Groen's example, and a dichotomous variable indicating whether respondents applied to more than one institution was included to control for some portion of pre-existing, unobserved heterogeneity assumed to influence one's migration decision.

Effects of four institutional characteristics on postgraduate migration were considered in this study. These four characteristics comprised institutional control, type, selectivity, and locale of institutions. About 83% of the institutions in the sample were public and 55.2% of institutions were Carnegie Classification Research I and II universities. Sampled institutions were classified by three levels of institutional selectivity (highly selective, selective, and non-selective). Approximately 70% of the institutions were non-selective institutions. Four categories to indicate locale of an institution were created from seven original locale categories from IPEDS

(Integrated Postsecondary Data System). Inclusion of locales was used to assess if the size of college locations was related to out-migration behavior. Large city and urban fringe of a large city were combined as one category as well as medium-size city and its urban fringe area. Large and small towns were also grouped together as one category.

Each state was grouped into one of four U.S. census regions (Appendix A). Level-3 variables were associated with each state, which have been known to be influential to one's migration decision. To assess an effect of each state's economic health on out-migration, gross state product (GSP) per capita was included in the analysis. U.S. Bureau of Economic Analysis releases GSP data by state and the year 2000 data were used in the study. A relationship between student migration and a state's funding for higher education was also explored. Higher education expenditure per capita for each state was estimated and included to examine if a larger level of funding was associated with reducing the likelihood of out-migration. Table 2 shows descriptive information on GSP per capita and state higher education expenditure by capita for four census regions. Given the evidence that situational or attractiveness associated with each state influences mobility across states (e.g., Greenwood & Hunt, 1989; Kodrzychi, 2001), such pull factors were also considered in the current study. Unlike Kodrzychi's approach where effects of specific factors such as maximum wind speed and a number of clear days on migration were examined, this study included Most Livable State (MLS) rankings, published by Morgan Quitno Press (2000). This particular ranking is based on each state's rankings for 44 factors including unemployment rate, crime rate, and percent of college-graduate residents. The year 2000 ranking was used in the study. Correlation between GSP and the MLS ranking was 0.179, while correlation between GSP and higher education expenditure was computed as -0.129.

Insert Table 2 here

*Analytical approach*

The dependent variable in the study was a dichotomous variable indicating whether survey respondents had left for another state after they graduated from their in-state institution. College graduates who moved to another state were coded as "1" and those who remained in the same state in which they attended college were coded as "0" in the dependent variable. Effects of the explanatory variables on the dependent variable were analyzed using three-level logit regression. The variables from each level were entered into an equation in sequence. Thus, three sets of coefficients were estimated and explainable variance was computed at each sequence. Variance inflation factors (VIF) were computed with 3.1 being the highest VIF. The panel weight was adjusted by dividing each weight score by the weight mean.

When using a dichotomous dependent variable in multi-level logit modeling, the level-1 random effect is not assumed to be normally distributed. Therefore, the level-1 equation lacks the residual term in the output. To mitigate this problem, this study applied a formula suggested by Snijders and Bosker (1999) to estimate explainable variances. Using a two-level model, they suggest the following:

$$\mathrm{var}(Y_{ij}) = \sigma_F^2 + \tau_3^2 + \sigma_R^2 \qquad (1)$$

Formula (1) illustrates the total variance $Y_{ij}$ drawn levl-1 unit $i$ in a randomly drawn level-2 unit $j$. $\sigma_F^2$ indicates the variance for a fixed effect (i.e., variance estimated by equation), and the

intercept variance is denoted by $\tau_0^2$. The level-1 residual variance is denoted by $\sigma_R^2$ and this value is fixed to $\pi^2/3 = 3.29$. Therefore, the explainable variance is estimated by Formula (2) below, which is the ratio between $\sigma_F^2$ and the total variance indicating a portion of the total variance that can be explained by the fixed effect.

$$R^2_{\text{dichot}} = \frac{\sigma_F^2}{\sigma_F^2 + \tau_0^2 + \sigma_R^2} \qquad (2)$$

**Empirical results**

Prior to entering the explanatory variables in the equation, the null model (i.e., empty model) was estimated. Based on this null model, a large portion of the total variance affecting one's out-migration decision was associated with individual differences (76.4%), followed by differences across institutions (19.7%) and differences at the state level (3.8%). This substantial variance associated individual characteristics was consistent with Kodrzychi's observation (2001).

Table 3 presents the results of the multi-level modeling analysis. Relative risk was also listed in the third column for each model, which was computed as exp(*b*) – 1. A positive sign in relative risk indicates a positive effect on out-migrant behavior, while a negative sign indicates an effect on retention in a native state. All the level-1 explanatory variables were entered in an equation for Model 1. Using Formula (2) above, the explainable variance from the fixed effect

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Insert Table 3 here

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was estimated to be 0.158. About 16% of the total variance associated with out-migrant behavior was explained by the individual characteristic variables.

The most noticeable effect was Hispanic college graduates who were 59% less likely to move to another state after graduation. Education majored graduates were chosen as a reference group in the analysis. This was because curriculum in education in America is generally linked to local schools where education majors are likely to find employment after graduation, which made them less likely to move to another state. In comparison to education majored graduates, students who majored in engineering, the field of liberal arts, math and computer science, social science and business were 109%, 98%, 94% 79%, and 76% more likely to leave their native states after graduation, respectively.

Other statistically significant coefficients were related to facilitating out-migration behavior. For instance, students who received a grant were about 73% more likely than those who did not receive a grant to move to another state. Students from the highest family income quartile were more likely to leave their native state. Student's multiple applications variable was initially included in the analysis as a proxy to control unknown heterogeneity affecting migration behavior. However, this variable was found to significantly predict future out-migrant behavior. Compared to students who only submitted one application to one institution, students who applied to a number of institutions were approximately 26% more likely to depart their native state after college graduation.

In addition to the individual characteristics, Model 2 was composed of institutional level variables. Explainable variance was estimated to be 0.188, which was a gain of 3 percentage points from Model 1 attributed by adding institutional characteristics. The leading effect on out-migration at level-2 was institutional selectivity. Students who graduated from highly selective

in-state institutions were approximately 2.7 times more likely to move to another state after graduation. Attending a selective institution increased a chance of leaving for another state by 59%.

In comparison to students who graduated from institutions located in large cities, students who attended an institution located in either a small or large sized town were 65% more likely to move to another state, followed by students who graduated from institutions in medium-size cities who were 34% more likely to do so. Doctoral institutions presented evidence that their graduates were more likely to remain in their native states. Students who graduated from a doctoral institution were 29% less likely to move to another state than students who graduated from an in-state research institution.

After entering the level-2 variables, some changes in coefficient values of the level-1 variables were observed. The coefficient for engineering showed about a 19% decrease in its value in Model 2. Similarly, social science also showed about an 11% decrease after entering the level-2 variables

State-level variables were added to the equation in Model 3 at last. Estimated explainable variance when all the explanatory variables from three levels entered was computed as 0.199. Thus, about 20% of out-migration variance can be explained by all the explanatory variables included in this study. The level-3 variables improved the explanatory power of the analysis by adding 1.1 percentage points to the total explainable variance.

Findings indicated statistically significant regional effects on out-migration behavior. Compared to the West region, students who resided in the Northwest and Midwest regions were about 167% and 101%, more likely to leave their native states after college graduation, respectively. One caveat in interpreting the finding on the Northwest region is that Northwest

states are rather small, and moving to another adjacent state within the region may be more common than other regions.

Each state's gross state product showed its positive effect on turning students away from out-migration. A one thousand dollar increase in GSP per capita decreased the likelihood of departure behavior by about 7%. Surprisingly, the state livable scale, which served as a proxy for state's amenities factors, did not show statistical significance. The sign of coefficient for state's higher education expenditure was found to be negative but did not achieve statistical significance.

While relative risks for significant level-1 coefficients in Model 2 remained similar in Model 3, a notable change was found in one of the level-2 variables after entering the state level variables. The relative risk for the highly selective variable increased from 2.7 to 3.4. Students who graduated from highly selective in-state institutions were approximately 3.4 times more likely to move to another state after graduation.

A number of limitations need to be mentioned. Participants in the study data graduated from college at different points in time, and residency status was based on where they lived in 2000. Therefore, it is tenable that some respondents might have graduated in 1999 and moved to another state after 2000.

The study also did not address enrollment patterns of the participants. For example, some student might have first attended an out-of-state institution, and returned to their native states to graduate from an in-state institution.

Additionally, racial demographics are diverse across states in America. The size of minority college graduates in some states was too small to estimate interaction effects between race and state-level variables.

**Discussion and implications**

This study investigated out-migration behavior among college graduates who attended in-state four-year institutions in the United States. Overall, the explainable variance was computed as 19.9%. Although methodological approaches are different, this is approximately an 8-percentage point increase from the similar study by Kodrzychi (2001). By employing the multi-level approach in the current study, the findings are relevant for a number of higher educational policy issues at the state and institutional levels.

In 2006, approximately 61% of Caucasian high school graduates aged 16 to 21 attended postsecondary institutions in America. Of these, 42% attended four-year institutions full-time. In the same year, approximately 45% of Hispanic high school graduates for the same age group enrolled in postsecondary institutions and 24% attended four-year institutions (U.S. Census, 2008). While the participation rate in higher education among Hispanic students is lower than that of Caucasian students, they are about 55% more likely than their Caucasian counterparts to remain in their native states after graduating from in-state institutions. Hispanic populations are concentrated in certain states, and California and Texas account for a half of all Hispanic populations (U.S. Census, 2001). Thus, improving a college graduation rate for Hispanic students at a state with a larger Hispanic population is expected to aid in increasing college-educated state residences. Moreover, Hispanic college graduates were underrepresented in academic programs such as Business and Engineering in the study sample. While Business and Engineering students were more likely to move to another state after graduation, the propensity of Hispanic college graduates remaining in their native state would offset out-migration rates for those who majored in Business and Engineering. Increasing a number of Hispanic students in

these academic programs would reduce the “brain drain” of Business and Engineering college graduates in some states over time.

In recent years, state-sponsored aid programs have been steadily growing across states in America. According to National Association of State Student Grant and Aid Programs (2008), the majority of state aid programs is in the form of grants. In 2007-08, approximately $8 billion was awarded in need- and non-need-base grants, while the total awarded grants were estimated to be $7.6 billion in 2006-07. Need-base grants are designed to improve access to higher education, while non-need-base grants encourage talented students to attend in-state institutions instead of losing these students to institutions in other states. Merit-base scholarships, such as the Hope Scholarship is found to be effective in promoting talented students to attend in-state institutions (Cornwell, Mustard, & Sridhar, 2006). While types of grants were not clearly specified in the current study, grant recipients were found to be 74% more likely to move to another state after college graduation than non-grant recipients. Policymakers may need to consider state-sponsored grants, which provide support not only for increasing enrollments at in-state institutions, but will also retain college-educated workers within a state. Maryland’s Science and Technology scholarship is one that requires students to remain in Maryland after they graduate from college (Groen, 2004). This Maryland scholarship promotes the knowledge-based state economy by retaining in-state college graduates, while it also justifies substantial investment in financial aid programs by receiving higher income taxes from aid recipients.

The current study was restricted to its sample of students who attended in-state institutions, as there are other types of post-graduation migrations. As for future research studies on student migration, a study that explores other migration behavior patterns as compared to the current study may shed light on an understanding of post-graduate college student migration behaviors.

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**TABLE 1. Sample Descriptive Summary**

| Variable | Label | Percentage in Sample | Mean | Standard Deviation |
|---|---|---|---|---|
| Level 1: Individual Characteristics | | | | |
| Intercept | | | | |
| Gender | Female | 56.8% | | |
| | Male * | 43.2% | | |
| Race | Asian | 12.2% | | |
| | Black | 5.3% | | |
| | Hispanic | 7.9% | | |
| | Caucasian * | 74.6% | | |
| Parent's Education | First-generation * | 41.2% | | |
| | One parent with BA | 22.8% | | |
| | Two parents with BA | 27.0% | | |
| | Unknown | 8.9% | | |
| Family Income | Less than $35k * | 25.8% | | |
| | $35k - $50k | 18.8% | | |
| | $50k - $75k | 22.8% | | |
| | Higher than $75k | 19.0% | | |
| | Unknown | 13.6% | | |
| Financial Aid | Grant | 40.2% | | |
| | Loan | 25.1% | | |
| Academic Major | Business | 18.0% | | |
| | Education * | 9.3% | | |
| | Engineering | 7.5% | | |
| | Math & Comp. sci. | 3.6% | | |
| | Life science | 9.9% | | |
| | Health science | 9.1% | | |
| | Social science | 30.8% | | |
| | Liberal arts | 11.7% | | |
| Marital Status | Married | 32.8% | | |
| | Other status * | 67.2% | | |
| Enrollment Behavior | Multiple application | 72.8% | | |
| | One inst. application * | 27.2% | | |
| Level 2: Institutional Characteristics | | | | |
| Control | Public | 82.7% | | |
| | Private * | 17.3% | | |
| Type | Research * | 55.2% | | |
| | Doctoral | 35.9% | | |
| | Baccalaureate | 8.9% | | |
| Selectivity | Highly selective | 4.5% | | |
| | Selective | 25.8% | | |
| | Non-selective * | 69.7% | | |
| Local | Large size city * | 29.7% | | |
| | Medium size city | 46.7% | | |
| | Small or Large town | 17.0% | | |
| | Rural area | 2.0% | | |
| | Unknown | 4.7% | | |
| Level 3: State Characteristics | | Percentage in Sample | Mean | Standard Deviation |
| Region | Northeast | 19.8% | | |
| | Midwest | 28.4% | | |
| | South | 32.8% | | |
| | West * | 19.0% | | |
| State GSP Per Capita in 2000 (in thousands) | Continuous | | 34.941 | 4.812 |
| State Higher Edu. Expenditure Per Capita in 1993 (in thousands) | Continuous | | 0.344 | 0.068 |
| State Livable Scale | Continuous | | 24.816 | 3.252 |

Sample size = 2,504

* = reference group in mult-level analysis

**TABLE 2. Detailed Descriptive Statistics at Census Regional Level**

| Migration Rate | Mean | Minimum | Maximum |
|---|---|---|---|
| All States | 23.3% | 10.2% | 61.5% |
| Northeast | 26.1% | 13.3% | 60.0% |
| Midwest | 28.7% | 20.0% | 45.7% |
| South | 21.7% | 10.8% | 61.5% |
| West | 15.2% | 10.2% | 35.7% |
| State GSP Per Capita (in thousands) | Mean | Minimum | Maximum |
| All States | 34.941 | 23.376 | 46.773 |
| Northeast | 39.429 | 28.222 | 46.773 |
| Midwest | 33.392 | 28.469 | 37.626 |
| South | 32.170 | 23.376 | 36.922 |
| West | 37.386 | 24.138 | 39.698 |
| State Higher Edu. Expenditure Per Capita (in thousands) | Mean | Minimum | Maximum |
| All States | 0.344 | 0.221 | 0.574 |
| Northeast | 0.292 | 0.221 | 0.484 |
| Midwest | 0.376 | 0.230 | 0.574 |
| South | 0.324 | 0.233 | 0.412 |
| West | 0.384 | 0.289 | 0.502 |
| State Livable Scale | Mean | Minimum | Maximum |
| All States | 24.816 | 17.370 | 35.020 |
| Northeast | 24.357 | 22.440 | 29.420 |
| Midwest | 27.405 | 24.740 | 35.020 |
| South | 23.304 | 17.370 | 29.570 |
| West | 24.039 | 19.370 | 30.980 |

**TABLE 3. Multi-Level Logit Analysis Results**

| Variable | Label | Model 1 *b* | Model 1 SE | Model 1 Relative Risk | Model 1 Sig. | Model 2 *b* | Model 2 SE | Model 2 Relative Risk | Model 2 Sig. | Model 3 *b* | Model 3 SE | Model 3 Relative Risk | Model 3 Sig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Level 1: Individual Characteristics | | | | | | | | | | | | | |
| Intercept | | -2.355 | | | ** | -2.561 | | | ** | -3.050 | | | ** |
| Gender | Female | 0.050 | 0.111 | | | 0.057 | 0.113 | | | 0.070 | 0.121 | | |
| Race | Asian | 0.015 | 0.160 | | | -0.050 | 0.158 | | | -0.046 | 0.180 | | |
| | Black | -0.230 | 0.264 | | | -0.254 | 0.269 | | | -0.215 | 0.292 | | |
| | Hispanic | -0.892 | 0.231 | -0.590 | ** | -0.816 | 0.226 | -0.558 | ** | -0.806 | 0.291 | -0.553 | ** |
| Parent's Education | One parent with BA | 0.076 | 0.134 | | | 0.052 | 0.129 | | | 0.057 | 0.137 | | |
| | Two parents with BA | 0.190 | 0.141 | | | 0.137 | 0.143 | | | 0.157 | 0.149 | | |
| Family Income | $35k - $50k | 0.374 | 0.180 | 0.454 | * | 0.376 | 0.189 | 0.457 | * | 0.398 | 0.188 | 0.489 | * |
| | $50k - $75k | 0.262 | 0.155 | 0.299 | + | 0.256 | 0.163 | | | 0.265 | 0.165 | | |
| | Higher than $75k | 0.432 | 0.194 | 0.540 | * | 0.384 | 0.208 | 0.468 | + | 0.419 | 0.210 | 0.520 | * |
| Financial Aid | Grant | 0.546 | 0.171 | 0.727 | ** | 0.542 | 0.174 | 0.719 | ** | 0.553 | 0.173 | 0.739 | ** |
| | Loan | 0.022 | 0.174 | | | -0.017 | 0.171 | | | -0.038 | 0.180 | | |
| Academic Major | Business | 0.563 | 0.258 | 0.756 | * | 0.530 | 0.271 | 0.699 | * | 0.526 | 0.275 | 0.692 | + |
| | Engineering | 0.738 | 0.306 | 1.092 | * | 0.601 | 0.315 | 0.824 | + | 0.625 | 0.328 | 0.867 | + |
| | Math & Comp. sci. | 0.661 | 0.339 | 0.936 | * | 0.589 | 0.353 | 0.803 | + | 0.613 | 0.363 | 0.846 | + |
| | Life science | 0.470 | 0.269 | 0.601 | + | 0.385 | 0.274 | | | 0.393 | 0.285 | | |
| | Health science | 0.440 | 0.351 | | | 0.403 | 0.364 | | | 0.405 | 0.377 | | |
| | Social science | 0.579 | 0.226 | 0.785 | * | 0.513 | 0.244 | 0.670 | * | 0.528 | 0.250 | 0.695 | * |
| | Liberal arts | 0.683 | 0.223 | 0.979 | ** | 0.693 | 0.242 | 1.000 | ** | 0.728 | 0.249 | 1.070 | ** |
| Marital Status | Married | -0.069 | 0.133 | | | -0.044 | 0.135 | | | -0.051 | 0.140 | | |
| College Application | Multiple applications | 0.233 | 0.106 | 0.263 | * | 0.244 | 0.105 | 0.276 | * | 0.245 | 0.110 | 0.278 | * |
| Level 2: Institutional Characteristics | | | | | | | | | | | | | |
| Control | Public | | | | | 0.061 | 0.190 | | | 0.040 | 0.209 | | |
| Type | Doctoral | | | | | -0.335 | 0.138 | -0.285 | ** | -0.346 | 0.147 | -0.293 | * |
| | Baccalaureate | | | | | -0.226 | 0.185 | | | -0.318 | 0.201 | | |
| Selectivity | Highly selective | | | | | 1.322 | 0.324 | 2.751 | ** | 1.481 | 0.253 | 3.399 | ** |
| | Selective | | | | | 0.464 | 0.149 | 0.591 | ** | 0.515 | 0.176 | 0.673 | ** |
| Locale | Medium size city | | | | | 0.292 | 0.146 | 0.339 | * | 0.252 | 0.148 | 0.287 | + |
| | Small or Large town | | | | | 0.498 | 0.196 | 0.645 | ** | 0.523 | 0.212 | 0.687 | * |
| | Rural area | | | | | 0.696 | 0.434 | | | 0.653 | 0.379 | 0.922 | + |
| Level 3: State Characteristics | | | | | | | | | | | | | |
| Region | Northeast | | | | | | | | | 0.982 | 0.313 | 1.669 | ** |
| | Midwest | | | | | | | | | 0.698 | 0.253 | 1.010 | ** |
| | South | | | | | | | | | 0.230 | 0.260 | | |
| State GSP Per Capita | Continuous | | | | | | | | | -0.071 | 0.021 | -0.069 | ** |
| State Higher Edu. Expenditure Per Capita | Continuous | | | | | | | | | -0.110 | 0.790 | | |
| State Livable Scale (z score) | Continuous | | | | | | | | | 0.145 | 0.081 | | |

| Variance Component | Variance | Variance | Variance |
|---|---|---|---|
| Levl-1 Fixed Effect Variance | 0.791 | 0.965 | 0.988 |
| Level-2 Error Variance | 0.751 | 0.690 | 0.655 |
| Level-3 Error Variance | 0.159 | 0.179 | 0.037 |

NOTE: ** = $p < .01$, * = $p < .05$, + = $p < .10$

**Apendix A. States by Region**

| Northwest | Midwest | South | West |
|---|---|---|---|
| Connecticut | Illinois | Alabama | Arizona |
| Maine | Indiana | Arkansas | California |
| Massachusetts | Iowa | Florida | Colorado |
| New Jersey | Kansas | Georgia | Idaho |
| New York | Michigan | Kentucky | Montana |
| Pennsylvania | Minnesota | Lousiana | Nevada |
| Rhode Island | Missouri | Maryland | New Mexico |
| Vermont | Nebraska | Mississippi | Oregon |
| | North Dakota | North Carolina | Utah |
| | Ohio | Oklahoma | Washington |
| | Wisconsin | South Carolina | |
| | | Tennessee | |
| | | Texas | |
| | | Virginia | |
| | | West Virginia | |