Who Attends Community Colleges in Texas? And Why?*

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1. Introduction

During 2002, the American Association of Community Colleges reported over 10 million students attending 992 public and 148 private community colleges in the United States. Of these institutions, the Texas Higher Education Coordinating Board (THECB) reports that 59 public community colleges are located in the state of Texas with total enrollments exceeding 460,000; of them, 119,800 are attending two-year colleges as first-time students. Moreover, throughout the 1990s, enrollment growth in Texas two-year colleges has outpaced enrollments at four-year colleges, while an ever-increasing fraction of attendees—both at two- and four-year colleges—are women, ethnic minorities, or academically disadvantaged (THECB 2003). What key factors are driving enrollment trends in Texas? And in what ways might they differ from broader, national two-year college trends? It is within this context we analyze factors influencing post-secondary the educational choices for recent Texas high school graduates by exploring the question: "Who Attends Two-Year Colleges in Texas?"

To begin investigating these questions, we employ a relatively underutilized data source, the Texas Schools Microdata Panel (TSMP). TSMP is a restricted administrative data set, which resides at the University of Texas at Dallas, and consists of multiple files from state public agencies; it includes information for Texas residents for elementary and secondary school histories, post-secondary educational outcomes, and individual earnings data and work histories from 1990 through 2002. The Texas public high school class of 1992 cohort is the primary sub-sample chosen for the analysis, which is an economically, socially and ethnically diverse student body, including more than 100,000 members. The

1992 graduating class also offers an unusual 10 year "window of observation," allowing an opportunity to better understand subsequent labor market outcomes.

Post-secondary schooling activities are analyzed in a rational choice framework, where graduating students choose between two- or four-year public colleges or entering the labor force. The multinomial logistic regression model (MNL) is then used to predict changes in probability associated with gender, race/ethnicity, college proximity, and cost of attending college. Results largely confirm previous work on determinants of two-year college attendance. Women, non-Hispanic whites, higher SES students, and individuals residing closer to colleges all are more likely to enroll in Texas two-year public colleges. Higher ability students are more likely to attend two-year colleges but only up to a certain point; beyond this threshold, they attend four-year schools. Tuition effects on the demand for community college schooling are relatively small and positive, which is contrary to expectations. However, the structure of two-year college tuition (in concert with the large number of observations in the Texas sample), which is determined by student residence, allows for an original quasi-experimental investigation into two-year college student demand price effects—the subject of future work. The present analysis ultimately serves as a foundation for research on the labor market returns to attending two-year versus four-year colleges.

An outline of the paper follows. The literature review is presented in the next section. In section three, the multinomial logistic framework is discussed. In section four, we introduce the Texas Schools Microdata Panel from which the Texas high school class of 1992 cohort file is derived. Data are summarized in section five and results in section six. We then conclude and discuss future work.

2. Literature Review

Gaining a deeper understanding of determinants of higher education has been a long-standing interest of social scientists. Education economists, in particular, have been intrigued by what factors help shape individual enrollment decisions at two-year and four-year colleges in the United States, how community colleges also influence overall educational attainment, and whether the labor market returns from attending two-year college, are in fact similar to those from more traditional four-year colleges. In this review, we briefly summarize the literature on the determinants of two-year college attendance, which serves as a foundation for subsequent work on returns to attending community colleges versus four-year colleges.

2.1. The Origin of the American Community College

The community college idea came into being during the late 19th and early 20th centuries. Among more notable explanations behind their introduction and growth was the surge in demand for post-secondary education, fueled in part by increasing high school graduation rates. Presumably, while four-year colleges could have expanded to accommodate this trend, community colleges gained favor and popularity, primarily due to broad support from well-known academics of the time (Cohen and Brawer 2001). Some academics advocated creating an institution—a sort of "junior college"—that would ease growing demand on universities. These so called, "junior colleges," would serve as preparatory institutions, offering students general undergraduate education. Universities or "senior colleges," on the other hand, could then focus on fostering higher-order scholarship, whereas community colleges would serve in a "transfer function" for universities.

Today, the "community college" designation is conferred upon any accredited institution awarding the associates degree in arts or sciences. They are interchangeably referred to "junior colleges" or "two-year colleges." Since inception, they have evolved beyond their "transfer role," serving their constituents in a "terminal function" beyond their initial preparatory role. In this capacity, community colleges currently award vocational degrees, offer adult basic education, job-training programs, and operate programs that help foster community development.

2.2. Determinants of Community College Attendance

The economics of education provides many examples of factors influencing community college enrollments, and how these same factors differentially impact enrollments for four-year institutions. In this section, I focus attention on factors viewed by the literature as most important and which are also found in our data source. They include tuition and college fees, college proximity, measured ability, and general economic conditions of the labor market.

Tuition is the most widely researched factor determining community college enrollment, as it measures the explicit cost of actual attendance. A number of researchers have examined the issue of tuition effects in student demand studies. As one might expect, holding other things equal, a student facing higher tuition costs is less likely to enroll, which has been repeatedly confirmed in empirical studies (Berne 1980; Sullock 1982; Leslie and Brinkman 1987; Rouse 1994). Berne (1980), for example, examines tuition effects on two samples of high school students immediately applying to community college in 1975. Computing net tuition—tuition less financial assistance—a $100 decrease in net tuition is associated with a 4 to 5 percentage increase in the likelihood of enrolling in a community college. Sullock (1982) uncovers a stronger relationship between price and attendance, finding a $100 tuition decrease raises full-time equivalent levels by 18 percent. In other work, Rouse (1994) estimates that a $100 tuition increase decreases the enrollment rate by 2.4 percentage points, within a multinomial logistic setting. Finally, in nearly universally cited work, Leslie and Brinkman (1987) perform a meta-analysis on tuition effects, showing a $100 tuition increase is associated with a drop of 0.7 percentage points under 1982-1983 price conditions and is valid among 18 to 24 year old first-time college enrollees. Their meta-analysis is national in scope, and the component studies include student price response coefficients (SPRC) for both two- and four-year colleges. Because community college students frequently come from families of lower socio-economic status, one might expect a significantly higher SPRC to be associated with two-year college tuition.[1] For example, in one tuition-reduction experiment involving public two-year colleges in Wisconsin, a $100 tuition decrease resulted in a substantial increase (1.3) in public community college enrollment rates (American Association of State Colleges & Universities 1977). Upon raising tuition at a later time at the same institutions, the rate of enrollment declined (1.0) slightly less.

College proximity refers to the distance an individual resides from a post-secondary school, and it remains an important determinant for community college enrollments (as compared to four-year colleges), giving it neighborhood institutional status. Recent work, however, suggests a declining role of distance over the past several decades (Hoxby 1997), in particular, for high-aptitude students (Avery and Hoxby 2003),

[1] Student price response coefficient (or SPRC) is a standard metric in demand studies. In demand studies, SPRC values reflect the change in the rate of enrollment among 18-24 year olds facing a $100 increase in the average 1982-1983 tuition and room and board price of $3,420 (Leslie and Brinkman 1988).

although low-income, high-aptitude students still appear to be sensitive to distance and whether a post-secondary option is in-state. Nonetheless, ceteris paribus, students residing closer to college campuses are more likely to enroll in college. Cost is the primary reason. That is, high school students living closer to college campuses may opt to continue living at home and thereby may save funds otherwise spent on room or board. Research repeatedly confirms that proximity is linked to college enrollments. However, critics rightfully point out that households in close proximity to campuses may in fact have a preference for higher levels of education; if true, they argue, any estimated effects of distance on post-secondary schooling choices may capture not its true effect but rather the underlying preferences of the household. Card (1993) wrestles with this issue implicitly in examining the labor market returns to schooling. Residing within 30 miles of a four-year college, Card shows, increases educational attainment by an average of 0.32 school years. Moreover, for low SES students, the estimated effect on schooling is as much as one full year of schooling.

Ability also affects enrollment decisions. Not only is it widely accepted that measured ability shapes the decision to attend college, but there is also a broad consensus in the literature that students sort into different types of colleges based upon similar ability. Upon high school graduation, deciding between entering the labor force and enrolling in a two-year versus four-year institution captures ability sorting. Rouse (1994) and others clearly illustrate this point using standardized assessment data from national longitudinal samples. In each sample, high school graduates entering four-year colleges have higher standardized test scores versus those entering two-year colleges who in turn have higher scores than those choosing not to enroll in college at all. In other work on two-year college enrollment decisions, Berne (1980) articulates this sorting behavior in a somewhat different manner: "Among two-year college applicants, higher levels of performance in high school, ability, and [SES] increase the applicant's likelihood of attending a community college up to a point after which the likelihood will decrease with increases in these variables." This discussion motivates consideration of the non-linear relationship in ability for models of post-secondary choice in this paper.

3. Theoretical framework and Methods

A multinomial logistic model (MNL) is used to determine which factors are important in influencing two-year college enrollment decisions. In this framework, students from the Texas high school class of 1992 are modeled as rational decision makers, deriving utility from each of their choices. Graduates choose whether to attend a two-year or four-year college or enter the labor force following high school graduation. An individual's observed choice is, therefore, assumed to maximize utility or individual well being.

3.1. Rational choice model

Following high school graduation, students choose among multiple career paths. Utility derived from a particular action is postulated as a function of related individual- and community-specific factors. In the present context, students choose between (1) entering the labor force (LF), (2) enrolling in a two-year college (2Y) or (3) four-year college (4Y). Formally, the level of utility U_{ij} for recent high school graduate *i* for choice *j* can then be modeled as follows

$$\begin{aligned} &U_{i,2Y} = \overline{U}_{i,2Y} + \varepsilon_{i,2Y} \\ (4.1) \qquad &U_{i,4Y} = \overline{U}_{i,4Y} + \varepsilon_{i,4Y} \\ &U_{i,LF} = \overline{U}_{i,LF} + \varepsilon_{i,LF} \end{aligned}$$

where ε_{ij} represents a random component of utility. An individual *i*, therefore, can receive utility from a single alternative *j* as depicted by

(4.2) $$U_{ij} = \beta_j X_i + \varepsilon_{ij}, \qquad j \in \Omega = \{2Y, 4Y, LF\}$$

where vector *X* captures individual-specific characteristics such as ethnicity, measured ability and economic status as well as representing community-specific attributes such as high school quality and condition of the local economy. High school graduates maximize their well-being by choosing alternatives that achieve the highest utility level. Therefore, high school students will only attend a two-year college if $U(2Y) > U(4Y)$ and $U(2Y) > U(LF)$. The probability of person *i* beginning a two-year college is therefore

(4.3) $$\Pr(U_{i,2Y} > U_{i,4Y}, U_{i,2Y} > U_{i,LF}) = \Pr(\varepsilon_{i4Y} - \varepsilon_{i2Y} < \overline{U}_{i,2Y} - \overline{U}_{i,4Y} \text{ and } \varepsilon_{iLF} - \varepsilon_{i2Y} < \overline{U}_{i,2Y} - \overline{U}_{i,LF}).$$

If $\eta_{kk'} \equiv \varepsilon_k - \varepsilon_{k'}$ and $\overline{U}_{kk'} \equiv \overline{U}_k - \overline{U}_{k'}$ (suppressing the *i* subscript), then the probability of attending community college can be expressed as

(4.4) $$P_{2Y} = \int_{-\infty}^{\overline{U}_{2Y,4Y}} \int_{-\infty}^{\overline{U}_{2Y,LF}} g_{2Y}(\eta_{2Y,4Y}, \eta_{2Y,LF}) d\eta_{2Y,4Y} d\eta_{2Y,LF}$$

where g_{2Y} is the joint density function for error terms in the community college alternative. If we assume the error terms are logistically distributed, the probability of attending community college is

(4.5) $$\Pr(2Y \mid X) = \frac{\exp(\beta_{2Y} X_i)}{\sum_{j \in \Omega} \exp(\beta_j X_i)}.$$

And the change in probability associated with a *partial change* in an explanatory variable can be derived as the following

(4.6) $$\frac{\partial \Pr(y = 2Y \mid X)}{\partial x_k} = \Pr(y = 2Y \mid X)\left[\beta_{k,2Y} - \sum_{j \in \Omega} \beta_{k,j} \Pr(y = j \mid X)\right].$$

It is remarkable that marginal effects, as depicted in (4.6), need not have the same sign as its corresponding coefficient $\beta_{k,2Y}$.[2]

It is duly noted that the current MNL framework does not fully capture the college decision. The model, for example, is conspicuously silent on the application process; nor does it confront institutional admission decisions. Colleges which are in a student's *true* choice set depend to a large degree on previous application decisions and preferences of the individual. Therefore, the choice sets students face are partly endogenous, requiring special estimation procedures. However, if the "independence of irrelevant alternatives" condition holds, then MNL estimates will still be consistent in the context of endogenous choice sets (Manski and Wise 1983).

4. Data Source: The Texas Schools Microdata Panel

The Texas Schools Microdata Panel (TSMP), a restricted data source at the University of Texas at Dallas, is used for the analysis. It includes individual level data from educational and labor force administrative sources, collected from several Texas public agencies and then merged by unique individual level identifiers. The principal data suppliers include the Texas Education Agency (TEA), the Texas Higher Education

[2] Refer to J. Scott Long (1997) for a derivation in the case of discrete changes in explanatory variables.

Coordinating Board (THECB), and the Texas Workforce Commission (TWC). Kain (2001) offers a detailed history of TSMP and its proposed future development.

A major advantage in using TSMP to analyze two-year college attendance determinants (and subsequently labor market returns for attending two-year and four-year colleges) is its unusually large size. Texas is second only to California in the size of its school-age population. In 1992, there were over 4 million children and young adults between ages 5 and 17 years of age in Texas schools. By 2000, there were over 1 million students attending Texas two- and four-year colleges (Digest of Education Statistics 2002). The substantial size of TSMP will, therefore, help distinguish causal findings, where previous estimates using smaller national samples may fail. Furthermore, analyzing previously understudied populations such as Asian Americans and high-ability students is also made possible.

4.1. The Texas High School Class of 1992

The Texas High School Class of 1992 is the TSMP subsample employed for the analysis and is chosen to maximize our "window of observation." These students were administered standardized tests in the 11th grade during the 1990-91 academic year and are the first class for which test results are available. In general, these students graduate from high school in the spring of 1992 and, if participating in post-secondary schooling at all, would begin in the fall of 1992, or shortly thereafter. Most, though certainly not all, would finish their higher education by 2002, the latest year of available data.

A working file is created from the initial sample by translating raw administrative files for the Texas Assessment of Academic Skills (TAAS), which contains standardized test data and is collected by the Texas Education Agency (TEA). The raw TAAS files contain 134,153 records between 1991 and 1992 of high school graduates from the class of 1992 (Appendix Table A4.1). A major limiting factor is the absence of student social security numbers (SSN). During secondary school enrollment, students (or parents) are not required to disclose SSN. Temporary identification numbers (TINs) are created as substitutes and assigned if SSN identifying data are undisclosed. Because TINs are unique to TEA data, 9,445 individual observations are lost during the merging process (with other administrative data sources) but the limitation does not appear to affect substantially sample representation, outside of very small differences in post-secondary activities (Table A4.1: columns one and two); nor do geocode prerequisites (column three). Further limiting the sample to graduates reporting both TAAS reading and math scores (column four) raises measured ability levels while, again, only marginally increasing college enrollment rates. Eventually, the sample is whittled to 103,673 observations—a 23 percent reduction—upon adhering to sample selection criterion (Appendix Table A4.1). As a widely-used benchmark, consider attrition in the National Longitudinal Survey of Youth 1979 (NLSY), a panel data set with 12,868 respondents. In 1989, only 78.5 percent of original respondents had participated in each survey year, which does not account for respondents dropped due to NLSY funding limitations (Center for Human Resource Research 1999).

While TSMP has its strengths, one of its limitations is including only students in Texas public two-year and four-year colleges. Student post-secondary choices are, therefore, observed only if graduates attend Texas public colleges and universities. Consequently, TSMP Texas high school graduates leaving the state (for college, employment, military service, etc.) are uncounted. Similarly, post-secondary activities for high school graduates remaining in the state who are physically incarcerated, attend private Texas colleges, or work in uncovered employment sectors cannot currently be observed.[3] Nonetheless, resulting biases are likely minimized as compared to analyses using comparable administrative data from other states (e.g., North Carolina and Ohio). For example, in 2000, 93 percent of Texas college freshmen attending any post-secondary educational institution remained in state; this Texas statistic is higher than similar ones for all 49 other U.S states. For the all states combined, the average number of high school graduates remaining in state is 80 percent (Digest of Education Statistics 2002). While I am unaware of other statistics documenting the number of recent graduates attending in-state private colleges, the total number of first-time freshmen in 2000 attending Texas private colleges is 26,823 but this figure includes both Texas residents and non-residents. In an attempt to address these data shortcomings, the sample is limited to high school graduates satisfying one or both of the following conditions: (1) participated in the covered employment sector in Texas within two years of graduating from a Texas public high school or (2) attended a Texas public two-year or four-year college. Sample representation is largely preserved (Table A4.1: columns four and five) and the regression sample is set equal to 103,673 observations. Final MNL estimates are robust across the latter two selection criterion.[4]

5. Descriptive of the Texas High School Class of 1992

A descriptive for enrollment patterns for the Texas high school class of 1992 cohort are presented in Tables 4.1, 4.1A, and 4.2A. All statistics reference measures of

[3] The Texas Schools Microdata Panel will soon include educational clearinghouse data, which will help identify students in both public and private colleges as well as those attending college out of state.
[4] See Appendix B4.1 for a detailed account of sample creation.

two- and four-year college attendance, individual level demographics, economic status, measured ability, college proximity, tuition, and local labor market conditions.

5.1. Enrollment Conventions and Patterns in Texas Public Colleges & Universities

The focus of this essay is college attendance, which can be defined in multiple ways. An individual is defined as having attended college if they attempted any college course within 2 years of high school graduation, where semester credit hours (SCH) are awarded. In this study, the first post-secondary educational institution a high school graduate attends defines whether she is a two-year or four-year college student.[5] Nonetheless, it remains a worthwhile pursuit to explore other definitions of attendance to develop a comparison benchmark. These additional definitions and their accompanying statistics are reported throughout Table 4.1A.

College enrollment statistics for young Texans reveal a far more nuanced picture of attendance than previously known. For example, an amazing 68 percent of high school graduates attended college (Table 4.1A: row a, column 1)—either two- or four-year college—at some point within two years following graduation. Just over half (row b, column 1) of the 1992 class enrolled in a community college, and 32 percent (row c, column 1) in a four-year college. One might then infer that individual Texas high school graduates tend to matriculate in both. This is in fact true. Graduates, for example, may attend a two-year college and simultaneously take classes at a four-year college, while holding down a job. While most college students do, in fact, work during the academic year, it is uncommon to find students consistently attending in both two and four-year campuses during the same period. Nearly 15 percent (row f, column 1) of class of 1992

[5] If the individual simultaneously attends both a two- and four-year college, then she is designated a two-year college student.

attended both a two-year and four-year college. First-time college attendance (as previously discussed) is the chosen metric for this essay. Accordingly, 43 percent (row g, column 1) first attended a two-year Texas public college, while 26 percent first enrolled in a four-year public university (row h, column 1).

Attendance patterns diverge along lines of gender, ethnicity, and SES (and are reported in Table 4.2A). For instance, 41 percent of Texas women (row a, column 2) have attended a two-year public college and is consistent with Rouse's (1994) findings. Twenty-nine percent of Texas women attend four-year colleges (row a, column 3). Texan men, on the other hand, attend both institutions at slightly lower rates, as do minorities, in general. Roughly 34 percent of black (row b, column 2) and Hispanics (row c, column 2) enroll in two-year colleges, as compared to 43 percent of non-Hispanic whites. Asians (row d) make up the only ethnic group more likely to attend a four-year college versus a community college; furthermore, over 85 percent of Asians in the Texas sample attend college at some point within 2 years of high school graduation. Receipt of free or reduce-priced school meals is a measure of economic status, since it is based on where an individual student's household falls along the poverty line.[6] Over 34 percent of free lunch recipients (row *e*) attend a two-year college and only half as many choose to attend a four-year college; this is less true for reduce-priced lunch recipients, where 38 percent transition to community college and 22 percent to four-year colleges (row *f*).

5.2. Ability, Accessibility, and the Economy

Demand for college is connected to individual measured ability; accessibility, as reflected by college proximity and tuition costs; and general economic conditions. For

[6] The National School Lunch Program eligibility guidelines state that a student's household must be within 130 percent of the poverty line to qualify for free lunch and 185 percent of the poverty line for receipt of reduced-priced lunch.

example, it is a widely replicated finding that measured ability is a predictor of college choice. As presented in Table 4.2A, Texas high school graduates selecting four-year colleges have significantly higher measured ability in mathematics (row *h*, 1693) and reading (row *i*, 1730) than their classmates entering two-year schools (math, 1563; reading, 1621) or those entering the labor force (math, 1515; reading, 1568). Geographic proximity also plays an expected role in attendance choice. College proximity is measured in miles using a straight-line distance metric from the nearest two-year and four-year institutions from students' high schools. On the whole, the class of 1992 lives an average of 15 miles (Table 4.1, row *m*) from the nearest two-year school and just over 21 miles from the nearest four-year college (Table 1, row *n*). From observing Table 4.2 (rows j and k), one can observe that high school graduates tend to prefer schools closer to home and conclude that distance matters. For example, those high school graduates enrolling in two-year colleges live approximately 13 miles from a two-year school but these same students live, on average, 16 miles from the closest public four-year college.

Direct tuition costs faced by the class of 1992 are constructed using tuition of the nearest college from students' high schools and it is calculated based on semester credit hours (SCH). Across Texas, two-year college tuition varies from $21 to $90 per SCH (Table 4.1, row *o*) for the 1992-1993 academic year; for four-year colleges it ranges between $56 and $102 (row *p*). SCH average $38 and $81 for two-year and four-year colleges, respectively. For each four-year Texas public college, tuition costs are determined by an individual's residential status. High school graduates residing in-state for a pre-determined period of time face lower tuition costs than other prospective attendees. Consequently, two tuition prices exist. Similarly, two-year public college tuition levels are also determined by residence. Those prospective community college students residing in-district—which is very closely related to county of residence—face lower tuition costs as well. Furthermore, two-year college tuition costs vary regionally in Texas also, irrespective of students' residence. As an example, community colleges in southern Texas (Figure 4.1) have higher in-district tuition costs. A consequence of this fact is different demographic groups will face different tuition prices. Hispanics in Texas, for example, live disproportionately closer to the Mexican border and, therefore, face higher community college tuition costs.

Finally, the local economy may also affect student college attendance decisions. Entry-level wages and unemployment rates characterize labor market opportunities at the county level. Entry-level wages for each county are created with 1992 annual wages of the previous graduating Texas class (the Texas high school class of 1991). Deciding whether to enroll in college, students weigh their potential future earnings with not only the direct cost of college but also forgone income. Annual earnings for high school graduates based on TWC data ranges from $4,900 to $16,500 (Table 4.1, row r) for Texas' 254 counties; these differences create different opportunity costs. All else equal, graduates in high-wage counties may be less likely to attend college due to better opportunities. Average annual earnings for high school graduates are $10,400 in 1992 (row r). The countywide unemployment rate, a more crude measure since it includes all sectors, ages and ability levels, captures labor market tightness. One might expect residents facing higher unemployment rates are less likely to find employment and may be more inclined to attend college. In 1992, average unemployment is 8.2 percent (Table

4.1: row *q*). It is remarkable that many Hispanics reside in areas with rates exceeding 12 percent.

6. Who Attends College in Texas?

In this section, multinomial logistic (MNL) regression results are presented in Table 4.3 for the effects of ethnicity, economic status, measured ability, college proximity, tuition, and local economic conditions on post-secondary activities. This section is parsed into sub-sections. First, the MNL model and its results are discussed in broad terms. Second, changes in probability that are associated with overall college attendance are taken up. We then separately examine changes in probability associated with two-year college attendance and four-year attendance.

6.1. Multinomial Logistic Results

As mentioned in section 4.3.1, MNL coefficient estimates need not have the same sign as their corresponding marginal effects. It is, therefore, reasonable to discuss marginal effects (or changes in probability or simulations) on attendance in subsequent sections. However, it should be noted that typically MNL estimates are significant at the 1 percent level, and all estimates are significant at the 5 percent level (except for certain regional controls and unemployment rates). In general, findings largely confirm previous research (where tuition is the exception). Thus, separate models are presented (in Table 4.3) for both linear- and quadratic-specified tuition. The omitted category for both models is labor force participation. Total regression sample size is 103,673; of these, 41,426 attend community college, 29,578 a four-year school, and 32,627 enter the labor force.

Some parameters in the models are restricted to zero for varying reasons. As an example, measured ability is related to community college attendance likelihood in a non-linear fashion. The likelihood of a student attending community college increases with ability but decreases after some threshold (as depicted in Figure 4.2). This is not true for four-year colleges (Figure 4.3), where a linear relationship exists. The coefficients on the quadratic term for measured ability in math (Table 4.3: row f, columns 2 and 4) and reading (row h, columns 2 and 4) are thus restricted to zero. For different reasons, restrictions are also imposed on how college proximity and tuition influence college choice. Taking an illustration from Rouse (1994), tuition at two-year colleges is permitted to affect utility only directly for that specific choice, while only indirectly influencing utility for four-year college attendance. Refer to Rouse (1994) for more a detailed discussion.

6.2. Predicting College Attendance in Texas

The effects of ability, ethnicity, college proximity, tuition, and labor market conditions on the probability of college attendance are represented in Table 4.3. However, to interpret the MNL coefficients reported in Table 4.3, we first must predict a "base" probability for each individual student using original values for their explanatory variables. Next, the variable of interest is changed by a specified amount, holding other variables constant. For indicator variables, "base" probabilities are first estimated assuming each person is in the base group; it is then assumed that each person in the sample is in the group of interest. For both discrete and continuous variables, the mean difference in predicted probabilities represents an estimate of the change in probability due to change from an *exogenous* event. Changes in probability are reported for linear tuition models (in columns one and two) and quadratic tuition (in columns four and five) in Tables 4.4A and 4.4B. Only findings differing significantly between the two specifications are presented for latter results (columns four and five).

The effects on the total probability of college attendance and discussed in this section is equivalent to $\Delta \Pr(2yr) + \Delta \Pr(4yr)$ and reported in columns 3 and 6. As an example, consider the counterfactual of a one standard deviation (200 point) increase in TAAS math scores. As one might expect, this has a positive effect on overall college attendance, raising the probability of an individual attending college by an estimated 0.084 (Table 4.4A: row a, column 3). But it appears college attendance is more sensitive to individual reading ability, as a standard deviation increase in reading skills raises the likelihood of attending college by 0.157 (row b, column 3). Yet a more plausible counterfactual of both higher reading and math scores raises the likelihood of attending college by 0.204 (row c, column 3), which is less than the total of raising each ability measure separately, suggesting the measures are positively correlated.

As expected, geographic proximity to post-secondary institutions affects overall college enrollment. Increasing the nearest two-year college by 5 miles decreases the probability of attending any college by 0.015 (Table 4.4A: row d, column 3), while a 5 mile increase in the proximity of a four-year college decreases the likelihood of attending college by far less (0.005), suggesting that community colleges better represent neighborhood institutions than four-year schools. Results are closely in synch with that found by Rouse (1994).

Economic status is also an important predictor of post-secondary choice and is captured by receipt of federally subsidized school meals. Students who are eligible for free meals through the National School Lunch Program (NSLP) occupy households within 130 percent of national poverty levels, while those eligible for reduce-priced meals live in households within 185 percent of the poverty line. Our prior is that students with higher family incomes are more likely to enroll in college, and this is borne out in the categorical analysis. To interpret household economic status, it is helpful to understand that in 1992, the U.S. officially categorized a family of four impoverished if its combined income is less than $14,335. In the same year, children in families with incomes less than $18,635 (130 percent of the poverty level) qualify for free lunch, and other students with household income levels between $18,636 and $26,520 (185 percent of the poverty level) are eligible for partially subsidized meals. If it is assumed that a typical child receiving free lunch and reduce-priced meals has family incomes of $12,500 and $22,500, respectively, then raising a child's income by $10,000 will increase the probability an individual attends college by 0.052 (Table 4.4A: row f, column 3). A similar exercise for children receiving reduce-priced meals reveals an even larger estimated effect on the probability of attending college. Again, the results are remarkably consistent with Rouse (1994), although external validity for higher stratum cannot be examined.

Conditional on ability and economic status, non-Hispanic blacks in Texas are more likely to enroll in college versus whites (Table 4.4A: row I, column 3), as are Asians (row k, column 3). On the other hand, Hispanics (versus whites) (row j, column 3) tend to be less likely to attend college as are men (versus women). Asians (versus) whites exhibit the strongest likelihood of attending college versus other demographic groups.

Local economic conditions also shape enrollment decisions among recent high school graduates as well. The measures used for the labor market quality are unemployment and "entry level" wages for recent high school graduates. The average unemployment rate is 8.2 percent, with higher unemployment in the southernmost region of Texas; average earnings for recent high school graduates are set at $10,440 in 1992, although these opportunity costs still vary by region. If (expected) earnings increase by $1,000 (roughly 10 percent), then the total probability of attending college decreases by 0.012 (Table 4.4B: row r, column 3) and is robust under multiple specifications. The total probability of college attendance is also affected by changes in the rate of unemployment, where a 1 percentage point increase in unemployment raises the probability of college attendance by 0.002 (row s, column 3).

Effects of tuition on post-secondary activities are mixed in Table 4.4B and are largely contrary to previously published estimates. That is, holding other factors constant, increasing two-year college tuition or raising the price of a SCH by $8 slightly increases (0.003) the total probability of college attendance (row l, column 3). This also holds for an $8 per SCH tuition hike at four-year schools, although the effect on overall college attendance is slightly smaller. In estimating a quadratic tuition term, the results change, where an $8 per SCH tuition increase has the expected result of decreasing the probability of attending college, even though these findings are more sensitive than previous research confirms. For linear tuition specification, these effects are atypical in the literature (Leslie and Brinkman 1988) but are not unique to student demand studies of price. As an example, Long (2003) abandons MNL estimates in favor of a conditional logistic framework partly due to positive price effects that result and suggests MNL is not rich enough to acknowledge choice-specific college attributes (e.g., college quality). An alternative explanation for positive tuition effects comes from relatively low public tuition levels in Texas, especially at two-year colleges. Failing to control for financial assistance, which may exceed direct tuition costs, may potentially confound negative net prices, whereby tuition is strictly less than financial aid. For example, a full-time, Houston Community College student, qualifying for financial assistance, faces $672 in tuition costs over a 9 month academic year during 1992 (THECB 1993); the net price she faces may in fact be negative, depending upon her economic status and may result in positive price effects. Financial assistance data are not available for the class of 1992 (but are featured for later cohorts). A simple diagnostic, restricting MNL analysis to Texas graduates not receiving subsidized meals, however, still results in positive price effects among children from higher SES families.

An all-consuming investigation of positive tuition effects is well beyond the scope of this current essay but is considered in future work (McFarlin 2004), where a potential partial solution is being explored. It exploits variation in two-year college tuition levels due to in- versus out-of-district residential status. Direct costs of attending a two-year college are determined to a large extent by individuals' county of residence. A regression-discontinuity design (RDD) will be used based on *neighborhoods* surrounding county borders, which would be a credible source of exogenous variation—comparing high school graduates on separate sides of the county border who face different prices but are arguably similar in other dimensions. In a study on the effect of school quality on housing prices, Black (1999) uses similar methods, where neighborhoods are constructed, which intersect school catchment zones.

6.3. Predicting Two-Year College Attendance in Texas

Predictions for changes in explanatory variables are reported in Tables 4.4A and 4.4B. First, 40 percent of Texas high school graduates first attend a two-year college within two years of graduating. The effects on changes in the total probability of attending college differ to some degree from the same effects on the probability of attending Texas two-year colleges. As an example, reading and math ability influence the two-year college enrollment decision differently. A one standard deviation (200 points) increase in TAAS reading score raises the probability of attending community college substantially or by 0.207 (row b, column 1), while an increase in math ability affects the probability of enrolling in college by less than one percent (row a, column 1); this is less than its impact on overall college attendance. Both college proximity measures affect community college attendance in predictable ways, whereby increasing the distance of the nearest two-year school negatively impacts two-year enrollments and increasing the distance of four-year schools positively affects the likelihood of enrolling in a community college, albeit to a lesser degree than its own proximity effect. As expected, improving the economic status of low SES children significantly increases the likelihood for them attending a two-year college. It has been suggested that community colleges are institutions that help provide equality of opportunity. The results are indeed consistent, if one thinks of two-year colleges as institutions serving those prospective students on the margin of attending college. Also, holding other factors constant, women are more likely to attend community college (row h, column 1), but all ethnic minority groups are less likely to attend two-year schools, which is especially true for African-American high school graduates. Considering tuition effects, previous estimates of the change in total probability of attending college under a linear tuition specification suggests, ceteris paribus, the overall college attendance likelihood increases with an $8 per SCH increase in two-year college tuition. In examining two-year college enrollments, the effects of tuition are relatively small, but a different picture emerges in that the probability of attending a two-year college increases by 0.006 (row l, column 1) and the probability of attending a four-year college actually decreases by 0.003 (row m, column 1). Labor market effects on two-year enrollments are also negligible.

6.4. Predicting Four-Year College Attendance in Texas

Since two-year and four-year college enrollments are intimately related, it is worthwhile also to consider the effects on the probability of enrolling in a four-year college, in so much as they strongly differ from previous results. Reading ability is one such example. In considering a one standard deviation (200 point) increase of TAAS reading skills, the probability of attending a four-year college actually falls by 0.05 (Table 4.4A: row b, column 2). Results differ somewhat from Rouse (1994), where she finds two-year enrollments are not being influenced by ability, even though four-year enrollments are substantially affected, although the results are not entirely comparable, as MNL predictions of two-year college attendance probabilities assume the two-year decision is non-linear in measured ability. Nevertheless, many high ability students in Texas appear to opt for community colleges instead. One may interpret this in a couple ways. First, the large accompanied increase in two-year enrollments might suggest that students on the margin of attending college may be opting to enroll. However, another interpretation for this unusual result is that high-ability students in Texas—unless they are admitted to a more selective Texas school or attend college out of state—are bargain hunters, preferring to minimize the cost of obtaining a college education (or degree) via matriculation in community college. Other effects largely have the typical signs discussed previously. That is, college proximity, an increase in economic status, status as a female (versus male), and improvements in labor market conditions—10 percent wage increase or 1 percentage point decrease in the unemployment rate—each raises the probability of four-year college attendance. Hypothetical changes in ethnicity as well as changes in tuition do not conform.

7. Conclusion and future work

In this article, we use a multinomial logistic framework to examine determinants of two- and four-year college enrollments decisions among 1992 high school graduates in Texas. A relatively young and untapped data source—the Texas Schools Microdata Panel (TSMP)—is employed for the analysis, boasting a sample of 103,673 individuals. In broad terms, evidence from the study confirms previous findings of two-year college enrollment determinants. That is, ceteris paribus, women and non-Hispanic whites (versus blacks, Hispanics, and Asians) are more likely than men to attend community colleges, as are students from higher socioeconomic stratum, and those residing in close proximity of two-year institutions. We also confirm previous, unexamined suggestions that two-year college enrollment decisions are non-linearly related to ability. That is, high school graduates of greater verbal or quantitative ability are more likely to enroll in two-year colleges but only up to a certain point; they then enroll in four-year institutions. Also noteworthy, individual mathematics and reading abilities differentially affect the enrollment decision, where students with better verbal skills being more likely to attend two-year schools and those with improved math skills are more likely to enroll at four-year colleges. Lastly, we find an unusual relationship of higher tuition actually increasing enrollment rates in Texas for both two- and four-year colleges. This finding deserves more attention in future iterations of this essay. Future work will entail collecting data on later graduating cohorts (starting with the class of 1997). For these cohorts, financial assistance data and income data are available that will help disentangle its confounding influence on enrollments. Additionally, a conditional logistic model that accounts for choice-specific attributes (e.g., college quality) will also be explored. Finally, in separate work (McFarlin 2004) will exploit variation in two-year college tuition caused by county boundaries to carry out a regression-discontinuity design for better understanding the nature of the effect of two-year college tuition on college enrollments.

Additionally, the work is preliminary in nature and lays the foundation for an analysis of the labor market returns to attending two-year versus four-year colleges with TSMP data. In future work on determinants to be included in this paper, we intend to take advantage of TSMP's large sample base to investigate less restrictive MNL models for high-ability and low-income populations and ethnic minorities. For example, Asians are often an understudied group owing to their relative small size in U.S populations; they make up 2,781 observations in the Texas class of 1992, which is comparable to some national samples in the student demand literature. Finally, clearinghouse enrollment data are forthcoming, which include individual enrollment data for most colleges in the United States. This will enhance our ability to track students at private universities and those selecting to enroll in out-of-state schools.

Table 4.1: Descriptive Statistics for the Texas High School Class of 1992
(Source: UTD Texas Schools Microdata Panel)

	Variables	Mean	SD	Min	Max	N
(a)	First-Time Enrollment at 2-Year College	0.4000	0.4899	. . .	. . .	**103673**
(b)	First-Time Enrollment at 4-Year College	0.2853	0.4516	. . .	. . .	. . .
(c)	Labor Force Participation	0.3147	0.4644	. . .	. . .	. . .
(d)	Female	0.5235	0.4994	. . .	. . .	[103602]
(e)	Black	0.1088	0.3113	. . .	. . .	. . .
(f)	Hispanic	0.2640	0.4408	. . .	. . .	. . .
(g)	Asian	0.0268	0.1616	. . .	. . .	. . .
(h)	Eligible for Free Lunch	0.1558	0.3626	. . .	. . .	. . .
(i)	Eligible for Reduced Lunch	0.0245	0.1546	. . .	. . .	. . .
(j)	Attended Urban High School	0.6610	0.4734	. . .	. . .	. . .
(k)	TAAS Math Score	1584.9376	200.3813	620.0000	2230.0000	. . .
(l)	TAAS Reading Score	1635.3828	187.9677	580.0000	2240.0000	. . .
(m)	Miles to Nearest 2-Year College	14.8793	16.4428	0.2500	195.7500	. . .
(n)	Miles to Nearest 4-Year College	21.0218	19.1364	0.2600	115.2000	. . .
(o)	2-Year College Tuition (per SCH)	37.9680	14.6487	21.4000	90.0000	. . .
(p)	4-Year College Tuition (per SCH)	81.3850	10.1157	56.0000	102.8000	. . .
(q)	Local Unemployment Rate	8.2334	4.2738	1.1833	33.6333	. . .
(r)	Entry Level Wages (per $1,000)	10.4404	0.9749	4.9063	16.4865	[103634]
(s)	Resides near Border of other US State	0.0941	0.2919	. . .	. . .	. . .
(t)	Resides near Border of Mexico	0.1081	0.3105	. . .	. . .	. . .

Note: Summary statistics are for individuals in the Texas public high school class of 1992. When a variable's sample size is unreported, then it equals 103,673 observations; otherwise sample size is indicated in brackets [N]. Minimum and maximum statistics are also not reported for variables which are indicators. An explanation for all variables is available in the data dictionary of the appendix.

Table 4.1A: Enrollment Patterns for the Texas High School Class of 1992
First 2 Years after high school graduation

(Source: UTD Texas Schools Microdata Panel)

Post-Secondary Activities	Conditional on HS Graduation	Conditional on Attending College
	(1)	(2)
(a) Ever Attended College	0.682	. . .
(b) Ever Attended Two-Year College	0.512	0.751
(c) Ever Attended Four-Year College	0.318	0.466
(d) Attended only Two-Year College	0.364	0.534
(e) Attended only Four-Year College	0.170	0.249
(f) Attended both	0.148	0.217
(g) First Attended Two-Year College (incl. Summer '92)	0.426	0.584
(h) First Attended Four-Year College (incl. Summer '92)	0.257	0.416
(i) First Attended Two-Year College	0.400	. . .
(j) First Attended Four-Year College	0.285	. . .

Note: Summary statistics are for individuals in the Texas public high school class of 1992. Column 1 conditions on individuals graduating from high school and column 2 conditions on individuals attending either a two-year or four-year college. The number of observations equals 103,673. Post-secondary activities are limited to events within 2 years of high school graduation. The following table replicates findings in Rouse (1994, pp. 67).

Table 4.2A: Demographics of Post-Secondary Activities for the Texas High School Class of 1992
(Source: UTD Texas Schools Microdata Panel)

		Labor Force	2-Year College	4-Year College
		(1)	(2)	(3)
(a)	Female	0.2932	0.4147	0.2921
(b)	Black	0.3861	0.3358	0.2781
(c)	Hispanic	0.3953	0.3732	0.2316
(d)	Asian	0.1525	0.3556	0.4919
(e)	Eligible for Free Lunch	0.4769	0.3435	0.1796
(f)	Eligible for Reduced Lunch	0.4033	0.3765	0.2202
(g)	Attended Urban High School	0.2936	0.4016	0.3048
(h)	TAAS Math Score	1514.7019	1562.9857	1693.1900
		(195.9119)	(180.7105)	(186.5014)
(i)	TAAS Reading Score	1567.9490	1620.9110	1730.0560
		(188.7835)	(167.6054)	(175.7118)
(j)	Miles to Nearest 2-Year College	16.5923	12.7130	16.0269
		(17.7907)	(14.2854)	(17.3426)
(k)	Miles to Nearest 4-Year College	22.4893	21.7911	18.3230
		(19.7390)	(19.3685)	(17.8087)
(l)	2-Year College Tuition (per SCH)	38.9356	37.4402	37.6412
		(14.7806)	(14.4805)	(14.6832)
(m)	4-Year College Tuition (per SCH)	81.9416	81.2148	81.0097
		(10.0082)	(9.9123)	(10.4833)
(n)	Local Unemployment Rate	8.3362	7.9845	8.4689
		(4.4945)	(3.5049)	(4.9359)
(o)	Entry Level Wages (per $1,000)	10.4686	10.3878	10.3996
		(0.9344)	(0.9344)	(0.9580)
(p)	Resides near Border of other US State	0.3372	0.3726	0.2902
(q)	Resides near Border of Mexico	0.3306	0.3247	0.3446
	Sample size	32,627	41,468	29,578

Note: Summary statistics are from individuals in the Texas public high school class of 1992. Sample means are reported with standard errors in parentheses. Explanations for all variables are available in the data dictionary of the appendix.

Table 4.3: MNL Estimates of Two-Year or Four-Year College Choice
(Source: UTD Texas Schools Microdata Panel)

	Independent Variables	(1)	(2)	(3)	(4)
		log [Pr(2yr coll) / Pr(Labor force)]	*log [Pr(4yr coll) / Pr(Labor force)]*	*log [Pr(2yr coll) / Pr(Labor force)]*	*log [Pr(4yr coll) / Pr(Labor force)]*
(a)	Black	-0.3410	0.5615	-0.3471	0.5444
		(12.88)**	(18.71)**	(13.10)**	(18.07)**
(b)	Hispanic	-0.2144	-0.2147	-0.2189	-0.2164
		(9.99)**	(8.08)**	(10.19)**	(8.14)**
(c)	Asian	0.5095	1.0946	0.4924	1.0704
		(8.40)**	(17.58)**	(8.12)**	(17.17)**
(d)	Female	0.2398	0.2818	0.2388	0.2805
		(15.62)**	(15.84)**	(15.55)**	(15.76)**
(e)	Math Score	1.8423	3.2408	1.7978	3.2347
		(3.96)**	(48.41)**	(3.87)**	(48.31)**
(f)	Math Score Squared	-0.4504	. . . .	-0.4393	. . . .
		(3.09)**		(3.01)**	
(g)	Reading Score	5.8143	2.6247	5.8489	2.6320
		(11.58)**	(36.79)**	(11.64)**	(36.88)**
(h)	Reading Score Squared	-1.4818	. . . .	-1.4896	. . . .
		(9.74)**		(9.78)**	
(i)	Eligible for Free Lunch	-0.4911	-0.8692	-0.4940	-0.8671
		(21.18)**	(29.47)**	(21.29)**	(29.40)**
(j)	Eligible for Reduced Lunch	-0.3007	-0.5118	-0.2928	-0.5030
		(6.33)**	(8.67)**	(6.16)**	(8.51)**
(k)	Attended an Urban High School	-0.2461	-0.1017	-0.2958	-0.1028
		(11.77)**	(4.21)**	(13.70)**	(4.25)**
(l)	Miles to Nearest 2-Yr College	-0.2381	. . . .	-0.2371	. . . .
		(42.07)**		(41.70)**	
(m)	Miles to Nearest 4-Yr College	. . . .	-0.1375	. . . .	-0.1405
			(25.54)**		(26.07)**
(n)	2-Year Tuition	0.3325	. . . .	-2.5775	. . . .
		(5.39)**		(8.98)**	
(o)	2-Year Tuition Squared	. . . .	. . . .	3.0016	. . . .
				(10.44)**	
(p)	4-Year Tuition	. . . .	0.4068	. . . .	-5.5827
			(4.89)**		(6.61)**
(q)	4-Year Tuition Squared	. . . .	. . . .	. . . .	3.7442
					(7.03)**
(r)	Local Entry Level Wages	-0.0391	-0.1095	-0.0588	-0.1065
		(4.40)**	(10.71)**	(6.44)**	(10.44)**
(s)	County Unemployment Rate	-0.0018	0.0301	-0.0030	0.0329
		(0.65)	(9.95)**	(1.06)	(10.81)**
	Quadratic Tuition	no		yes	

Note: The dependent variable and its respective sample sizes are defined as follows: (1) labor force (N=32,627), (2) two-year college (N=41,468) , and (3) four-year college (N = 29,578). Z-statistics are found in parentheses below coefficients. ** Significant at 1% level * Significant at the 5% level. The equations also include a constant, indicator for "Other" ethnicity group, missing flags for free & reduced lunch status. Regional controls for counties bordering Mexico and other US states are also not reported. Math & reading test scores and entry level wages are normalized, dividing by 1,000. Tuition is normalized, dividing by 100. Miles to nearest college are normalized, dividing through by 10. Omitted coefficients have been restricted to equal zero.

Table 4.4A: Changes in Probabilities of Attending Two-Year and Four-Year Colleges
(Source: UTD Texas Schools Microdata Panel)

	Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)
		Δ Pr($2\,yr$)	Δ Pr($4\,yr$)	(1)+(2)	Δ Pr($2\,yr$)	Δ Pr($4\,yr$)	(4)+(5)
	200 Point Test Score Increase						
(a)	Mathematics (M=1600, SD=200)	+0.9	+7.5	+8.4	. . .	. . .	. . .
(b)	Reading (M=1600, SD=200)	+20.7	-5.0	+15.7	. . .	. . .	. . .
(c)	Both	+19.9	+0.6	+20.4	. . .	. . .	. . .
	5 Mile Increase in Distance						
(d)	Two-Year	-2.7	+1.2	-1.5	. . .	. . .	. . .
(e)	Four-Year	+0.7	-1.1	-0.5	. . .	. . .	. . .
	Household Economic Status						
(f)	Free Lunch to Reduced Lunch	+2.0	+3.2	+5.2	. . .	. . .	. . .
(g)	Reduced Lunch to Ineligible	+2.3	+5.1	+7.4	. . .	. . .	. . .
	Demographic Status						
(h)	Male to Female	+2.5	+2.0	+4.6	. . .	. . .	. . .
(i)	Black to White	+13.8	-14.0	-0.2	. . .	. . .	. . .
(j)	Hispanic to White	+2.9	+1.3	+4.2	. . .	. . .	. . .
(k)	Asian to White	+2.1	-13.6	-11.5	. . .	. . .	. . .
	Quadratic Tuition		no			yes	

Note: The changes in probabilities are evaluated using individual level data. Estimates are based upon the 2 models estimated in Table 4.3. For the household income status, an individual receiving free lunch lives in a household within 130% of the poverty line, while students who received reduced-priced lunch are in households with income between 131% and 185% of the poverty line. In columns (3) and (4), we do not report changes in probability for entries (a) through (k), since they do not differ from probability changes in columns (1) and (2).

Table 4.4B: Changes in Probabilities of Attending Two-Year and Four-Year Colleges
(Source: UTD Texas Schools Microdata Panel)

	Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)
		Δ Pr(2 *yr*)	Δ Pr(4 *yr*)	(1)+(2)	Δ Pr(2 *yr*)	Δ Pr(4 *yr*)	(4)+(5)
	$8 per SCH Tuition Increase						
(l)	Two-Year	+0.6	-0.3	+0.3	-4.6	+2.0	-2.5
(m)	Four-Year	-0.3	+0.6	+0.2	+4.2	-7.0	-2.8
(n)	Both	+0.3	+0.3	+0.6	-0.6	-5.2	-5.8
	$15 per SCH Tuition Increase						
(o)	Two-Year	+1.1	-0.5	+0.6	-8.4	+3.7	-4.7
(p)	Four-Year	-0.6	+1.0	+0.4	+7.3	-12.0	-4.8
(q)	Both	+1.0	+0.5	+1.5	-1.7	-9.3	-11.0
	County Labor Market						
(r)	$1,000 Wage Increase	+0.2	-1.4	-1.2	-0.3	-1.2	-1.5
(s)	1% Unemployment Increase	-0.3	+0.5	+0.2	-0.4	+0.6	+0.2
	Quadratic Tuition		no			yes	

Note: The changes in probabilities are evaluated using individual level data. Estimates are based upon the 2 models estimated in Table 4.3
For the household income status, an individual receiving free lunch lives in a household within 130% of the poverty line, while students who received reduced-priced lunch are in households with income between 131% and 185% of the poverty line. In columns (3) and (4), we do not report changes in probability for entries (a) through (k), since they do not differ from probability changes in columns (1) and (2).

Figure 1: Texas Public Two-Year Colleges

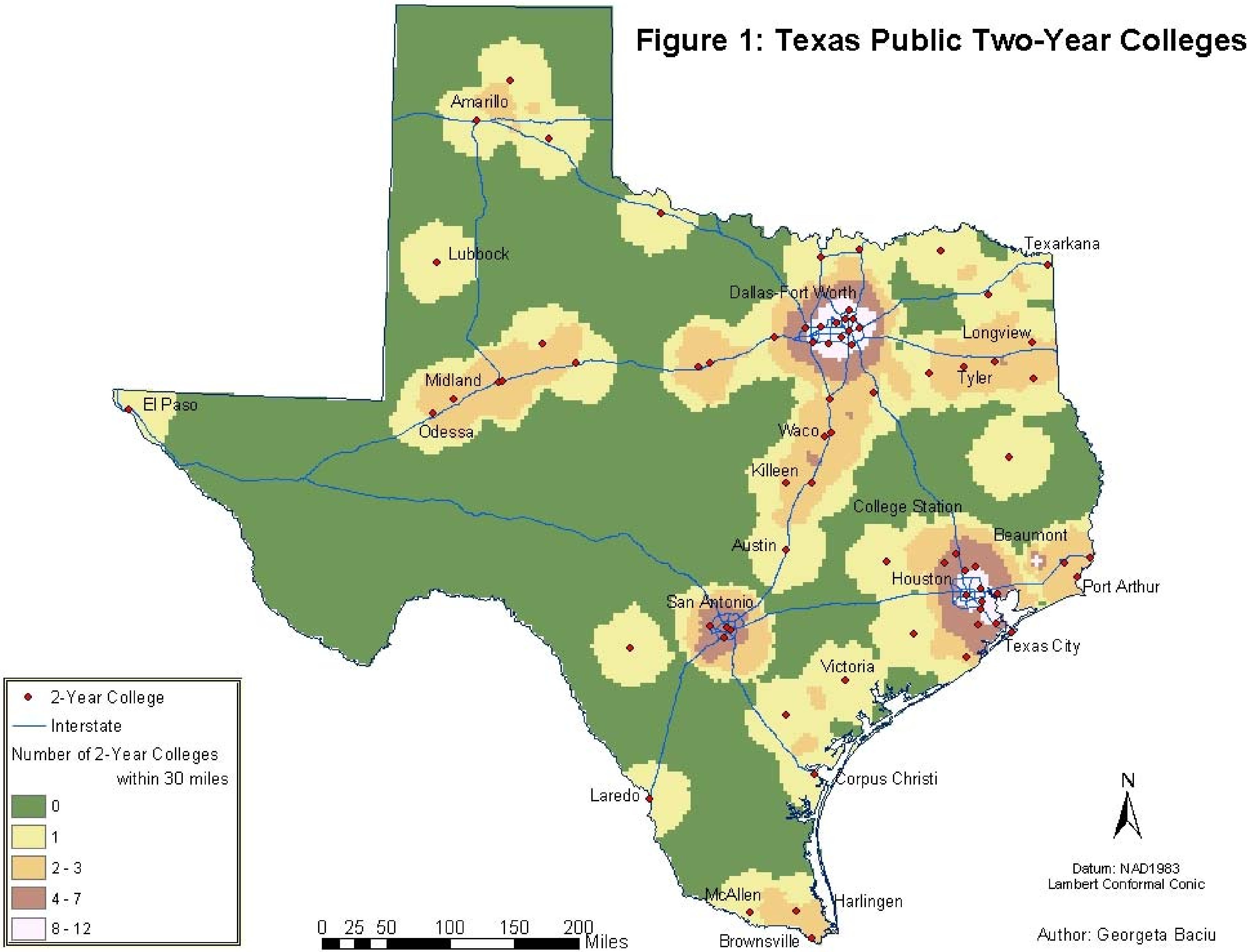

Table 4.4A: Changes in Probabilities of Attending Two-Year and Four-Year Colleges
(Source: UTD Texas Schools Microdata Panel)

	Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)
		Δ Pr($2yr$)	Δ Pr($4yr$)	(1)+(2)	Δ Pr($2yr$)	Δ Pr($4yr$)	(4)+(5)
	200 Point Test Score Increase						
(a)	Mathematics (M=1600, SD=200)	+0.9	+7.5	+8.4	. . .	. . .	. . .
(b)	Reading (M=1600, SD=200)	+20.7	-5.0	+15.7	. . .	. . .	. . .
(c)	Both	+19.9	+0.6	+20.4	. . .	. . .	. . .
	5 Mile Increase in Distance						
(d)	Two-Year	-2.7	+1.2	-1.5	. . .	. . .	. . .
(e)	Four-Year	+0.7	-1.1	-0.5	. . .	. . .	. . .
	Household Economic Status						
(f)	Free Lunch to Reduced Lunch	+2.0	+3.2	+5.2	. . .	. . .	. . .
(g)	Reduced Lunch to Ineligible	+2.3	+5.1	+7.4	. . .	. . .	. . .
	Demographic Status						
(h)	Male to Female	+2.5	+2.0	+4.6	. . .	. . .	. . .
(i)	Black to White	+13.8	-14.0	-0.2	. . .	. . .	. . .
(j)	Hispanic to White	+2.9	+1.3	+4.2	. . .	. . .	. . .
(k)	Asian to White	+2.1	-13.6	-11.5	. . .	. . .	. . .
	Quadratic Tuition		no			yes	

Note: The changes in probabilities are evaluated using individual level data. Estimates are based upon the 2 models estimated in Table 4.3. For the household income status, an individual receiving free lunch lives in a household within 130% of the poverty line, while students who received reduced-priced lunch are in households with income between 131% and 185% of the poverty line. In columns (3) and (4), we do not report changes in probability for entries (a) through (k), since they do not differ from probability changes in columns (1) and (2).

Appendix B4.1

Sample Creation

The Texas School Microdata Panel (TSMP) is located at the Cecil and Ida Green Center for the Study of Science and Society at the University of Texas at Dallas (UTD). It contains elementary and secondary education, post-secondary education and labor force data from Texas state public agencies, which include the Texas Education Agency (TEA), the Texas Higher Education Coordinating Board (THECB), and the Texas Workforce Commission (TWC).

The initial Texas high school class of 1992 sample was created from raw Texas Assessment of Academic Skills (TAAS) files collected by TEA during 1991-92. For Texas public high school class of 1992, TAAS was administered once in October 1991 and again in April 1992. The two files are merged taking the better TAAS sub-score for each student. The combined test files contain 197,701 Texas high school students. Some are assigned temporary identification numbers (TINs) while enrolled in elementary or secondary public schools, as parents are not required to disclose student social security numbers (SSN). The TIN becomes a student's alternative identification from grades K-12. It is not recognized, however, by other state public agencies, and, therefore, 9,445 observations are lost during the merging process. Missing geocode and standardized test data further limit the sample. A final correction is made to account for individuals whose post-secondary outcomes are not observed due to leaving the state, attending a private college or university within the state and for those individuals not participating in the Texas labor force. The final regression working sample includes 103,673 individuals. Sample selection criterion and sample representation may be gauged using Appendix Table A4.1.

Appendix B4.2

Data Dictionary

Each variable employed in the analysis for chapter 4 is described in this section, and each falls into one of the following categories: post-secondary outcomes, demography, ability, geography, price (tuition) and the labor market.

Post-secondary outcomes:

Ever Attended College: 0-1 indicator variable. It indicates if individual ever attended a public two-year college or four-year college in Texas between summer 2002 and spring 2004 semesters. Attendance is defines as enrolling in a class that awards a positive number of semester credit hours.

Ever Attended Two-Year College: 0-1 indicator variable. It indicates if individual ever attended a Texas public two-year college between summer 2002 and spring 2004 semesters.

Ever Attended Four-Year College: 0-1 indicator variable. It indicates if individual ever attended a Texas public four-year college between summer 2002 and spring 2004 semesters.

Attended only Two-Year College: 0-1 indicator variable. It indicates if individual a two-year public Texas college but not a four-year public college in Texas between summer 2002 and spring 2004 semesters.

Attended only Four-Year College: 0-1 indicator variable. It indicates if individual a four-year public Texas college but not a two-year public college in Texas between summer 2002 and spring 2004 semesters.

Attended both (two- and four-year colleges): 0-1 indicator variable. It indicates if individual attended a Texas two-year and four-year public college during Summer 2002 to spring 2004. One does not need to be concurrently enrolled in both institutions to have attended both.

First Attended Two-Year College (incl. Summer '02): 0-1 indicator variable. It indicates if individual first attended a two-year college or simultaneously attended both a two-year and four-year college in Texas from summer 2002 to spring 2004.

First Attended Four-Year College (incl. Summer '02): 0-1 indicator variable. It indicates if individual first attended a four-year college but did not concurrently enroll in a two-year public college in Texas from summer 2002 to spring 2004.

First Attended Two-Year College: 0-1 indicator variable. It indicates if individual first attended a two-year college or simultaneously attended both a two-year and four-year college in Texas from fall 2002 to spring 2004.

First Attended Four-Year College: 0-1 indicator variable. It indicates if individual first attended a four-year college but did not concurrently enroll in a two-year public college in Texas from fall 2002 to spring 2004.

Semester Credit Hours: Variable equals number of community college semester credit hours each individual takes. It is based on students enrolled in the reporting institution as of the 12th class day of the fall and spring semesters and the 4th class day for summer terms. The variable represents the total attempted semester credit hours; it is distinct from total credit hours completed (totalsch).

Demographic Variables:

Ethnicity: 0-1 indicators for ethnic origin. Variables are non-Hispanic white, African American (black), Hispanic, Asian, and other ethnic groups, including American Indian, Alaskan Native, Foreign, and ethnicities not identified (other).

Female: 0-1 indicator identifying student gender (female=1).

Free Lunch: 0-1 indicator for students identified as receiving free lunch. This is distinct from individuals who are eligible for free meals via the National School Lunch Program. Students receiving free lunch reside in households within 130 percent of the poverty line.

Reduce-priced lunch: 0-1 indicator for students identified as receiving reduce-priced lunch. This is distinct from individuals who are eligible for reduce-priced meals via the National School Lunch Program. Students receiving reduce-priced meals reside in households between 131 and 185 percent of the poverty line.

Attended an urban high school: 0-1 indicator for schools located in districts serving the central city of MSAs with populations over 250,000, according to 1990 decennial census figures.

Ability Variables:

TAAS Math Score: continuous variables for mathematics assessment is 1 of 3 parts for the Texas Assessment of Academic Skills. The raw score has been translated from TEA files. Students not in attendance receive scores of 450.

TAAS Reading Score: a continuous variable for reading assessment is 1 of 3 parts for the Texas Assessment of Academic Skills. The raw score has been translated from TEA files. Students not in attendance receive scores of 440.

Geography:

Miles to nearest 2-Year College: Continuous variable displays minimum distance from each high school to nearest two-year college in Texas. The minimum distances are calculated based on straight-line distance.

Miles to nearest 4-Year College: Continuous variable displays minimum distance from each high school to nearest four-year public college in Texas. The minimum distances are calculated based on straight-line distance.

Resides near border of other U.S. state: 0-1 indicator. Resides in a Texas county which borders another U.S. state.

Resides near US-Mexican border**:** 0-1 indicator. Individual resides in a Texas county on the US-Mexican border.

Price Variables:

Two-Year College Tuition: The in-district cost per semester credit hour for the nearest two-year public college in Texas. Costs are for the 1992-93 academic year. If an in-district school exists for the individual, but it is not the nearest school, then the in-district two-year public college's tuition is used.

Four-Year College Tuition: The cost per semester credit hour for the nearest four-year public college in Texas. Costs are for the 1992-93 academic year.

Labor Market Opportunities:

Local Unemployment Rate: a continuous variable representing the unemployment rate for the county in which an individual resides. Data are collected from TWC and reflect the 1992 labor market.

Entry Level Wages: a continuous variable that approximates the entry level wages an 18 year old individual will command in the local (county) labor market. It is calculated using the 75^{th} percentile 1992 earnings of the Texas high school class of 1991 for each county.

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