Time May Change Me: Examining How Aspirations for College Evolve During High School

Abstract

There is a little information about whether and if so how student aspirations for college change over time. We introduce a conceptual model to explain how student aspirations may change over time, utilize panel methods to examine the extent to which this happens during high school, and investigate which factors are associated with such changes. We find that students increase and decrease their college aspirations over time, and such changes are strongly related to high school performance and family mobility. The results suggest that postsecondary stakeholders may need to focus more on the complexities underlying changes in student aspirations.

"And these children that you spit on
As they try to change their worlds
Are immune to your consultations
They're quite aware of what they're going through"

– "Changes" by David Bowie

INTRODUCTION

In the last three decades, the decision to pursue a postsecondary education has become one of the most widely studied topics among higher education scholars (e.g., Cabrera & La Nasa, 2000; Davis, Nagle, Richards & Awokoya, 2013; Park & Hossler, 2014; Zhang, Hu, Sun, & Pu, 2016). The influence of financial aid on the college enrollment decision has also received considerable attention (e.g., Cohodes & Goodman, 2014; Dynarski & Scott-Clayton, 2013; Kim, 2004). The growing interest in student college choice has largely been driven by the institutional and public policy environments. From the institutional perspective, the reasons are primarily related to the rise of enrollment management strategies and the desire of four-year colleges and universities to *shape the class* (Duffy & Goldberg, 2014; Stevens, 2009). From an enrollment management perspective, postsecondary institutions seek insight into how students make their college enrollment decisions so that they can devise ways to influence students' decisions. In addition, virtually all states and the federal government are encouraging postsecondary attendance and graduation, otherwise, as Bergeron and Martin, (February 19, 2015) warn, "the United States will lose ground to countries that have prepared better for the demands of the 21st century workforce and, ultimately, the United States economy and security will be jeopardized."

A precursor of college-going behavior among middle and high school aged students is their formation of postsecondary aspirations (Andres, Adamuti-Trache, Yoon, Pidgeon, & Thomsen, 2007; Bettinger, Long, Oreopoulos & Sanbonmatsu, 2009; Engle, 2007; Hu, 2003; Hossler & Stage, 1992; Hossler, Schmit & Vesper, 1999). Cooper (2009) observes that the first

step to postsecondary attainment among our youth is *to dream*, that is to develop the aspiration to attend a college or university. Student pathways to college are considered as a multi-stage process including educational aspiration formation, academic preparation, and actual enrollment in college (Choy, Horn, Nuñez, & Chen, 2000; Cooper, 2009; Harding, Parker & Toutkoushian, 2017; Hossler & Stage, 1992; Hossler, Schmit & Vesper, 1999). However, little is known about the temporal nature of student decision-making in terms of their pursuit of a college degree.

In addition, there is little information about whether and how high school students change their college aspirations, and what factors might contribute to these changes. Theoretically-based models often frame student aspiration formation as unidirectional, where some students go from not wanting to attend to wanting to attend college. These models assume that once a student decides about whether or not to go to college, they do not change their mind. However, over the course of one's adolescent years student aspirations may increase or decrease, perhaps multiple times. This may be especially true during high school, when students receive information about colleges as well as signals about their chances of success in via high school grades, encouragement from teachers, peers, friends, and relatives. Understanding the extent to which changes in aspirations happen, and the factors that are associated with them, will improve our knowledge of the early stages of college choice and help develop policies to maintain and/or raise aspirations. Thus, relevant questions to answer are: What factors are associated with college aspirations? How stable are student aspirations, and what factors lead to changes in aspirations during high school?

We answer these questions by examining the factors associated with postsecondary educational aspirations, and the stability of these aspirations over time. First, we discuss how the traditional model of college choice can be used and expanded upon to describe how and why

student aspirations for college might vary over time. Next, we examine student educational aspirations by using a longitudinal data set from Indiana that includes responses to surveys when students were in grades 9 and 11. Each year students provided information about their postsecondary aspirations, which allows an examination of how aspirations changed during this key developmental period and what factors were associated with any such changes. An important contribution is that we demonstrate the use of panel data methods to problems such as this, where the dependent variable is categorical rather than a continuous measure. Empirically, first we estimate cross-sectional multinomial logistic regression models to examine the determinants of postsecondary aspirations in each grade. We then estimate random and fixed effects multinomial logistic regression models to focus on how aspirations change over time. This approach allows us to provide more detail about how aspirations for college vary over time, and the factors associated with such changes.

LITERATURE REVIEW AND THEORY

Several theoretical and conceptual models have been used to frame student college choice research. These theories and models have roots in sociology and economics. The sociological approach describes college choice as the result of the interaction between educational aspirations and constraints. In this framework, interactions of social and cultural capital factors such as parental education, family income, and the extent to which parents transmit educational values to their children through cultural practices, such as visiting museums and reading to their children, have an impact on students' educational aspirations. Sociological theories do not focus as much as some other theories on the actual enrollment decision, rather they examine the earlier stages of college choice such as the formation of postsecondary educational aspirations (Bourdieu, 1986; Hearn, 1991; Hossler, Schmit, & Vesper, 1999; McDonough, 1997; Perna, 2006).

Economic theory asserts that individuals view college as a means to acquire skills that are valued in the labor market. College is thought to be an investment in human capital because individuals incur direct costs and forego earnings in the short run in order to realize net financial benefits in the long run (Becker, 1975; Ellwood & Kane, 2000; Paulsen, 2001; DesJardins & Toutkoushian, 2005). Human capital theory assumes that individuals estimate the total benefits of attending a college (e.g., increases in earnings, improved life-course outcomes) and compare them to expected costs (e.g., tuition, room/board, books; foregone earnings; leisure time; psychic costs, etc.; Becker, 1975; Leslie & Brinkman, 1987).

Combined models of college choice attempt to capture the multi-stage process of the college decision-making process. A number of models of student college choice have been proposed including Jackson (1982), Hanson and Litten (1982), Chapman (1981), DesJardins et al. (2006), and Perna (2006). Hossler and Gallagher (1987) synthesized some of the previous work on college choice to propose a three-stage model that is composed of predisposition, search, and choice. More recently, Toutkoushian and Paulsen (2016) extended the college choice model to five stages (aspiration, search, application, admission, and enrollment).

MODELING INTERTEMPORAL COLLEGE CHOICE

Herein we expand on the aspirations stage in these college choice models by conceptualizing the intertemporal nature of student decision-making. The aspiration stage is important because it is a necessary condition for enrolling in college. A student must first decide whether they would like to go to college before the search process can begin, which then leads to the possibility of applying to one or more institutions and having their applications evaluated by these institutions, and then making a final decision regarding enrollment.

Expanding on the model described by Toutkoushian and Paulsen (2016), the following explains how aspirations are determined and can change over time. In this model, the *j*-th student forms a latent (unobserved) demand for college-going at time *t* (a_{jt}^{*}) which is a time-varying function of the utility derived at the same time from the calculation of the expected benefits (B_{jt}) and costs (C_{jt}) of going to college, the utility at time *t* from expected consumptive benefits of college (Z_{jt}),[1] the ability to pay for college (Y_{jt}), personal and family characteristics (V_{jt}) that can change over time (i.e., are said to be variable or non-immutable), and other personal and family characteristics (F_j) such as gender and race/ethnicity that are fixed or immutable factors:[2]

$$a_{jt}^{*} = f_t(U_t(B_{jt} - C_{jt}), U_t(Z_{jt}), Y_{jt}, V_{jt}, F_j) \quad (1)$$

A student aspires to college when the latent demand in (1) exceeds an unobservable threshold for the student (denoted $\bar{a}_{jt}$), the student's perceived value of not going to college, which is subject to change over time as new information is acquired and one's circumstances change.

This conceptualization can also be generalized to the student's attendance and choice margins, that is, whether to attend college and, if so, where to attend (e.g., a two-year or four-year college). Assume that the student can estimate latent demands for two- and four-year institutions (denoted a_{2jt}^{*} and a_{4jt}^{*} respectively). A student's observed aspiration for each type of institution at time *t* (A_{jt}) then depends on the relative magnitudes of the latent demands and whether they exceed the threshold for going to any college:

[1] As noted by Toutkoushian and Paulsen (2016), Becker and Toutkoushian (2013) and others, individuals may also receive non-financial benefits (e.g., learning enjoyment; marriage opportunities) or incur non-pecuniary costs (e.g., studying may be difficult) from attending college as well, which also have an impact on college decision making.

[2] Of course, it is possible that a person could change their gender or racial/ethnic identity, but these are usually treated as though they are fixed over time.

$$A_{jt} = \begin{cases} \text{Four year if:} & a^*_{4jt} > a^*_{2jt} \text{ and } a^*_{4jt} > \bar{a}_{jt} \\ \text{Two year if:} & a^*_{2jt} > a^*_{4jt} \text{ and } a^*_{2jt} > \bar{a}_{jt} \\ \text{No college if:} & a^*_{4jt} < \bar{a}_{jt} \text{ and } a^*_{2jt} < \bar{a}_{jt} \end{cases} \quad (2)$$

Often overlooked is that these latent demands are not always static; students may be continuously updating their demands for college and no college options. First, these demands may change as students acquire new information about the benefits and costs of college, their ability to afford a college education, and their chances of college success. During the early stages of this process, the estimated benefits and costs of college represent average rather than specific values that operationalize the benefits/costs associated with different decisions (e.g., whether to attend, what type of institutions to consider). Second, latent demands for college may change because student preferences (U_t) change over time. Research from psychology, for example, indicates that individual preferences can evolve as the person ages, especially through their mid-20s (Slovic, 1995). For example, the value that a student attaches to the consumptive benefits of going to college may vary from 9th to 11th grade. Third, latent demands may change if students adjust the importance of the components of demand. This would be reflected in the functional relationship (f_t) in (1) changing, and changes in coefficients for these factors in statistical models.

Changes in demand between two periods (*t* and *t-k*) for option *i* can be expressed as:

$$\Delta a^*_{ijt,t-k} = a^*_{ijt} - a^*_{ijt-k} = f(\,)_{ijt} - f(\,)_{ijt-k} \quad (3)$$

When the value in (3) is positive, the student has an increasing latent demand for the margin (aspiration; choice) being considered. If the change in (3) is sufficiently large, some students will alter their college choice decisions. For example, if salaries for high school graduates rise, students may expect higher benefits from *not* going to college, and $\bar{a}_{jt}$ would increase. For those deciding to go to college, student aspirations may also change in terms of *where* to attend (e.g.,

two- or four-year; public/private). For example, making community colleges tuition free may increase the latent demand for this type of institution relative to other types of institutions.

A student's choice process is often described as unidirectional: initially they have no intention of going to college, but then acquire information about the costs/benefits and decide they want to attend, and remain in this state from this point forward (i.e., $\Delta a^{*}_{ijt,t-k} > 0$ for i = 2-year or 4-year institutions). However, aspirations for college can change in more than this one direction. With age, students acquire information about college and feedback regarding their own abilities that in turn drives their aspirations to pursue a college education or not. Through this iterative process some students who initially are interested in going to college may decide not to go. For example, a student who experiences a decline in grades during high school may lower their aspiration for college. Similarly, negative shocks to family income may also lower college aspirations. In addition, within the group of students who initially aspire to a four-year college, some may lower their aspirations to a two-year degree. However, it is also possible for educational aspirations to increase over time, for example participation in athletics in some instances can have such an impact (Hwang, Feltz, Kietzmann, and Diemer, 2016).

Information processing is a key component of this college choice model. This notion focuses on how students gather and convert information into decisions regarding postsecondary education (Huber, 1984; Stinchcombe, 1990; DesJardins and Toutkoushian, 2005). This perspective accounts for differential access to college information as well as the lack of information among students. According to this approach, college information channels are parents and siblings, high school teachers and counselors, college admissions personnel, recruitment materials, college guidebooks, and college fairs (e.g., Avery, 2010; Ceja, 2006; Hossler, Schmit & Vesper, 1999). Information acquired may alter benefit/cost calculations,

leading to reductions in demand for college. One way this is possible is if students initially underestimate the (net) price of attendance or overestimate their chances of admission or success in college. Thus, information acquisition may induce increases or decreases in college aspirations. We examine whether and if so how such changes occur.

DATA AND METHODS

Data

We use longitudinal data on high school students from Indiana to determine the factors related to changes in college aspirations during high school. The dataset drew from several sources including two statewide surveys conducted in 1999-00 on 9th grade students and the other done in 2001-02 on 11th graders. Focusing on these grades is relevant because these years coincide with the period when many students are forming college aspirations, yet this time is before the period when students typically begin the formal college search and application stages.

The surveys were developed by LearnMore and distributed to virtually all public- and private-school 9th and 11th grade students. Each school administered and returned the completed surveys to LearnMore.[3] We limited our sample to students who responded to both surveys and had non-missing data on key explanatory variables included in our models (n=31,532). The effective sample consisted of one-third of 9th graders in the state. The LearnMore surveys included questions capturing student demographics (e.g., gender, race/ethnicity, family status), post-high school educational and occupational aspirations, perceived college attendance barriers, and so on. Of particular interest was the question pertaining to students' educational aspirations after high school. Both surveys asked students to indicate "the highest level of schooling they

[3] The survey was administered by all public schools in the state and most private schools except for a few very small or specialized private schools. In the Fall 1999 there were 81,049 9th graders in public schools in Indiana (NCES), and an estimated additional 10% to 15% of students enrolled in private schools.

expect to achieve."[4] Given the wording of this question, one may wonder whether this measures aspirations or expectations. However, as Morgan (2006) discusses,

> "Expectations are sometimes distinguished from aspirations *in theory* (emphasis added), with the former stipulated to refer to realistic appraisals rather than idealistic goals. Nonetheless, almost all empirical research has utilized the same straightforward operationalization for both concepts. Educational expectations and aspirations are usually answers that adolescents give to questions such as: 'Do you plan to go to college?' and 'As things stand now, how far in school do you think you will get?' These survey questions elicit future plans which are generally quite optimistic, thereby qualifying as sufficiently idealistic for the analytic and explanatory purposes of those who wish to have a measure of aspirations" (Morgan, 2006, p. 1529).

Perna also notes (2006), "Adelman (1999) argues that 'aspirations' reflect outcomes that are desired regardless of how realistic, while "plans" reflect a more realistic appraisal of future behavior and a scheme for achieving the desired outcome. Despite these conceptual distinctions, however, researchers tend to use the labels aspirations, expectations, and plans interchangeably" (Perna, 2006, 126-127).[5] We follow the prior research and use the LearnMore question to identify whether, in grades 9 and 11, students aspired to earn a two- or four-year degree or did not plan to go to college. Thus, the outcome is nominal with three values at each point in time.

[4] Responses included: May leave high school before graduation; high school diploma; high school diploma + education/training of < two years; two year college degree; four year college degree or higher; undecided or other

[5] More information about these issues can be found in Kahl, 1953; Alexander and Eckland, 1975; Spenner and Featherman, 1978; Hauser, et al. 1982; Morgan, 2005; Bozick, et al., 2010; Trebbels, 2015.

The statistical models include variables chosen based on our conceptual framework and the student choice literature. They represent fixed (immutable) characteristics such as gender and race, and variable (non-immutable) characteristics such as high school grade point average (GPA) and other factors that could change from 9th to 11th grade. Some factors that in theory could be time-varying were fixed because the surveys only collected data about them in either grade 9 or 11, but not both. The immutable variables included in the regressions were:

Gender. Many college choice studies include gender as a predicting factor, but the effects of gender are ambiguous. Some studies found higher educational expectations for females (Hossler & Stage, 1992), others found higher educational expectations for males (Hao & Bonstead-Bruns, 1998). Hossler and Stage (1992) found female students' educational aspirations increase with discussions with their parents about college, but this is not always true for males. Some studies found higher college going rates for females (Perna & Titus, 2004; 2005), whereas others found no significant difference in college-going rates by gender (Perna, 2000). We operationalized gender by the use of a single indicator variable for males (1=male, 0=female).

Ethnicity/Race. Compared to their white and Asian peers, African American and Latino students have been found to be less likely to aspire to college (Bohon, Johnson, & Gorman, 2006; Cooper, 2009; Elliott, 2009; Hossler & Stage. 1992; Hossler, Schmit, & Vesper, 1999). There are, however, variations in these patterns. For example, Raleigh and Kao (2010) found that the educational aspirations of immigrant children were higher than those of native-born students of color. Herein, we categorized students as either white, black, Asian, Hispanic, or other race.

Family Status. There is ample evidence that growing up in a two-parent household has a positive effect on educational aspirations (Barber & Eccles, 1992; Charles, Roscigno, & Torres, 2007; Garg, Melanson, & Levin, 2007; Heard, 2007; Sarsour, Sheridan, Jutte, Nuru-Jeter,

Hinshaw & Boyce, 2011). We operationalized this construct by creating indicator variables for students living with both parents, living with only their mother (father), or living in some other arrangement. Even though family status could be time-varying, the survey only asked students about their family status in grade 9.

Twenty-first Century Scholar Enrollment. The Twenty-first Century Scholars (TFCS) program is a last dollar grant program providing recipients with funds to cover Indiana public college tuition and fees (but not room and board), or an equivalent amount to attend an in-state private institution for up to four years. The program also provides recipients with a range of support services during high school. Given the importance of the TFCS program during the observation period, we include a variable to capture program participation in the 9th grade.

High School Attended/School Context. School context also shapes college aspirations. High school academic quality and affluence measured by teacher qualifications, average academic achievement and family income, advanced courses availability, college counseling, access to technology, and expenditures per student are related to college choice outcomes (Harper & Griffin, 2011; Perna, 2004). In this study, context is included using variables measuring the percentage of students in each school (in 9th grade) who took the SAT and the percentage of students receiving free or reduced price lunch.

The following time-varying variables were included in the models:

Academic Performance. Higher academic preparation and greater academic achievement are associated with higher postsecondary aspirations and positive college choice outcomes. High academic ability increase the odds that students will enroll in college preparatory classes in high school, enroll in more math and science classes, take more AP courses, and graduate with higher grades (Hughes et al., 2005; Joensen & Nielson, 2009; Iatarola. Long, & Conger, 2011). Not

surprisingly, it also increases the odds of their admission to a college or university (DesJardins et al., 2006; Ellwood & Kane, 2000; Hossler et al., 1989; Hossler & Stage, 1992; Perna, 2000; 2006; Perna & Titus, 2004; 2005; St. John, 1991). Academic performance was represented in our analysis by the student's self-reported cumulative grade point average in grades 9 and 11, and squared GPA to capture any quadratic relationship between grades and college aspirations.

Ability to Pay for College. Studies have found that socio-economic status (SES) influences college choice outcomes such as aspirations, application decisions, and enrollment choices. For example, students from lower-income families are less likely to aspire to go to college (Kao & Tienda, 1998). Social and cultural capital are also closely associated with college choice (Bourdieu, 1986; McDonough, 1997; Terenzini et al., 2001). Parents' educational attainment, parental involvement in their child's education, and parental educational expectations of their child have been found to be strongly associated with students' college aspirations, application behavior, and enrollment decisions (Harper & Griffin, 2011; Hossler, Schmit & Vesper, 1999; Hossler & Stage, 1992; Kao & Tienda, 1998; McDonough, 1997; Perna, 2000; Perna & Titus, 2004, 2005; Plank & Jordan, 2001; Rowan-Kenyon, Bell & Perna, 2008). Our dataset does not include information about each student's family SES so we used the median household income in the family's Census tract in grades 9 and 11 as a proxy. The unemployment rate in each Census tract in grades 9 and 11 is included as a proxy for opportunity costs.

Mobility. We created a variable indicating whether the student changed counties between grades 9 and 11. Moving during high school happens for many reasons that relate to college aspirations. For example, some students move to take advantage of educational opportunities. Students may incur costs from moving due to the disruption in their lives, and the act of moving may also indicate instability in their family's situation.

Disability Status. Physical, emotional, and intellectual disabilities may be barriers to success throughout a student's educational experience. Students with disabilities are less likely to be academically successful in primary, secondary, and postsecondary education (Denhart, 2008; Gil, 2007; Konrad, Fowler, Walker Test, & Wood, 2007). Disability status was captured by indicator variables for whether the student had a learning or physical disability in each grade.

Methods

The statistical models focused on how the aforementioned factors affect the *levels* of student postsecondary aspiration in each year, and any changes in aspirations between grades 9 and 11. First, we estimated two cross-sectional multinomial logistic regression models, one each for grades 9 and 11:

$$A_{j9} = \alpha_9 + \boldsymbol{F}_j\boldsymbol{\beta} + \boldsymbol{V}_{j9}\boldsymbol{\gamma} + \varepsilon_{j9} \quad \text{if Grade 9} \quad (4.1)$$

$$A_{j11} = \alpha_{11} + \boldsymbol{F}_j\boldsymbol{\beta} + \boldsymbol{V}_{j11}\boldsymbol{\gamma} + \varepsilon_{j11} \quad \text{if Grade 11} \quad (4.2)$$

where A_{jt} = postsecondary aspiration for student *j* in grade *t* (*t*=9 or 11), α_t = an equation-specific intercept, $\boldsymbol{F}_j$ = a set of unchanged or immutable characteristics described above, with coefficients $\boldsymbol{\beta}$), $\boldsymbol{V}_{jt}$ = a set of variable/non-immutable characteristics with coefficients $\boldsymbol{\gamma}$, and ε_{jt} represents a random error term. These models enabled us to identify how, at each point in time, students' postsecondary aspirations were associated with the explanatory variables. Each sample included 31,532 observations, one for each student.

Next, we employed panel data methods to focus on the *changes* in student aspirations across grades. A panel dataset was constructed that contained two observations for each student, one each for the 9th and 11th grades. Using this dataset, we estimated a "pooled" multinomial logistic regression that did not adjust for the multiple student observations across panels:

$$A_{jt} = \alpha + \boldsymbol{F}_j\boldsymbol{\beta} + \boldsymbol{V}_{jt}\boldsymbol{\gamma} + \theta T_{jt} + \varepsilon_{jt} \quad \text{if Grade 9 or 11} \quad (5.1)$$

where all variables are defined as before and T = 1 if 11th grade, 0 if 9th grade.

We then extended 5.1 by including random effects:

$$A_{jt} = \alpha + \boldsymbol{F}_j\boldsymbol{\beta} + \boldsymbol{V}_{jt}\boldsymbol{\gamma} + \theta T_{jt} + (\alpha_j + \varepsilon_{jt}) \quad \text{if Grade 9 or 11} \qquad (5.2)$$

where α_j = a random intercept for the j-th student. The error term is a combination of a pure random term and a component that is specific to each student. The random effects model is appealing because (1) it takes into account the non-independence of repeated student observations; (2) it permits the use of the whole sample regardless of whether or not student aspirations changed between grades 9 and 11; and (3) it permits the estimation of relationships between fixed factors (e.g., gender) and aspirations. However, the model assumes individual-level effects are independent of the covariates, an often-untenable assumption in social science research when unobserved heterogeneity (e.g., motivation, omitted ability) is likely to be present.

We also employed a fixed effects multinomial logistic estimator, which models the *change* (from 9th to 11th grade) in aspirations for postsecondary education (the outcome) as a function of explanatory variables that could change over time (see Pforr, 2014, for details). Two versions of the fixed effects model were estimated:

$$A_{jt} = \boldsymbol{\alpha}_j + \boldsymbol{V}_{jt}\boldsymbol{\gamma} + \theta T_{jt} + \varepsilon_{jt} \quad \text{if Grade 9 or 11} \qquad (5.3)$$

$$A_{jt} = \boldsymbol{\alpha}_j + \boldsymbol{V}_{jt}\boldsymbol{\gamma} + \theta T_{jt} + \left(T_{jt} * \boldsymbol{F}_j\right)\boldsymbol{\delta} + \varepsilon_{jt} \quad \text{if Grade 9 or 11} \qquad (5.4)$$

where $\boldsymbol{\alpha}_j$ = fixed effects for each student and (T_{jt} * $\boldsymbol{F}_j$) = interactions between time-invariant variables in our model and a dummy variable indexing time, and $\boldsymbol{\gamma}$ represent the within-student effect of changes in each regressor on changes in postsecondary aspirations.. Equation (5.3) represents the more traditional fixed effects model where only time-varying factors (measuring "within" student variation) are included as regressors. However, as demonstrated by Wooldridge (2010, 2013) and Allison (2005, 2009), even though their values do

not change over time, fixed regressors (e.g., gender) *can* be included in a fixed effects model if they are interacted with the relevant time variable. These coefficients provide insights into how *changes* in these variables relate to *changes* in the dependent variable from the 9th to 11th grade.

The fixed effects estimator offers an advantage over the pooled and random effects estimators: it removes the influence of student-specific observable and *unobservable* characteristics. The latter is possible given repeated observations for students; students act as controls for themselves, thereby controlling for student time-invariant unobserved heterogeneity such as motivation or unmeasured ability. Controlling for unobserved factors is important because not doing so tends to bias estimates for the regressors included in the model. The fixed effects estimator is only relevant when the value of the outcome changes over time. Given that our dependent variable has only three possible values and we have only two points in time, many students do not report changes in aspirations between grades 9 and 11. Thus, the sample contains observations only for the 15,796 students who had changes in aspirations from 9th to 11th grade.

RESULTS

Descriptive Results

Table 1 displays descriptive information about the transitions in college aspirations between grades 9 and 11. The last column indicates that in 9th grade there were 31,532 students in the sample, of which 20 percent (n = 6,321) said they wanted to go to college. About eight percent (n = 2,650) of 9th graders initially indicated aspirations to earn a two-year degree, and 72 percent (n = 22,561) planned to earn a four-year degree or higher. The last row indicates that by 11th grade, aggregate aspirations increased only slightly, with fewer (18%) students indicating they did not want to go to college at any level, and 10% reporting they wanted to pursue a two-year degree. Four-year degree aspirations remained quite stable over time.

Although aggregate aspirations were quite stable from 9th to 11th grade, there was considerable movement in aspirations *within* students. The "on diagonal" pairings (i.e., No College – No College; Two Year – Two Year; Four Year – Four Year) indicate the number of students with stable postsecondary aspirations between grades 9 and 11. Other values indicate how student aspirations changed (increased or decreased) over time. About one-fourth of the students changed aspirations for college during this two-year period. Surprisingly, the students who did change their minds were about evenly split between those with increasing (n=4,090) and decreasing (n=3,808) aspirations. Of those with increasing aspirations, about half who said No College in 9th grade changed their minds to some type of college by the 11th grade, with two-thirds of these switching from "No College" to "Four-year College." Also, 2,994 (1,708+1,286) students who in 9th grade indicated they wanted to earn a four-year degree reduced their aspirations for college by grade 11. Another 814 students lowered their aspirations from aspiring to a two-year degree to not going to college. These results indicate that the relatively stable *overall* aspirations observed mask changes in aspirations *within* individuals during this period.

There was also heterogeneity in terms of transition chances within each choice category. Only one-third (n = 875) of students who initially indicated interest in earning a two-year degree *did not change* their aspirations over time, whereas 87 percent (n = 19,567) of students who initially indicated aspirations for a four-year degree had stable preferences.

We also analyzed aspiration transitions by race/ethnicity, first generation status, and average household income (available on request). Of white (first-generation) 9th graders who initially indicated they did not want to attend college, 50 (55) percent remained in that state by 11th grade, whereas only 39 (46) percent of their African American (non-first generation) peers did so. A higher percentage of Black students changed aspirations from No College to Four-year

College in 11th grade than their white peers. Students from the highest income quartile were 7 percentage points (40% vs. 33%) more likely to increase aspirations from two- to four-year institutions than their lowest quartile income peers, and the former were 10 percentage points more likely to change aspirations from No College to Four-Year than the latter (28% vs 38%).

We also estimated a logistic regression where the outcome was 9th graders saying they did not want to go to college in 9th grade *and* giving the same response in 11th grade (vs. others). Controls included were race/ethnicity, gender, 9th grade GPA, household income, and first-generation status. This analysis examined whether some of the unconditional results noted above hold when accounting for other factors. Males (first-generation students) had odds of remaining uninterested in college from 9th to 11th grade that were about 60 (30) percent higher than that of their female (non-first generation) peers. Hispanic students had 20 percent higher odds, but Black students had odds only .40 that of white students of not aspiring to college in either grade.

---------- Insert Table 1 about Here ----------

Table 2 provides descriptive statistics broken down by grade for the fixed and variable factors included in the statistical models. With regard to the variable factors, between grades 9 and 11 the average GPA of students fell from 3.08 to 3.01 and six percent of students moved to a new location. For the fixed variables, many students were the first in their families to aspire to college, and only about two-thirds reported living with two parents. Interestingly, the unemployment rate in Indiana rose by more than a point from 9th to 11th grade.

---------- Insert Table 2 Here ----------

Inferential Results

Table 3 provides cross-sectional results indicating how the fixed and variable factors included as regressors related to aspiration in grades 9 and 11. The first (last) two columns

correspond to student aspirations in grade 9 (11). The reference category for the dependent variable was No College. The estimates are odds ratios and robust standard errors reported.

---------- Insert Table 3 Here ----------

Overall, the results indicate that even though the signs and significance level patterns of the regressors are similar in grades 9 and 11 across models, in many instances the magnitudes of the effects differ. In general, the coefficients for a number of the variables in the model were larger for grade 11 than grade 9 sample, even though each sample consists of the same students.

Beginning with the time-varying variables, in 9th and 11th grade a student's GPA has a quadratic relationship with their intent to earn a two-year degree, and a positive association with aspiring to a four-year degree (relative to the no college category). For the two-year to no college comparison, the quadratic term indicates that aspirations for a two-year degree at first increase with GPA and then decrease. Examining all pairwise comparisons of the dependent variable (available upon request), as students' academic performance improves, they increase their college aspirations and substitute away from a two-year degree towards a four-year degree.

Compared to their peers, students enrolled in Indiana's TFCS program had higher odds of aspiring to earn a four-year degree, by about 18 (32) percent in 9th (11th) grade. Students with a learning or physical disability had lower odds (than their peers) of aspiring to earn a four-year degree in both grades. In both grades, males had lower odds of aspiring to earn a four-year degree, but in grade 9 there was no such effect for the two-year margin, and in grade 11 males had 17 percent lower odds of aspiring to a two-year college. Interestingly, African Americans were more likely than white students to aspire to earn a four-year degree (relative to not aspiring to college) in both years. Consistent with the literature, first generation students' odds of aspiring to a four-year degree (relative to no college) were 50 (in 9th grade) to 60 percent lower (in 11th

grade) than their non-first generation peers. Also, the increase in the unemployment rate from grade 9 to 11 noted in our descriptive statistics appears to have reduced the odds (by about 18%) of aspiring to a four-year degree in grade 11.

Table 4 displays the findings from the panel data models. Columns 1 and 2 contain the pooled multinomial regression results, and the random effects estimates are in columns 3 and 4. Relative to the cross-sectional models, these models include two categorical time-varying measures: whether a student moved to a different county between grades 9 and 11 (1 if moved; 0 otherwise) and a dummy variable to capture any time trends in the data.

Estimates of the variance of the random effects (var(RI[stuid]) measure the variation in aspirations for college due to differences between individuals (cet. par.). A likelihood ratio test of the pooled vs. random effects model provides evidence that the latter fits the data better than the former (LR chi2(3) = 3363.02, prob>chi2 = 0.000).[6] Thus, unless otherwise noted discussion of results will focus on the random effects model. Notwithstanding the better fit of the random effects model, the results were similar across the two models, and the signs and significance levels were comparable to those in the two cross-sectional models. Aspirations for a two-year degree initially rose with GPA and then fell, whereas there was a positive association between GPA and aspirations for a four-year degree throughout the range of GPA values. Males and first-generation college students were again less likely to aspire to earn a four-year degree, and African Americans and Asians were more likely to opt for pursuing a four-year degree. Compared to their peers, students enrolled in Indiana's TFCS program were again more likely to aspire to earn a four-year degree. Students who moved had odds of aspiring to a four-year degree (compared to not going to college) that were 16 to 38 percent lower (in grades 9 and 11,

[6] The random terms covariance (cov(RI2[stuid]), RI4[stuid]) is significant indicating a correlation between these terms.

respectively) than their non-moving peers. The positive time-trend (Grade 11 variable) estimates for the two- and four-year margins indicates that (cet. par.) in 11th grade students had 42 to 61 percent higher odds of aspiring to a two- and four-year college, respectively, than in 9th grade.

---------- Insert Table 4 Here ----------

Table 5 provides the results from the fixed effects multinomial logistic regression models. These models measure *changes* in aspirations as a function of *changes* in the time-varying explanatory variables, *but only for students who had changes in their aspirations* (resulting in a smaller sample relative to the other models). Fixed effects models control for observed (e.g., race/ethnicity, gender…) and unobserved (e.g., intelligence, genetics, …) immutable factors that might explain changes in aspirations, the parameter estimates are less vulnerable than the pooled or random effects models to omitted variable and selection biases (see Chamberlain, 1980, for details).

Columns 1 and 2 report the findings from the model without interactions of the fixed explanatory variables with time, and columns 3 and 4 present the results including these interactions.[7] Again, interactions were included to observe the effect of time-invariant regressors on changes in aspirations.[8]

Table 5 presents the results with the comparison being between students who, in 9th grade, said they did not aspire to attend college but changed their aspirations by 11th grade to either desiring to attend a two- or four-year institution. Thus, the odds ratios indicate the direction and magnitude of the effect of each variable on a student changing their aspirations in

[7] A likelihood ratio test was conducted to examine whether including the interaction terms improved the fit of the model relative to a main-effects only model. The null is rejected (LR chi-square=122.97; prob > chi-square of 0.0000) indicating that the main effects model fits the data better than the model with interaction terms.

[8] To conduct this test in a multinomial logistic model setting we conducted Hausman tests for each pair of outcomes categories for the fixed and random effects models. In each instance the null hypothesis that the coefficients were equal across these models was rejected, indicating (in lay terms) that the fixed effect model is preferred.

9th grade from No College to aspiring to a two- or four-year degree in the 11th grade. Other outcome category contrasts were estimated by changing the reference category of the dependent variable to two- and then four-year. Some of these results are discussed in the narrative below.

The results for the fixed effects models are in several cases notably different from the cross-sectional, pooled, and random effects results. Students who initially indicated no intention to go to college in 9th grade, but had increases in their high school GPA over time, were much more likely to increase their aspirations for both two- and four-year institutions. There is evidence of a quadratic relationship between changes in academic performance in high school and aspiration changes over time. This result implies that the positive effect of increases in GPA inducing increases in college aspirations initially rises with GPA but then falls. This negative quadratic relationship holds for both the two- and four-year margins, whereas the pooled and random effects results exhibited a negative (positive) relationship for the two- (four-) year margin. In other pairwise comparisons, students who aspire to go to a two-year (four-year) college in 9th grade and whose grades increase during high school have very small odds (OR=.25 and OR=.17, respectively) of saying No College by the 11th grade. In sum, there is evidence that GPA increases from 9th to 11th grade induce increases in aspirations for college.

Students who moved between grades 9 and 11 are less likely to change their aspirations from no college to any type of college. For example, relative to students who did not move, moving between grades 9 and 11 reduces the odds of changing aspirations from no college to a two-year (four-year) institution by about 27 (31) percent [(.727-1)*100]; [(.692-1)*100]. Thus, moving during the 9th to 11th grade years dampens one's aspirations for college.

The random effects results discussed in Table 4 indicated a negative relationship between learning disability status and aspiring to attend a four-year institution (relative to No College),

but no such relationship for the two-year college margin. The fixed effects results indicated no such negative relationship for either the two- or four-year margins. This change appears to be due to changes in the point estimates between the random and fixed effects models, but maybe more importantly, to much larger standard errors for the fixed effects model. The latter is probably due to smaller sample sizes because only students who change aspirations are included, and relatively few students change their learning disability status from 9th to 11th grade.

Unlike the random effects model results, no statistically significant effect of the unemployment rate nor the median household income in the students' locale was found for the fixed effects estimator. In addition, the random effects results showed evidence of a general time-trend, with aspirations for college rising over time. However, the fixed effects model results only find a significant time-trend for the No College to two-year contrast.

Interestingly, some of the interaction terms were statistically significant suggesting that the *effects* of some of the fixed characteristics on aspirations actually change over time. This is noteworthy because failing to include these interactions terms masks the effects of these immutable characteristics. In particular, compared to their peers, first-generation college students are less likely to increase their aspirations over time, and students in two-parent families are more likely to have increased their aspirations from no college to a four-year degree from the 9th to 11th grade. From 9th to 11th grade male students generally have lower aspirations for college than their female counterparts do. Specifically, males who initially aspired to no college had odds of changing their minds and saying two-year (four-year) that were only .74 and .87 (respectively) that of females. In results not shown, male students who initially aspired to a four-year degree were more (less) likely to indicate no college (two-year) in 11th grade than their female peers. In addition, males who, in 9th grade, stated a desire to attend a two-year institution

had higher odds of reducing their aspirations (saying no college) by the 11th grade than female students. Compared to whites, Asian students who changed their aspirations (from either no college or two-year) had three times higher odds to aspire to attend a four-year institution.

---------- Insert Table 5 Here ----------

One explanation for differences between the random and fixed effects results is that there are unobserved time invariant factors that are controlled for in the latter model that are not accounted for in the former model. Accounting for unobserved variables would tend to explain away or even change some of the observed relationships produced by the random effects model.

LIMITATIONS

There are, of course, a number of limitations of the study. Because the data were collected in 1999-2000 and 2001-2002, it is possible that the results we reported here have changed over time. In addition, the surveys did not ask questions about some of the factors that have been shown to be predictive of aspiration formation and change, including (but not limited to) parents' occupational status and educational/occupational expectations for their children, peer influences, locus of control, and the students' own occupational expectations. Finally, the fixed effects estimator can only be applied to cases where there is variation in the dependent variable. Normally, when the dependent variable is continuous and there are many years of repeated observations this is not a problem. However, in our case the dependent variable is categorical with three possible values and we only had two observations per student.

Nonetheless, the data used herein remain valuable for the purpose of our study for several reasons. First, they provide a rich source of information about college aspirations for a large proportion of students in an entire state. There are nationally representative data sources [Monitoring the Future (MTF), Beginning Postsecondary Students, High School & Beyond

(HS&B), National Education Longitudinal Study (NELS), Education Longitudinal Study (ELS), High School Longitudinal Study (HSLS)] containing aspirations measures, which have been used (Hanson, 1994 and Adelman, 1999 used HS&B; Qian and Blair, 1999 used NELS) for generalizations to the entire country. However, some of these data sources are even more dated (MTF, NELS) than the LearnMore survey or cover about the same observation window (ELS) as our data. Perhaps equally important, Palmer, Hayek, Hossler, Jacob, Cummings, and Kinzie (2004), in their review of studies on college choice over a 50-year period, conclude that one of the clearest patterns is not that the factors influencing college choice have changed during this time frame but rather students are engaging in the process earlier and earlier. In addition, given the two-stage sampling design (sample institutions, then students within colleges) there are small samples within states and institutions.

Second, our study demonstrates how aspirations can change over time for students, and how a dataset with repeated measures on student aspirations could be used to examine this important issue and other similar issues. In this sense, the data from Indiana's LearnMore statewide survey is an illustration of how this can be done, and the considerations and issues that researchers face in doing so. Given the recent addition of the High School Longitudinal Study to the NCES suite of datasets, it appears it may be very useful to conduct a study similar to ours. The HSLS interviews 9th and 11th graders, and asks a question about future postsecondary schooling. An improvement to our survey is that the HSLS asks a question that tries to capture student aspirations more adequately.[9]

SUMMARY AND DISCUSSION

[9] The HSLS students were asked about the "highest level of education they would complete *if there were no barriers."* The addition of the resource constraints qualifier is important when trying to measure student aspirations rather than their expectations/plans (see Hauser and Anderson, 1991 for more about this).

Although student aspirations for college likely evolve over time, little is known about when these aspirations are formed and whether or how they may change over time. Human capital theory and the perspective of information processing would suggest that students are continuously updating their estimates of the costs and benefits of going to college as they obtain new information about financial aid, their own academic performance, and other factors. Thus, it is important to understand how new information may lead to reductions in postsecondary aspirations for some, increases in aspirations for others, and no change for the rest.

Herein we extended the traditional model of college choice to demonstrate that aspirations for college are intertemporal in nature. This temporal variability may be the result of changes in information and/or the background circumstances of students, changes in their preferences for education, or changes in the way they utilize information to make decisions about college. Because high school students are at a stage of life where their preferences are evolving, such changes will tend to lead to temporal variability in their choices about college.

We applied panel data methods to study the postsecondary aspirations of students using a sample of Indiana students surveyed in 9th and 11th grade. Nearly one-quarter of the sample changed their minds about going to college between grades 9 and 11. They were about evenly split between those raising and lowering their aspirations for college. Accordingly, plans for college among high school students are perhaps more fluid than previously thought. Educators and policy makers often focus their attention on raising the aspirations of students who do not want to go to college. However, maybe more attention should be paid to students who reduce their postsecondary aspirations, and try to determine if this change is due to factors (e.g., finances; lack of information) that could be addressed by policy or program interventions.

To learn more about why students *change* their aspirations for college, we applied a statistical model that allowed us to examine the qualitative (directional) aspects of such changes (e.g., from no college to two-year; two-year to four-year; etc.), and to quantify the effects of the included regressors on changes in aspirations. In so doing, we were able to examine whether, and if so how much change happened among this group of high school students, and the extent of the movement among the choices available to them. Importantly, the fixed effects estimator used allowed us to examine the effects of immutable and non-immutable characteristics on aspirations while accounting for the unobservable attributes of each student.

The most consistent finding from the data is that as high school GPA increased, students were more likely to raise their level of aspirations for college (the access margin) and less likely to reduce their aspirations for the type of college they might want to attend (the choice margin), regardless of their original intention. This result suggests that aspirations for college are heavily influenced by student perceptions of their chances of admission to and success in college. This may be because high school grades are often used in determining college admissions. As students gain academic proficiency during high school, they may realize they can compete with other students in college and have a reasonable chance of earning a degree. At the same time, the results provide an increased sense of urgency for high school counselors, teachers, and parents for those students whose grades are falling over time.

With regard to the immutable characteristics, we found that first-generation college students, who, on the 9th grade survey, indicated no aspirations for college, were less likely than their peers to raise their aspirations by 11th grade. Our results also exhibit interesting patterns by gender. Males who initially did not plan to go to college were less likely than females to raise their aspirations. At the same time, males who initially planned to attend a two-year college were

more likely than females to change their aspirations in either direction (no college or four-year). Males who planned to attend a four-year institution were less likely (than females) to want to switch to a two-year institution, but more likely to decide to opt out of college altogether. One of the most vexing implications of these findings are, as Hossler, Schmit, and Vesper (1999) point out, that these students may not have taken the requisite curriculum to be admitted or to be successful in colleges. This suggests that parents, counselors and teachers should make efforts to encourage more students to take college preparatory curricula.

Interestingly, for students who changed their aspirations, whether or not they were part of the TFCS program was not significantly related to changes in college aspirations from 9th to 11th grade. Given the range of college-related services provided to students who enroll in this program, we might expect to see a positive relationship between TFCS participation and changes in aspirations. This finding is consistent, however with research demonstrating that TFCS participation has a small effect on college access and enrollment (Toutkoushian, et al., 2015).

To summarize, our results demonstrate that aspirations for college during high school are not fixed. Many students change their aspirations about whether and where to go to college. Nearly half the students who in 9th grade said they did not want to attend college altered their aspirations by the 11th grade. For many students, college aspirations increased over time, however, we also observed the opposite pattern. Although the policy focus is often on *increasing* students' college aspirations, with hopes of increasing enrollments, equally important may be to focus on *maintaining* or preventing the *lowering* of aspirations during high school.

The way in which students form their aspirations for college over time is complex. Like David Bowie who, in his song "Changes" was reflecting on the passage of time and how it affects people, researchers and policy makers also need to focus on the complexities underlying

changes in student postsecondary aspirations. An improved understanding of these mechanisms could help make progress in understanding how to improve college access and choice and in so doing raise educational attainment. Our study points to the need to work with students and their families during their K-12 journey to increase their knowledge about the pecuniary and non-financial benefits and costs of postsecondary education so that they can make informed decisions during high school. At a minimum, such analyses require longitudinal data on students at *many* different points in time to uncover precisely how and why aspirations form and change.

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Table 1: Changes in Postsecondary Aspirations by Grade for Indiana Students

	Aspirations: Grade 11			
Aspirations: Grade 9	No College	2-Year Degree	4-Year Degree	Total: Grade 9
No College	3,192 (50%)	1,042 (16%)	2,087 (33%)	6,321 (20%)
2-Year Degree	814 (31%)	875 (33%)	961 (36%)	2,650 (8%)
4-Year Degree	1,708 (8%)	1,286 (6%)	19,567 (87%)	22,561 (72%)
Total: Grade 11	5,714 (18%)	3,203 (10%)	22,615 (72%)	31,532

Notes: Sample includes students with complete data in both grades 9 and 11 on the variables used in the panel data models.

Table 2: Descriptive Statistics for Explanatory Variables

	Grade 9				Grade 11			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
GPA ***	3.08	0.71	0.5	4	3.01	0.73	0.5	4
GPA Squared ***	10.02	4.08	0.25	16	9.57	4.18	0.25	16
Learning Disability	0.02	0.16	0	1	0.03	0.16	0	1
Physical Disability ***	0.01	0.08	0	1	0.00	0.05	0	1
Enrolled in TFCS	0.07	0.26	0	1	0.07	0.26	0	1
Moved between Grades 9 and 11	0.00	0.00	0	0	0.06	0.24	0	1
Male	0.48	0.50	0	1	0.48	0.50	0	1
White [REF]	0.80	0.40	0	1	0.80	0.40	0	1
Black	0.04	0.19	0	1	0.04	0.19	0	1
Hispanic	0.02	0.12	0	1	0.02	0.12	0	1
Asian	0.01	0.10	0	1	0.01	0.10	0	1
Other Race	0.08	0.28	0	1	0.08	0.28	0	1
Race Missing	0.05	0.23	0	1	0.05	0.23	0	1
1st Generation Student	0.44	0.50	0	1	0.44	0.50	0	1
Non 1st Generation [REF]	0.34	0.48	0	1	0.36	0.48	0	1
Generation Unknown	0.20	0.40	0	1	0.20	0.40	0	1
Live with Two Parents	0.64	0.48	0	1	0.64	0.48	0	1
Live with Mother	0.11	0.32	0	1	0.11	0.32	0	1
Live with Father	0.02	0.15	0	1	0.02	0.15	0	1
Live Other Arrangements [REF]	0.20	0.40	0	1	0.20	0.40	0	1
Missing Living Arrangements	0.03	0.17	0	1	0.03	0.17	0	1
Pct SAT-Taking at HS	57.44	14.18	8	100	57.44	14.18	8	100
Pct Free Lunch at HS	10.82	8.63	1	63	10.82	8.63	1	63
Unemployment Rate ***	3.09	1.04	1.2	7	4.27	0.91	2.5	6.9
Median HH Income ***	42.60	8.35	31.25	73.37	41.22	8.52	30.10	73.21

Notes: Sample size each year = 31,532. [REF] = reference category in multivariate models. ***Differences in means were significant at the 0.001 level.

Table 3: Cross-Sectional Results -- College Aspirations in Grades 9 and 11

	Grade 9		Grade 11	
	2-Year	4-Year	2-Year	4-Year
GPA	3.730***	1.646**	5.130***	5.422***
	(0.740)	(0.260)	(1.016)	(0.950)
GPA Squared	0.806***	1.170***	0.772***	0.996
	(0.030)	(0.034)	(0.030)	(0.032)
Learning Disability	0.837	0.656***	0.898	0.608***
	(0.105)	(0.065)	(0.097)	(0.059)
Physical Disability	0.910	0.976	0.390*	0.304***
	(0.280)	(0.210)	(0.144)	(0.094)
Enrolled in TFCS	1.021	1.182**	1.178+	1.323***
	(0.092)	(0.075)	(0.101)	(0.091)
Male	1.072	0.702***	0.832***	0.665***
	(0.051)	(0.023)	(0.038)	(0.023)
Black	1.139	2.020***	1.685***	2.911***
	(0.153)	(0.190)	(0.216)	(0.304)
Hispanic	0.804	0.817+	0.915	0.969
	(0.139)	(0.096)	(0.153)	(0.125)
Asian	1.138	1.158	0.736	2.113**
	(0.352)	(0.229)	(0.313)	(0.560)
Other Race	0.751***	0.659***	0.845*	0.762***
	(0.057)	(0.035)	(0.062)	(0.044)
1st Generation Student	1.090	0.504***	0.912	0.399***
	(0.070)	(0.020)	(0.056)	(0.018)
Live with Both Parents	1.041	1.085*	0.943	1.156***
	(0.060)	(0.044)	(0.051)	(0.049)
Live with Mother	1.052	1.091	0.902	1.084
	(0.086)	(0.062)	(0.070)	(0.065)
Live with Father	1.341*	1.109	1.052	0.942
	(0.178)	(0.113)	(0.132)	(0.099)

(Table continues)

	Grade 9		Grade 11	
	2-Year	4-Year	2-Year	4-Year
Pct SAT-Taking at High School	1.000	1.007***	1.001	1.011***
	(0.002)	(0.001)	(0.002)	(0.001)
Pct Free Lunch at High School	1.000	0.999	0.993*	0.997
	(0.003)	(0.002)	(0.003)	(0.003)
Unemployment Rate	1.051+	0.969	0.985	0.922**
	(0.030)	(0.019)	(0.033)	(0.023)
Median Household Income	0.998	1.009***	0.993	1.008*
	(0.004)	(0.003)	(0.004)	(0.003)
Log Likelihood – Null	-24,274.19		-24,601.97	
Log Likelihood – Model	-20,509.54		-19,884.91	
Wald Chi-Square	5,895.12***		6,686.98***	
Pseudo R2	0.16		0.19	

Notes: Sample size for each model = 31,532. Dependent variable is the student's college aspiration as of each grade (base category = no college). Coefficients are expressed as odds ratios. Robust standard errors are shown in parentheses. Models include dummy variables for students with missing living arrangements, race/ethnicity, and parent education status. Reference category for race is White. Reference category for parental education is non-1st generation student. Reference category for living arrangements is Living in Other Arrangements.
+p < .10, *p < .05, **p<.01, ***p<.001 (two-tailed tests).

Table 4: Panel Data Results – Pooled and Random Effects Models

	Pooled OLS		Random Effects	
Variable	2-Year	4-Year	2-Year	4-Year
GPA	4.503***	3.024***	6.052***	5.406***
	(0.626)	(0.357)	(1.038)	(0.986)
GPA Squared	0.784***	1.076***	0.757***	1.085*
	(0.021)	(0.023)	(0.025)	(0.035)
Learning Disability	0.871	0.626***	0.850	0.566***
	(0.071)	(0.043)	(0.088)	(0.059)
Physical Disability	0.622*	0.623**	0.568	0.605
	(0.147)	(0.107)	(0.166)	(0.156)
Moved between Gr9 and Gr11	0.904	0.725***	0.843	0.616***
	(0.074)	(0.045)	(0.082)	(0.055)
Unemployment Rate	1.024	0.952**	1.028	0.936**
	(0.022)	(0.015)	(0.027)	(0.022)
Median Household Income	0.996	1.009***	0.996	1.014***
	(0.003)	(0.002)	(0.004)	(0.003)
Male	0.931*	0.677***	0.892**	0.536***
	(0.030)	(0.016)	(0.037)	(0.022)
1st Generation Student	1.003	0.454***	0.960	0.282***
	(0.044)	(0.014)	(0.054)	(0.014)
Enrolled in TFCS	1.094	1.238***	1.123	1.357***
	(0.068)	(0.058)	(0.088)	(0.107)
Black	1.437***	2.500***	1.588***	3.748***
	(0.131)	(0.174)	(0.186)	(0.443)
Hispanic	0.883	0.923	0.867	0.886
	(0.106)	(0.080)	(0.133)	(0.135)

(Table continues)

	Pooled OLS		Random Effects	
Variable	2-Year	4-Year	2-Year	4-Year
Asian	0.963	1.554**	1.027	2.100**
	(0.242)	(0.249)	(0.326)	(0.528)
Live with Two Parents	0.986	1.120***	1.002	1.247***
	(0.039)	(0.033)	(0.051)	(0.063)
Live with Father	1.179	1.021	1.209	0.978
	(0.108)	(0.074)	(0.144)	(0.123)
Live with Mother	0.967	1.084	0.971	1.134
	(0.054)	(0.045)	(0.070)	(0.081)
Pct SAT-Taking at High School	1.000	1.009***	1.001	1.014***
	(0.001)	(0.001)	(0.002)	(0.002)
Pct Free Lunch at High School	0.996	0.997	0.995	0.996
	(0.002)	(0.002)	(0.003)	(0.003)
Grade 11	1.323***	1.416***	1.418***	1.606***
	(0.053)	(0.041)	(0.065)	(0.063)
var(RI[stuid])			5.600***	82.816***
			(0.691)	(13.552)
cov(RI2[stuid], RI4[stuid])			3.262***	
			(0.377)	
Log Likelihood – Null	-48,917.67		-48,917.67	
Log Likelihood – Model	-40,526.85		-38,845.34	
Wald Chi-Square	12,514.72***		-----	
Pseudo R2	0.172		-----	

Notes: Sample size = 63,064 for each model. Dependent variable is the student's college aspiration as of each grade and year (base category = no college). Coefficients are expressed as odds ratios. Robust standard errors are shown in parentheses. Models include dummy variables for students with missing living arrangements, race/ethnicity, and parent education status. Reference category for race is White. Reference category for parental education is non-1st generation student. Reference category for living arrangements is Living in Other Arrangements. +p < .10, *p < .05, **p<.01, ***p<.001 (two-tailed tests).

Table 5: Panel Data Results – Fixed Effects Models

	No Interactions		With Interactions	
	2-Year	4-Year	2-Year	4-Year
GPA	4.012***	5.876***	3.930***	5.794***
	(1.178)	(1.595)	(1.167)	(1.595)
GPA Squared	0.799***	0.828***	0.800***	0.831***
	(0.045)	(0.041)	(0.046)	(0.042)
Learning Disability	1.085	1.286	1.062	1.250
	(0.174)	(0.198)	(0.174)	(0.195)
Physical Disability	0.731	0.928	0.724	0.931
	(0.332)	(0.311)	(0.333)	(0.324)
Moved between Gr9 and Gr11	0.672**	0.681***	0.692**	0.727**
	(0.091)	(0.079)	(0.095)	(0.085)
Unemployment Rate	1.057	1.000	1.054	1.011
	(0.050)	(0.041)	(0.050)	(0.042)
Median Household Income	1.019	1.011	1.014	1.006
	(0.015)	(0.013)	(0.015)	(0.013)
Grade 11	1.435***	1.309***	1.826*	0.939
	(0.094)	(0.073)	(0.462)	(0.196)
Gr11 * Male	-----	-----	0.743***	0.874*
			(0.054)	(0.053)
Gr11 * 1st Gen	-----	-----	0.810*	0.686***
			(0.078)	(0.051)
Gr11 * TFCS	-----	-----	1.205	1.176
			(0.165)	(0.132)
Gr11 * Black	-----	-----	1.432	1.275
			(0.305)	(0.221)
Gr11 * Hispanic	-----	-----	1.158	1.283
			(0.312)	(0.304)
Gr11 * Asian	-----	-----	0.862	3.164*
			(0.565)	(1.550)

(Table continues)

	No Interactions		With Interactions	
	2-Year	4-Year	2-Year	4-Year
Gr11 * Two Parents	-----	-----	0.894	1.184*
			(0.080)	(0.088)
Gr11 * Dad	-----	-----	0.757	0.862
			(0.152)	(0.157)
Gr11 * Mom	-----	-----	0.814	1.023
			(0.102)	(0.107)
Gr11 * SAT	-----	-----	1.002	1.007**
			(0.003)	(0.003)
Gr11 * Free Lunch	-----	-----	0.995	1.002
			(0.005)	(0.004)
Log Likelihood – Null	-5,291.32		-5,247.13	
Log Likelihood – Model	-5,265.45		-5,203.97	
Wald Chi-Square	366.00***		459.99***	
Pseudo R2	0.04		0.05	

Notes: Sample size = 15,796. Dependent variable is the student's college aspiration as of each grade and year (base category = no college). Coefficients are expressed as odds ratios. Robust standard errors are shown in parentheses. Models include dummy variables for students with missing living arrangements and missing race/ethnicity. Reference category for race is White. Reference category for parental education is non-1st generation student. Reference category for living arrangements is Living in Other Arrangements. +p < .10, *p < .05, **p<.01, ***p<.001 (two-tailed tests).