Competing risks or different pathways? An event history analysis of the relationship between financial aid and educational outcomes for Latinos

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Competing risks or different pathways? An event history analysis of the relationship between financial aid and educational outcomes for Latinos

At a time when Latinos make up a growing proportion of the U.S. school population and increasingly seek entrance to postsecondary education, the role of financial aid in postsecondary access remains uncertain. Although federal, state, and institutional grants have historically helped the lowest income students pay for their educational costs, grants have generally not kept pace with rising costs (Advisory Committee on Student Financial Assistance, 2001; Ficklen & Stone, 2002). Evidence suggests that education costs have increasingly shifted to students and their families via loans (Price, 2004). Although a higher proportion of Latinos enrolled in postsecondary institutions received grants compared to loans in 2003-2004 (50% compared to 30%), the average dollar amount was greater for loans than for grants ($5,620 and $3,810 respectively). However, Latinos remain particularly reliant on federal grants. About half of all Latinos received federal grants in 2003-2004 while 16 percent received state aid and 17 percent received institutional aid. This suggests that Latinos—who are more likely to come from low-income families and be first-generation students—may be particularly affected by the decline in grants.

In addition, increased reliance on criteria other than financial need in awarding aid potentially further threatens affordability. The most recent indication of a policy shift toward using merit criteria in awarding aid is the federal government's National Science and Mathematics Access to Retain Talent Grant, known as the National SMART Grant. Also illustrative of this shift is Georgia's Helping Outstanding Pupils Educationally (HOPE), which began in the 1990s and served as a model for other states. Findings from research on the initial years of HOPE's implementation (e.g., Dynarski, 2002) raise concerns about the implications of such programs for socioeconomic equity in access to higher education. For example, HOPE

initially contributed to the redistribution of financial aid resources from underrepresented, lower-income students to white, middle-class students. While more research is needed on new programs such as National SMART Grants—as well as on changes to existing programs such as HOPE—it appears that Latinos are competing for a shrinking pool of aid awarded by criteria favoring historically privileged groups (e.g., high-income, white). The proportion of Latinos receiving institutional aid has remained flat since 1995-1996 (Santiago & Cunningham, 2005).

The cumulative effect of these changes is the erosion of access to postsecondary education for those with limited financial resources. The Advisory Committee on Student Financial Assistance estimates that during the first decade of this century 4.4 million college-qualified low- and moderate-income high school graduates will be unable to attend a four-year college and 2 million will attend no college whatsoever—because of insufficient financial resources. Moreover, low- and moderate-income students who do attend college struggle each year to meet the cost of attendance (Ficklen & Stone, 2002). Although certainly not all Latino students come from low- or moderate-income families, their numbers are disproportionately high. Latinos over the age of 25 have among the lowest per-capita income of any racial or ethnic group in the United States (American Community Survey, 2006, U.S. Census Bureau).

Table 1. United States Per Capita Income and Educational Attainment by Race/Ethnicity, Adults 25 and Older, 2006

Race/Ethnicity	Per Capita Income	Bachelor's Degree Holders
Whites (not Latino or Hispanic)	$29,406 (+/-50)	19%
African American	$16,559 (+/-74)	11%
Latino	$14,736 (+/-71)	8%
Asian American	$27,884 (+/-188)	30%
American Indian or Alaskan Native	$15,736 (+/-295)	8%

Note. Per capita income based on the previous 12 months and is calculated in 2006 inflation-adjusted dollars.

The erosion in financial access for lower-income students comes at a time when, despite the fact that more Latino high school graduates are prepared for college than ever before, the gap is wider than ever between Latinos and non-Latinos in college completions. This gap (perhaps better described as a *gulf*) at the postsecondary levels represents what Suro and Fry call "the greatest disparity in educational outcomes between the nation's largest minority group and the white majority" (2005, p. 174). The educational marginalization of Latinos should be of great concern across the philosophical spectrum. From a utilitarian perspective, the benefits of educating Latinos may outweigh the costs of inaction. Those who increasingly form the foundation of the U.S. economy—and those who will play a central role in replacing baby boomers in the workforce—are now least likely to be formally educated. This threatens the U.S. supply of human capital, historically our competitive advantage and a vital resource in an economy relying more and more on knowledge workers. From a social equity perspective, should current trends in the education of Latinos continue, progress made in the U.S. prior to and especially as part of the civil rights movement toward altering the nation's landscape of racial apartheid will continue to erode, leaving a nation still more deeply divided racially, socially, and economically.

In this context, this study responds to calls from Carter (2006) and others (Nora, 1990; Nora & Cabrera, 1996; St. John, Paulsen, & Carter, 2005) for more research on the effects of financial aid on underrepresented students. Specifically, this study investigates the following question: "To what extent do differentiated forms of aid—loans, grants, institutional aid, and work-study—affect the educational attainment of Latinos and how do these effects change over time?" This study seeks to address limitations in common approaches to studying financial aid use by employing event history analysis (EHA), which allows us to not only understand more

about *how* aid (or the lack thereof) promotes or perturbs access for Latinos, but as importantly *when* those effects occur and how they vary over time. Knowing more about the relationships between timing of aid and academic success among Latinos has practical implications for policy makers and campus financial aid practitioners who—empowered with knowledge about when aid is most effective—might be able to more effectively distribute scarce resources to students.

For postsecondary education scholars this project seeks to expand the literature on financial aid by more closely studying how financial aid operates for one segment (albeit a very heterogeneous one) of the student population. Moreover, this study adds to the growing body of work (Calcagno, Crosta, Bailey, & Jenkins, 2007; Chen & DesJardins, 2007; DesJardins, 2001; DesJardins, Ahlburg, & McCall, 1994; DesJardins, Ahlburg, & McCall, 1999; DesJardins, Ahlburg, & McCall, 2002; DesJardins, Kim, & Rzonca, 2003; DesJardins, McCall, Ahlburg, & Moye, 2002; Ishitani & DesJardins, 2002) that conceptualizes and studies educational attainment as a temporal process via EHA methodological approaches. Degree completion, specifically earning a baccalaureate degree, is the form of attainment on which this paper focuses.

Persistence as a Temporal Process

The temporal, longitudinal nature of persistence is implicitly recognized in the extant research literature (e.g., Bean, 1980; Braxton & Lien, 2000; Pascarella & Terenzini, 1980; St. John, 1992; St. John, Paulsen, & Starkey, 1996; Tinto, 1975, 1982, 1988), yet most education researchers continue using a cross-sectional analytic approach and relatively few studies employ methods that incorporate temporal aspects into their conceptual and analytic models . St. John, Cabrera, Nora, and Asker (2000) draw attention to the time-varying nature of student persistence, noting that "…changes over time in financial-aid packages can influence students' academic and

social integration processes, as well as their subsequent persistence decisions" (p.41). To address this shortcoming education scholars have begun applying event history analysis techniques developed in other fields to the study of persistence and other outcomes (Calcagno, et al., 2007; Chen & DesJardins, 2007; DesJardins, et al., 1994; DesJardins, Ahlburg, et al., 2002; DesJardins, et al., 2003; DesJardins, McCall, et al., 2002; Doyle, 2006; Ishitani, 2003; Ishitani & DesJardins, 2002; Ishitani & Snider, 2004; McLendon, Heller, & Young, 2005; Singer & Willett, 1993; Willett & Singer, 1991; Willett & Singer, 1995).

Event history analysis, in its most basic form, is the longitudinal analysis of individuals' or organizations' experiences of events of interest over time (Allison, 1984). EHA explicitly incorporates the temporal dimension in estimating coefficients and the overall fit of the model, while allowing for variation from time period to time period in explanatory variables. Blosfeld and Rohwer (2002) argue that event history analysis of social processes addresses a number of shortcomings with cross-sectional approaches, namely that EHA (a) does not assume statistical equilibrium across time with regard to the probabilities of moving from one state to another, (b) it allows consideration of the ways in which explanatory variables affect inflows and outflows of a given state, (c) it enables researchers to better understand directionality of causal relationships, (d) it permits modeling of processes of change, and, finally (e) EHA does not restrict as time-constant explanatory variables that in fact change over time. Cross-sectional methods of studying the effects of finances on persistence assume that the likelihood of persistence remains constant across time (i.e., statistical equilibrium); that grants have the same effect on keeping students continuously enrolled as they do on encouraging a student who has stopped out to re-enroll (i.e., inflow and outflow of a given state); or that changes in costs and aid from year to year do not weigh into student's decisions/ability to persist (i.e., time-varying covariates), as a few examples.

For a more detailed discussion of the use of event history techniques in studying educational attainment see DesJardins (2003).

This study uses event history analysis to explore the longitudinal effects of financial aid on the persistence for Latino students who enrolled in public postsecondary education between 1999-2000 and 2006-2007 in a new settlement state—Indiana. Prior research has demonstrated that financial aid is a necessary, but not sufficient condition of educational attainment, particularly for underrepresented students. Although financial aid alone may not remove barriers to success for students from low-income families (Stinebrickner & Stinebrickner, 2003), studies have demonstrated that it can have an equalizing effect across racial and ethnic groups (Nora, 1990; St. John, et al., 2005) by removing financial constraints to access, encouraging preparation, and enabling students to focus more fully on academic concerns—although the effects of aid likely vary among different underrepresented racial groups (Heller, 1997). Moreover, as St. John, Paulsen, Starkey (1996) and others (Cabrera, Nora, & Castaneda, 1993; Nora, 1990) suggest, financial aid affects the actions of individual students directly (e.g., making school attendance possible for low-income students) and indirectly (e.g., freeing students from worries about tuition bills so they can allocate more time to studying and do better in school).

Moreover, profound demographic changes underway in the United States ensure that postsecondary institutions throughout the country—including those in the Midwest and South—will be called to respond to more and more Latino students knocking at their doors. The rapid growth of the Latino population in the United States since the 1970s has been called ‘the great demographic change of our era’ (Suro, 2006). However, important shifts have occurred in the settlement patterns of immigrants. Traditional settlement states include California, Florida, Illinois, New Jersey, New Mexico, New York, and Texas. However, so-called ‘new growth’

states, located primarily in the South and the Midwest, were designated as such because the growth of the foreign-born populations exceeded growth in the largest traditional settlement state of Texas during the immigration wave of the 1990s. New growth states received about 19 percent of the immigrants each year from the period between 1992 and 1999 and as much as 23 percent during the peak between 1999 and 2000. In total, new growth states received 25 percent of all new immigrants from Latin America (Passel & Suro, 2005). New settlement states, including Nevada, Georgia, North Carolina, Oregon, Virginia, Washington, and Massachusetts each received more than 200,000 Latino immigrants between 1980 and 2000, more than tripling their Latino populations (Suro & Tafoya, 2004). Though Indiana received fewer than 200,000 immigrants during this period, it is considered to be a newcomer state (Fry, 2006).

Theoretical Framework

Although scholars have used a variety of theoretical approaches and frameworks to study educational attainment in postsecondary education—for example, ethnomethodology and symbolic interactionism (Attinasi, 1989), critical theory (Tierney, 1992), and social cognitive theory (Torres, 2006)— the student integration conceptual model has remained dominant in the study of student persistence since the original work of Spady and Tinto (Spady, 1970, 1971; Tinto, 1975, 1988, 1993) . However, recent research suggests that the student integration model may not be the best framework for understanding the attainment of underrepresented students, including Latinos.

Limitations of the student integration model of persistence include that it does not account for the role of finances and it does not account for differences among groups, particularly racial/ethnic groups and men and women. In addition, a growing body of evidence

suggests a range of factors contribute to differences between the persistence of underrepresented students and that of white, higher-income students, including factors such as mentoring (Torres, 2006), faculty interaction (Anaya & Cole, 2001), family support (Hernandez, 2000), and financial aid (Paulsen & St. John, 2002; St. John, et al., 2005; St. John, et al., 1996; Stinebrickner & Stinebrickner, 2003; Titus, 2006). Rendon, Jalomo, and Nora (2000) have offered a particularly poignant critique of the integration model of student persistence for its assumption of assimilation, its emphasis on student failure, its exclusion of historical and social factors, its lack of consideration of systemic barriers to success, and its failure to challenge dominant paradigms and assumptions. Braxton and colleagues (2000; 1997) undertook a systematic evaluation of the validity of the student integration model and found modest empirical support for the concept of academic integration, noting that, contrary to the way it was originally operationalized by Tinto, the strongest evidence for the validity of academic integration comes from multi-institution (rather than single-institution) studies. These shortcomings of integration models of persistence are not surprising, especially given the limitations set out by Tinto (1982) in the explication of his model and in the focus of early testing of the model on traditional, predominantly white students (e.g., Pascarella & Terenzini, 1979, 1980).

Student Adjustment and College Impact

This turn toward more explicit consideration of contexts, evident in much of the more recent scholarship on persistence (e.g., St. John, et al., 2005; St. John, et al., 1996; Titus, 2006; Torres, 2006), is in part a response to previously unacknowledged shortcomings with integration and attrition models, particularly as they were applied to understanding the experiences of

underrepresented students. A thread of persistence research has developed seeking to integrate, synthesize, and extend retention theory.

Building on prior work that looked at the effects of environmental factors on persistence (Cabrera, Stampen, & Hansen, 1990) Cabrera and colleagues (1992; 1993) developed and tested an integrated model that incorporates elements from both the integration and attrition models. Nora and Cabrera (1996) further developed this *Student Adjustment Model* in testing the effects of prejudice and discrimination on the adjustment of underrepresented students. The Student Adjustment Model conceptualizes colleges as having academic and social domains in which students' experiences can negatively or positively affect their cognitive and affective development, which in turn affects academic and intellectual development, commitment to degree attainment, and institutional commitment. In this model the academic and social domains are seen as interdependent, with students' experiences in one sphere reinforcing experiences in the other. Compared to earlier retention theory, the adjustment model incorporates greater consideration of student contexts as a major factor in persistence.

Extending the theoretical foundations for discerning the role of contexts on persistence, Berger and colleagues (2000; 1998) investigate the ways in which organizational attributes interact with student characteristics to affect retention. The college impact model (Berger & Milem, 2000) focuses on student peer culture and institutional structural-demographic characteristics—such as selectivity and institution type—as they interact with student behaviors, characteristics, and ultimately educational outcomes. Titus (2006) extends this model to include institutional resources, including revenue and expenditure patterns. This study utilizes these conceptual frameworks to guide empirical analyses.

Data Sources and Sample

Data for this study come from the Indiana Commission for Higher Education (ICHE) statewide student information system (SIS) unit record database and the National Center for Education Statistics Integrated Postsecondary Education Data System (IPEDS). SIS data are collected from all public universities, colleges, and community colleges in Indiana for enrollment-related transactions—for example, courses taken, grades received, race, ethnicity, and all other information necessary for institutional business. Institutional price data from IPEDS along with receipt of aid data from SIS are used to calculate the net price of attending college (total cost of attendance less total aid) for each student. Total cost of attendance is calculated based on students' residency status, i.e., resident or nonresident of the state, and whether the student lived on- or off-campus, including with family if a dependent. Total college costs included tuition, room, board, fees, books, supplies, and other expenses as reported by the institutions to IPEDS.

First-time, first-year baccalaureate degree-seeking Latinos, African Americans, and Whites who began in Indiana's public four-year institutions in 1999 (n=28,576) constitute the sample of interest. Among all students who began in Indiana public postsecondary institutions in 1999 (n=43,846), those who started in baccalaureate degree programs represented just over 65 percent, with the remainder enrolling in a community college. Baccalaureate-degree students were followed annually through the end of the 2006-2007 academic year (eight years in all). This includes those students who may have transferred to a community college at some point during the study period. Because White students are included in this study only as a point of comparison

for Latinos and because of data constraints associated with analysis of person-period datasets, a representative random sample of White students was drawn for inferential modeling. The effective sample size, therefore, is 4,369 first-time, first-year entrants (783 Latinos, 1,865 African Americans, and 1,721 Whites) representing 34,952 person-periods (4,369 students per year times eight years). The sample includes all Latinos and African Americans who began studies in 1999.

Although much of the research on Latinos' educational attainment has focused on community colleges (because this is where the majority of Latinos enroll nationally) there is good reason to focus on Latinos who begin at four-year institutions. First, Indiana has not historically had a community college system. Therefore, the majority of first-time entrants who are Latino have enrolled in baccalaureate degree institutions. For example, among all Latinos who began postsecondary education in 1999 (n=1,147) just over three-quarters (76%) began at a four-year institution (See Table 2). In fact, Latinos enrolled in community colleges at rates lower than African Americans (34%) and Whites (28%).

Table 2. Institution of First Enrollment by Race/Ethnicity, 1999

	Hispanic		African American		White	
	Count	*Column %*	*Count*	*Column %*	*Count*	*Column %*
Two-year	275	0.24	1122	0.34	10946	0.28
State universities	80	0.07	503	0.15	6115	0.16
Regional campuses	473	0.41	662	0.20	7180	0.18
Urban university	62	0.05	460	0.14	3460	0.09
Research universities	257	0.22	571	0.17	11680	0.30
Total (Row %)	1147	(0.03)	3318	(0.08)	39381	(0.89)

There are conceptual and methodological reasons for focusing on Latinos who began at a four-year institution as well. Ostensibly, students who begin their studies in a baccalaureate degree program intend at the point of initial enrollment to earn or at least work toward a

baccalaureate degree within four to six years. An associate's degree seeking student may finish her studies in two to three years whereas a baccalaureate degree student can take four to five. Combining these two groups makes it difficult to ascertain whether increasing hazard of stopout in the first few years is a function of associate's degree completion, stopout, intermittent attendance, transfer, or a host of other possible enrollment outcomes, for example. Absent data regarding students' degree aspirations, focusing on baccalaureate degree-seeking students alone provides some control for different intentions. However, future work will consider the patterns and pathways of Latinos enrolled in community colleges.

Models and Methods

Competing risks are conceptualized as related but mutually exclusive events in which experiencing one event removes someone from risk of experiencing another event at the same point in time (Allison, 1984). Exit from postsecondary education is the general event of interest in this study. Conceptually, there are a variety of ways students can exit postsecondary education at any point in time, such as stopping out, departing for an extended period, transferring to another institution, or earning a postsecondary credential, to list a few. Therefore, for the purposes of this analysis stopping-out (i.e., not attempting to earn credit during an entire academic year) and graduation (earning a baccalaureate degree) are the specific forms of exit considered.

The definition of stopout used here is distinct from traditional definitions in that it does not focus on a single institution, but rather departure from an entire state's system of public postsecondary education. This is consistent with research on educational mobility and social stratification (e.g., Spady, 1970) and in recognition of increasingly complex patterns of student

enrollment (Adelman, 1999, 2006). Because students may stop in and out of postsecondary education while working toward a degree, stopout is considered a repeated event, with students remaining in the sample (or risk pool) until graduation. Once a student graduated, she was no longer considered at-risk for exit of any form.

A discrete-time model was used to estimate the effects of financial aid on timing to first departure with time (*t)* measured in academic years. As suggested by Allison (1984), in instances where time is measured in discrete units it is appropriate to employ discrete-time methods. Equation 1 denotes the general form of the model where $h(t_j)$ represents the hazard rate at a discrete point in time (*j*), *D* represents the baseline hazard intercept parameter at time periods 1 through 8, and β_1 through β_5 represent the slope coefficients for the predictor variables.

Equation 1. General Form of Discrete-time Survival Model

$$\text{logit } h(t_j) = \begin{array}{l}[\alpha_1 D_1 + \alpha_2 D_2 + ... + \alpha_8 D_8] + \\ [\beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5]\end{array}$$

The models control for factors posited by theory and previous research to affect academic success in vectors of variables (*x*) for (a) student background (x_1), (b) academic preparation (x_2), (c) campus characteristics (x_3), (d) college enrollment characteristics (x_4), and (e) financial aid (x_5). Table 3 lists the variables included in the event history models.

Table 3. Variables Included in the Discrete-Time Event History Models

Student Background	Academic Preparation	Campus Characteristics	College Enrollment Characteristics[a]	Financial Aid[a]
Age[a]	% Free lunch HS	% Faculty of Color[a]	Housing	Cost of attendance
Gender	High school rank	% Students of Color[a]	Credits attempted	Cumulative loan debt
Race/ethnicity	SAT score		Dev. ed. credits	Applied for aid
Income[a]			Cumulative credits	Received aid
			Institutional type	Need-based aid receipt
			Declared major	
			GPA	

a denotes time-varying variables

A series of seven event history models were estimated (See Table 4). First, a baseline model including Latinos, African Americans, and Whites was estimated to ascertain to what extent differences in likelihood of stopout and graduation exist by race/ethnicity and to establish hazard profiles for each event. Next, models were estimated separately for each racial/ethnic group to examine the relationships between financial aid, campus characteristics, and the events of interest.

Table 4. Event History Models

Model	Groups	Events	IVs	Method
1	All	Stopout, Grad.	All	Multinomial
2	Latinos	Stopout, Grad.	All	Multinomial
3	African Americans	Stopout, Grad.	All	Multinomial
4	Whites	Stopout, Grad.	All	Multinomial
5	Latinos	Stopout	Time-varying	Fixed-effects
6	African Americans	Stopout	Time-varying	Fixed-effects
7	Whites	Stopout	Time-varying	Fixed-effects

Endogeneity and Unobserved Difference

A persistent and growing concern in financial aid research is the problem of endogeneity (DesJardins, et al., 1999; Dowd, 2006). As Cellini (2008) notes, endogeneity—caused by reverse causality or self-selection bias within models—blunts our ability to make causal inference. Absent controlled experimentation it is difficult to discern to what extent student characteristics associated with applying for aid contribute to observed effects of financial aid. Though no perfect solution exists to address this thorny issue, three approaches were taken in this study to help isolate the effects of unobserved differences. First, key variables were lagged to reduce the effects of reverse causality. For example, loan amounts from the year one were used to predict likelihood of exit during the second year. This helps eliminate the question of whether enrollment lead to taking out loans or loans contributed to departure. Conceptually using lagged

variables also has makes sense as it is likely that what a student does and experiences one year likely affects what happens the following year.

Next, all models included a dichotomous indictor of whether a student had applied for aid. The inclusion of a dichotomous indicator of aid receipt may serve as a proxy variable to help control for omitted variables (Cellini, 2008). In this case, applying for aid is hypothesized to be related to unobserved characteristics, such as motivation, parental encouragement, and access to information about college, consistent with prior research (DesJardins, 2001). Finally, fixed-effects models for stopout including only the time-varying variables were estimated. By using a fixed-effects approach the effects of changes in key explanatory variables within students (rather than across students) were analyzed. This offers some control for addressing concerns regarding unobserved heterogeneity. It was assumed for purposes of these models that the unobserved characteristics within students remained constant across time.

Limitations

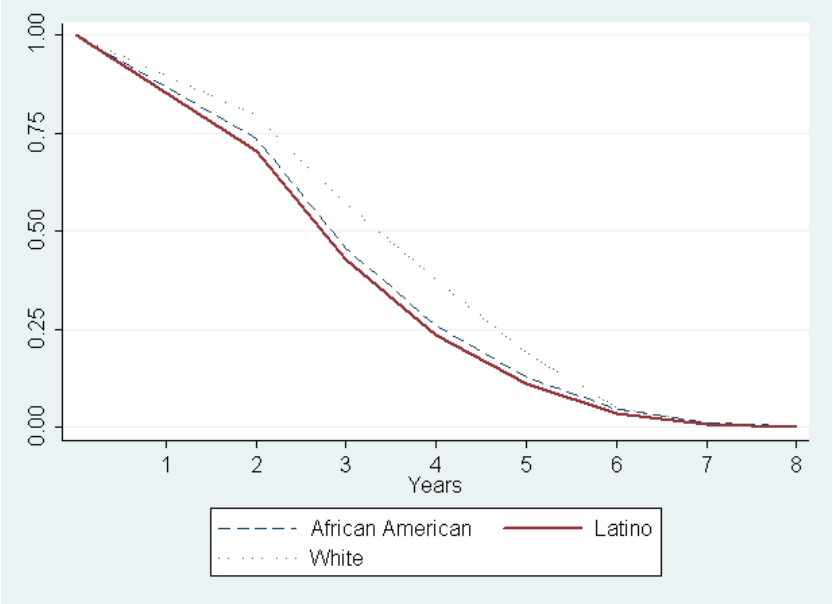
Several limitations warrant consideration before discussing findings from the models. First, data regarding amounts of institutional, state, and federal grants received by students was inaccurately reported for a number of four-year institutions across Indiana in 1999. Therefore, this study relies on dichotomous indicators of receiving need-based aid (as a proxy for Pell) in place of grant amounts. Given prior findings regarding the reliance of Latinos on grants (e.g., Olivas, 1985), particularly federal grants, exclusion of this information may provide a less than complete portrait of the relationships between aid and the educational attainment of Latinos. Next, no controls were included for generational or immigration status. Prior research (e.g., Fry, 2006) has shown significant differences in the educational trajectory of first, second, or third

generation Latinos, as one example. Finally, the annual data in this study does not capture dynamic patterns of enrollment that may occur term-to-term.

Findings

Descriptive analysis shows that stopping-out was most common in the third and fourth years of enrollment among all students. However, differences emerge with respect to stopout by race and ethnicity. Represented graphically, we find that the surivor function is steeper in the initial years of enrollment for Latinos and African Americans than Whites, indicating that Latinos and African Americans were more likely to stopout in the initial years of enrollment (See Figure 1).

Figure 1. Kaplan-Meier Survival Estimates for Stopout by Race/Ethnicity



A Log-Rank test for equality of stopout survivor functions by race and ethnicity confirms the conclusion that there is a significant difference with respect to timing to stopout among Latinos, African Americans, and Whites, χ^2 =29.28, p-value < 0.00.

Most students who completed a baccalaureate degree did so in the fourth (n=643) and fifth (n=671) years (See Table 5). By the end of the study period nearly 60 percent of students had not yet completed a degree. Differences by race and ethnicity were evident.

Table 5. Kaplan-Meier Survival Estimates for Graduation

Time	Beg. Total	Fail	Survivor Func.	Std. Error	95% Conf. Int.	
2	4369	4	0.9991	0.0005	0.9976	0.9997
3	4365	17	0.9952	0.001	0.9926	0.9969
4	4348	643	0.848	0.0054	0.837	0.8583
5	3705	671	0.6944	0.007	0.6805	0.7079
6	3034	255	0.6361	0.0073	0.6216	0.6501
7	2779	113	0.6102	0.0074	0.5956	0.6245
8	2666	65	0.5953	0.0074	0.5806	0.6097

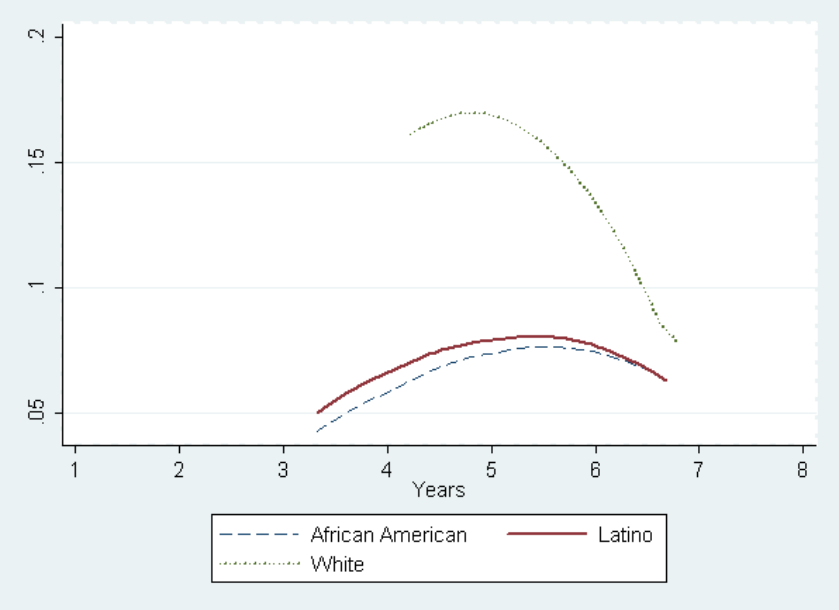
Whites had the highest rate of completion (54%), followed by Latinos (33%) and African Americans (31%) (See Table 6).

Table 6. Degree Completion by Race/Ethnicity

	Count	Proportion
Latinos	258	33%
African Americans	578	31%
Whites	932	54%
Total	1768	40%

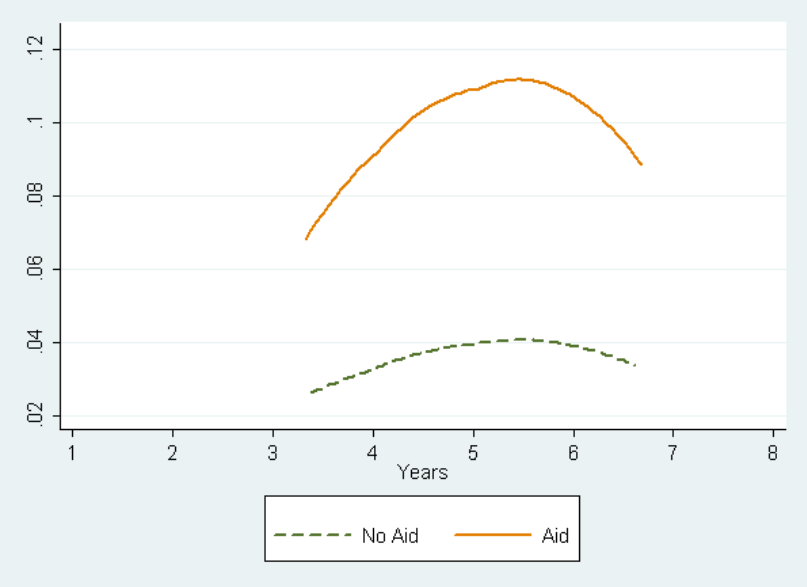
Latinos and African Americans were most likely to complete a degree in five years, whereas most Whites who earned a degree did so in four years. Overall, the incidence of degree completion in any period for Latinos and African Americans was much lower than that of their White peers, as is represented graphically in Figure 2. A Log-Rank test for equality survivor functions confirms the conclusion that there is a significant difference with respect to timing to graduation among Latinos, African Americans, and Whites, $\chi^2 = 289.54$, p-value < 0.00.

Figure 2. Smoothed Hazard Estimates for Degree Completion by Race/Ethnicity



Descriptive analysis of the effects of financial aid on timing to degree completion among Latinos suggests that receipt of financial aid has a significant and positive effect on degree completion. As represented in Figure 3 Latinos who received aid had a significantly higher incidence of graduation than their Latino peers who did not receive aid. A Log-Rank test for quality of the survivor function confirms a statistically significant difference in timing to degree completion between Latino who received aid and those who did not, χ^2 =97.93, p-value < 0.00.

Figure 3. Smoothed Hazard Estimates for Degree Completion Among Latino by Aid Receipt



Inferential Findings

Financial Aid

Results from the inferential models—which allow us to control for factors hypothesized to affect stopout and graduation—suggest that financial aid has a modest effect on likelihood of graduation, primarily through reducing the likelihood of stopout and possibly through reducing cost of attendance.

Cost of attendance. Among all groups, the cost of attendance was associated with greater propensity to stopout, though it was statistically significant for Latinos and Whites only. Perhaps somewhat surprisingly, cost of attendance appeared to be positively related to degree completion (See Table 7). For Latinos, A $1,000 increase in cost of attendance increased the likelihood of stopping out the following year by just over three percent. For Whites a $1,000 increase in cost was associated with a nearly seven percent increase in the likelihood of stopout and roughly a three percent increase in likelihood of graduating. No statistically significant relationship was found between cost of attendance and stopout or graduation for African Americans.

Loan debt.

Generally, findings from the models suggest that increased debt is negatively related to graduation for all groups, but that differences emerge in regard to its effects on stopout. With respect to stopout, an $1,000 increase in loan debt was associated with about a six percent decrease in likelihood for Whites. Though not statistically significant, the coefficient for the effects of loans on stopout for Latinos and African Americans was positive, suggesting loans make a Student of Color more likely to stopout. With respect to graduation, a $1,000 increase in cumulative loan debt made it about one percent less likely a White student would graduate compared to about 1.4 percent for African Americans. No statistically significant relationship between loan debt and graduation was found for Latinos.

Applying for and receiving aid. For all groups, applying for financial aid appeared to have no statistically significant relationship with stopout or graduation, with the exception of African Americans, for whom it was associated with a decreased likelihood (by about 17%). Receiving financial aid significantly reduced the likelihood of stopout for African Americans and White (by about 31% and 1% respectively), but had no similar effect for Latinos. Interestingly, receipt of any form of aid reduced the likelihood of graduation by about half for Whites, controlling for all else. No significant relationship was found among receiving need-based aid, stopout, or graduation, controlling for all else.

Table 7. Selected Results from Competing Events Regression Models

	Latinos		African Americans		Whites	
	Model Two		Model Three		Model Four	
	Stopout	Graduation	Stopout	Graduation	Stopout	Graduation
Cost of attendance ($1,000s)	0.031 (0.02) *	0.033 (0.02)	0.005 (0.01)	0.022 (0.02)	0.068 (0.01) *	0.034 (0.011) *
Cumulative loans ($1,000s)	0.00 (0.01)	-0.011 (0.01)	0.00 (0.00)	-0.014 (0.0) *	-0.006 (0.003) *	-0.01 (0.003) *
Received aid	-0.236 (0.17)	0.201 (0.29)	-0.274 (0.12) *	0.094 (0.26)	-0.006 (0.107)	-0.405 (0.138) *
Need-based aid receipt	-0.027 (0.16)	-0.195 (0.22)	-0.108 (0.1)	-0.081 (0.16)	-0.142 (0.118)	0.173 (0.15)
Applied for aid	-0.099 (0.15)	-0.152 (0.36)	-0.179 (0.09) *	-0.165 (0.32)	-0.106 (0.106)	-0.088 (0.169)
Age	0.075 (0.01) *	0.028 (0.04)	0.041 (0.01) *	0.019 (0.02)	0.07 (0.011) *	-0.055 (0.033)
Income ($1,000s)	0.004 (0.0) *	0.007 (0.0) *	0.004 (0.0) *	0.005 (0.0) *	0.005 (0.001) *	0.008 (0.001) *
% Free lunch HS	0.01 (0.0) *	-0.007 (0.01)	0.009 (0.0) *	-0.006 (0.0)	0.001 (0.004)	0 (0.006)
% Faculty of Color	-1.275 (0.62) *	0.292 (1.38)	-1.064 (0.32) *	-0.635 (0.93)	-2.425 (0.704) *	1.847 (0.882) *
% Students of Color	0.013 (0.79)	-0.418 (1.69)	-0.202 (0.49)	-0.666 (1.14)	-0.435 (1.534)	-0.304 (1.712)
Credits attempted	-0.112 (0.01) *	0.054 (0.01) *	-0.092 (0.01) *	0.062 (0.01) *	-0.122 (0.007) *	0.06 (0.009) *
Cumulative credits	0.053 (0.0) *	0.017 (0.01) *	0.048 (0.0) *	0.005 (0.0)	0.052 (0.003) *	-0.006 (0.003)
Dev. ed. credits	0.023 (0.09)	-0.405 (0.19) *	0.01 (0.03)	-0.651 (0.29) *	0.024 (0.09)	-5.003 (0.647) *
Years Stopped-out	3.584 (0.17) *	-1.983 (0.48) *	3.242 (0.1) *	-2.23 (0.23) *	4.675 (0.172) *	-2.237 (0.274) *
AIC		3843.647		9757.158		7058.737
BIC		4275.172		10244.227		7540.663
-2 Log L		9629.158		6930.737		20839.272

Standard error in parentheses

* significant at the 0.05 level

The results from the fixed-effects models for the effects of financial aid on stopout largely confirm the preceding findings (See Table 8). For all groups, an increase in cost of attendance was associated with an increase in the likelihood of stopping-out (about 6% for Latinos, 4% for African Americans, and 10% for Whites). As loan debt increased for Latinos, the likelihood of stopping-out decreased, controlling for all else. A $1,000 increase in cumulative loan debt decreased the likelihood of Latinos stopping out by about three percent compared to about two percent for Whites. Applying for aid and receiving need-based aid were associated with a decreased likelihood of stopout for African Americans, but was not statistically significant for Latinos or Whites.

Table 8. Selected Results from Fixed-Effects Stopout Models

	Model Five	Model Six	Model Seven
	Latinos	African Americans	Whites
Cost of attendance ($1,000s)	0.056 (0.026) *	0.038 (0.014) *	0.099 (0.014) *
Received aid	-0.023 (0.287)	0.006 (0.185)	-0.087 (0.227)
Need-based aid receipt	-0.418 (0.281)	-0.4 (0.165) *	-0.209 (0.217)
Cumulative loans ($1,000s)	-0.035 (0.014) *	-0.001 (0.009)	-0.021 (0.009) *
Applied for aid	-0.197 (0.168)	-0.54 (0.099) *	-0.262 (0.148)
Time	-1.797 (0.152) *	-1.665 (0.091) *	-1.993 (0.136) *
Income ($1,000s)	0.004 (0.002) *	0.004 (0.001) *	0.005 (0.001) *
Compared to On-Campus			
Off-campus	0.118 (0.28)	0.803 (0.145) *	0.824 (0.204) *
With Parents	0.534 (0.629)	0.518 (0.267)	1.784 (0.476) *
% Faculty of Color	-0.841 (0.423) *	-0.933 (0.239) *	-1.708 (0.41) *
% Students of Color	-0.513 (1.954)	0.478 (1.062)	2.551 (2.36)
Credits attempted	-0.106 (0.011) *	-0.088 (0.006) *	-0.123 (0.009) *
Cumulative credits	0.091 (0.008) *	0.076 (0.004) *	0.09 (0.006) *
Dev. ed. credits	0.055 (0.075)	-0.056 (0.027) *	-0.08 (0.081)
GPA	-0.197 (0.099) *	-0.204 (0.054) *	-0.245 (0.086) *
Declared major	0.581 (0.303)	0.471 (0.148) *	0.57 (0.237) *
Compared to Research Universities			
Regional	0.276 (0.432)	0.1 (0.269)	-0.414 (0.391)
Branch	-0.272 (0.749)	0.208 (0.311)	-0.711 (0.46)
Urban	-0.331 (0.504)	-0.015 (0.268)	-0.408 (0.4)
Community College	-0.657 (0.47)	-0.174 (0.284)	-1.39 (0.381) *
Years Stopped-out	3.751 (0.198) *	3.366 (0.115) *	4.558 (0.185) *
AIC	1413.56	3863.52	1785.25
BIC	1554.26	4022.51	1941.89
-2 Log L	1371.56	3821.52	1743.25

Standard error in parentheses

* significant at the 0.05 level

Other factors influencing stopout and graduation

For all groups, not surprisingly, being stopped-out was the strongest predictor of future stopout or graduation. Moreover, as the amount of time spent stopped-out increased so too did the likelihood of remaining stopped-out or not graduating. For example, a one year increase in the number of years stopped-out decreased the likelihood of graduating 600 percent for Latinos, compared to over 800 percent for African Americans and Whites.

Campus characteristics as well as student enrollment characteristics also exerted strong influences on the outcomes of interest in this study as well. For example, the proportion faculty of color at the institution attended by the student reduced the likelihood of the stopping out the following year by about 250 percent for Latinos and 11 percent for African Americans. The strongest effect was observed for Whites, for whom a one point increase in the proportion faculty of color was associated with being more than 11 times less likely to stopout the following year. No similar relationship was observed among the proportion of students of color, stopout, and graduation, however.

Credit taking patterns were also significantly related to stopout and graduation. For all groups, taking more rather than fewer credits each academic year reduced the likelihood of stopping-out the following academic year. Taking one credit more reduced the likelihood of a Latino student stopping-out the next year by about 11 percent. An increase in credits was associated with a nine percent decrease in likelihood of stopping out for African Americans and a 13 percent decrease for Whites. Attempting more credits increased the likelihood of graduation for Latinos by about 5 percent compared to 6 percent for African Americans and Whites. Though somewhat counterintuitive, an increase in cumulative credits attempted was associated with an

increased likelihood of stopout as well as graduation for Latinos. Taking one additional credit increased the likelihood of stopout about five percent but also increased the likelihood of graduating just under two percent. For both African Americans and Whites, an increase in cumulative credits increased the likelihood of stopout (about five percent for both). Although relatively few students attempted developmental education credits, doing so was negatively related to graduation for all groups. A one credit increase in developmental education decreased the likelihood of graduating by about 50 percent for Latinos and 91 percent for African Americans. The effect was greater for Whites. An increase in developmental education credits decreased the likelihood of graduating about five times.

Discussion

The most consistent finding in this study is the relationship between cost of attendance and educational attainment. Among all groups, as cost increased so too did the likelihood of stopping-out, even after controlling for income, prior year loans, and current cumulative loan debt. Curiously, perhaps, for Whites a $1,000 increase in cost of attendance was associated with greater likelihood of graduation. Higher cost of attendance among Indiana's public institutions is positively correlated with higher levels of selectivity. This finding for Whites could be an artifact of them being more likely to attend higher cost, more selective institutions. Indeed, 67 percent of Whites attended higher cost research universities compared to 32 percent of Latinos and 29 percent of African Americans.

The combination of a consistently significant relationship between cost and attendance and a weaker and less consistent relationship between financial aid and attendance is intriguing. Economic theory posits that financial aid alters students' assessments of the relative costs and benefits of attending postsecondary education by reducing the net price paid. Therefore, it is

reasonable to assume that if total cost were found to have a significant effect on departure, financial aid would have an equally strong effect. This is not the case in this study.

The effects of aid extend beyond the pecuniary to the psychosocial, however. A substantial and growing body of research has demonstrated that price responsiveness varies by student characteristics (Heller, 1997). For example, low-income students may be more responsive to different forms of aid than their higher-income peers (Paulsen & St. John, 2002). Moreover, some research (St. John, et al., 2005) suggests that price responsiveness may differ across racial and ethnic groups and that students may be more responsive to costs than to aid (St. John & Starkey, 1995).

Overall, this suggests that the larger effect for total cost relative to aid found in this study may be an example of aversion to higher costs, or *sticker shock*. If so, receiving financial aid may not offset this effect. Indeed, prior research (Nora, Barlow, & Crisp, 2006) suggests that Latinos, particularly those with low incomes, may be more responsive to costs than to offers of aid. DesJardins, Ahlburg, and McCall (2002) attempt to address the relationship between costs and perceived ability to pay by modeling the effects of aid *offered* on students' decisions to reenroll, controlling for total costs of attendance.

Contrary to prior work, this study finds that Latinos and African Americans appear less sensitive to price than their White peers. However, it is possible that—given financial constraints—Latino and African Americans chose to attend lower cost institutions than their White peers. This issue warrants additional research and may be a fruitful direction for future study.

Campus characteristics and student enrollment characteristics had significant effects on attainment as well. Entering variables into the model as sequential blocks indicate that,

collectively, college experience variables significantly improved overall model fit and explanatory power. Moreover, the inclusion of college enrollment characteristics impacted findings for variables previously entered into the models. For example, once we controlled for college experience the effects of academic preparation in high school—as measured by high school curriculum and high school rank—diminished or were no longer statistically significant.

Implications

In the nature of research, this study raises as many questions as it answers. Foremost, the findings from this study lend support to the commonsense notion that students' decisions to remain enrolled (or not) are made year to year, semester to semester, and perhaps day to day. Put differently, persistence is inherently a temporal process, which we must study with appropriate longitudinal methodologies. This longitudinal study looked at one component of that temporal process—financial aid. The results support the argument that we must consider time when looking at financial aid and educational attainment to understand how aid promotes or perturbs persistence among underrepresented students. Need-based aid, propensity to apply for aid, college experience, sensitivity to cost, and institutional context all emerge from this research warranting further exploration.

The consistently negative relationship between costs of attendance coupled with the findings for the effects of loans may suggest that—although aid may provide some financial support in promoting attainment—ultimately students still struggle to pay the bills. A fuller financial picture may be especially important for Latino students—as so many of them tend to live off campus, possibly resulting in their total costs being understated compared to students who live on campus (for whom room and board data are available). Findings from the National

Postsecondary Student Aid Study suggest that to pay for school Latino students may rely more than their white counterparts on earnings from work (Santiago & Cunningham, 2005). Additional research is needed to gain a better understanding of the trade-offs between incurring debt and engaging in other efforts to control costs, and of the effects of these strategies on departure.

Future research on the relationships between aid, debt, and departure should look at students' their academic progress and their nonacademic financial obligations, which may be as pertinent to persistence as students' ability to pay tuition. In addition, future work should not ignore the psychosocial aspects of financial aid and total cost of attendance. Given the low number of Latinos who completed a postsecondary degree in this study it is reasonable to assume that slow progress toward one's goals coupled with few Latino peers attaining a degree may make Latino students more averse to paying the cost of tuition. Put differently, students' cost-benefit calculation may change if they perceive the benefits to be more fiction than reality. The relationship between the pecuniary and psychosocial effects of aid over time is likely a productive area for mixed-methods research. Rich, qualitative data about Latino students' perceptions of loans, grants, and costs of attendance as they progress through school coupled with econometric modeling using event history techniques has potential to further illuminate the complex relationships this study has only begun to bring into relief.

The Road Ahead

Closing the postsecondary completion gulf between Latinos and whites is an ethical imperative as well as a social, economic, and democratic requirement. To find practical solutions for the dominant patterns and problems that created and widened this gulf, researchers, policy makers, educators, students, and communities need to work together. As Suro and Fry (2005)

note, the United States is in the midst of a demographic shift as significant as the mass migrations around the turn of the 20th century or the baby boom following World War II. Latinos, both foreign and domestic-born, are at the center of this shift. Concurrently and for a variety of reasons access to postsecondary education is eroding for Latinos. The confluence of these currents has the potential to accelerate the erosion of equity ground gained during the civil rights era, creating a de facto state of segregation where economic mobility and democratic participation follow racial and ethnic lines.

A necessary component of educational equity is access to postsecondary education, but alone it will not bridge the education gulf between whites and Latinos—the minority group that is becoming the majority. Nonetheless, ensuring access to postsecondary education for college-qualified Latinos regardless of their financial resources is arguably an easier first step than overcoming institutional racism and cross-generational poverty. In our long-term effort for an equitable society, we must continue to find ways to make college affordable for all.

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