

Graduate Student Persistence: Evidence from Three Decades

By Suchitra Gururaj, Julian Vasquez Heilig, and Patricia Somers

Suchitra Gururaj is a doctoral student at University of Texas at Austin.

Julian Vasquez Heilig is assistant professor of educational policy at University of Texas at Austin.

Patricia Somers is associate professor of higher education at University of Texas at Austin.

A previous version of this paper was presented at the 2007 Association for the Study of Higher Education Conference.

This article conducts a meta-analysis of results of studies by Andrieu (1991), DeAngelis (1998), and Liseo (2005) to assess changes over time in the effects of financial aid and other factors on graduate student persistence. A descriptive review of the studies finds that combination aid packages encouraged persistence in 1987 (Andrieu, 1991), while any aid promoted persistence in 1993 (DeAngelis, 1998). In 2000, loans and assistantships, as well as tuition increases, were related to persistence (Liseo, 2005), demonstrating that available aid may offset tuitions at private institutions. The individual studies demonstrate the significance of differing financial variables during different time periods. The meta-analysis demonstrates that every form of aid is significant in promoting graduate student persistence and that grants, in particular, offer the greatest bang for the buck among this population. These findings present policy implications for improving graduate student retention.

Educational policy researchers in the United States have tried to assess recently how increased individual educational attainment not only contributes to personal wealth and opportunities but also enhances the potential of individuals to contribute in a financially and socially responsible manner to their communities (see, for example, Texas State Data Center, 2007; Watts, 2007). The call for increased educational attainment seems to have been answered; in fact, in the academic year 2004-2005, approximately 2.5 million students were enrolled in graduate or first professional programs in the United States. Notably, participation has increased by 59 percent since the mid-1970s (NCES, 2007, Table 210). Moreover, the number of participants in post-baccalaureate programs is projected to increase through 2015. However, there is little research on the subsequent persistence and graduation of this burgeoning group of enrolled graduate students. There is no national database that tracks graduate student attrition, and colleges and universities often lack systems to follow the progress of graduate students at the institution (Bair & Haworth, 2004). While 2,755,402 students were reported to have received any degree by U.S. public and private institutions in 2003-2004, and 48,378 of those students received doctoral degrees (NCES, 2007, Table 304), little is known of the graduate students who did not persist through to masters or doctoral degree attainment. This group of dropouts and stop outs is not insignificant; for example, approximately 50 percent of all doctoral students will not persist to graduation (Isaac, 1993; Tinto, 1993).

The persistence of students who enroll in graduate programs is certainly important in light of individual students' educational aspirations. But institutions that employ resources to carefully cull their entering classes also lose when graduate students drop out. Understanding the effects of financial

aid on graduate student attendance, may encourage institutions to promote better enrollment management at the graduate level (Ehrenberg, 2002). According to Bair and Haworth's (1999) "meta-synthesis" of literature regarding graduate student persistence, attrition varies depending on the field and program of study, as well as departmental culture and overall difficulties with dissertation completion. In response, institutions invest funding in graduate students, not only in the form of social and academic supports, but also in the form of financial aid.

Aid for graduate and professional students has always been distinct from undergraduate student aid programs. In addition to self-funding and tuition reimbursement from employers, graduate students are supported by institutional funds, federal grants and contracts, and foundation/corporate funds that are awarded in the form of fellowships, scholarships, and assistantships. While both undergraduate and graduate students are eligible for federal student loans, the loan limits are different for each.

Moreover, graduate student retention may have been affected by federal financial aid policy shifts over the last thirty years. Specifically, in the 1970s, the nation expanded grant programs. Later, the Reagan administration retreated from funding expansion for educational programs by placing more fiduciary responsibility on families for higher education costs. The 1992 reauthorization of the Higher Education Act prioritized the lack of access for low-income students, while also increasing the loan availability for middle-income students. This reauthorization introduced unsubsidized loans that had no income restriction. In doing so, the legislation encouraged the accumulation of debt. The late 1990s once again focused on affordability for the middle-class, this time concentrating on providing tax relief. President Clinton's Lifetime Learning Credits provided families with a federal income tax credit. Over these two decades, tuition costs and loan availability rose, thereby encouraging both access and debt simultaneously.

Nonetheless, research has rarely investigated the effects of varying types of financial assistance on graduate student persistence over time. The limited research points out that aid that does not require students to work (fellowships and grants) or enables them to work within their fields (assistantships) encourages persistence more than other types of aid, or no aid at all (Bair & Haworth, 1999). This article analyzes the results of the existing studies of National Postsecondary Student Aid Study (NPSAS), the nationwide study conducted by the U.S. Department of Education describing how students pay for postsecondary education, to assess the effects of financial aid on graduate student persistence.

This article, moreover, seeks to highlight the characteristics of financial aid across three decades that are the most influential in the persistence of graduate students and concludes by outlining subsequent policy implications.

Literature Review

While there is much research on the persistence of undergraduates, much less exists on the persistence of graduate students. Since the 1970s, models of undergraduate persistence have been grounded in both economic and sociological theory (Astin, 1975, 1977; Bean, 1981, 1982; Pascarella & Terenzini, 1977, 1979; Tinto, 1993).

Although Tinto (1993) and others (Thomas, Clewell, & Pearson, 1991) have reported similar findings regarding undergraduate and graduate persistence, Tinto clarifies that differences between graduate and undergraduate students involve the strength of social and academic integration. For doctoral students in particular, Tinto drew on anthropological models of integration, stating that doctoral students pass through three distinct phases—coursework, candidacy, and dissertation—and that the persistence challenges vary for each of those phases. Students who are able to attend full-time are more quickly integrated and are likely to finish. It follows that students who take longer to finish their programs of study are less likely to complete their degrees.

The two-stage model developed by Girves and Wemmerus (1998) for studying graduate student persistence asserts that for master's students, departmental and student characteristics, financial support, and perception of faculty influenced persistence. Grades, however, are integral to master's students' progress. Because grading standards can vary with programs, choice of graduate program becomes critical for these students who may be encouraged or discouraged by their performance against the grading standards in their programs. For doctoral students, in contrast, performance on qualifying exams, ability to do independent research, and financial support all influence whether a student persists. According to Girves and Wemmerus, the graduate student's perception of his or her relationship with a mentor is also critical to persistence.

Lovitts (2001) examined the institutional factors that influence graduate persistence. Students who dropped out were less likely to have integrated themselves into the academic and social life of their departments, including engaging in strong professional relationships with faculty. Lovitts asserted that institutions can encourage persistence by combining academic challenge with the support of departmental faculty.

While some research on graduate student persistence has entered the literature in recent years, there continues to be a shortage of research on the specific influence of financial aid on graduate student persistence. Tinto (1993) suggested that financial aid packaging policies are more conducive to recruitment and persistence in the early years of graduate school than persistence to degree completion. Moreover, short-term changes in financial aid can have long-term ramifications on persistence (Tinto, 1982, 1993). In a similar vein, both Kallilo (1995) and Ethington and Smart (1986) cited financial aid as a variable in the choice of which graduate school to attend, acknowledging that it might create long-term effects. In their analysis of already enrolled graduate students, Girves and Wemmerus (1998) discussed the effects of financial aid in the context of its ability to promote critical interaction and engagement, specifically by doctoral-level students. They indicated that students with

teaching and research assistantships were more likely to seek involvement in their programs and complete their doctorates. Graduate assistants gain the benefit of engagement with faculty members and are therefore socialized faster. While their course of study determined the importance of financial support for doctoral students (as opposed to the lesser influence on master's students), they recommend further study on the effects of different types of financial aid offered.

The three studies compared here (Andrieu, 1991; DeAngelis, 1998; Liseo, 2005) offer longitudinal insight into the specific effects of financial aid packaging on the persistence of graduate students. All three studies develop inferential statistical models by utilizing national data from NPSAS to examine within-year persistence of graduate and first-professional students. Andrieu (1991), who used NPSAS:87, found that graduate students who received grants, loans, and assistantships were more likely to persist. Those who received only one type of aid were less likely to persist than those students who had no aid. Students enrolled part time who worked were more likely to persist than those who were enrolled full time and who did not work. Finally, she suggested that tuition increases negatively affected persistence.

DeAngelis (1998) replicated the Andrieu study using NPSAS: 93 and added several new variables, including debt load. She developed six additional models to examine the influence of financial aid on within-year persistence, three of which used variations in financial aid packaging and three of which used net cost (price variables with aid amounts). She found that price response and net cost models were the most predictive. She concluded, "[R]eceipt of financial aid significantly and positively influenced the within-year persistence of graduate and professional students [in 1993]" (p. 138). She concurred with Andrieu that students who received all three types of aid (i.e., grants, loans, and work) were more likely to persist.

Liseo (2005) added tax credits to the existing models and performed analyses on various subpopulations using NPSAS:2000. She found that aid packages were positively associated with persistence. In contrast to the other NPSAS studies, Liseo found some differential effects by race and gender. For Asian students, aid was positively associated with persistence. For African American students, no aid variables were significant. Female students were more likely to persist if they received increased amounts of loans and assistantships.

This article draws upon three studies (Andrieu, 1991; DeAngelis, 1998; Liseo, 2005) to explore how financial aid has affected the persistence of graduate and first professional students from 1987 to 2000, and discusses financial aid policy implications for the future.

Conceptual Framework

A model of graduate student within-year persistence was developed for this study based upon previous graduate student persistence research by Andrieu, St. John, and colleagues (Andrieu, 1991; Andrieu & St. John, 1993; DeAngelis, 1997; Liseo, 2005; St. John & Andrieu, 1995; St. John, Oescher, & Andrieu, 1992). As suggested by Hu and St. John (2001), the outcome variable considered in each of the three NPSAS studies is within-year persistence, which is considered as a proxy for the sufficiency of financial aid. That is, students who drop out mid-year often believe they do not have sufficient funding to complete the school year. The students drop out in frustration or stop out while trying to save funds to return to college. As previously noted, Tinto (1993) indicates that the longer students take to finish their programs of study, the less likely they are to complete their degrees. Students who enroll in consecutive academic terms do not prolong their progress by stopping out.

This paper considers the value of within-year persistence to evaluate the success of financial aid in promoting graduate student persistence on a yearly basis. Unlike undergraduates, graduate students often compete for funding on a year-to-year basis, and that funding may be responsible for the pace of progress toward degree completion. Moreover, students who stop out or drop out, due to lack of funding or any other reason, are unlikely to persist through to graduation. A study of the effectiveness of within-year persistence reveals the ramifications of adequate or inadequate financial assistance on graduate students' ability to persist in the longer term.

Based on the previous graduate student persistence research, and research on attainment drawn from economics (Baird, 1993; Cabrera, Nora, & Castaneda, 1992; Farrell & Rusbult, 1981; Olivas, 1995) and sociology (Blau & Duncan, 1978; Sewell & Shah, 1967), the models introduced in the studies by Andrieu (1991), DeAngelis (1998), and Liseo (2005), as well as in the current meta-analysis, include background, college experience, field of study, price, aid, and previous debtload as factors.

Method

Participants

Andrieu's study (1991) used a sample of students from the National Postsecondary Student Aid Survey (NPSAS) of 1987. The sub-sample included 6,559 masters, doctoral, and professional degree students from that survey: 2,850 from public schools and 3,709 from private schools. The gender distribution was 3,558 men and 3,001 women.

DeAngelis (1998) used the 1993 survey (NPSAS:93), drawing on a sample of 13,399 graduate and professional students from that database, including 9,302 graduate students and 4,097 professional students enrolled full- and part-time at public and private universities. Her sample was comprised of 6,573 men and 6,758 women (68 cases lacked gender identification).

Liseo's study (2005) drew on a sample from NPSAS:2000, which included 4,020 graduate and professional students, 3,360 attending full- and part-time at public and private universities. Of the sample, 2,152 were women and 1,868 were men.

Methodologies of the Studies

Andrieu's seminal study (1991) developed a logistic regression model for research on graduate student persistence. The model measured within-year persistence, used as a proxy for the sufficiency of financial aid (Hu & St. John, 2001) and conducted a stepwise logistic regression to test the following factors:

- Background: ethnicity, gender, age, income, dependency status, employment status, and mother's education
- Graduate experience: Grade point average (G.P.A.), full- or part-time status, and level of enrollment (masters or doctoral), type of institution (public or private)
- Expected earnings by major (based on the salary survey of graduates in the study year)
- Individual aspirations: postsecondary plans
- Financial commitment: financial aid and its packaging

In regard to financial commitment, Andrieu's study was the first to examine whether the receipt of any aid influenced within-year persistence, how price responsive students were, and whether specific aid packages influenced within-year persistence.

DeAngelis (1998) replicated Andrieu's study and added debt load to her model. In addition to the basic within-year persistence model developed by Andrieu, DeAngelis developed six alternative financial aid models to assess the influence of financial aid on graduate and professional students. These six models addressed financial aid packaging; aid packaging, tuition and fees, aid packaging regarding repayment, price response, debt load, and net cost. Moreover, the aid packaging variations included seven variations, including grants only, loans only, assistantships only, grants and loans, grants and assistantships, loans and assistantships, and a combination of the three. The second aid packaging model included a price variable in regard to tuition and fees, while the third packaged aid in regard to repayment obligations.

Liseo (2005) replicated the models of both prior graduate persistence studies while adding tax credits to reflect the 1997 inclusion of Lifetime Learning Credits in tax law. She also assessed the influence of the model's variables by gender and ethnicity. In describing the demographics of her sample, Liseo wrote that 68.7 percent of the sample received aid. Notably, debt load was highest in the African-American population. Like Andrieu (1991) and DeAngelis (1998), Liseo used logistic regression to systematically add variables to test model parsimony.

Statistics

While Ordinary Least Squared (OLS) regression is used to describe the relationship between a dependent variable and the independent variables, the technique is based on two assumptions about the data. First, variables are assumed to be continuous. The assumption is that the relationship between an outcome variable and independent variables is expressed by a straight line.

However, both assumptions are violated when the outcome is dichotomous (Cabrera, 1994). Since the outcome is dichotomous (the student persisted or not) in the persistence studies, logistic regression is used in place of OLS. For logistic regression, the resulting graph of the relationship is an S-shaped curve bounded by 0 and 1, and not the straight line produced by OLS regression.

The basic logistic regression equation is:

$$P = E(Y | X) = \frac{\exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n)}{1 + \exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n)}$$

Whatever the values of the constants β_i or the variables X_i , P is between 0 and 1 can also be thought of as a probability measure that the outcome variable will be 1 (yes). Like OLS, the relationship between the outcome and explanatory variables is expressed in terms of beta weights. Likewise, there are a pseudo R^2 , Somers' D , and goodness of fit measures for logistic regression, which are used in the three studies presented here. The beta coefficients are converted to delta-p's, a standard measure of change (Peterson, 1984) to make the data more user friendly. All three studies analyzed here used logistic regression and reported the results in both beta weights and delta-p's.

Results

The results for the full models in all three studies are presented in Table 1. In Andrieu's study, set in the economically uncertain 1980s, full-time attendance negatively influenced within-year persistence. Andrieu's analysis of financial aid packaging resulted in critical findings. She determined that students, especially at private institutions, were price sensitive to increases in tuition, such that it decreased persistence. While private college tuitions are usually higher, this finding may indicate that in the 1980s at least, grants and scholarships did not keep up with tuition increases.

When controlling for the price of rising tuition and its effects at all types of institutions, however, Andrieu found that the only configuration of aid that positively influenced graduate student persistence was one with grants, loans, and assistantships, as opposed to any of the aid types by themselves. At the same time, while no single aid variable was positively significant, the receipt of any aid was significant. Table 1 shows that assistantships alone, in fact, decreased persistence numbers because students could seldom live on assistantship salaries alone. This finding was at odds with that of Girves and Wemmerus (1988) who found that graduate assistantships were most beneficial to students because they promoted academic and social integration. Not only did a \$1,000 increase in tuition decrease the probability of within-year persistence in the Girves and Wemmerus study, but each \$1,000 increase in assistantship earnings did as well, reflecting the difficulties in keeping up with the student perceptions of affordability. Moreover, when adjusting for packages of aid including tuition, students with higher expected incomes were expected to persist more often.

Table 1: Summary of Persistence (Full Logistic Stepwise Regression Models)

		Background	Graduate Experience	Aspirations	Expected Earnings	Financial Commitment
Andrieu	N/S	Race Age Gender Income Status	GPA Level		Expect	
	Positive	Mother Some College** Working*				
	Negative	Mother Advanced Degree**	Full-time** Continue** Private**			Aid** Tuition**
DeAngelis	N/S	Gender Income	Other Majors		Expect	
	Positive	Latino** Mother Some College** Age**	Level** Full-time** Professional Major** Allied health** Business** Engineer** Public**	Masters**		Aid**
	Negative	Married**	GPA** Other grad Degree** No Major**			
Liseo	N/S	Age Race Work Income Dependents Married	Major Type Level Full-time			
	Positive		GPA*			Tuition* Aid*
	Negative					

* $p < .05$. ** $p < .01$. N/S denotes variables that were not significant.

DeAngelis (1998) determined that a combination of grants, loans, and assistantships had significant influence on within-year persistence in 1993. Using the six models of alternative aid configurations, DeAngelis found that, contrary to Andrieu's (1991) results, all aid packages, except those including assistantships, were positively significant. Further, a combination of grants and loans increased the probability of persistence. She found that both "free" (grants/scholarships) and "obligatory" (loans and assistantships) aid positively influenced persistence. That students seemed willing to incur debt with obligatory aid seems to confirm Tinto's theory that integration into the culture of the university encourages persistence even in the face of having to assume loans to attend college. DeAngelis found that in \$1,000 increments, students were more likely to persist at lower levels of tuition. However, the coefficient for tuition (.0191) remained negative and significant when financial aid was included in the model. The price response model demonstrated the same idea: an increase of \$1,000 of aid received in the form of grants, loans, or assistantships, increased the probability of within-year persistence. Debt load (i.e., debt from previous year's loans) did not have a significant influence by itself; however, when combined with aid and assessed as net cost, it was positively significant in promoting persistence. DeAngelis suggested that graduate and professional students are primarily concerned with a long-term investment and will incur debt in the course of making this investment. DeAngelis' results, indicated that, once a student has a relationship with an institution, that student is willing to spend more money to continue the relationship.

In Liseo's final model, financial variables were important. Tuition was significant in that, for each \$1,000 increase in tuition, all students were more likely to persist. Likewise, for each \$1,000 increase in loan aid or increase in assistantship aid, all students were more likely to persist; she concluded that perhaps these students were receiving sufficient support. Liseo also found that, among males, a \$1,000 increase in tuition or in assistantship funding both increased the likelihood to persist. Women responded in kind to those two sources, as well as to a \$1,000 increase in student loans. While no variables were significant for the African American population, among the Latino population an incremental increase in tuition (and aid) encouraged persistence. For each \$1,000 increase in tuition, Asian students were more likely to persist; however, each incremental increase of debt load discouraged their persistence. These associations of tuition with increased persistence, said Liseo, may indicate that students who are invested in an institution will stay on (as DeAngelis found) or perhaps that many of these students attended more expensive private institutions where generous aid offset increases in tuition. The Lifetime Learning Tax Credits that Liseo added to the model did not have any impact on students' persistence. She suggested that the \$1,000 tax credit, to be claimed after tuition and fees are paid, was not substantial. Alternatively, in 2000, many students may not have been aware of the availability of these tax credits.

The comparison of the results from the 1987, 1993, and 2000 data shows a remarkable transformation. In 1987 (Andrieu, 1991), no single aid variable was significant, while the effect of aid packages was positively significant. DeAngelis

(1998) found that a combination of grants, loans, and assistantships, as well as any aid, were significant and positive in 1993. Liseo (2005), in contrast with Andrieu and like DeAngelis, found that five aid variables were significant; however, she found that two were negative (grants and graduate debtload) and three were positive (loans, assistantship, and tuition and fees).

Financial Aid Effect Magnitude Analysis

We conducted a meta-analysis in order to précis the changes in the significance of financial aid variables over time in each of the NPSAS studies. Meta-analysis is a “study of the studies” (Raudenbrush & Bryk, 2002, p. 205) that enables the summary of a collection of studies by “a single common-effect size estimate” (p. 205). Alternatively, and in this case, a meta-analysis offers possible explanations of why results of like studies may vary. The meta-analysis utilizes a combined estimation method. Effect magnitude analyses are used to consider the degree of relation between variables. The variables in the financial aid studies considered here are measured on a scale of dollars in thousands. As a result, the raw regression coefficients for the variables can be combined directly (Greenwald, Hedges, & Lane, 1994). This procedure for combining the logistic regression coefficients includes simple averaging as the data analysis technique.

The delta-p statistic (see explanation under method) is useful for conducting the effect magnitude analysis as it allows the researcher to make comparisons between each of the research studies due to the use of the same statistic for the variables in each of the studies. The results of the effect magnitude analysis, as defined by the averaged significant effect sizes for each of independent variables are noted in Table 2.

Table 2: Mean Regression Coefficients ($p \leq .05$)

Input Variable	Equations	(Studies)	Full Sample
Any aid	(2)	(2)	.084
Total grants	(2)	(2)	.186
Total loans	(5)	(2)	.076
Total assistantships	(4)	(2)	.093
Tuition and fees	(4)	(3)	.030
Undergraduate debt	(0)	(2)	--
Graduate debt	(1)	(1)	--

The mean standardized delta-p regression coefficient for total grants that a graduate student received computed over all studies is .186. This coefficient is the largest of the effects and translates to an 18 percent increase for each \$1,000

for the probability retention of a student in graduate school. By the standards of educational aid interventions, this is a fairly large effect.

The mean effect obtained in the studies for “any aid” provided to students and total assistantships also showed large outcome effects. Notably there were some positive and some negative effects. Together, the any aid coefficients showed about a 9 percent increase in the probability of retention of graduate students.

The total amount of loans student held also showed a positive effect on graduate persistence. Overall, for every \$1,000 in loans, students were 7 percent more likely to persist in graduate school. The mean effects for tuition also appear to be positive across each of the studies. What this suggests is that for each increase of \$1,000 in tuition, there is an increased probability of 3 percent for graduate student retention. There is a concomitant increase in the cost of tuition and financial aid offered, and this would seem to be particularly true at highly selective colleges.

Taken together, the effect size analyses show that several financial aid variables have positive effects for the retention of students in graduate school. The effects of the financial aid variables average to be positive in all cases. The typical effects for debt are mixed and non-significant. The studies considered in this meta-analysis of graduate school persistence and financial aid did not find debt significant. Yet, higher tuition is significant. This finding is not necessarily intuitive with the established research literature on retention in undergraduate programs. When considering other background variables (major type, marital status, economic status), these three studies did not find debt to be a significant predictor of graduate student retention. Perhaps a control variable measuring prestige would illuminate whether tuition and total aid may actually be proxies for institutional selectivity.

Discussion and Policy Implications

What is interesting about these studies is that they examine the comprehensive NPSAS data at a point in each of the past three decades. This longitudinal view of financial aid for graduate student persistence provides the opportunity to consider questions of policy over the long term. Andrieu is positioned in the late 1980s, during a period in which the Supplemental Loan to Students was created specifically to provide loans to graduate and professional students. As we look forward from Andrieu (1987) to DeAngelis (1993), we would expect the availability of loans would have led to greater student persistence. In fact, the analysis finds that during the intermediary years between studies (1987 and 1993) more aid in the form of loans was made available to students and positively influenced the retention of graduate students. Across this time period, we find that total loan amounts do significantly predict graduate student persistence, and that the availability of loans appears to have encouraged persistence as students were better able to meet their financial responsibilities. However, the long-term unintended consequences of large amounts of debt on graduate students is a highly salient issue that requires more study, but lies outside of the purview of this paper.

Rapidly escalating tuition in the 1980s and 1990s also appears to affect within-year persistence. While greater levels of tuition and aid do predict graduate student success, as noted previously, more work needs to be done to understand whether these variables are measuring institutional selectivity or whether rises in tuition do actually increase graduate student persistence for some currently unknown reason.

These findings suggest several possible implications for institutions of higher education. The increased amount of aid in the 1980s and 1990s meant that a package with any type of aid would assist graduate students. There are also possible implications for recruitment of students in fields that will have lower expected incomes. Regardless of program, it appears that when background characteristics are controlled for, packages with different types of aid have the potential to increase graduate student persistence. However, this does not relieve institutions from continuing to find ways to promote equity and encourage subgroup participation and success in graduate programs via the aid process. In fact, the finding that various background characteristics do not necessarily predict success across studies when aid variables have been controlled for may suggest that institutions of higher education are able to overcome the traditional barriers to graduate student persistence when they provide tailored and appropriate aid for students from heterogeneous backgrounds.

Notably, Liseo (2005) is positioned in the years after the legislative enactment of the Clinton higher education tax credits. Liseo did not find the tax credits to be significant predictors of graduate student persistence. However, the recency of the tax policy shift and difficulties initially experienced by students in claiming the credit might necessitate a reanalysis of the credits in the current environment. . If the Lifetime Learning Credits are now more well-known and better utilized, they could have a different impact on graduate student persistence in new models.

Ultimately, the most important finding in this meta-analysis is that grants are the largest predictor of student success in graduate school regardless of background characteristics. In the policy environment since the terrorist attacks of September 11, 2001, funding for higher education institutions has declined as national security considerations demand more money (Somers et al., 2004). Our findings suggest that the biggest improvement in graduate student retention may be found in increasing federal aid to institutional grant programs. The effect is about double that of other aid types. A large increase of direct-to-student federal grants is contrary to the current political winds, but it appears to offer the greatest potential gain for graduate student persistence.

Limitations

Several limitations in this meta-analysis study must be considered. The primary limitation is the small body of research that broadly and quantitatively examines the impact of aid on graduate student persistence. As a result, this meta-analysis only considers the NPSAS studies for the magnitude effect analysis. Further, the studies examined do not include p-values, precluding the ability to conduct a combined significance test meta-analysis. Additionally, because all three studies are involved in the analyses, the most influential study cannot be dropped from the average alpha-p coefficients to provide a more robust and balanced measure of effects. As more NPSAS studies become available, some of these concerns can be integrated into new models to be considered in future meta-analyses.

Future research would also benefit from the ability to examine year-to-year persistence in addition to within-year persistence. Rather than creating a snapshot measure of persistence, future studies can take a longer view of graduate student success by using graduation as the dependent variable. While the examined studies do not find debt burden to be a significant predictor of within-year graduate student success, future models that examine graduation, within-year graduate student persistence, and variables that represent workforce outcomes are especially important in light of the rapidly escalating costs of graduate school. It is an open question whether the context of the 1980s and 1990s in regards to the relationship of debt to persistence would remain non-significant in 2010 in light of the 2007-2009 recession and continued economic challenges.

As previously discussed, a control variable for different Carnegie education institution types was used but may not isolate effects in the data representing the complex interaction between financial aid and tuition costs at institutions with differing levels of prestige. Program specific evaluations within these institutional contexts may also produce interactions that the current studies did not consider.

Conclusion

While considerable research has been undertaken to examine the social and academic supports integral to graduate student persistence, this study begins to address the gap in the literature about the effects of financial aid and other financial considerations on graduate student within-year persistence. Because increased educational attainment contributes to both personal and community wealth as well as to concomitant social benefits, this study suggests that institutions and policy makers focus on grants as a means to prevent attrition and promote persistence. Further research should delve deeper into the critical role of funding in graduate student enrollment, persistence, and subsequent degree completion.

References

- Andrieu, S. C., & St. John, E. P. (1993). *The influence of prices on graduate student persistence*. *Research in Higher Education*, 34(4), 399-425.
- Andrieu, S.C. (1991). *The influence of background, graduate experience, aspirations, expected earnings, and financial commitment on within-year persistence of students enrolled in graduate programs*. Unpublished doctoral dissertation, University of New Orleans.
- Astin, A.W. (1975). *Preventing students from dropping out*. San Francisco: Jossey-Bass.
- Astin, A. W. (1977). *Four critical years: Effects of college on beliefs, attitudes and knowledge*. San Francisco: Jossey-Bass.
- Bair, C.R., & Haworth, J.G. (1999). *Doctoral student attrition and persistence: A meta-synthesis of research*. Paper presented at Association for Study of Higher Education Annual Meeting, San Antonio, TX.
- Bair, C.R., & Haworth, J.G. (2004). *Doctoral student attrition and persistence: A meta-synthesis of research*. In J.C. Smart (Ed.), *Higher Education: Handbook of Theory and Research*, Vol. XIX (pp. 481-534). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Baird, L. (1993). *Increasing graduate student retention and degree attainment*. San Francisco: Jossey-Bass.
- Bean, J. P. (1980). *The synthesis and test of a causal model of student attrition*. *Research in Higher Education*, 12(2), 155-187.
- Bean, J. (1982). *Conceptual models of student attrition: How theory can help the institutional researcher*. In E. Pascarella (Ed.), *Studying student attrition* (New Directions in Institutional Research series no 36, pp. 17-33). San Francisco: Jossey-Bass.
- Blau, P. M., & Duncan, O.D. (1967). *The American occupational structure*. New York: John Wiley and Sons.
- Cabrera, A. F. (1994). *Logistic regression analysis in higher education: An applied perspective*. In J. C. Smart (Ed.), *Higher education: Handbook of Theory and Research*. New York: Agathon Press.
- Cabrera, A. F., Nora, A., & Castaneda, M. B. (1992). *The role of finances in the persistence process: A structural model*. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.
- DeAngelis, S. (1998). *The influence of price and price subsidies on within-year persistence of graduate and professional students*. *Journal of Student Financial Aid*, 28, 41-57.
- Ehrenberg, R.G. (2002). *Tuition Rising: Why Colleges Cost So Much*. Cambridge: Harvard University Press.

- Ellis, E. M (2001). *The impact of race and gender on graduate school socialization, satisfaction with doctoral study and commitment to degree completion*. Western Journal of Black Studies, 25(1), 30-46.
- Ethington, C. A., & Smart, J. C. (1986). *Persistence to graduate education*. Research in Higher Education, 24, 287-303.
- Farrell, D., & Rusbult, C. E. (1981). *Exchange variables as predictors of job satisfaction, job commitment, and turnover: The impact*. Organizational Behavior & Human Performance, 28(1), 78-95.
- Girves, J.E., & Wemmerus, V. (1988). *Developing models of graduate student degree progress*. Journal of Higher Education, 59, 163-189.
- Greenwald, R., Hedges, L.V., & Laine, R.D. (1994). *When reinventing the wheel is not necessary: A case study in the use of meta-analysis in education finance*. Journal of Education Finance 20(1), 1-2.
- Hu, S., & St. John, E.P. (2001). *Student persistence in a public higher education system: Understanding racial and ethnic differences*. Journal of Higher Education 72(3), 265-286.
- Isaac, P. D. (1993 Winter). *Measuring graduate student retention*. New Directions for Institutional Research, 13-25.
- Kallio, R.E. (1995). *Factors influencing the college choice decisions of graduate students*. Research in Higher Education, 36(1), 109-124.
- Liseo, P.A. (2005). *Graduate and professional student within-year persistence and financial aid*. Unpublished dissertation, University of Missouri – St. Louis. UMI: AAT3178912.
- Lovitts, B.E. (1996). *Who is responsible for graduate student attrition—The individual or the institution? Toward an explanation of the high and persistent rate of attrition*. Baltimore: University of Maryland. (ERIC Document Reproduction Service No. ED399878).
- Lovitts, B.E. (2001). *Leaving the Ivory Tower*. Lanham: MD: Rowman and Littlefield.
- National Center for Education Statistics. (2006). *Digest of Education Statistics: 2006*. Retrieved June 1, 2007 from http://nces.ed.gov/programs/digest/d06/ch_3.asp
- Olivas, L. (1995). *Arizona State University: An historical review of minority students, faculty, and staff*. Tempe: Office of Institutional Analysis.
- Pascarella, E.T., & Terenzini, P.T. (1979). *Interaction effects in Spady's and Tinto's conceptual models of college dropout*. Sociology of education, 52, 197-210.
- Pascarella, E. T., & Terenzini, P. T. (1977). *Patterns of student-faculty interaction beyond the classroom and voluntary freshman attrition*. Journal of Higher Education, 48(5), 540-552.

- Pauley, R., Cunningham, M., & Powell, T. (1999). *Doctoral student attrition and retention: A study of a non-traditional Ed.D. program*. *Journal of College Student Retention*, 1, 225-238.
- Peterson, T. (1984). *A comment on presenting the results of logit and probit models*. *American Sociological Review*, 50(1), 130-131.
- Raudenbush, S.W., & Bryk, A.S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage.
- St. John, E. P. & Andrieu, S. C. (1993). *The influence of prices on graduate student persistence*. *Research in Higher Education*, 34, 399-425.
- St. John, E. P., & Andrieu, S. C. (1995). *The influence of price subsidies on within-year persistence by graduate students*. *Journal of Higher Education*, 29(2), 143-168.
- St. John, E.P., Oescher, J., & Andrieu, S. (1992). *The influence of prices on within-year persistence by traditional college-age students in four-year colleges*. *Journal of Student Financial Aid*, 22, 27-38.
- Sewell, W. H., & Shah, V.P. (1967). *Socioeconomic status, intelligence, and the attainment of higher education*. *Sociology of Education*, 40, 1-23.
- Somers, P., Wild, R., Biermann, S., Wetstein, K., Deloach-Packnett, G., & Biddix, P. (2004, November). *In search of Generation 9/11*. Paper presented at Association for Study of Higher Education Annual Meeting, Kansas City, MO.
- Texas State Data Center and Office of the State Demographer. Retrieved April 20, 2007 from <http://txsdc.utsa.edu/presentations>.
- Thomas, G. B., Clewell, B., & Pearson, W. (1987, September). Case study of major doctoral producing institutions in recruiting, enrolling, and retaining Black and Hispanic graduate students. A report to the Graduate Record Examination Board, Princeton, NJ.
- Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.
- Watts, A.L. (2001). *Education and the common good: Social benefits of higher education in Kentucky*. Frankfort, KY: Long-term