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Advanced Degrees of Debt: Analyzing the Patterns and Determinants of Graduate Student Borrowing

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INTRODUCTION

In 2010, student debt surpassed credit card debt in the United States (Federal Reserve Bank, 2012), and exceeded one trillion dollars in 2011 (Consumer Financial Protection Bureau, 2012). Currently, there are more than 37 million Americans holding postsecondary student debt, and 67% are between the ages of 18 and 39 (Whitsett, 2012). While the majority of student debt is concentrated at the undergraduate level (Reed & Cochrane, 2012), borrowing for graduate education is at a record high and increasing rapidly. In the 2011–2012 academic year alone, graduate students borrowed more than 35

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billion dollars in federal and private loans to finance their education—more than double what was borrowed just one decade ago, after accounting for inflation (College Board Advocacy and Policy Center, 2012). Although a number of doctoral students in the sciences, engineering, and other STEM disciplines receive adequate funding and complete their degree with little or no debt, many other graduate students have become increasingly dependent on loans at the master's, professional, and doctorate level (National Center for Education Statistics, 2011; National Science Foundation, 2012). According to the College Board Advocacy and Policy Center (2012), federal loans comprised 67% of all graduate student aid, compared to only 38% of all federal aid that was made available to undergraduate students.

Despite record debt levels and the growing importance of a graduate degree, graduate students have not been the focus of debt-reducing legislation or policy (Wendler et al., 2012). In fact, in summer 2012, the Budget Control Act of 2011 effectively eliminated subsidized Stafford loans for students pursuing graduate degrees—a measure that is predicted to increase graduate student debt load by approximately 6% on average (Androitis, 2012). Given that roughly half of all graduate students have already borrowed for their undergraduate education (National Center for Education Statistics, 2008), an increasing number of graduate degree holders could face excessively high or insurmountable debt loads in the years to come.

Recently, a substantial number of researchers in higher education and other fields have devoted attention to the student debt problem in the United States; however, nearly all have focused on undergraduates. Several studies examine attitudes related to undergraduate debt or the effect of loans on college choice (Burdman, 2005; Kim, 2004; McDonough & Calderone, 2006; Perna, 2008), while several others explore the relationship between undergraduate borrowing and college persistence or completion (Dowd & Coury, 2006; Hossler, Ziskin, Gross, Kim, & Cekic, 2009; Kim, 2007). A number of researchers have also explored the relationship between loan burdens and the decision to pursue graduate education (Kim & Eyermann, 2006; Malcom & Dowd, 2012; Millett, 2003; Monks, 2001; Zhang, 2011), but only a few studies have focused on the impact of graduate debt specifically (Field, 2009; Grayson, Newton, & Thompson, 2012; Kim & Otts, 2010). Further, no studies have attempted to understand what drives graduate borrowing.

In response to that research gap, our study attempts to analyze the patterns and predictors of graduate student borrowing. More specifically, we use data from two recent releases of the National Postsecondary Student Aid Study (NPSAS:2000, NPSAS:2008) to explore relationships between individual- and institution-level variables and graduate student borrowing and also to determine whether graduate borrowing levels have changed for students overall and within particular graduate disciplines. We incorporate several statistical techniques to assess the significance of our findings.

LITERATURE REVIEW

The 1992 reauthorization of the Higher Education Act constituted a watershed moment for federal financial aid policy and, for the first time, made loans available to all students, regardless of income (Hannah, 1996). It and subsequent acts, such as the provision of the Lifetime Learning Credit in 1997, have expanded access to postsecondary education but also have encouraged more borrowing among graduate and undergraduate students (Gururaj, Heilig, & Somers, 2010). Over the same period, graduate tuition in the public and private college sectors has grown dramatically, consistently outpacing inflation rates and growth rates in income (George, 2007). Some have attributed rising tuition to relative declines in state financial support (Harter, Wade, & Watkins, 2005; Toutkoushian, 2009), while others have argued that institutions amplify their tuition rates to capture the growing amounts of federal aid that have become available (Cellini & Goldin, 2012; Turner, 2012). Whatever the reason, the cost of graduate education in America has continued to rise—growing by more than 50% in the past 10 years alone (National Center for Education Statistics, 2011)—while graduate funding provided through grants and assistantships has continued to decline in relative value (Kim & Otts, 2010), forcing many graduate students to increasingly rely on federal loans, the terms of which have changed significantly over the past several years.

Formerly, graduate students were granted access to subsidized federal (i.e., Stafford) loans and could borrow as much as \$8,500 per year without accruing interest while in school. However, in 2011, federal lawmakers passed the Budget Control Act, which eliminated the subsidy and did away with loan repayment incentives for graduate students, costing the average graduate borrower an additional \$2,000, approximately (Baum & McPherson, 2012). As of 2012, graduate students demonstrating exceptional financial need still qualify for a subsidized, low-interest Perkins loan; however, these loans are made available to only less than 5% of the entire graduate population (National Center for Education Statistics, 2008). Currently, the majority of graduate students receive federal assistance in the form of unsubsidized Stafford loans and Graduate PLUS loans—the latter of which is not available to individuals with an adverse credit history—and are increasingly reliant upon private loans that carry variable interest rates and that have led to high default rates among borrowers in recent years (Chopra, 2012).

In sum, trends in graduate tuition and loan policy have moved a larger proportion of graduate students to borrow and have also increased the amount of debt students incur for graduate school. However, the extent to which other factors, at the individual- and institutional-level, accelerate or slow the growth of graduate debt remains unclear.

Until now, research related to education debt has been severely limited at the graduate level, and has focused primarily on the effects and consequences of undergraduate loan burden. For example, research examining the relationship between loan burden and undergraduate persistence has been plentiful but mixed and has yielded results indicating positive (Chen & DesJardins, 2008; Dowd, 2004; Jackson & Reynolds, 2013; St. John, 1990) and negative (DesJardins, Ahlburg, & McCall, 2002; Dowd & Coury, 2006) effects. Findings with respect to college completion are also inconsistent. Several studies failed to uncover a significant relationship between undergraduate borrowing and degree attainment (Dowd, 2004; Dowd & Coury, 2006; Ishitani, 2006), although one more recent study produced negative effects for low-income and minority students specifically (Kim, 2007). Beyond undergraduate outcomes, other research has examined the effects of undergraduate debt on graduate school enrollment and choice. Millett (2003) discovered that undergraduate debt exerted a negative influence on applying to graduate school, while Malcom and Dowd (2012) and Zhang (2011) revealed a negative relationship between undergraduate debt and graduate school enrollment.

In contrast to the literature on undergraduate debt, research examining graduate school debt remains in short supply. A few studies have attempted to isolate the trends and determinants of graduate student borrowing, but they have relied on descriptive analyses or very lean regression models. Rapoport (1998), for instance, analyzed aggregate data provided by the *Survey of Earned Doctorates* and discovered, perhaps surprisingly, that doctoral recipients in science and engineering (S&E) fields incurred more debt from 1993 to 1996 than students in other graduate fields; but it is important to note that his study does not control for other predictors of graduate borrowing and, moreover, includes psychology and social sciences among S&E disciplines. In a later descriptive study, Rapoport (1999) examined the same survey and time period to find that doctoral recipients of underrepresented minority status incurred more graduate debt than their White counterparts—a finding that was subsequently contradicted by Price (2004a), who used data from the *Baccalaureate & Beyond Longitudinal Study: 1993/1997* to analyze whether gender, race, income group, and undergraduate institution influence educational debt. In particular, Price used linear regression to demonstrate that graduate students of Caucasian and high-income backgrounds incurred more debt, on average, than African American and low-income graduate students, respectively. Price attributed lower debt levels among underrepresented and/or disadvantaged students to the fact that they were more likely to graduate from less expensive comprehensive undergraduate institutions; however, Price's parsimonious model fails to control for other factors that are likely to predict total graduate debt, such as degree program, attendance intensity, and an institution's financial characteristics, for example.

In the most recent study on graduate debt levels, Kim and Otts (2010) performed a descriptive analysis of the 2005 Survey of Earned Doctorates and reported that there were substantial differences in borrowing across degree levels and degree types. In contrast to Rapoport (1998), Kim and Otts discovered that doctoral students in engineering, physical science, and biological science were the least likely to rely on loans to finance their graduate education (21%, 28%, and 28%, respectively), while doctoral students in the social sciences and humanities were most likely to do so (52% and 49%, respectively). Additionally, the two researchers also found that debt levels for graduate study were greater than those for undergraduate study, regardless of discipline. However, it is important to reiterate that the findings of Kim and Otts, like the findings of Rapoport (1998, 1999), are descriptive in nature only.

While analyses exploring the predictors of graduate student debt are tenuous at best, research examining the consequences of graduate borrowing is slightly more robust. Numerous studies, for example, have identified financial resources as an important predictor of graduate degree-related outcomes. Bair and Haworth (2004), for instance, reported that graduate students who relied on their own financial resources spent more time in graduate school and were less likely to complete their degree, while several other studies revealed that students without sufficient departmental funds, in the form of fellowships or research assistantships, were less likely to complete doctoral degrees in particular (Abedi & Benkin, 1987; Bowen & Rudenstine, 1992; Dolph, 1983; Ehrenberg & Mavros, 1995; Siegfried & Stock, 2001).

Other research focuses on the influence of student loans specifically. In a regression-based analysis of the factors driving graduate degree progress at a major Midwestern university, Girves and Wemmerus (1988) found that loans had no significant bearing on graduate persistence at the master's or doctoral level. However, in a recent study, Kim and Otts (2010) relied on more comprehensive data sources and more sophisticated analytical techniques to uncover a negative and significant relationship between loans and time to degree. Except for the social sciences, doctoral students who borrowed more in loans for their graduate education completed their degrees in less time than doctoral students who borrowed less or who did not borrow at all. The two authors admit that their finding is "rather surprising, given previous research" but suggest that large loan amounts may motivate students to "complete a degree and enter the workforce as quickly as possible so they do not accumulate additional debt and can begin to reduce the volume of loans by entering repayment earlier" (p. 22).

Finally, a few studies highlight the influence of graduate debt on career outcomes. Rosenblatt and Andrilla (2005), for instance, found that medical graduates with relatively high levels of student debt were less likely to pursue careers in family medicine, while Grayson, Newton, and Thompson (2012)

discovered that high debt levels moved medical graduates away from primary care and toward medical specialties with higher earning potential. In other professions, Field (2009) suggested that loans have a negative influence on the likelihood that law school graduates will embark on a career in public interest law, while Green and Hawley (2009) revealed that large amounts of student debt lead many psychologists to regret their chosen profession.

The aforementioned studies demonstrate the potentially negative impact of graduate student debt and highlight a need for further empirical research examining the drivers of graduate student borrowing. Also evident are the implications that such work will have for students, policymakers, graduate programs and institutions, and other key stakeholders.

THEORETICAL FRAMEWORK

This study is guided by economic theories of human capital and rational choice, as both provide insight into the precursors of graduate school enrollment and borrowing. Generally, the human capital model posits that students invest in education to maximize their utility and that decisions to pursue further schooling are based on expected costs and benefits (Elwood & Kane, 2000). Becker (1993) and others argue that cost-benefit analyses related to educational pursuits are influenced by both monetary and non-monetary elements. For example, prospective lawyers or consultants are likely to count greater earnings as one reason to attend business or law school, but they are also likely to consider the host of non-pecuniary benefits that a professional degree, in particular, may bring—such as better working conditions, greater prestige, and higher class status (Schleef, 2000). Consequently, human capital models also suggest that borrowing will vary across disciplines and is likely to be greater among students enrolling in degree programs that, on average, yield relatively greater returns (Thomas, 2000).

Like benefits, costs assume a financial and non-financial form. In addition to direct monetary costs and foregone earnings, prospective graduate students must also account for the potential psychic costs associated with their enrollment (Cunha, Heckman, & Navarro, 2005), which may include stress associated with “juggling” family and graduate school (Rice, Sorcinelli, & Austin, 2000) or anxiety generated by the prospect of an onerous or insurmountable loan burden (Field, 2009). For example, students with significant undergraduate debt may be dissuaded from taking on additional debt needed to attend graduate school (Millett, 2003). Alternatively, individuals with a spouse and/or children may decide against graduate education and the family-related sacrifices their attendance would likely entail, regardless of academic ability or wealth (Brus, 2006). These perspectives warrant empirical attention to the influence that financial obligations and family circumstances may have on graduate school borrowing. More broadly, they

suggest that decisions regarding education-related investments are rational yet varied (Manski, 1993), and depend considerably on predilections and circumstance (Perna, 2004).

DesJardins and Toutkoushian (2005), for example, argue that rationality is not exclusive to those who make investments in schooling that the majority of observers would deem appropriate or as yielding the most benefit. Individuals can still act rationally and make choices that ultimately, and foreseeably (at least to others), produce undesirable outcomes. DesJardins and Toutkoushian (2005), as well as other economic theorists (e.g., Becker, 1993; Elwood & Kane, 2000; Paulsen, 2001), insist that such behavior is entirely consistent with the human capital model and can be attributed to personal preferences that derive from the attributes and experiences which shape how individuals perceive the utility of postsecondary education—such as tolerance for risk or the amount and quality of education-related information to which a prospective student has access—and which can vary considerably across both race (De La Rosa & Hernandez-Gravelle, 2007; Rabin & Thaler, 2001) and gender (Alexitch, 2006; Roszkowski & Grable, 2010). Previous literature suggests, for instance, that African Americans and Latinos are less likely to have reliable information about college costs and financial aid (Freeman, 1997; González, Stoner, & Jovel, 2003; Perna, 2000), and as a consequence, may incur more educational debt than nonminority students (Malcom & Dowd, 2012; Price, 2004b).

In addition to personal preferences and experiences, other contextual forces are also likely to mediate graduate borrowing. Expectedly, the financial condition of graduate schools and programs will have a substantial impact on enrollees' borrowing levels. Institutions that are better endowed and that can draw on a variety of revenue sources other than tuition are more likely and more able to provide graduate scholarships and grants (Slaughter & Rhoades, 2004), while students pursuing graduate degrees at less profitable institutions and/or in more professionalized fields are more likely to finance their graduate education via loans (Hoffer et al., 2006). The extent to which institutions are able to subsidize graduate education may also be influenced, in part, by broader economic trends and cycles. Such subsidies are likely to wane during periods of economic downturn (Hodel, Laffey, & Lingenfelter, 2006).

RESEARCH QUESTIONS

In sum, the above theoretical perspectives suggest that amounts borrowed at the graduate level will vary according to an individual's background, circumstances, and context; however, no study has empirically confirmed whether this is indeed the case. To address this gap in research, we relied on statistical modeling to examine individual- and institution-level factors

associated with graduate student borrowing, specifically addressing the following research questions:

1. To what extent have graduate borrowing levels changed in the past decade overall, at different degree levels, and within different graduate programs?

2. To what extent does graduate borrowing vary across race and gender?

3. To what extent do family-related circumstances influence graduate borrowing?

4. To what extent does past educational debt predict graduate borrowing?

5. Are there differences in graduate borrowing by degree level and academic discipline?

6. Do financial characteristics at the institution level, such as tuition and fees charged, reliance on tuition, and education expenditures, influence graduate borrowing?

METHOD

Data and Variables

To address the above research questions, we analyzed student-level data from the 2000 and 2008 National Postsecondary Student Aid Studies (NPSAS), as well as institution-level data provided by IPEDS via the Delta Cost Project. Since 1987, the National Center of Education Statistics (NCES) has relied on NPSAS to gather comprehensive data on how students finance their postsecondary education. The NPSAS surveys contain nationally representative samples of undergraduate *and* graduate students, and as such, provided data suitable to a national analysis.

In addition to including information on the demographic characteristics and achievement of respondents, NPSAS also includes data on the type and amount of debt students incurred during the course of their graduate education. Independent variables drawn from NPSAS and included at the student level are those which previous research and theory have associated with student debt, namely gender, race, marital status, age, number of dependents, enrollment intensity (full-time, part-time, or mixed), the total amount of grant, fellowship, and assistantship dollars received during the 2007–2008 academic year, and graduate degree program (Dowd, 2008; Harrast, 2004; Price, 2004b). Data provided by the Delta Cost Project encompasses several independent, institution-level variables that reveal how colleges generate revenue or that influence the costs and/or debt their students incur—specifically graduate tuition, graduate fees, and institutional expenditures per student¹

¹This variable includes expenditures on instruction, research, public service, academic support, student services, operations, and scholarships/fellowships.

and tuition reliance (Gladieux & Perna, 2005; Gross, Osman, Hossler, & Hillman, 2009; Volkwein & Szelest, 1995); the last variable indicates the net tuition share of an institution's operating revenues (i.e., tuition "divided by" federal, state, and local appropriations, grants, and contracts; private gifts, grants, and contracts; and investment returns). Finally, the dependent variable used in our analyses indicates the cumulative amount borrowed for graduate school only, specifically among students who completed graduate degrees in 2000 or 2008, and includes all federal and private institutional loans that graduate-degree completers ever borrowed for their graduate education. Our dependent variable and independent variables for grant/money received, graduate tuition, and graduate fees are logged to ease inference and to provide a more normal distribution to the data.

Analytic Techniques

For the purpose of this analysis and in order to detect significant differences, if any, in graduate student borrowing over the past decade, we selected for our analytic sample respondents earning a graduate degree in 2000 or 2008. Limiting our analysis to degree completers only—as opposed to NPSAS respondents at different stages of their graduate degree program—was necessary, because it provided a standardized measure of loan burden against which to compare students of various backgrounds, circumstances, and institutions. The analytic samples for the 2000 and 2008 NPSAS cohorts included 2,520 and 4,520 respondents, respectively and, after weighting, represented approximately 550,000 and 1.05 million students attending nearly 2,000 postsecondary institutions across the United States.

To determine whether there are significant differences in graduate borrowing over the time period under study, we performed survey-weighted, adjusted Wald tests analyzing differences in mean cumulative borrowing between 2000 and 2008, after accounting for inflation. We applied survey weights to the NPSAS 2000 and NPSAS 2008 datasets to compensate for differences in the selection probabilities and response rates of NPSAS participants, and also to facilitate comparisons between the two nationally representative samples of graduate students. In addition to analyzing differences in borrowing between the total cohorts, we also examined differences between subpopulations of the 2000 and 2008 samples, by degree level and field of study specifically. These analyses allowed us to uncover variations in borrowing by discipline and to determine which areas and/or types of graduate education experienced the greatest changes in student borrowing.

After assessing differences in borrowing between the two cohorts, we examined factors associated with graduate student borrowing, in particular, by estimating a two-level tobit model for the most recent NPSAS cohort (2008). The tobit model incorporated into this study used a random intercept, allowing us to determine whether, in addition to individual characteristics,

programmatic and/or institutional characteristics influenced borrowing levels. Employing a random intercept also corrected for the bias and inefficiency (in estimates) that may have resulted from failing to account for the nestedness and intra-cluster correlation associated with the NPSAS data (Luke, 2004; Raudenbush & Bryk, 2002).

We relied on a tobit specification, instead of using ordinary least squares, to correct for the large proportion of students who did not borrow money to fund their graduate education. In cases where a dependent variable has a disproportionately high count of zeros (i.e., many students with zero debt), OLS yields parameter estimates that are inconsistent and downward biased (Maddala & Lahiri, 2009). In contrast, the tobit estimator, a type of censored regression estimator, is designed to account for the non-negative nature of a dependent variable and, in this case, allowed for censoring at zero when students held no graduate student debt. The two-level tobit model is formally expressed in the following system of equations, where the observable variable, Y_{ij} , is equal to the latent variable whenever positive, and is zero otherwise:

$$Y_{ij} = \begin{cases} Y_{ij}^* & \text{if } Y_{ij} > 0 \\ 0 & \text{if } Y_{ij} \leq 0 \end{cases}$$

where Y_{ij}^* is a latent variable:

$$Y_{ij} = \mu_j + \beta X_{ij}$$

$$\mu_j = \mu + \Gamma X_j + \varepsilon_j$$

and where Y_{ij} indicates the cumulative graduate debt of students who earned their graduate degree in the 2008 calendar year; μ_j indicates the random intercepts that vary over cluster (i.e., institution); and \mathbf{X}_{ij} and \mathbf{X}_j represent vectors of individual- and institution-level variables, respectively.

Yielding reliable estimates from our tobit model required the implementation of three additional techniques. First, several of the variables included in our study contained missing data, namely those for institutional fees (8%), tuition (8%), expenditures (7%), and tuition reliance (7%). Therefore, we employed full-information maximum likelihood (FIML),² an increasingly preferred missing data technique (Allison, 2012; Baraldi & Enders, 2010;

²In FIML, estimation is based on all observed data. More specifically, it relies on a reduced form of the multivariate distribution for cases with missing data, thereby allowing all cases with at least one data point to contribute to the maximum likelihood function. We use MPlus statistical software to estimate our model via FIML.

Raykov & Marcoulides, 2010), to estimate our model and reduce the potential bias that may have been generated by missingness in the NPSAS 2008 dataset (Allison, 2002).

In addition, to account for the multilevel and complex sampling design of the NPSAS sample, we relied on stratification and clustering variables, as well as (scaled) student-level and school-level sampling weights, which were incorporated into our model to improve the precision and efficiency of our estimates (Rabe-Hesketh & Skrondal, 2006; Thomas & Heck, 2001).

Finally, coefficients generated by tobit models indicate a linear effect on the latent variable, rather than on the actual outcome, and, in their aggregate, cannot be relied upon to assess the magnitude or source of a particular change in Y_{ij} . Therefore, to more accurately gauge the relationship between our independent variables and *observed* graduate borrowing, we employed a technique developed by McDonald and Moffit (1980) that decomposes marginal effects into two parts: (a) the effect of an independent variable on graduate debt for borrowers only (i.e., conditional on our dependent variable, cumulative graduate debt, being uncensored); and (b) the effect of an independent variable on the probability of borrowing for non-borrowers in particular. Overall, tobit decomposition guards against overestimation and improves our ability to make inferences, specifically by distinguishing changes in Y_{ij} that are related to marginal changes in (positive) borrowing from changes in Y_{ij} that are related to increases (or decreases) in the probability of borrowing any money at all (Maddala, 1983).

LIMITATIONS

This study has several limitations worth noting. First, since we were analyzing secondary data, our analysis was limited only to those variables incorporated into the NPSAS and IPEDS datasets. It is likely that there were other important predictors of graduate borrowing and graduate study that NPSAS or IPEDS did not measure and for which we were unable to control. For example, indicators of family and socioeconomic background, undergraduate performance, and attitudes toward debt have been shown to influence graduate school enrollment and education-related debt (Heller, 2001; McDonough & Calderone, 2006; Monks, 2001) but are unobserved or unobservable and, hence, are not included in either NPSAS study. Their omission prevents us from asserting definitive causal connections between our independent variables and outcome.

Second, there is a possibility that, in some instances, our dependent variable did not encompass all loans that students secured for their graduate education. For example, NPSAS did not include data indicating whether students borrowed money from family or friends; it occasionally relied on self-reported data for information about private loans.

Finally, although our study spans eight years, it cannot be considered longitudinal. It is important to point out that debt levels are observed only once for each NPSAS respondent, either in 2000 or 2008; and although we had originally planned to model and subsequently compare parameter estimates between the 2000 and 2008 samples, missing data at the institution level (during 2000) and inconsistencies between the 2000 and 2008 NPSAS variables prevented us from doing so. Our study may also fail to account for significant fluctuations in cumulative graduate debt which may have been attributed to changing economic conditions within the time period under study, but which occurred during years for which we did not have any data (e.g., the 2001–2003 economic recession).

RESULTS

Table 1 details the mean proportion of graduate-degree completers borrowing for their graduate education in 2000 and 2008, as well as their mean borrowing amounts. Strikingly, among all students who relied on loans to finance their graduate education, the average student borrowed more than \$40,000, on average, during his or her graduate tenure, which is nearly double the amount that the average student borrows during his/her undergraduate career (Whitsett, 2012). Students earning professional degrees, in particular, borrowed close to \$90,000.

Our descriptive analysis also uncovered some interesting trends. Most notably, between 2000 and 2008, there was an increase in the proportion of master's students who borrowed money to fund their graduate education, which led to an increase in average loan levels among all students. Further, while the proportion of professional and doctoral students borrowing for their graduate education remained consistent during the time period studied, doctoral students experienced a substantial increase in their average debt level at the point of graduation. This difference is mostly attributed to students who completed professional doctorates outside of medicine, in fields such as education (EdD), psychology (PsyD), science or engineering (DSC or D Eng), and ministry (D Min).

Table 2 presents the results of our tobit model, along with marginal effects on borrowing for borrowers and marginal changes in the probability of borrowing for non-borrowers. Since the dependent variable indicating graduate debt is in logarithmic form, estimates are presented as elasticities or semi-elasticities.

After accounting for other factors associated with graduate borrowing, African-American and Latino students appear to incur more graduate debt than their white counterparts, on average, borrowing ($e^{.778} - 1 =$) 118% and ($e^{.398} - 1 =$) 49 percent more for graduate school, respectively. In contrast,

TABLE 1
CUMULATIVE AMOUNT BORROWED FOR GRADUATE EDUCATION (AT TIME OF GRADUATION)
IN 2008 DOLLARS

<i>Graduate Degree Recipients</i>	<i>1999–2000</i>		<i>2007–2008</i>		<i>Difference</i>	
	<i>%Borrowing</i>	<i>Mean Debt^t</i>	<i>%Borrowing</i>	<i>Mean Debt^t</i>	<i>%Borrowing</i>	<i>Mean Debt^t</i>
Total	48.66%	\$47,270	56.62%	\$41,002	7.96%***	-\$6,268**
Degree Type						
Master's degree (all)	42.02%	\$31,372	55.19%	\$31,031	13.17%***	-\$341
Professional degree (all)	86.67%	\$88,991	86.83%	\$89,680	0.16%	\$689
Doctoral degree (all)	43.49%	\$42,242	46.57%	\$56,480	3.08%	\$14,238*
Degree Program						
Master of Science (MS)	37.49%	\$31,576	49.85%	\$30,684	12.36%**	-\$892
Master of Arts (MA)	43.54%	\$29,650	60.78%	\$29,975	17.24%***	\$325
Master of Education (MEd)	33.54%	\$21,957	55.92%	\$26,487	22.38%***	\$4,530*
Master of Business Administration (MBA)	39.94%	\$39,568	55.47%	\$31,927	15.53%**	-\$7,641
						\$241
						\$3,946***
						\$736
						\$7,933*
						\$3,457
						\$5,309*
						\$7,450***
						\$1,905

Table 1, cont.

Graduate Degree Recipients	1999–2000			2007–2008			Difference		
	%Borrowing	Mean Debt ¹	Mean Debt ²	%Borrowing	Mean Debt ¹	Mean Debt ²	%Borrowing	Mean Debt ¹	Mean Debt ²
Other master's degree (e.g., MPA, MSW, MPH)	56.92%	\$32,085	\$18,262	57.65%	\$35,946	\$20,724	0.73%	\$3,861	\$2,462
Law (JD or LLB)	86.82%	\$75,195	\$65,283	88.62%	\$80,081	\$70,971	1.80%	\$4,886	\$5,688
Doctor of Philosophy (PhD)	41.88%	\$42,573	\$17,830	35.43%	\$44,995	\$15,940	-6.45%	\$2,422	-\$1,890
Doctor of Medicine (MD, DMD, PharmD, DVM)	86.52%	\$103,368	\$89,436	84.03%	\$105,423	\$88,589	-2.49%	\$2,055	-\$847
Other Doctorate (e.g., EdD, PsyD, D.Min.)	45.89%	\$41,789	\$19,178	64.34%	\$66,565	\$42,828	18.45%**	\$24,776**	\$23,650***
N		2,610				4,520			
Weighted Sample		567,874				1,043,928			

Significance levels : * : .05 ** : .01 *** : .001

¹Borrowers only

²All graduate students

³Source: NPSAS:2000 & NPSAS:2008 Restricted Data

⁴Notes: Weighting Variables: STUDYWWT2(2000) WTA000(2008)

TABLE 2
EXPLAINING GRADUATE DEBT (2008)

<i>Variable</i>	<i>Tobit Results</i>	<i>Marginal Effects Conditional on Being Uncensored</i>	<i>Marginal Effects Probability Uncensored</i>
Student-Level Variables			
Gender (reference category: male)			
Female	0.537*	0.223*	0.031*
Race (reference category: White)			
Black	1.873***	0.778***	0.106***
Hispanic	0.957*	0.398*	0.54*
Asian	-2.103***	-0.874***	-0.119***
Other	-0.260	-0.108	-0.015
Age	-0.038*	-0.016*	-0.002*
Marital status (reference category: not married)			
Married	-1.592***	-0.661***	-0.090***
Attendance intensity (reference category: full-time)			
Part-time	-1.741***	-0.723***	-0.099***
Mixed full-time/part-time	-0.280	-0.116	-0.016
No. of dependents	0.284*	0.118*	0.016*
Ln (cumulative undergraduate debt)	0.618***	0.257***	0.035***
Degree (reference category: master of science [MS])			

Table 2, cont.

<i>Variable</i>	<i>Tobit Results</i>	<i>Marginal Effects Conditional on Being Uncensored</i>	<i>Marginal Effects Probability Uncensored</i>
Master of arts (MA)	0.388	0.161	0.022
Master of education (MEd)	0.145	0.060	0.008
Master of business admin. (MBA)	0.035	0.015	0.002
Other master's degree	0.819	0.340	0.047
Law (JD or LLB)	5.298***	2.201***	0.301***
PhD in math, science, or engineering	-2.674***	-1.111***	-0.152***
PhD in social science	1.811	0.752	0.103
PhD in humanities	1.442	0.599	0.082
PhD in education	2.795*	1.161*	0.159*
PhD in other field	-0.743	-0.309	-0.042
Doctor of medicine (MD, DMD, PharmD, DVM)	5.640***	2.343***	0.320***
Other doctorate degree (EdD, PsyD, D.Min)	2.399***	0.997***	0.136***
Fellowship/assistantship \$ (Ln)	-0.081*	-0.034*	-0.005*
<i>Institution-Level Variables</i>			
Tuition (Ln)	0.050	0.021	0.003
Fees (Ln)	0.478***	0.199***	0.027***
Expenditures per student (Ln)	0.546	0.277	0.031
Tuition reliance	5.586***	2.321***	0.317***

Number of obs. (Unweighted) 4,520
 Student population (Weighted) 1,043,928
 R^2 (within) 0.268
 R^2 (between) 0.247

Significance levels * : .05 ** : .01 *** : .001

¹Source: NPSAS:2008 Restricted Data

²Notes: Weighting variables: WTA000(2008)

Asian students borrowed less, possessing a level of graduate debt that was $(1 - e^{-.874})$ 58% lower, on average. These findings are consistent with recent research at the undergraduate level, which highlight the relatively high debt-loads of African Americans and Latinos in particular (Johnson, Van Ostern, & White, 2012; Price, 2004b).

Age and circumstances, in addition to race, also appeared to influence graduate debt, as older, married, and part-time students borrowed less for their graduate education on average. These findings may be attributable to the fact that students who fall into one or several of these categories are more likely to have an additional source of financial support, such as a job, spouse, or savings. Specifically, a one-year increase in age was associated with a 1.6% decrease in cumulative graduate debt on average and a 0.2% decrease in the probability of borrowing (for non-borrowers). Additionally, married status was associated with a 48% and 9% decrease in debt amount and the probability of borrowing, respectively; while borrowers attending graduate school part-time incurred 51% less debt, on average, and were 9% less likely to borrow if they had not borrowed for graduate school previously.

Other factors, however, may have offset or attenuated the seemingly positive influence that life/professional experience and relationships exerted on graduate debt levels, the most evident of which was having children. For example, this study finds that assuming responsibility for an additional dependent was associated with a 13% increase in graduate debt for borrowers and 1.6% increase in the probability of borrowing for non-borrowers, which, in part, may reflect the well-documented financial hardships that many parents face on the path to a graduate degree and for which financial aid is rarely a sufficient remedy (Kennelly & Spalter-Roth, 2006; Springer, Parker, & Leviten-Reid, 2009). This is especially so in the case of female parents, who, on average, are likely to earn lower salaries and accrue less financial savings (before or during graduate school), which would allow them to cover a substantial portion of their educational expenses (Carnevale, Jayasundera, & Cheah, 2012). These considerations may explain our finding of a positive, yet modest, relationship between female gender and graduate student borrowing. In particular, we found that female students borrowed 25% more for their graduate education, on average and holding other variables in the model constant.

While most results yielded in this study can be interpreted on the basis of past theory and research, other findings are not as easily understood. Most striking is the significant yet positive relationship between undergraduate debt and graduate borrowing—a 1% increase in cumulative undergraduate debt was related to a 0.25% increase in cumulative graduate debt, as well as a 0.04% increase in the probability of borrowing. Indeed, it is plausible that students borrowing for their undergraduate education come from back-

grounds and circumstances that make them more likely to borrow during their graduate years. However, it is also reasonable to conclude that students with relatively high levels of undergraduate debt would be particularly opposed to incurring high levels of debt in graduate school, while students with minimal or no undergraduate debt would be more inclined to fund their graduate expenses via loans, if necessary. Theories of human capital support the latter rationale but do not necessarily account for the context in which decisions about graduate school and graduate borrowing are made.

Given the increasing importance of a graduate degree, many more individuals are likely to view graduate school as a necessity, rather than a choice (Collins, 2002; Wendler et al., 2012), and may decide to pursue a graduate degree, whatever the price. Alternatively, other research suggests that prospective graduate students are, in general, unaware of the financial implications of graduate study and may unknowingly borrow more than they are able to pay back (Golde & Dore, 2001; Whitsett, 2012). Ultimately, regardless of reasons, the positive relationship between undergraduate and graduate loans highlights the ever-increasing levels of educational indebtedness in the United States and suggests a potentially destructive pattern of borrowing among many graduate students.

In addition to individual characteristics, programmatic characteristics also appear to predict graduate borrowing. For example, post-estimation Wald tests show that students pursuing a law degree (JD), medical degree (MD), or professional doctorate (EdD, PsyD, D.Min) incur between approximately 170 and 2650% more graduate debt than students pursuing a master's or PhD degree, and were as much as 60% more likely to borrow if they had not already done so previously. These findings are not entirely surprising, especially since students in professional doctorate programs have a greater number of credit requirements and/or are less likely to receive graduate assistantships, institutional funding, or employer-provided tuition assistance, as many MBA and MEd students do (Austin & Wulff, 2004; Gicheva, 2012b). However, post-estimation analysis also suggests that there are substantial differences in borrowing across PhD programs, indicating that students pursuing their PhD in education, humanities, and social sciences take on more graduate debt than PhD students in STEM fields. Differences in debt were especially pronounced when we compared PhDs in education against PhDs in math, science, or engineering, as the former incurred 870% more debt, and were 31% more likely to borrow, on average and all other factors being equal. These results conform to previous research (Kim & Otts, 2010; National Science Foundation, 2012) and illuminate that gradations in debt exist not only between degrees, but within degrees as well.

Finally, there were two significant factors at the institution level. As shown in Table 2, both fees and tuition reliance appeared to exert a strong and posi-

tive influence on graduate borrowing, above and beyond that determined by other student and programmatic characteristics. In particular, a 1% increase in fees was associated with a 0.2% increase in graduate debt for borrowers and 0.03% increase in the probability of borrowing for non-borrowers, while a .01 unit increase in an institution's tuition reliance ratio was associated with approximately a 2% increase in student graduate debt and a 0.3% increase in the probability of borrowing, on average. These findings, although anticipated, are nevertheless worrisome, especially in light of current trends surrounding graduate education.

DISCUSSION AND FUTURE RESEARCH

For the past several years, institutions of higher education, and graduate schools in particular, have been forced to endure a “perfect storm” of rising costs and reduced public support, and have increasingly relied on tuition to meet expenses. According to the Government Accountability Office (GAO) (2012), from 1999 through 2009, net tuition and fees increased from 16% to 22% at public institutions, and from 29% to 40% at private non-profit institutions—a rise that the GAO attributes to significant decreases in endowment income and a decline in state and local appropriations.

In response to current economic conditions and government divestment in higher education, graduate institutions have been compelled to seek new ways of generating revenue, and many have sought to capitalize on what is commonly perceived as a dynamic of credential inflation in the United States (Collins, 2002; Van de Werfhorst & Andersen, 2005). In an effort to advance their careers and to distinguish themselves from the growing mass of bachelor's degree holders, an increasing number of professionals have chosen to earn graduate degrees—a decision that is welcomed and subsequently rewarded by most employers, who also have a need to differentiate.

Our results appear to empirically validate this rise in demand for graduate schooling, among both students and employers, as evidenced by the increased proportion of students willing to finance their graduate degrees through loans and by the increase in average borrowing levels among students enrolled in rapidly expanding areas of graduate education, most notably master's-level and professional doctoral education. These results are further substantiated by several recent reports showing that a graduate degree is fast becoming a prerequisite to entry or advancement in many increasingly professionalized fields, such as business, education, and healthcare (Aud et al., 2012; Wendler et al., 2012).

As graduate education becomes more normative, and as revenue-seeking institutions increasingly take advantage of graduate demand by offering

more graduate programs (Jacquette, 2011; Slaughter & Rhoades, 2009), and by raising and/or introducing new fees (Flaherty, 2012; Patton, 2012a),³ it becomes necessary that research identify which graduate students are particularly vulnerable to these trends. Our study suggests that students who have been traditionally underserved in higher education—such as women, underrepresented minorities, and the previously indebted—are also likely to borrow the most.

Further, given the direction of higher education finance and our finding of a positive relationship between tuition reliance and graduate borrowing, our study portends even greater levels of indebtedness in the years to come among *all* students. The extent to which debt levels have risen among graduate students, especially since the 2008 economic recession, will remain unclear until the most recent round of NPSAS is released. However, the data used in this study encompass a period of relative prosperity for the U.S. economy and for U.S. higher education especially (State Higher Education Executive Officers 2011). Given our descriptive and analytical findings, we anticipate sharp growth in debt levels among students in many graduate fields, as well as more default.

Individuals experience obvious and inevitable consequences to increased graduate borrowing, but rising debt levels in American graduate education are likely to have important social ramifications as well. As mentioned previously, several studies have revealed that high debt levels reduce the probability that students will pursue public interest jobs (Field, 2009; Rothstein & Rouse, 2011). Other research identifies student debt as a factor in preventing an increasing number of individuals from marrying, starting a family, purchasing a home, and investing in markets and/or new entrepreneurial endeavors (Baum & O'Malley, 2003; Brint & Rotondi, 2008; Gicheva, 2012a; La Mort, 2010). These are the very activities that facilitate the growth of human and social capital and which are essential to the sustained growth and competitiveness of American society.

With debt levels on the rise and a clear trend of privatization in the American higher education system, it seems unlikely that graduate education will become more affordable in the years ahead. We therefore recommend that future policy and research explore interventions that move individuals to make prudent and practical decisions about graduate education and borrowing. In the past decade, several studies have highlighted the lack of knowledge that prospective graduate students exhibit regarding the costs and career outcomes of graduate education (Golde & Dore, 2001; Wendler et al., 2012). Other journalistic reports describe bankrupt dropouts or broke graduates

³ Institutional fees are rarely covered by scholarships, fellowships, or assistantships; consequently, such fees are usually charged to all graduate students, regardless of degree program.

hampered by inutile and/or inappropriate degrees (Androitis, 2012; Patton, 2012b; Simon, 2012), many of whom are unaware of the debt-reducing options available to them. As of 2012, only 700,000 borrowers were enrolled in income-based repayment plans (IBR) provided by the federal government, despite the fact that over 1.6 million borrowers could have used IBR to reduce their monthly payments and overall debt (White House, 2011). Currently, nearly two-thirds of all student borrowers misunderstand aspects of their student loans or the student loan process (Whitsett, 2012).

In response to the lack of knowledge that prospective, current, and former graduate students exhibit with respect to educational borrowing and loan repayment, the Council of Graduate Schools (CGS), along with TIAA-CREF, has recently committed funds to the development of financial literacy programs at 15 graduate schools throughout the United States (Council of Graduate Schools, 2012). CGS's initiative is the first of its kind in the country and constitutes an encouraging first step; but given the statistics above, more needs to be done. Information alone will not solve the graduate debt problem; but improving financial and career-related awareness, as well as knowledge of financial aid, loan forgiveness, and other debt-prevention and debt alleviation programs, may enable more graduate students to successfully navigate an increasingly competitive economy and costly education system, while avoiding the pitfalls that have hampered so many of their predecessors with advanced degrees of debt.

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