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Kim E. Bullington & William L. Nuckols

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THE RELATIONSHIP BETWEEN STATE FUNDED MERIT SCHOLARSHIPS AND STUDENT LOAN DEBT

Mary Borg
University of North Florida

Mary Beal
University of North Florida

Harriet Stranahan
University of North Florida

ABSTRACT

This article uses a sample of 13,643 students attending a 4-year state university in Florida to estimate a selection-bias corrected quantile regression of loan debt at graduation. The study investigates whether the debt levels of students who received the Florida Bright Futures (FBF) scholarship are significantly different from the debt levels of students who did not receive the scholarship. The empirical results show that FBF recipients accumulate higher debt, on average, than similar students who did not receive the award. However, for students from the lowest income households and with the highest levels of debt, the FBF scholarship award does reduce the overall amount of debt they accumulate.

Keywords: student debt; merit-based scholarships; public finance

Over the last few decades there has been a dramatic shift in the way higher education has been financed in the US. Since 2000, most state and local governments have significantly reduced funding for higher education resulting in significant tuition inflation and an explosion of federally subsidized student loan debt that has generated concern across many sectors (Federal Reserve Bank, 2019). Multiple states, including Florida, have further shifted the funding formula for undergraduate student aid toward

merit-based scholarships for high performing graduating seniors (Lederman, 2018). Not surprisingly, research suggests this pronounced shift from need-based to merit-based funding benefits higher socioeconomic families (Heller & Marin, 2004).

The phenomenon of rising student debt has been highly publicized by the media. In 2020, Americans owed over $1.64 trillion in student loan debt, an amount that is approximately $587 billion more than credit card debt (Studentloanhero.com, 2020). The Pew Research Center reported that student loan originations increased by 326% between 1990 and 2014 (Fry, 2014). During roughly the same time, forty-one states and the District of Columbia instituted merit-based scholarships for college undergraduate students beginning with the Georgia Helping Outstanding Pupils Educationally (HOPE) scholarship in 1993. In 2018, 15 states and the District of Columbia awarded a larger amount of money in merit-based scholarships than in need-based scholarships, and Georgia awarded no need-based scholarships at all. It is interesting to note that these states, except Alaska, Utah, and the District of Columbia, rank in the bottom half of the median household income distribution for US states and territories in 2018. They are as follows (with their rank in the income distribution shown in parentheses): Alaska (9), Arkansas (50), Florida (38), Georgia (29), Kentucky (45), Louisiana (48), Mississippi (51), Montana (39), Nevada (30), New Mexico (49), South Carolina (43), South Dakota (33), Tennessee (42), Utah (13), West Virginia (52), and the District of Columbia (1) (Inside HigherEd, 2018). It seems ironic that the states with the greatest financial need are the most likely to award more merit-based aid than need-based aid.

Using a sample from a large public university where 50% of students qualify for Florida Bright Futures (FBF) merit-based scholarships and 50% do not, our study explores whether college graduates who did not qualify for the merit scholarship in high school accrue significantly more debt during college. For students who do qualify for FBF scholarships, we examine which groups of students are more likely to use the scholarship funds to avoid debt.

LITERATURE REVIEW

We could find very little previous research that examined the relationship between student debt burdens and merit-based scholarships, but we did find plenty of research on the two subjects separately. Therefore, we discuss the topics separately and then make some conjectures about how the two might be related.

Several studies examine how student loan debt affects the behavior of students while they are in college. Poplaski et al. (2019) found that students who had student debt were more likely to report being financially stressed during college, and they were also more likely to report that the stress was affecting their overall health. The authors hypothesize that this may be part of the reason that several researchers (Gross et al., 2013; Jackson & Reynolds, 2013, Letkiewicz et al., 2015; Robb et al., 2012, Robb, 2017) have found that students with high debt burdens take longer to finish their degrees and are more likely to drop-out before finishing.

The consequences of student debt for recent college graduates are not any better. Baum and Saunders (1998) found that the students with the highest levels of debt

were less likely to go to graduate or professional school after graduation. Research also shows that highly indebted students were more likely to live with their parents after graduation and were not able to move to other cities to further their education or find better employment (Millet, 2003; Houle & Warner, 2017). Several studies found that graduates who took out more debt were also less likely to be married, less likely to have a child, and were more likely to have a negative net worth (Aldo et al., 2019; Min & Taylor, 2018; Velez et al., 2019). Research has also shown that heavily indebted students were not as likely to buy homes as their less-indebted counterparts (Anderson et al., 2021; Baum & O'Malley, 2002; Mezza et al., 2020). Despard et al. (2016) found that debtors from low- and moderate-income households had a 51% higher probability of experiencing material hardships, a 19% higher probability of experiencing medical hardships and a 27% higher probability of experiencing financial difficulty after graduation than their counterparts without student debt. These studies conclusively show that graduating with a substantial amount of student debt causes financial hardships that affect the most important life decisions of young adults.

There are also several studies that show racial and ethnic differences in the distribution of student debt. Several recent studies show that Black students are more likely to take on debt and take on heavier debt burdens when they do acquire debt than their counterparts from other races (Goldrick-Rab et al., 2014; Grinstein-Weiss et al., 2016; Houle, 2014; Jackson & Reynolds, 2013; Kim et al., 2016; Jimenez & Glater, 2020; Price, 2004;). In fact, Jackson and Reynolds (2013) found that Black students disproportionately have higher student debt loads, are more likely to acquire debt and not finish college and are more likely to default on their loans. Grinstein-Weiss et al. (2016) found that the average amount of debt held by Black students in their sample of low- and moderate-income students was $7721 more than the debt of the non-Black students. A study by Elliot and Lewis (2015) found that 77% of Hispanic college graduates had student debt compared to 64% of White graduates and 59% of Asian graduates. Only Black students surpassed them, with 82% having student debt upon graduation (Elliot & Lewis, 2015). Beal et al. (2019) found racial and ethnic differences in both the decision to borrow and the amount of the student loan when the student did borrow. Asian students were significantly less likely to take out student loans, but if they did take out a loan, there was no difference in the amount of loans they acquired. Hispanic students were as likely to take out a loan as other students, but when they did, the loan was significantly smaller. Blacks were significantly more likely to take out a loan, but when they did, it was also significantly smaller.

The socio-economic status (SES) of the student's household, which includes both income and parents' education, affects a student's probability of attending college and the probability of acquiring student debt during that process. As expected, there is an inverse relationship between parents' income and the amount of student debt that their children acquire (Houle, 2014). This is because higher income households have been shown to provide more money for their children's education, to save more for their children's college education, and to spend more for the room and board and social activities of their college-age children (Choy & Berker, 2003; Flaster, 2018;

Nam, 2021; Quadlin & Conwell, 2020; Schoeni & Ross, 2005; Steelman & Powell, 1991)

Similarly, higher parental education levels are also associated with lower levels of student debt (Flaster, 2018; Houle, 2014). One reason may be because more highly educated parents are better equipped to navigate the labyrinth of financial aid forms and scholarship applications that accompany college attendance (Hossler & Vesper, 1993), and they are also more aware of true college costs and tuition discounting schemes (Grodsky & Jones, 2007). More educated parents are also more likely to financially plan, save, and go into debt for their children's college educations (Cha et al., 2005; Charles et al., 2007; Cataldi et al., 2018; Steelman & Powell, 1991).

From this brief review of the literature related to student loan debt, we conclude that student loan debt has a detrimental effect on the social and economic outcomes of students. Furthermore, the students who are most likely to suffer from these detrimental effects are students of color and students who come from low SES households. The next section of the literature review explores the research on merit-based scholarship aid with attention given to what the research might say about whether the growth in merit-based aid exacerbates or alleviates the negative effects of student loan debt.

The research on merit-based scholarships is diverse. Much of it has examined the enrollment effects that the aid has had for in-state colleges and universities. Programs like Georgia's HOPE scholarship increase the likelihood that young people will attend college and also cause students to switch from two-year colleges to four-year colleges (Dynarski, 2000, 2002). Similar place-based scholarship programs like the Tennessee Promise and the Kalamazoo Promise scholarships had the same effect on enrollment and four-year college preference (Bartik et al., 2021; Nguyen, 2020; Page et al., 2019;). Many of the Promise scholarships also increased the likelihood that minority and disadvantaged students will complete college (Bartik et al., 2021; Bell & Gándara, 2021). There is also evidence that students who receive state merit-based scholarships are more likely to attend an in-state university (Cornwell et al., 2006; Nguyen, 2020) Cornwell et al. (2006). found that two-thirds of the increase in the first-year classes in Georgia's universities over the period from the beginning of the HOPE Scholarship (1993 to 1997) was due to students remaining in-state for college. There is also evidence that students who receive state merit-based scholarships to attend in-state schools are more likely to remain in the state after graduating (Harrington et al., 2016; Hickman, 2009).

The research on the distributional effects of state merit-based aid finds that much of the benefit goes to students who could already afford to attend college (Cornwell & Mustard, 2007; Heller, 2006, Pulcini, 2018; Gándara & Li, 2020). For example, Binder et al. (2002) found that White students received disproportionately more New Mexico Lottery Success Scholarships than students of other races and ethnicities. In addition, Binder and Ganderton (2004) found that for every low-income student awarded a New Mexico Lottery Success Scholarship almost three more went to students with higher family incomes. Florida's Bright Futures Scholarships and Michigan's Merit Award Scholarships go primarily to the students who attend the high schools in the state who had the highest college-participation rates before the

implementation of the merit-based scholarship programs (Heller & Rasmussen, 2002). These distributional effects are made even worse by the fact that many of these state merit scholarships are funded with regressive lottery taxes, leading some to call them *Reverse Robinhood* mechanisms (Borg & Borg, 2007). Stranahan and Borg (2004) analyzed the net distributional effect of the Florida Bright Futures Scholarship by estimating separate equations for household lottery expenditures and FBF scholarship benefits. They found that high socioeconomic households received a net program benefit of almost $2,200; whereas low SES households incurred a net program loss of almost $700.

A recent study from New Mexico found that in addition to detrimental monetary effects, lottery-funded scholarships may also cause academically challenged students to drop-out of college. Erwin and Binder (2020) found that academically well-prepared students increased their likelihood of graduating from the flagship University of New Mexico by 10 percentage points since the institution of the New Mexico Legislative Lottery Scholarship (NMLLS) in 1997, but academically less-prepared students decreased their likelihood of graduating by 11.6 percentage points (a 38.8 percent decrease) over the same period. The authors speculate that the scholarship program, which effectively erased the difference in tuition at two- and four-year colleges, may have caused weaker students to enroll in the more prestigious four-year institution, for which they were not prepared. On a somewhat brighter note, Klein and Perry-Sizemore (2017) found that high school graduation rates improved significantly more over the period from 1990 to 2000 in the states that instituted merit-based scholarships versus the states that did not. They hypothesize that possibility of receiving a merit-based college scholarship caused students to work harder in high school.

The literature on the distributional effects of merit-based aid does not offer much hope that the increasing trend in merit-based aid may somehow offset the increasing burden of student debt. However, the two studies that we found that looked specifically at the effect of merit-based scholarships on student debt burdens cause us to be somewhat optimistic. Chen and Weiderspan (2014) found that Georgia's state funding of merit-based aid programs reduced the debt burdens of Georgia HOPE Scholarship recipients. Beal et al. (2019) found similar results when they examined the debt burdens of Florida Bright Futures scholarship recipients. Their study found that students who received FBF scholarships had a significantly lower probability of having to take out a loan, and if they did take out a loan, the amount of the loan was significantly lower than those of students who had not received a FBF scholarship. What neither of these studies address, however, is whether the merit scholarships reduce the debt burden for all students uniformly or whether the greatest debt relief is received disproportionately by students with different household income and debt levels. Our research adds to the extant literature by estimating a quantile regression that sheds light on the relationship between merit-based scholarship funding and student loan debt for students with different levels of household income and total debt.

METHOD

Our study estimates student loan debt using a selection bias corrected quantile regression for a sample of 13,643 students attending the University of North Florida, one of the twelve universities in the Florida State University System. We were able to create the dataset because we were granted access to student data that included demographic and income information obtained from the students' Free Application for Federal Student Aid (FAFSA) records. The dependent variable is the amount of loan debt accrued at the time of graduation (year 2014). Whereas other studies analyzing student loan debt use OLS regression methods, quantile regression analysis allows a multidimensional view of whether the impact of a variable, its β value, differs across quantile levels of debt. We assess whether student socioeconomic and financial characteristics impact student borrowing behavior and if this effect differs for students facing different levels of debt at graduation. The model results in a consistent set of coefficients which may differ for each quantile. Cobas-Valdés et al. (2017) point out that quantile regression allows researchers to focus on the data at the tails of the distribution, which is often the most important target of policy. For example, we may be more concerned about the factors adversely impacting the most indebted students, rather than the average student.

We estimate a linear quantile regression of loan debt at the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} quantiles with sample selection bias following Buchinsky (2001). Because we observe debt only for students whose benefits of borrowing outweigh the costs, we include a selection bias correction in the estimation. The conditional observed loan debt (y) for each quantile Θ is given by Equation 1 where x is the vector of explanatory variables and hΘ (x1, γ0) is the selection bias correction. Quantile regression analysis allows us to test whether the impact of a variable, β_Θ, differs depending upon the total amount of debt accrued.

$$\text{Quant}\Theta\ (y \mid x2) = x'\beta_\Theta + h\Theta\ (x1, \gamma 0) \qquad (1)$$

Our dataset contains student financial and demographic information obtained from the Free Application for Federal Student Aid (FAFSA) as well as information on students' Florida Bright Futures Scholarship awards and Pre-Paid College funding. We investigate the impact of academic and socioeconomic characteristics on a student's willingness to accrue more debt. We examine whether the impact of these predictors differs across debt quantiles. Finally, we analyze whether Florida's merit-based scholarships have any effect on student debt burdens and, if so, whether the impacts differ for students facing different amounts of debt. We further examine how Florida's merit-based scholarship awards interact with household income to impact student debt.

RESULTS

Table 1 contains the descriptive statistics for all variables in the sample and for the subset of students who have loan debt. The results show that about 62% of the sample are female and 72% are White with an average age of 23. Almost 60% of the students are classified as dependents for federal tax purposes suggesting these students have stronger family financial support than students classified as independent. A small proportion of students are married or have children. The university is located close to a relatively low-cost community college system and more than 60% of students transferred from another community college or institution. About 50% of the sample received FBF scholarships and about 12% had some type of Florida Pre-Paid credits. The Florida Pre-paid College fund is a program designed to help parents of young children save for college and residence hall expenses at an in-state institution by providing a subsidized long-term payment plan years in advance of attending.

The descriptive statistics suggest that 66% of students have loan debt, but they are not very different from the entire sample in terms of average age, choice of major, ethnicity or gender. Students with loan debt are slightly more likely to be married, have children and to be transfer students. Also, those who take out loan debt have lower average family incomes, are less likely to be classified as dependents, less likely to have Florida Prepaid College funds or have been awarded Florida Bright Futures Scholarships. The descriptive statistics suggest that in contrast to the full sample, students who take out loans have more responsibilities but fewer resources to draw on while completing their degrees.

Our analysis required two stages. In the first stage, we estimated a probit model to determine which students were likely to have debt at the time of graduation. The first stage model allowed us to calculate the selection bias correction term, hΘ (x1, γ0). We do not show the results of this analysis, but the selection bias correction term, hΘ (x1, γ0), is included in the second stage regression equations as the variable INVMILL, the inverse Mills ratio. It is significant in all the second stage regression results, which indicates that the bias correction was needed to accurately estimate the loan debt at graduation for our sample of students.

Table 1: Variable Explanations and Descriptive Statistics

	All Student Graduates		Student Graduates with Loan Debt		
All Students	N Obs	Mean	Students with Loans	N Obs	Mean
Loan Debt at graduation	13643	12018	Loan Debt	9070	18078
LOAN_YES=1 if student has loans	13643	0.66	LOAN_YES	9070	1
INC1000 is household income in 1000's	13643	68.09	INC1000	9070	58.30
AGE is student age at graduation	13643	23.76	AGE	9070	24.25
FEMALE= 1 if student is female, = 0 otherwise	13643	0.62	FEMALE	9070	0.63
ASIAN = 1 if student is Asian, = 0 otherwise	13643	0.05	ASIAN	9070	0.04
BLK =1 if student is Black, = 0 otherwise	13643	0.12	BLK	9070	0.15
HISP=1 if student is Hispanic, = 0 otherwise	13643	0.08	HISP	9070	0.08
OTHER = if student is any other Ethnicity, = 0 otherwise	13643	0.03	OTHER	9070	0.03
WHITE =1 if student is Caucasian, = 0 otherwise	13643	0.72	WHITE	9070	0.70
DEPENDENT =1 if student is dependent of family, = 0 otherwise	13643	0.58	DEPENDENT	9070	0.50
MARRIED=1 if student is married, = 0 otherwise	13643	0.13	MARRIED	9070	0.15
CHILDREN=1 if student has children at home, = 0 otherwise	13643	0.12	CHILDREN	9070	0.15
TRANSFER = 1 if student did not start as a first-time freshman but transferred in from another institution, = 0 otherwise	13643	0.61	TRANSFER	9070	0.68
HEALTH =1 if student graduated in College of Health, = 0 otherwise	13643	0.15	HEALTH	9070	0.15
BUSINESS = 1 if student graduated in College of Business, = 0 otherwise	13643	0.17	BUSINESS	9070	0.16
ENGINEER =1 if student graduated from College of Engineering, = 0 otherwise	13643	0.07	ENGINEER	9070	0.07
ARTSCI = 1 if student graduated from Arts and Sciences, = 0 otherwise	13643	0.48	ARTSCI	9070	0.48
EDUC = 1 if student graduated from College of Education, = 0 otherwise	13643	0.12	EDUC	9070	0.13
FBF = amount of award for Florida Bright Futures scholarships (there are different levels of awards)	13643	2956	FBF	9070	2477
FBFyes = 1 if student had any level of Florida Bright Futures Scholarship, = 0 otherwise	13643	0.50	FBFyes	9070	0.39
FLPREPAY = amount of Florida prepaid credit	13643	795	FLPREPAY	9070	556
FLPREPAYyes = 1 if student has any level of Florida prepaid credits, = 0 otherwise	13643	0.12	FLPREPAYyes	9070	0.09

Regression Results

The regression results from this second stage are shown in Tables 2 and 3. Two sets of regression results are shown because we used two different formulations of the Florida Bright Futures (FBF) variable—the first is the dollar value of the award and the second variable (FBFyes) is a dichotomous (dummy) variable coded 1, if the student received the scholarship, and 0, if the student did not receive the scholarship. Table 2 shows the regression results that include the FBF variable measured as the award amount, and Table 3 shows the regression results that include the dichotomous FBFyes variable. In both models, we also included interaction terms, between the FBF variable and the student's household income (INC1000). In the first model, the interaction term is labeled INC*FBF and in the second model it is labeled INC*FBFyes. Both interaction terms are calculated by simply multiplying the value of the two variables together. The interaction terms allow us to determine if the effect of the FBF scholarship on a student's debt at graduation varies for students with different income levels.

The regression results in Tables 2 and 3 predict the amount of debt a student has at graduation for the sample as a whole and for five different quantiles of student debt (10%, 25%, 50%, 75%, and 90th). The results suggest that there are several important predictors of student debt, and many of these factors impact student debt accumulation differently across the various debt quantiles.

We begin by discussing the demographic and socioeconomic variables that have a significant impact on loan debt. The variables representing age, gender, marital status, race, ethnicity, and having children while in college do not significantly affect the amount of student debt at graduation, except in two of the debt quantiles. Previous research found that Black students borrowed significantly more than other races (Goldrick-Rab et al., 2014; Grinstein-Weiss et al., 2016; Houle, 2014; Jackson & Reynolds, 2013; Kim et al., 2016; Price, 2004). In contrast, our results suggest that Blacks' borrowing does not differ significantly from Caucasian students except in the highest (90th) debt quantile, and Black students borrow *less* in that highest quantile than Caucasian students. This means that when we single out the part of the sample that has the highest 10% of debt at graduation, Caucasian students have higher debt levels on average than Black students. Similarly, the debt level of Hispanic students does not differ significantly from Caucasian students except in the middle debt level (50th quantile), and as was the case with Black students, Hispanic students tend to accumulate less debt overall than Caucasian students in this middle range of debt. Finally, the loan debt of Asian students does not vary significantly from Caucasian students in any of the quantiles. Therefore, our results suggest that at most debt levels there are no significant differences in debt at graduation for any racial or ethnic groups. In the two quantile levels that do show differences (the 50th for Hispanic students and the 90th for Black students), Black and Hispanic students have less debt than Caucasian students.

The results in Table 2 also suggest that family support impacts student debt burdens in an unexpected way. Household income has a positive and significant effect

Table 2: Quantile Regression of Loan Debt with Selection Bias Correction and Variable FBF

DEPENDENT VARIABLE: LOAN DEBT	Heckman 2nd Stage Total Sample	Heckman 2nd Stage Quantile10	Heckman 2nd Stage Quantile25	Heckman 2nd Stage Quantile50	Heckman 2nd Stage Quantile75	Heckman 2nd Stage Quantile90
INC1000	18.41***	6.589**	9.807**	7.406	14.61**	59.02***
	(4.202)	(3.163)	(4.434)	(5.264)	(5.992)	(9.016)
INC*FBF	0.00541***	0.00186***	0.00432***	0.00687***	0.00653***	0.00379**
	(0.000704)	(0.000530)	(0.000743)	(0.000882)	(0.00100)	(0.00151)
AGE	20.81	-26.67	59.56	118.7**	56.62	-44.73
	(46.97)	(35.36)	(49.57)	(58.85)	(66.99)	(100.8)
MALE	118.3	300.7	-201.9	517.0	665.6*	296.1
	(267.9)	(201.7)	(282.7)	(335.6)	(382.0)	(574.8)
ASIAN	54.30	243.8	197.4	-26.73	603.3	476.1
	(745.1)	(560.9)	(786.3)	(933.5)	(1,063)	(1,599)
BLK	-1,035**	-278.5	332.4	-300.4	-974.3	-2,398**
	(505.7)	(380.7)	(533.7)	(633.6)	(721.3)	(1,085)
HISP	-835.0*	-447.2	-752.1	-1,223**	164.3	-523.4
	(434.0)	(326.7)	(458.0)	(543.7)	(618.9)	(931.2)
OTHER	408.4	87.22	618.1	590.4	1,403	601.7
	(671.0)	(505.1)	(708.2)	(840.7)	(957.0)	(1,440)

DEPENDENT VARIABLE: LOAN DEBT	Heckman 2nd Stage Total Sample	Heckman 2nd Stage Quantile10	Heckman 2nd Stage Quantile25	Heckman 2nd Stage Quantile50	Heckman 2nd Stage Quantile75	Heckman 2nd Stage Quantile90
DEPENDENT	-3,447***	-637.6*	-2,328***	-3,376***	-5,736***	-7,639***
	(434.7)	(327.2)	(458.7)	(544.6)	(619.9)	(932.7)
MARRIED	-579.1	-218.5	-389.7	-510.3	-136.3	-1,050
	(396.2)	(298.2)	(418.1)	(496.3)	(565.0)	(850.1)
CHILDREN	17.29	108.7	-148.3	463.6	-286.9	-705.4
	(393.9)	(296.5)	(415.8)	(493.5)	(561.8)	(845.3)
TRANSFER	-6,037***	-354.9	-1,593***	-4,805***	-9,200***	-10,798***
	(379.4)	(285.6)	(400.4)	(475.4)	(541.1)	(814.2)
HEALTH	-858.0**	261.9	13.53	-8.461	-1,092*	-2,808***
	(436.3)	(328.4)	(460.5)	(546.6)	(622.3)	(936.3)
ENGINEER	1,197**	705.6*	1,274**	1,484**	1,280*	911.4
	(544.6)	(410.0)	(574.8)	(682.3)	(776.7)	(1,169)
ARTSCI	-292.6	39.33	354.3	479.1	-835.0	-1,175
	(359.9)	(270.9)	(379.8)	(450.8)	(513.2)	(772.2)
EDUC	-1,029**	65.55	287.0	463.7	-1,513**	-4,159***
	(500.0)	(376.3)	(527.6)	(626.4)	(713.0)	(1,073)
FBF	-0.453***	-0.105**	-0.257***	-0.394***	-0.486***	-0.453***
	(0.0665)	(0.0500)	(0.0701)	(0.0833)	(0.0948)	(0.143)

DEPENDENT VARIABLE: LOAN DEBT	Heckman 2nd Stage Total Sample	Heckman 2nd Stage Quantile10	Heckman 2nd Stage Quantile25	Heckman 2nd Stage Quantile50	Heckman 2nd Stage Quantile75	Heckman 2nd Stage Quantile90
FLPREPAY	0.133**	0.0869*	0.155**	0.165**	0.229**	0.262*
	(0.0667)	(0.0502)	(0.0704)	(0.0836)	(0.0952)	(0.143)
INVMILL	-16,139***	-6,240***	-10,020***	-15,243***	-17,979***	-26,589***
	(2,061)	(1,551)	(2,175)	(2,582)	(2,939)	(4,422)
Constant	30,945***	8,688***	14,403***	25,365***	40,529***	56,059***
R^2	0.080					
Observations	9,070	9,070	9,070	9,070	9,070	9,070

Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3: Quantile Regression of Loan Debt with Selection Bias Correction and Variable FBFyes

	2nd Stage Quantile Regression with FBFyes Dummy& FBFyesINC1000 Interaction				
	(1)	(2)	(3)	(4)	(5)
VARIABLES	q10	q25	q50	q75	q90
INC1000	6.703**	11.80***	9.200	17.72***	59.32***
	(3.020)	(4.085)	(6.283)	(5.610)	(9.619)
FBFyes	94.00	-92.40	1,164	1,978**	2,776*
	(725.2)	(1,017)	(1,247)	(804.1)	(1,608)
FBFyes*INC1000	4.649*	6.310	25.54***	29.97***	6.179
	(2.720)	(4.190)	(4.619)	(7.301)	(15.85)
AGE	4.145	131.1**	153.1***	157.0***	108.1
	(44.00)	(60.72)	(48.62)	(59.19)	(76.75)
MALE	145.0	-86.31	316.0	682.6	358.3
	(140.8)	(270.6)	(366.3)	(420.2)	(484.3)
ASIAN	74.05	-491.4	-11.36	1,127**	1,027
	(300.6)	(813.6)	(891.2)	(524.9)	(1,435)
BLK	101.0	767.1	-40.75	-351.5	-1,035
	(397.4)	(605.4)	(520.5)	(532.5)	(902.8)
HISP	-418.6	-864.4*	-1,249***	469.1	138.1
	(284.7)	(505.3)	(422.3)	(833.9)	(576.6)
OTHER	94.10	533.2	776.6	1,836*	964.1
	(791.4)	(675.8)	(737.1)	(1,010)	(1,431)
DEPENDENT	-980.9***	-2,780***	-4,456***	-7,094***	-9,135***
	(357.5)	(498.0)	(651.0)	(598.8)	(796.1)
MARRIED	-257.6	-493.8	-687.8	-394.4	-951.2
	(367.9)	(460.2)	(436.7)	(697.8)	(861.5)

	2nd Stage Quantile Regression with FBFyes Dummy& FBFyesINC1000 Interaction				
	(1)	(2)	(3)	(4)	(5)
VARIABLES	q10	q25	q50	q75	q90
CHILDREN	95.37	-5.528	465.9	-82.94	-470.2
	(365.2)	(529.0)	(614.6)	(791.9)	(816.9)
TRANSFER	-112.2	-1,304***	-4,529***	-7,757***	-8,591***
	(251.8)	(273.5)	(417.5)	(487.7)	(818.1)
HEALTH	344.1	227.9	-54.99	-1,180*	-2,492***
	(259.4)	(300.2)	(706.4)	(668.8)	(829.0)
ENGINEER	862.7**	1,435***	1,791***	1,095	1,299
	(391.3)	(448.8)	(486.6)	(762.5)	(1,028)
ARTSCI	23.82	724.9***	653.6	-512.5	-521.0
	(228.9)	(197.7)	(440.2)	(687.6)	(750.7)
EDUC	155.2	740.8	550.7	-1,304*	-3,719***
	(263.1)	(460.4)	(559.5)	(675.4)	(833.8)
FLPREPAY	0.0794*	0.107	0.184**	0.222**	0.153
	(0.0451)	(0.0765)	(0.0849)	(0.0907)	(0.0987)
INVMILL	-4,710***	-6,957***	-15,933***	-18,500***	-23,282***
	(1,588)	(2,449)	(3,306)	(2,705)	(4,779)
Constant	6,989***	10,595***	24,035***	35,649***	47,365***
	(1,054)	(1,969)	(1,798)	(1,913)	(2,984)
R^2	0.080				
Observations	9,070	9,070	9,070	9,070	9,070

on the amount of debt at graduation for the total sample and for all the quantiles of debt except the middle (50^{th}) quantile. This means that, in general, the students with the highest household incomes accumulate more debt than their lower-income counterparts. The only exception to this is for the sample of students with the average level of debt (the 50^{th} quantile). At first this result seems counterintuitive, but it makes sense when we consider that students with lower incomes may qualify for more need-based aid, and so they do not need to borrow as much as their higher income counterparts. Another possible explanation is that higher income parents have different expectations of what their child's college experience should entail. They may expect their child to live on campus, study abroad, and experience the social aspects of college life as well as the educational aspects; whereas lower income households may expect students to live at home and work while attending college. Higher income households may also expect their children to go into higher paying occupations (as they did), and so they will have the income they need to pay off the debt in the future. Whatever the explanation may be, it is encouraging to discover that the greatest student debt burdens are not being borne by the students with the least income, at least in our sample of students.

Another key indicator of family support is whether the student is classified as dependent (designated for federal tax credit purposes) or independent. As expected, the results suggest that students who are dependents receive support from their families that enables them to avoid the highest loan debt. This effect, the amount of debt avoided by dependents, becomes larger for students in the highest quantiles of debt. Finally, the Florida Prepaid College fund is another indicator of family support for higher education. Our results on this variable, like the results on household income, at first seem counterintuitive. We find that students with Florida Prepaid College funds have higher student loan debts than students who did not have these funds. The result holds for the overall model and for students in the 50^{th} and 75% debt quantiles. The explanation for this is the same as the explanation for why debt levels increase with higher household income. The students whose parents or grandparents could afford to contribute to these funds for many of their pre-college years are less likely to qualify for need-based aid, or they have more expensive expectations of college life than students who did not have pre-paid college funds.

Choices that students make about where to attend college initially and which major to choose also affect student debt. Students who transfer from another college accrue significantly less student loan debt than students who entered the university as first time in college (FTIC) students. This result reflects the fact that most of the transfer students in our sample started their undergraduate studies at a less-expensive community college. Although every major requires the same number of credits to graduate, loan debt differs significantly across college majors. No doubt expected income at graduation, which differs by major and occupation, helps explain differences in students' willingness to accrue debt while in college. For example, our results show that education majors take on less debt at every quantile level than engineering majors.

The regression results in Table 3 are substantially the same as the regression results in Table 2 because the only difference in the two models is the specification

of the FBF scholarship variable and the interaction term between the FBF variable and income. Therefore, we forgo a detailed discussion of the Table 3 results and proceed to the interpretation of the two formulations of the FBF variable and their effects on student debt in the next section.

The Effect of FBF Scholarships on Student Debt

The FBF scholarship program has existed for decades, and in 2018-19, it provided more than 100,000 scholarships to the highest performing Florida students, spending over $540 million that year alone. FBF represents the greatest share of state grant aid for undergraduates in Florida (Florida Bright Futures, 2018); thus, it should have an important impact on student debt levels. *A priori*, we would expect that non-recipients, who are generally from lower SES households, would graduate with more loan debt after college than students who received the FBF scholarship.

We use the quantile regression results in Table 3 to create Figure 1, which shows the impact of receiving the Florida Bright Futures scholarship (FBFyes) on student loan debt. The results show that FBFyes and the interaction term FBFyes*INC1000 are both significant predictors of total loan debt. This means that receiving the FBF scholarship does significantly affect a student's loan debt and that the loan debt of FBF recipients versus non-recipients will be different at different income levels. To understand exactly how receiving the scholarship affects the loan debt of students from different income levels and with different levels of debt, we must calculate $\beta\Theta$, which is the partial derivative of Loan Debt with respect to receiving or not receiving the FBF scholarship (FBFyes). However, a knowledge of partial derivatives is not necessary to understand $\beta\Theta$. It can be understood as a shift parameter whose value increases or decreases (depending upon whether $\beta\Theta$ is greater than or less than zero) the amount of loan debt for students who have received a FBF scholarship. If the student has not received a FBF scholarship, then the value of $\beta\Theta$ is zero.

Table 2: Quantile Regression of Loan Debt with Selection Bias Correction and Variable FBF

DEPENDENT VARIABLE: LOAN DEBT	Heckman 2nd Stage Total Sample	Heckman 2nd Stage Quantile10	Heckman 2nd Stage Quantile25	Heckman 2nd Stage Quantile50	Heckman 2nd Stage Quantile75	Heckman 2nd Stage Quantile90
INC1000	18.41***	6.589**	9.807**	7.406	14.61**	59.02***
	(4.202)	(3.163)	(4.434)	(5.264)	(5.992)	(9.016)
INC*FBF	0.00541***	0.00186***	0.00432***	0.00687***	0.00653***	0.00379**
	(0.000704)	(0.000530)	(0.000743)	(0.000882)	(0.00100)	(0.00151)
AGE	20.81	-26.67	59.56	118.7**	56.62	-44.73
	(46.97)	(35.36)	(49.57)	(58.85)	(66.99)	(100.8)
MALE	118.3	300.7	-201.9	517.0	665.6*	296.1
	(267.9)	(201.7)	(282.7)	(335.6)	(382.0)	(574.8)
ASIAN	54.30	243.8	197.4	-26.73	603.3	476.1
	(745.1)	(560.9)	(786.3)	(933.5)	(1,063)	(1,599)
BLK	-1,035**	-278.5	332.4	-300.4	-974.3	-2,398**
	(505.7)	(380.7)	(533.7)	(633.6)	(721.3)	(1,085)
HISP	-835.0*	-447.2	-752.1	-1,223**	164.3	-523.4
	(434.0)	(326.7)	(458.0)	(543.7)	(618.9)	(931.2)
OTHER	408.4	87.22	618.1	590.4	1,403	601.7
	(671.0)	(505.1)	(708.2)	(840.7)	(957.0)	(1,440)
DEPENDENT	-3,447***	-637.6*	-2,328***	-3,376***	-5,736***	-7,639***
	(434.7)	(327.2)	(458.7)	(544.6)	(619.9)	(932.7)
MARRIED	-579.1	-218.5	-389.7	-510.3	-136.3	-1,050
	(396.2)	(298.2)	(418.1)	(496.3)	(565.0)	(850.1)

DEPENDENT VARIABLE: LOAN DEBT	Heckman 2nd Stage Total Sample	Heckman 2nd Stage Quantile10	Heckman 2nd Stage Quantile25	Heckman 2nd Stage Quantile50	Heckman 2nd Stage Quantile75	Heckman 2nd Stage Quantile90
CHILDREN	17.29	108.7	-148.3	463.6	-286.9	-705.4
	(393.9)	(296.5)	(415.8)	(493.5)	(561.8)	(845.3)
TRANSFER	-6,037***	-354.9	-1,593***	-4,805***	-9,200***	-10,798***
	(379.4)	(285.6)	(400.4)	(475.4)	(541.1)	(814.2)
HEALTH	-858.0**	261.9	13.53	-8.461	-1,092*	-2,808***
	(436.3)	(328.4)	(460.5)	(546.6)	(622.3)	(936.3)
ENGINEER	1,197**	705.6*	1,274**	1,484**	1,280*	911.4
	(544.6)	(410.0)	(574.8)	(682.3)	(776.7)	(1,169)
ARTSCI	-292.6	39.33	354.3	479.1	-835.0	-1,175
	(359.9)	(270.9)	(379.8)	(450.8)	(513.2)	(772.2)
EDUC	-1,029**	65.55	287.0	463.7	-1,513**	-4,159***
	(500.0)	(376.3)	(527.6)	(626.4)	(713.0)	(1,073)
FBF	-0.453***	-0.105**	-0.257***	-0.394***	-0.486***	-0.453***
	(0.0665)	(0.0500)	(0.0701)	(0.0833)	(0.0948)	(0.143)
FLPREPAY	0.133**	0.0869*	0.155**	0.165**	0.229**	0.262*
	(0.0667)	(0.0502)	(0.0704)	(0.0836)	(0.0952)	(0.143)
INVMILL	-16,139***	-6,240***	-10,020***	-15,243***	-17,979***	-26,589***
	(2,061)	(1,551)	(2,175)	(2,582)	(2,939)	(4,422)

DEPENDENT VARIABLE: LOAN DEBT	Heckman 2nd Stage Total Sample	Heckman 2nd Stage Quantile10	Heckman 2nd Stage Quantile25	Heckman 2nd Stage Quantile50	Heckman 2nd Stage Quantile75	Heckman 2nd Stage Quantile90
Constant	30,945***	8,688***	14,403***	25,365***	40,529***	56,059***
R^2	0.080					
Observations	9,070	9,070	9,070	9,070	9,070	9,070

Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3: Quantile Regression of Loan Debt with Selection Bias Correction and Variable FBFyes

	2nd Stage Quantile Regression with FBFyes Dummy& FBFyesINC1000 Interaction				
	(1)	(2)	(3)	(4)	(5)
VARIABLES	q10	q25	q50	q75	q90
INC1000	6.703**	11.80***	9.200	17.72***	59.32***
	(3.020)	(4.085)	(6.283)	(5.610)	(9.619)
FBFyes	94.00	-92.40	1,164	1,978**	2,776*
	(725.2)	(1,017)	(1,247)	(804.1)	(1,608)
FBFyes*INC1000	4.649*	6.310	25.54***	29.97***	6.179
	(2.720)	(4.190)	(4.619)	(7.301)	(15.85)
AGE	4.145	131.1**	153.1***	157.0***	108.1
	(44.00)	(60.72)	(48.62)	(59.19)	(76.75)
MALE	145.0	-86.31	316.0	682.6	358.3
	(140.8)	(270.6)	(366.3)	(420.2)	(484.3)
ASIAN	74.05	-491.4	-11.36	1,127**	1,027
	(300.6)	(813.6)	(891.2)	(524.9)	(1,435)
BLK	101.0	767.1	-40.75	-351.5	-1,035
	(397.4)	(605.4)	(520.5)	(532.5)	(902.8)
HISP	-418.6	-864.4*	-1,249***	469.1	138.1
	(284.7)	(505.3)	(422.3)	(833.9)	(576.6)
OTHER	94.10	533.2	776.6	1,836*	964.1
	(791.4)	(675.8)	(737.1)	(1,010)	(1,431)
DEPENDENT	-980.9***	-2,780***	-4,456***	-7,094***	-9,135***
	(357.5)	(498.0)	(651.0)	(598.8)	(796.1)
MARRIED	-257.6	-493.8	-687.8	-394.4	-951.2
	(367.9)	(460.2)	(436.7)	(697.8)	(861.5)
CHILDREN	95.37	-5.528	465.9	-82.94	-470.2
	(365.2)	(529.0)	(614.6)	(791.9)	(816.9)
TRANSFER	-112.2	-1,304***	-4,529***	-7,757***	-8,591***
	(251.8)	(273.5)	(417.5)	(487.7)	(818.1)
HEALTH	344.1	227.9	-54.99	-1,180*	-2,492***
	(259.4)	(300.2)	(706.4)	(668.8)	(829.0)

	2nd Stage Quantile Regression with FBFyes Dummy& FBFyesINC1000 Interaction				
	(1)	(2)	(3)	(4)	(5)
VARIABLES	q10	q25	q50	q75	q90
ENGINEER	862.7**	1,435***	1,791***	1,095	1,299
	(391.3)	(448.8)	(486.6)	(762.5)	(1,028)
ARTSCI	23.82	724.9***	653.6	-512.5	-521.0
	(228.9)	(197.7)	(440.2)	(687.6)	(750.7)
EDUC	155.2	740.8	550.7	-1,304*	-3,719***
	(263.1)	(460.4)	(559.5)	(675.4)	(833.8)
FLPREPAY	0.0794*	0.107	0.184**	0.222**	0.153
	(0.0451)	(0.0765)	(0.0849)	(0.0907)	(0.0987)
INVMILL	-4,710***	-6,957***	-15,933***	-18,500***	-23,282***
	(1,588)	(2,449)	(3,306)	(2,705)	(4,779)
Constant	6,989***	10,595***	24,035***	35,649***	47,365***
	(1,054)	(1,969)	(1,798)	(1,913)	(2,984)
R^2	0.080				
Observations	9,070	9,070	9,070	9,070	9,070

Figure 1: Difference in Loan Debt for FBF vs. Non-Recipients, ßΘ

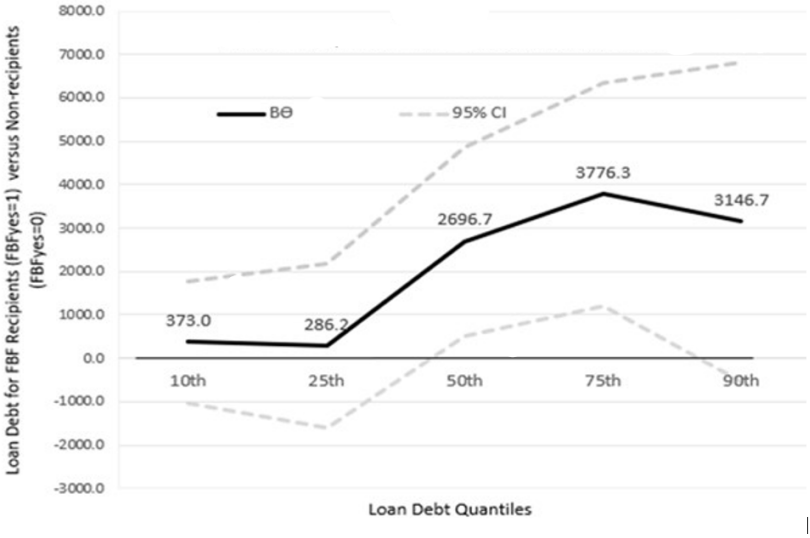


Figure 1 shows the estimate of βΘ evaluated at a household income equal to $60,000 (approximately the median value of household income in our sample) with 95% confidence limits. In other words, βΘ is the amount of difference in the loan debt of FBF scholarship recipients with $60,000 of household income compared to the loan debt for FBF non-recipients who also have $60,000 of household income. The dark line in Figure 1 shows the estimated value of βΘ for students with different debt levels. The first point on the line indicates that students who received a FBF scholarship and graduated with the lowest 10% of debt levels (and who have a household income of 60,000) will have a total debt level that is $373 dollars more than identical students who did not receive the scholarship. Moving to the students with debt levels in the 50th quantile, the students who received the FBF scholarship will graduate with $2696.70 more debt than non-recipients. In the highest debt quantile (90%), the FBF recipients have a total debt level that is $3146.70 greater than their non-recipient counterparts.

However, because these differences are estimates based on statistical sampling, we can't be 100% sure that the numbers represented on the dark line are the true values of the differences in debt between FBF scholarships recipients and non-recipients. However, the confidence limits shown by the dashed lines in the diagram allow us to say that we are 95% confident that the true value of the differences are equal to a number between the dashed lines surrounding the estimates. The graph shows that for the 10th, 25th and 90th quantiles the lower confidence limit lies below zero, and therefore, there is a 95% chance that the true value of the difference is really zero. This is too great a chance for us to say definitively that there is a *real* difference, in spite of the fact that the estimate on the dark line is greater than zero, so we must

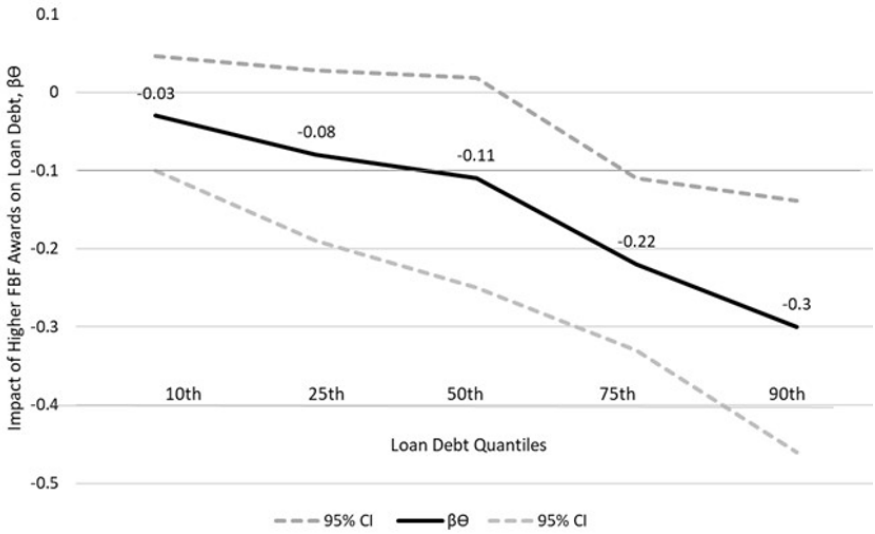
conclude that there is no statistically significant difference in debt accumulation between FBF recipients and non-recipients for students in these debt quantiles. However, between the 50th and 75th debt quantiles, the lower confidence limit is always above zero. Thus, we are 95% confident that the student loan differences between FBF recipients and non-recipients are not zero at those debt levels; they are statistically significant. In other words, we can say with only a 5% chance of being wrong, that FBF recipients in this upper midrange of debt (50th – 75th quantiles) have higher debt burdens after college than similar students who did not receive the FBF scholarship. Furthermore, we repeated our calculations of $\beta\Theta$ across different levels of household income, and we found this same result at all income levels. We estimated $\beta\Theta$ for household incomes ranging from $0 to 100,000 and the debt levels between FBF scholarship recipients and non-recipients were only significantly different between the 50th and 75th debt quantiles. At each level of household income, among the students with debt levels between the 50th and the 75th quantiles of debt, the FBF recipients had significantly higher debt levels than the non-recipients.

Why are the students who receive FBF scholarships accumulating more debt than students who do not receive the scholarship in the 50th through 75th quantiles of debt? Wouldn't they use their scholarships to reduce their loan debt rather than acquiring more? In some cases, perhaps, but our results show no evidence of this, in general. The propensity to take on more educational loan debt after receiving the FBF scholarship may be explained by the microeconomic theory of in-kind subsidies (Rosen & Gayer, 2013). This theory predicts that when the in-kind subsidy (in this case, money that can only be spent on higher education at one of Florida's universities or colleges) is relatively small compared to the overall expenditures on the good, the recipients of the subsidy will consume the same amount or more of the good being subsidized compared to the amount they were spending before the subsidy. For example, this is the case with Supplemental Nutritional Assistance Program (SNAP) benefits, previously called Food Stamps. Most SNAP recipients spend all their SNAP money as well as some of their own income on approved grocery items. It is also consistent with Susan Dynarski's (2000, 2002) results that found that the Georgia HOPE scholarship caused students to switch from two-year colleges to four-year colleges. The increase in education resources provided by the scholarship caused them to consume more education and, in some cases, students needed to acquire more debt to increase their educational spending.

Next, we explore whether the size of the FBF award impacts borrowing behavior among scholarship recipients. Table 2 shows that both the amount of the award (FBF) and the interaction term between the amount of the award and household income (INC1000*FBF) are significant predictors of loan debt, and, as we did before in deriving Figure 1, we use both variables to calculate the marginal effects across quantiles (β_Θ). Figure 2 shows the predicted marginal effects (β_Θ) across debt quantiles for higher FBF awards, evaluated at household income (INC1000) equal to $40,000. The dark line shows the estimates of these marginal effects at different debt levels. For example, the first point on the line at the lowest debt quantile of 10% is -0.03. This means that for students with household incomes of $40,000 who accumulate overall student loan debt in the lowest 10% of the debt distribution, every

$1 of additional FBF scholarship money reduces their overall debt by three cents (-0.03). However, because the upper 95% confidence limit (the dashed line) above that estimate includes the value of 0, we must conclude that there is a 95% chance that the true value of this marginal effect may be zero, or in other words, there is no statistically significant effect on the debt level caused by an increase in the FBF award. In fact, Figure 2 shows that the size of the FBF award has no significant effect on student debt levels in the 10th, 25th or 50th quantiles of debt since zero is within the upper confidence limit for those debt quantiles. This suggests that the amount of the FBF award does not impact student loan debt for students with below average to average debt levels.

Figure 2: Impact of Higher FBF Awards on Loan Debt Across Quantiles

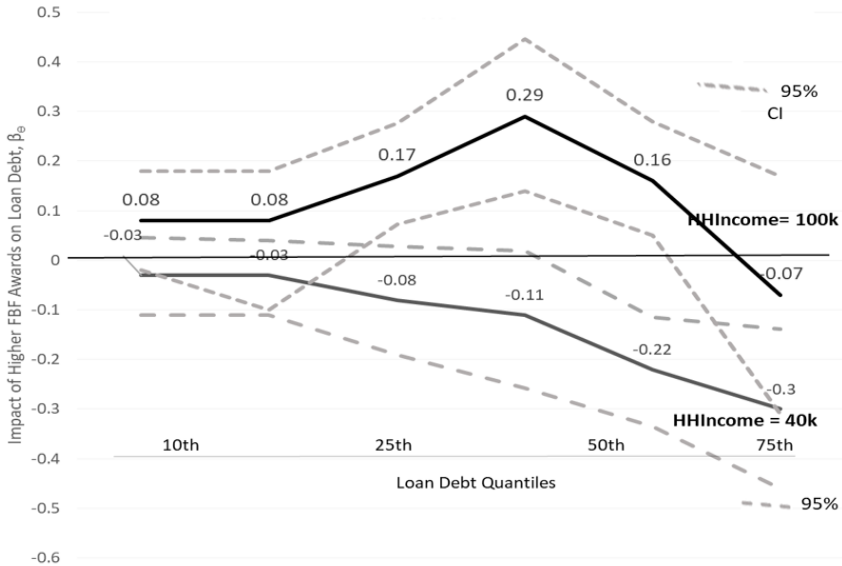


However, Figure 2 also shows that students with the highest loan burdens, the 75th and 90th quantiles, do use additional scholarship awards to significantly reduce their debt. At these debt levels, our results show that for each additional dollar of the FBF scholarship award, loan debt falls by 22–30 cents, on average. This result suggests that FBF recipients with a household income of $40,000 and the highest levels of accumulated debt do use increases in the amount of their FBF scholarships to reduce debt. Furthermore, we repeated this experiment for households at different income levels, and we found that for households earning $55,000, or less, higher FBF awards significantly reduced loan amounts for students in the 75th and 90th quantiles of debt. However, for households earning more than $55,000, this was not the case.

To demonstrate the difference in the amount of debt accumulated by FBF recipients with higher household incomes, we have added the graph for FBF recipients with $100,000 of income to the graph of FBF recipients with $40,000 of household income. These two graphs are shown together in Figure 3. The contrast

between these two graphs shows that the FBF scholarship recipients with lower household income ($40,000) use their FBF awards to reduce loan debt significantly for students in the 75th and 90th debt quantiles, but the FBF scholarship recipients with higher household income ($100,000) significantly *increase* their student loan debt in the 25th, 50th and 75th debt quantiles. Specifically, the graph of the FBF recipients with $100,000 of household income shows that for every additional dollar of FBF scholarship money, the accumulated student loan debt increases 17 cents, 29 cents, and 16 cents for students at the 25th, 50th and 75th debt quantiles, respectively. Only the high-income students with the least amount (10% quantile) and the highest amount (90th quantile) of accumulated debt had no significant change in the amount of debt they accrued from increases in the FBF award. In general, our models predict that students from lower income households are more likely to use higher FBF scholarship awards to avoid accumulating additional debt; whereas students from higher income households are more likely to increase their borrowing as scholarship awards increase.

Figure 3: Impact of Higher FBF Awards on Loan Debt by Household Income, ßo



DISCUSSION

Over the last few decades many state and local governments have dramatically reduced funding for higher education. This has resulted in tuition inflation and a surge in student loan debt. Many states, including Florida, have also shifted the funding for

undergraduate students away from need-based aid toward merit-based scholarships. These merit-based awards disproportionately benefit students who come from the highest SES households (Binder & Ganderton, 2004; Borg & Borg, 2007; Cornwell & Mustard, 2007; Heller, 2006; Stranahan & Borg, 2004). Florida Bright Futures scholarships represent the greatest share of state grant aid for undergraduates, yet only half of the students entering college in Florida meet the qualifications. One could argue that FBF scholarship recipients enter college with greater academic abilities, based on their high school grades and SAT or ACT scores, as well as greater financial resources, based on receiving the scholarship awards as well as higher household incomes, on average. Do these advantages result in FBF scholarship recipients leaving college with lower student debt burdens? Based on our research, the answer to this question is, "It depends."

One of the advantages of our data is that over the period that our data were collected, all Florida Bright Futures Scholarship recipients were required to submit a FAFSA application; therefore, our data include a much broader income distribution since many high-income households that would not normally submit a FAFSA application did so in order to receive the scholarship. One factor that determines the answer to this question is the overall debt level that students accumulate by the time they graduate. For example, there is no significant difference in the amount of debt accumulated by FBF recipients and non-recipients in the lowest and highest ends of the debt distribution (the 10^{th}, 25^{th} and 90^{th} quantiles of overall student debt levels). However, among students in the upper mid-range of the debt distribution (the 50^{th} and 75^{th} debt quantiles), FBF recipients accumulate significantly *more* loan debt than otherwise equal non-recipients. In this case, we suggest that the FBF scholarship creates an education-specific income effect inducing students to spend more on all goods including higher education when they receive the award. Our results also show that the Florida Pre-Paid College Plan, a similar in-kind higher education subsidy, has a comparable effect. Students that have pre-paid college tuition plans increase their educational investment by borrowing more than similar students without the pre-paid plans.

Household income is another factor that affects the debt accumulated by FBF scholarship recipients versus non-recipients. We find that FBF recipients from higher income households choose to borrow more for college than FBF recipients from lower income households. FBF recipients from lower income households may have access to need-based scholarships, whereas students from higher income households do not. It may also be that FBF recipients from higher income households have expectations of a more expensive college experience that includes living on campus, studying abroad, and participating in campus social life, which requires more borrowing. Whatever the reason, our results show that even though merit-based scholarships are disproportionately received by higher income students, they have not disproportionately improved the debt burdens of these students relative to their lower income counterparts.

We also examine the borrowing behavior of FBF recipients in response to changes in the FBF award amounts. Our results show that students from lower income households ($55,000 and below) in the bottom half of the debt distribution (below the

50th quantile) did *not* significantly change their debt levels in response to additional FBF award amounts; however, the lower income ($55,000 and below) students in the top half of the debt distribution (50th quantile and above) did significantly reduce debt as award amounts increased. Students from the highest income households ($100,000) in the upper midrange of the debt distribution (50th and 75th debt quantiles) actually *increased* their student debt levels as their FBF awards got larger.

In summary, our model predicts that FBF recipients accumulate higher debt, on average, than similar students who did not receive the award. However, for students from the lowest income households and with the highest levels of debt, the FBF scholarship award does reduce the overall amount of debt they accumulate. This means that FBF scholarship recipients are at no significant advantage relative to non-scholarship recipients when it comes to student debt accumulation for students from high income households. However, in the specific case of low-income students with the highest debt levels, they do receive significant debt relief from their FBF scholarships.

The policy implications of our research are straight-forward. If states wish to use their merit scholarship programs to help reduce student debt burdens, they should target those scholarships at lower income households, perhaps by giving higher awards to low-income students and lower awards to high-income students.

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MARY BORG, PhD, is a Professor of Political Economy in the Department of Political Science and Public Administration at the University of North Florida. Her research interests are in public finance, especially in the distributional effects of lottery-funded merit scholarships. Her numerous research articles have been published in the *National Tax Journal, Demography,* the J*ournal of Economic Education*, and *Educational Policy,* among others. Email: mborg@unf.edu

MARY BEAL, PhD, Mary Beal earned her M.S. and Ph.D. in Economics from Florida State University in 2007 following a B.A. in both Economics and Physics from the University of Virginia. She is currently an instructor of Economics at UNF where she has taught Principles of Microeconomics, Principles of Macroeconomics, Intermediate Microeconomics, Special Topics on Real Estate Economics and Economics & Business Statistics at the undergraduate level. Mary has also taught Economic Analysis, Making Decisions With Data, and Economics of Business Decisions at the graduate level. She is an applied microeconomist that uses regression analysis as her primary analytical tool to research a wide variety of issues including labor, real estate, education, and student loan debt. Email: M.beal@unf.edu

HARRIET STRANAHAN, PhD, is a Professor of Economics at UNF. Her courses include Graduate and Undergraduate Business Statistics, Principles of Microeconomics, Labor Economics and Public Finance. She has lead several Study Abroad courses to Argentina, Chile, Spain, Portugal, Italy and South Africa. Her research has appeared in well recognized economics journals including Contemporary Economic Policy, National Tax Journal, Journal of Public Finance and Journal of Economics of Education. Harriet is very active in the business community providing expert consulting assistance with projects including economic impact analysis, return on investment, value of life, analysis. Email: hstanah@unf.edu

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What's in a Debt Letter? A Content and Linguistic Analysis of Student Loan Debt Letters

Z. W. Taylor
University of Texas

Karla Weber
University of Wisconsin-Madison

Gretchen Holthaus
Wichita State University

ABSTRACT

Since 2012, many Title IV institutions of higher education have sent their students debt letters to inform them of their outstanding loan amounts, estimated or real monthly payments, and other loan-related information. However, no extant research has analyzed whether these letters are written at an appropriate level for college students, nor has research articulated what complex jargon is used in these letters (e.g., *subsidized, consolidated*) and what content is contained in these letters (e.g., interest rates, loan types). Subsequently, this study analyzes a sample of 24 letters gathered from institutions of higher education across the country to fill these research gaps. Results suggest most debt letters are not comprehensible by the average first- or second-year college student, jargon differs between sectors (e.g., public, private), and debt letters share many common elements, such as aggregate loan totals and interest rates, but many do not include contact information or any multimedia, even though letters were written to be delivered digitally. Implications for research, practice, and financial aid communication are addressed.
Keywords: debt letters, financial aid, college students, debt

With growing public awareness of student loans and what some refer to as a "student debt crisis," (Quinton, 2016b, para. 1) legislators and college administrators alike have begun to show increasing interest in better managing students' debt burdens and informing students how to be well-informed borrowers. Currently, for the Federal Direct Loan program first-time student borrowers are required to sign a Master Promissory Note (MPN), as well as complete entrance counseling. The entrance counseling is meant to help the first-time borrower learn about the loan and its commitments (Klepfer, 2015). But even with these requirements, average student debt continues to climb, and students continue to report a lack of awareness of the debt they are taking on and the implications repayment has on their future income and budget (Burd et al., 2018; Johnson et al., 2018; Marx & Turner, 2020).

As the concern over student debt has grown, the U.S. Department of Education (ED) and other federal agencies have begun to release new documents and tools to supplement these requirements. In 2012, ED announced the Shopping Sheet, now called the College Financing Plan. Although schools are not required to provide this plan, it provides a standard template for financial aid offers and allows the student to better compare and consider different offers so they can make the most informed financial decisions (U.S. Department of Education, 2019). Then, in November 2019, ED notified institutions of their intent to change the MPN process to make it an annual process. Student and parent borrowers would need to acknowledge their current loan debt each new academic year before their school could make a new loan disbursement. Though available to students now, the ED delayed the required student completion of the new Annual Student Loan Acknowledgement until 2021 (Federal Student Aid, 2020). Most recently, the Consumer Financial Protection Bureau (CFPB) released *Your Financial Path to Graduation*, an online tool designed to assist students with understanding both the cost of college and how to budget for those costs while learning to make informed financial decisions around paying for college (Consumer Financial Protection Bureau, 2020).

However, state legislators from thirteen states to date have attempted to engage their institutions of higher education with their outstanding student loan borrowers through the sending of debt letters: a letter mailed from the student's last attended institution which informs the student (current or former) of how much student debt they owe and what kind (Darolia & Harper, 2018; Stoddard et al., 2017; Taylor & Holthaus, 2020). Institutions sending some of the first debt letters in the country, such as Indiana University and Montana State University, have explained that sending a student a debt letter is another way to inform students of their student loan borrowing, yet the research into the effect of these debt letters has been variable and only short-term (Darolia & Harper, 2018; Stoddard et al., 2017). However, no research has examined whether most college students can read and comprehend the contents of the debt letter or what content is presented in debt letters, even though prior research has suggested that many students and their families do not understand financial aid award letters (Burd et al., 2018) and do not understand how to complete the Free Application for Federal Student Aid (FAFSA), which is the official application for federal student aid in United States (Bettinger et al., 2012;

Dynarski & Clayton, 2006; Taylor, 2019a). Moreover, students often struggle to comprehend financial aid jargon, such as *FAFSA*, *tax return transcript*, and *verification*, terms that are important for students to understand to successfully apply for and receive federal student aid to attend a postsecondary institution in the United States (Taylor, 2019a, 2019b; Taylor & Bicak, 2019).

As a result, given that hundreds of institutions of higher education across thirteen states in the U.S. send debt letters to their current or former student loan borrowers, this study will fill considerable research and practice gaps by answering the following questions:

1) How readable are debt letters and does readability level vary by institutional sector or institution?
2) What are the most commonly used terms in debt letters (e.g., *subsidized, consolidated*)?
3) What content is included in debt letters (e.g., *aggregate loan totals*, *interest rates*, etc.)?

Answering these questions will inform both financial aid practitioners and researchers as to how debt letters can be simplified and more informative for student loan borrowers, helping these borrowers understand their loan debt and how to access resources to repay their loans.

LITERATURE REVIEW

Although the sending of debt letters is a recent phenomenon in higher education, several studies have addressed how institutions send debt letters and a few behavioral student outcomes as a result of receiving a debt letter. While these studies are limited in their generalizability when considered individually, these studies may provide a more complete understanding of debt letters and their associated outcomes when compared with the current study at hand.

Indiana University Debt Letters

As one of the first universities to initiate debt letters in 2012, Indiana University (IU) is often looked to as a success story associated with this initiative (Darolia, 2016). Within two years of instituting debt letters, IU students had reduced their borrowing by about $44 million, or 16% overall (IU Newsroom, 2015b). By 2018, federal and private loan borrowing at IU had decreased by 19%, or more than $126 million total (McRobbie, 2018). These results garnered a great deal of media attention at the time, with articles published in national news sources such as *The Wall Street Journal* (Korn, 2017), *CNN Money* (Quinton, 2016b), and *Yahoo Finance* (Woodruff, 2015), among others. Some of these articles asked if this simple solution solve the student loan crisis (Quinton, 2016b). While the debt letter solution may have seemed simple to outsiders, a much more complex financial literacy initiative was in place at IU.

During this timeframe, the university developed a “multi-faceted financial literacy program and started adopting policies to increase student financial assistance and promote on-time graduation” (IU Newsroom, 2016a, n.p.). In

addition to debt letters, IU also offered peer-to-peer financial counseling, a podcast on personal finance, a website with quizzes and loan calculators, a full-time enrollment campaign, and changed the financial aid loan acceptance process to make it easier to decline loans (Quinton, 2016a). Because the debt letters were part of larger efforts to reduce loan borrowing, it is difficult to determine the effects from the letter alone, as other initiatives were also implemented during this timeframe.

Administrative focus on financial education efforts was also exceptionally high at IU during this time. IU's president mentioned the university's work on financial literacy as a priority in every state of the union address from 2011 to 2018 (McRobbie, 2018). The president also chose to award the senior vice president and chief financial officer at IU, MaryFrances McCourt, with the President's Medal for Excellence for her work on student affordability and her oversight of the IU Office of Student Financial Literacy in 2016 (IU Newsroom, 2016b). In addition to a high level of institutional focus on financial education, the university also led a national initiative on financial literacy by co-founding the Higher Education Financial Wellness Association, formerly known as the National Summit on Collegiate Financial Wellness (IU Newsroom, 2015a).

Due to the comprehensive financial literacy efforts in place at IU, as well as the administration's extraordinary focus on the subject, the loan debt reduction experienced at IU may not be causally linked to student loan debt letter initiatives alone. To determine the effects of loan debt letters, it is beneficial to turn to other institutions that have implemented similar stand-alone initiatives for further examination.

Montana State University Debt Letters

Montana State University (MSU) implemented debt letters similar to Indiana University's in 2012, and Stoddard et al. reviewed the efficacy of these letters in 2017. MSU's letter differed from IU's in that it included debt thresholds at which point letters would be sent to some, but not all, students. The MSU students who received letters were first year students who had more than $6,250 in student loans, sophomores with more than $12,000, juniors with more than $18,750, and any student with more than $25,000 in debt received a letter. Students were provided with incentives to meet with financial planners and career coaches. MSU's debt letters also included strategies to reduce borrowing and work towards a timely graduation. In particular, federal Satisfactory Academic Progress (SAP) regulations were outlined, informing students of the need to pass 67% of courses each semester to continue to receive federal funding. Information was also shared on the university's tuition plateau program, in which students do not incur any additional tuition charges after enrolling in 12 credit hours a semester. By charging the same amount for 12 and 15 credit hours, for example, the university sought to increase credit hours completed, leading to higher on-time graduation rates.

Additionally, MSU outlined benefits to earning a college degree, including lower average unemployment rates and better long-term health outcomes. To study the outcomes of MSU's debt letter, Stoddard et al. (2017) used a difference-in-

differences approach, using the University of Montana as a comparison site, where no student debt letters were sent. In this study, the researchers did not find a significant reduction in the amount of student loans borrowed due to the debt letters, controlling for gender, race, major, age, and several other characteristics. However, the researchers did find positive academic effects associated with the debt letters.

Receiving a letter increased average grade point averages for the semester, as well as the number of credit hours completed. These effects continued into the following semester and year. Students receiving debt letters also experienced higher retention rates by semester and year compared to their peers who did not receive the letters at the University of Montana. The authors of the report argued that the academic successes students experienced may be attributable to the information provided about SAP. While student loan debt did not significantly decrease, there were other, unintended positive outcomes associated with the letters. MSU's outcomes suggest that outlining SAP and other benefits to completing coursework towards a timely graduation are important to include in student loan debt letters.

University of Missouri Debt Letters

Darolia and Harper (2018) studied debt letters sent by the University of Missouri (UM), and these debt letters sent by the university differed from other debt letters in that they only provided factual information about loan debt and estimated repayments pulled directly from the National Student Loan Data System (NSLDS). Unlike MSU and IU, other financial education resources were not promoted simultaneously, and students were not outwardly encouraged to reduce their borrowing. Debt letters at UM were not written with the intent to increase or decrease loan-borrowing behavior, but rather to provide factual information.

Darolia and Harper (2018) found in their 2017 review that sending a debt letter at the University of Missouri did not lead to a change in the amount students borrowed or the likelihood that they would borrow. Although UM's debt letter did not alter borrowing behavior, it did induce more information seeking among some students. The researchers found that students receiving debt letters were two percent more likely to seek a meeting with a financial aid officer. Interviews conducted by Darolia and Harper (2018) with debt letter recipients demonstrated that students did not find the letters particularly distinguishable from others sent by the financial aid office or other offices on campus. Out of 23 students interviewed, just nine remembered receiving the debt letter, and another four reported being unsure. Additionally, two out of four students in a control group stated that they had received the debt letter, when they in fact had not. Overall, the debt letters sent at UM did not appear to be particularly memorable for students.

One concern about sending debt letters is that they may potentially discourage students who need loans to complete their education from utilizing them (Quinton, 2016a). Research has demonstrated that students who are averse to borrowing, and that have unmet need of $2,000 or more during their first year of college, are less likely to complete their degree (The Institute for Higher Education Policy, 2008). The researchers at UM, therefore, looked for any negative completion outcomes associated with sending debt letters to students. They found no negative outcomes

associated with sending debt letters to students, however. Students receiving debt letters were no more likely to withdraw from courses, change their major, leave the university, or change the number of hours they worked in work-study positions (Darolia & Harper, 2018).

Although the researchers were unable to determine any harm that had been caused by the letters, they did find that they may not be the most effective approach to addressing student loan debt either. Half of students who received an emailed debt letter reported that they believed that it was the best approach, while the other half that were interviewed did not recommend debt letter emails, believing that students skimmed or overlooked them (Darolia & Harper, 2018). The researchers found that students who receive frequent communication about their finances may decrease their attention to any one message. Some students even reported purposefully avoiding paying attention to their student debt. In interviews, students suggested that other approaches such as tweets, texts, songs/videos, presentations/budgeting classes, letters sent to parents, or one-on-one financial or academic advising may be more beneficial. It is important to note that, overall, students who were interviewed about debt letters referred to their lack of understanding, not a lack of data as hindering their financial decision-making. This research echoes some of the findings of prior research focused on text messaging, finding that community college students may be more likely to refile their FAFSA and stay in school after receiving a text message reminder instead of another form of communication, such as a postcard or email (Castleman & Page, 2016).

Review of Debt Letter Findings To-Date

Together, the three studies at Indiana University, Montana State University, and the University of Missouri suggest that debt letters by themselves may not be effective in reducing student loan debt, but as part of larger financial education programs, they may be beneficial (Darolia & Harper, 2018; Stoddard et al., 2017). When students are provided information on additional resources, they are more likely to engage in help-seeking behavior (Darolia & Harper, 2018). Experimenting with other methods of communicating student debt information, such as through academic courses, presentations, social media, (Darolia & Harper, 2018), and text messages (Castleman & Page, 2016) is also recommended. Including information on Satisfactory Academic Progress and other incentives to graduate on-time are important in student debt letters as well (Stoddard et al., 2017).

Smaller studies, such as the one from Taylor et al. (2021), scanned six different debt letters—two of which were from IU Bloomington and Montana State University—to find that debt letters were often too difficult for most first-year college students to read and contained complex jargon that students may struggle to understand. Akin to the IU and MSU studies, McKinney's (2017) dissertation explored college student behaviors after receiving a debt letter and found that students were more likely to reduce their borrowing as a result of receiving the letter. However, McKinney (2017) did not control for demographic characteristics or other factors related to student borrowing, while the study was also situated at a single institution and gathered only one year of data.

While there are several important findings from the literature that have been published on student debt letters to-date, additional research is still needed to improve outcomes associated with these initiatives. Moreover, after an extensive literature search, the research team was unable to find related work in international settings, rendering research into how educational institutions communicate debt to students even more important.

METHOD

The following sections outline the methods employed by the researchers to identify the population and sample of study and how the researchers collected and analyzed data. All debt letters analyzed in this study can be made available in anonymized versions by request. Per agreements between the researchers and the institutions sending the debt letters, the researchers cannot publicly share original versions of all debt letters analyzed in this study.

Debt Letter Mandates and Identifying the Population

To date, politicians in thirteen states have mandated that Title IV (federal loan participating) institutions of higher education send their current and former students holding federal student loans a student loan debt letter. These states include California, Florida, Illinois, Indiana, Maryland, Nebraska, Oregon, Pennsylvania, Texas, Utah, Virginia, Washington, and Wisconsin (Attigo, 2020). According to the National Center for Education Statistics' (2020) Integrated Postsecondary Education Data System (IPEDS), there are 2,685 institutions of higher education in these 13 states that could be sending unique debt letters to their students. The research team is aware that organizations contract with state systems and multiple campuses to send debt letter templates to their students, meaning that not all debt letters may be different from campus to campus, especially if campuses are in the same state system like the University of California System (Attigo, 2020). As a result, it is unclear how many institutions are complying with their state mandates and sending student loan debt letters. Moreover, it is unclear whether state level departments of education, the ED, or the Office of Federal Student Aid (FSA) are regularly auditing these institutions to ensure that institutions are sending timely, accurate debt letters per state laws.

Data Collection

Since early debt letter mandates began in 2015 in Indiana and 2016 in Nebraska (Quinton, 2016), the research team began soliciting blinded debt letters (no personally identifiable information) at professional conferences and within extant personal and professional networks, including through state- and national-level organizations. However, the research team found that collecting debt letters—even anonymized or blinded ones—was exceedingly difficult for several reasons provided by financial aid professionals. These reasons included uncertainty surrounding changing state laws and debt letter requirements, competitive

advantages against other institutions, and an uneasiness of sharing a financial document meant for a specific student, even though we asked practitioners for anonymous or blinded copies of the debt letters. Additionally, the stress and uncertainty produced by the COVID-19 global pandemic rendered collecting debt letters even more cumbersome.

Given these hurdles the research team was only able to collect twenty-four unique debt letters over a two-year period, representing less than 1% of the overall population of institutions of higher education who have been mandated to send debt letters. However, the research team felt that analyzing twenty-four letters across multiple textual aspects—including both linguistic and qualitative analyses—would make a novel contribution to the literature, seeing as few studies have analyzed whether students are likely able to read debt letters (McKinney, 2017) and what types of information are included in debt letters (Taylor et al., 2021).

Data Analysis

To optimize the analysis of the debt letters across multiple textual aspects, the research team decided to employ both quantitative linguistic and qualitative methodology to build upon extant research and fill gaps in the literature.

Linguistic Analysis

First, this study sought to build upon extant research suggesting that financial aid-related communication could be very difficult for traditionally-aged college students to read. FAFSA instructions (Taylor, 2019b) and application fee waiver statements (Taylor, 2019a) are difficult to read and often written above the 16th grade English reading level, and financial aid award letters are often difficult to read and contain confusing jargon and vague definitions of critical terms (Burd et al., 2018). From here, this study employed Taylor's (2019a, 2019b) linguistic methodology to analyze the English readability level, debt letter length (by word count), token-type ratio, and word frequency of each letter to approximate each letter's difficulty and content. The instruments used have been validated by nearly sixty years of readability research related to how texts are written and can be simplified to increase the readability of text for a wide variety of audiences (DuBay, 2007). To perform the linguistic analysis of the debt letters, we used Readability Studio, a quantitative linguistics software program with the ability to analyze text and text files across many readability measures, including word count, token-type ratio, and word frequency (Oleander Software, 2020). In analyzing the text, we used Readability Studio to calculate the following measures, with results displayed in Table 1.

Table 1: Readability, Length, and Lexical Diversity of Debt Letters, by Institution Type (n = 24)

Institution type	ARI	FK	GFI	SMOG	AVG*	WC	TTR
Public 2-Year	15.2	14.8	13.1	15.8	14.7 (1.5)	447.5	0.50
Public 4-Year	15.1	14.9	12.1	15.7	13.9 (1.0)	572.9	0.52
Private 4-Year	15.3	15.9	12.0	15.8	14.7 (1.1)	572.6	0.52
All	15.2	15.1	12.1	15.8	14.1 (1.1)	542.0	0.51

Note: *Averages followed by standard deviations in parentheses.

- The Automated Readability Index (ARI). The ARI is a measure of readability difficulty that calculates the grade level of narrative text, examining the average word and sentence length of a given selection of text. The use of the ARI for this study's purpose is validated by its appropriateness for adult-level textual analysis, given the ARI's implementation by the Army National Guard and other branches of the United States Department of Defense. Moreover, the ARI has been found to be an accurate and valid measure of readability difficult across many settings (DuBay, 2007). ARI is measured by counting the number of words per sentence, number of keystrokes per sentence, and the overall number of words per sentence and then running a grade level calculation

$$G = (4.71 * (RP/W)) + (0.5 * (W/S)) - 21.43 \quad (1)$$

  where G = grade level, W = number of words, RP = number of strokes (characters and punctuation less sentence terminating punctuation, i.e., periods), and S = number of sentences (Kincaid & Delionbach, 1973).
- The Flesch-Kincaid grade level test (FKGLT). The Flesch-Kincaid grade level test calculates the grade level of technical documents and nonfiction based on sentence length and syllable count. The use of Flesch-Kincaid (FK) for this study's purpose is validated by its longitudinal use—over forty years—by the United States Navy in its evaluation of the reading levels of entry-level and experienced naval cadets. Moreover, the FK has been found to be an accurate and valid measure of readability difficult across many settings (DuBay, 2007). FK is measured by counting the number of words in the document, number of syllables in the document, and then dividing by the number of sentences. The calculation is

$$G = (11.8*(B/W)) + (.39*(W/S)) -15.59 \quad (2)$$

  where G = grade level, W = number of words, B = number of syllables, and S = number of sentences (Kincaid et al., 1975).
- The Gunning-Fog index (GFI). The GFI) calculates the grade level of a document based on numbers of sentences and complex words, defined as words that contain three or more syllables except for proper nouns, words

made three syllables by adding the inflections *-ed* and *-es*, and compound words composed of simpler words, i.e., *horsepower = horse + power*. The use of the GFI for this study's purpose is validated by its widespread use across a variety of disciplines for over forty years (Schlief & Wood; 1974; Wong, 1999). Moreover, the GFI has been found to be an accurate and valid measure of readability difficult across many settings (DuBay, 2007). GFI is measured by counting the overall number of words, overall number of complex words (words with three or more syllables) and then the overall number of sentences. The calculation is

$$G = .4*(W/S + ((C/W)*100)) \quad (3)$$

where G =grade level, W = number of words, C = number of complex words, and S = number of sentences (Gunning, 1952).

- The Simple Measure of Gobbledygook Readability Formula (SMOG). The SMOG is a measure of readability difficulty that calculates the grade level of any document at least 30 sentences in length based on the number of complex words and total sentences. A complex word is defined as one with three or more syllables, with complex sentences featuring a semicolon counted as two sentences. The use of the SMOG for this study's purpose is validated by its widespread use across a variety of disciplines for over forty years, especially the healthcare field where complex jargon (gobbledygook) is commonly used to describe medical conditions (DuBay, 2007). SMOG is measured by counting the number of complex words with three syllables or more per sentence and then the number of complex words in the overall document. The calculation is

$$G = C \text{ per } 30 \text{ sentence passage} \quad (4)$$

where G = grade level, and C = number of complex words (three syllables or more) using SMOG's proprietary conversion table (McLaughlin, 1969).
- Word count. Word count is the overall number of words in a text.
- Token-type ratio (TTR). TTR is the number of unique words divided by the overall word count of a text, calculated primarily as a proxy for lexical diversity. Texts with a higher TTR have a more differentiated lexicon than texts with lower TTRs. Additionally, TTRs are often expressed in decimals (0.54) or percentages (54%), but each expression holds the same meaning.

Table 2: Word Frequency Corpora Analysis of Debt Letters, by Institution Type (n = 24)

Institution Type			
Public 2-Year (n = 2)	Public 4-Year (n = 15)	Private 4-Year (n = 7)	All (n = 24)
your (27)	your (263)	your (101)	your (391)
you (22)	loans (185)	you (96)	you (300)
loan (14)	you (182)	loans (83)	loans (282)
student (14)	loan (163)	loan (60)	loan (237)
loans (14)	student (154)	federal (50)	student (204)
repayment (11)	information (85)	student (36)	federal (134)
amount (10)	federal (78)	repayment (33)	information (122)
information (7)	debt (68)	information (30)	repayment (109)
debt (7)	repayment (65)	direct (26)	debt (100)
financial (7)	financial (62)	debt (25)	interest (86)
borrowed (7)	interest (57)	interest (24)	financial (86)
education (6)	total (48)	year (22)	direct (73)
aid (6)	direct (45)	borrowing (22)	total (68)
federal (6)	estimated (38)	borrowed (21)	borrowed (61)
visit (6)	estimates (37)	total (18)	year (55)
please (5)	we (36)	academic (18)	estimated (54)
year (5)	borrowed (33)	financial (17)	estimates (53)
interest (5)	monthly (31)	estimated (15)	academic (50)
resources (4)	payment (30)	contact (14)	borrowing (49)
academic (4)	included (29)	estimates (13)	aid (44)
degree (4)	please (29)	private (13)	amount (44)
borrowing (4)	academic (28)	amount (13)	please (44)
future (4)	year (28)	limit (13)	monthly (43)
options (4)	aid (27)	included (12)	payment (40)
letter (3)	education (26)	payments (12)	education (39)
provided (3)	estimate (26)	grants (12)	estimate (37)
included (3)	resources (24)	aid (11)	private (37)
students (3)	private (24)	university (10)	resources, we (36)

Note: Frequency in parentheses; only content words reported (corpora cleaned of articles, prepositions, conjunctions).

Finally, the research team merged all debt letters (a corpus) and then merged debt letters separately by institution type (two-year public, four-year public, and four-year private) to understand the lexical diversity by specific terms used in debt letters. We used Readability Studio to analyze the word frequency of the corpus and the individual institutional corpora; results are displayed in Table 2 of this study.

Qualitative Analysis

To add an additional layer of meaning to the analysis of debt letters, we also employed qualitative measures to better understand what types of information has been included in debt letters. To build upon prior studies (Darolia, 2016; Darolia & Harper, 2018; McKinney, 2017; Stoddard et al., 2017; Taylor & Holthaus, 2020), we first generated a codebook (Miles et al., 2014) of debt letter content that we knew appeared in many debt letters that we have reviewed in our professional practice and that have appeared in peer-reviewed studies. These codes included aggregate debt totals, loan types, interest rates, cost estimates, estimated or real payment amounts, and contact information. We then employed a double-blind coding approach by each using the codebook to code all 24 debt letters and then came together collectively to discuss our codes, following best practices (Maxwell, 2013; Miles et al., 2014).

After learning our codes were identical during the first round of coding, the team re-coded each debt letter, searching for other information that may not have been captured by our initial codebook. Again, we performed another round of double-blind coding and compared results collectively, learning that we also needed to generate codes for the presence of multimedia within a debt letter (e.g., a table, picture, infographic, embedded video, etc.) and hyperlinks (e.g., the presence of a hyperlink, how many hyperlinks were embedded in each debt letter). Once these additional codes were generated, the research team performed one final, third round of coding to ensure accuracy, comparing results collectively and finding that all codes were uniform across all members of the research team. The results of this analysis are displayed in Table 3 of this study.

Table 3: Descriptive Analysis of Debt Letter Content, by Institution Type (n = 24)

Institution type	Aggregate Totals	Loan Types	Interest Rates	Cost Estimate	Payment Amounts	Contact Information	Multimedia	Hyperlinks
Public 2-Year (n = 2)	100%	0%	0%	0%	50.0%	100%	0%	100%
Public 4-Year (n = 15)	100%	46.7%	86.7%	20.0%	80.0%	66.7%	33.3%	100%
Private 4-Year (n = 7)	85.7%	71.4%	85.7%	28.6%	85.7%	71.4%	28.6%	85.7%
All	95.8%	50%	79.2%	20.8%	79.2%	70.8%	29.2%	95.8%

RESULTS

The results of this study are presented through each research question.

Research Question 1: How Readable Are Debt Letters?

Data in Table 1 suggest that many debt letters may not be readable for first- and second-year college students who read between the 12th-and 14th-grade English reading comprehension level. Across all sectors, the average debt letter was written at the 14.1 grade level, with public two-year and private four-year institutions composing debt letters at the 14.7 grade level. However, overall standard deviations in Table 1 indicate that debt letters within institution type may not vary by readability level, as the highest standard deviation was within public two-year institutions at 1.5 grade levels of reading comprehension. Yet, there was variance among different readability levels, as the ARI, FK, GFI, and SMOG all measure different syntactic (sentence structure) and semantic (word choice) elements of a sentence or paragraph.

Regarding semantics, the ARI, FK, and SMOG all heavily calculate lexical complexity as part of the readability formula. Overall ARI (15.2), FK (15.1), and SMOG (15.8) scores compared to the overall GFI score (12.1) likely indicate that lexical difficulty most influences the high readability of debt letters in this study, as measured by the ARI, FK, and SMOG. The GFI is measured by counting the number of complex sentences and words in a text, with complex words being defined as words with three syllables or more. However, the GFI more heavily calculates sentence complexity, putting less emphasis on lexical complexity and a text's syntactic structure. We elaborate on this finding in the Discussion section of this study.

In terms of word count (text length), public two-year institutions (n = 2) composed much shorter debt letters than four-year peers, as two-year institutions used 447 words on average to communicate debt to students, whereas four-year institutions used roughly 572 words to communicate the same. Although this study includes a weak sample of two-year institutional debt letters, the word count difference between institution types was a notable finding of this study. Akin to similar word counts within four-year institutional debt letters, data in this study also suggest that debt letters may share a uniform lexical complexity across the entire letter, evidenced by TTRs between 0.50 and 0.52 across all institutions. These similar TTRs likely indicate that the lexicon that institutions employ is similar, meaning that common words such as *loan*, *student*, and *repayment* appear in all debt letters, no matter the institution. In addition, TTRs of 0.50 indicate that 50% of the words used in debt letters are unique, meaning they are only used once in the letter. With this information, it is possible that students may only encounter key terms in a debt letter once, failing to provide the student with enough context in the letter and repetition of the word to reinforce its meaning and truly educate the student of the term. We also elaborate on this finding in the Discussion section of this study.

Research Question 2: What Words Are Used in Debt Letters?

Regarding the words used in debt letters across different institutional sectors, data in Table 2 suggest that debt letters tend to address students in the second person (*you*, *your*) while using much of the same lexicon (*loan*, *student*, *information*, *debt*, and *repayment*). However, there were subtle institutional differences, such as the frequency of the word *federal* across debt letters in public two-year and four-year debt letters. For instance, the word *federal* only appeared three times on average across two public two-year debt letters (1.5 times per letter), whereas the word *federal* appeared 78 times across 15 debt letters from public four-year institutions (5.2 times per letter) and 50 times across 7 debt letters from private four-year institutions (7.1 times per letter). Here, four-year institutions seemingly discuss the *federal* nature of student debt and the redirecting of students away from their institutions of higher education and toward repayment at the federal level.

Additionally, debt letters across all sectors seem to emphasize *repayment* and *borrowing/borrowed*, suggesting that one of the purposes of student loan debt letters is to inform students that they have borrowed money which must be repaid. As all debt letters uniformly emphasized concepts such as *loans*, *interest*, *financial*, and *debt*, debt letters in this study suggest that institutions mean to educate their student borrowers regarding their student loan debt, making a novel contribution to the literature. Prior studies have suggested that student loan debt letters may be used as a tool for students to alter their borrowing habits or change their academic pathways (Darolia, 2016; Darolia & Harper, 2018; McKinney, 2017; Quinton, 2016; Stoddard et al., 2017). However, the language used in the debt letters in this study suggests that perhaps the primary function of debt letters is to inform students of their loan debt and how to repay those loans. Yet, it is important to note that this information may indeed change a student's behavior, and without any form of quantitative analysis to explore student behavior *after* reading a debt letter, the body of research in this field remains incomplete. As a result, students receiving a debt letter may be changing their behavior, including changing their major, course load, institution, or enrollment status, leading to varied postsecondary outcomes as a consequence of the debt letter.

Table 2 also indicates that many public four-year debt letters provided estimates of student loan debt and not actual repayment amounts or monthly payments, evidenced by the frequency of *estimated* (38 occurrences), *estimates* (37), *estimate* (26) across fifteen letters (6.7 occurrences per letter). Private four-year debt letters were slightly less likely to mention the *estimated* nature of debt information than public four-year institutions, as *estimated* (15 occurrences) and *estimates* (13) appeared across seven private four-year debt letters (4 occurrences per letter). Inversely, public two-year debt letters did not mention any form of *estimate,* even though there were only two public two-year debt letters in this study. As a result, students receiving public four-year debt letters may either be more aware of the estimated nature of their student loan debt than students receiving debt letters from private four-year or public two-year institutions.

There were also several outliers in the data, as public two- and four-year institutions composed the only debt letters to use the word *please*, while public four-

year institutions were the only ones to use the second person pronoun *we* to refer back to the institution. Although it is unclear why several institutions chose to use these terms to inform their students about student loan debt, using the word *please* may be attributed to institutions encouraging their current or former students to *please visit* or *please contact* their financial aid office for more information. Moreover, using the word *please* may have been an attempt at encouraging or nudging the student to contact a resource if they required assistance, yet the same encouragement or nudging was not apparent in private four-year debt letters. Additionally, after reviewing the public four-year debt letters, all instances of *we* were used from the sender's perspective without including the student (ex: *We encourage*, *We know*, *We want you to*). This indicates that the usage of *we* could have been used to emphasize that the institution was sending the letter and thus, the letter could be seen as a trusted source of information. Also, the usage of *we* could have been a way to personify the institution, rendering the debt letter less formal and perhaps more relatable or friendly from a student's perspective. However, without student input and a longitudinal analysis of student behavior, this finding remains speculative.

Additionally, the word *grants* (12 occurrences) only appeared in private four-year debt letters, further suggesting that different types of institutions communicate student debt in different ways, even though the majority of students attending institutions of higher education access the same types of federal loans from the same system. The occurrence of *grants* in private four-year debt letters could suggest that private institutions remind students to seek outside, non-loan financial resources, such as grants, in lieu of taking out student loans within debt letters. Moreover, private four-year debt letters may make mention of *grants* more often than public debt letters, as private institutions may be better positioned to award institutional grants to their students to offset these students' cost of education and their need for student loans. This finding would also suggest that private four-year institutions may view debt letters as an educational tool to inform their students of alternative sources of funding that do not need to be repaid, in addition to informing students of their outstanding student loan balance, interest rates, and estimated monthly payments.

Finally, as all debt letters were sent by the institution to the student, the use of the word *we* by public four-year institutions may signal that public four-year institutions were more willing to refer to themselves, and thus their institutional services, as the collective pronoun *we* is inherently self-reflexive. This finding reveals that public four-year institutions were more likely to position themselves as a collective organization that a student can contact for more information, whereas other institutions may not have the capacity to respond to all student questions, rendering it difficult for the institution to refer back to itself (as *we*) for students to access for more information.

Research Question 3: What's in a Debt Letter?

Across twenty-four unique debt letters, data in Table 3 suggest that nearly all debt letters include loan aggregate totals (95.8% of all letters), interest rates

(79.2%), payment amounts (79.2%), and hyperlinks to additional information (95.8%). However, these percentages differ by institution type, as public two-year debt letters did not mention interest rates, while only 85.7% of private four-year debt letters included hyperlinks, while all public debt letters did so. Like the data in Table 2, the content presented in Table 3 suggests different institution types include different information within debt letters.

Also echoing earlier findings, few debt letters included cost estimates of attending an institution (20.8% of all debt letters), signaling that debt letters primarily serve the purpose of informing a student of their debt and little else: the cost of college is separate from the debt a student accrues. Additionally, only 50% of all debt letters (and no public two-year debt letters) included information about what types of loans a student holds. This finding also indicates that institutions believe it is more important to tell a student *how much debt they owe* and not *what kind of debt they owe*, failing to educate the student regarding the different types of student loans and their corresponding repayment obligations.

Data also suggest that many debt letters in this study were meant for one-way communication of student debt: from institution to student and not from student to institution. Exemplifying this communication style is the finding that only 66.7% of public four-year institutions included contact information on their debt letter, meaning that the institution wanted to *communicate with the student* but did not encourage *communication from the student.* However, a higher percentage of private four-year debt letters and all public two-year debt letters included contact information, suggesting that perhaps public four-year institutions prefer one-way communication with a student or simply do not have the resources to field questions from students, given the volume of debt letters that larger, public four-year institutions may send.

Finally, data in Table 3 suggest that debt letters in this study were meant to be sent electronically, evidenced by the high percentages of debt letters including hyperlinks (95.8%). However, it seems that many debt letters did not fully embrace the digital nature of the debt letter and the flexibility of modern technology, as very few debt letters included any form of multimedia, such as a video, picture, table, or other way to differentiate student loan debt information for a wide variety of learners. Here, it seems many debt letters were meant to be emailed or accessed from a student's institutional portal, yet these debt letters prioritized text and not other communication elements, potentially limiting how well students can comprehend the information in the debt letter.

DISCUSSION

The following section provides limitations as well as implications for research, practice, and policy.

Limitations

As with any study, there were several limitations of this work, some of which may be addressed by future research.

First, the research team was only able to gather 24 unique debt letters from 24 different institutions of higher education, whereas the most recent available data from Attigo (2020) suggests that over 2,000 institutions of higher education across thirteen states may be sending debt letters to their current and former students with outstanding student loan debt. As a result, this study's small sample does not represent the overall population of hypothetical debt letters. Moreover, this study only analyzed two student loan debt letters from public two-year institutions, so future research could focus much more on how two-year institutions communicate debt to their students. However, it is notable that many institutions did not feel comfortable sharing their debt letters publicly while also consenting to having their debt letter studied and reported on. From here, future studies could collect larger numbers of debt letters and perform similar analyses to inform the field.

Second, this study employed quantitative linguistic and qualitative measures to analyze the readability, simplicity, diction, and content of debt letters. Yet, the research team did not engage with college students—or any human audience—to explore whether these students or other audiences could read the debt letters, nor did we explore whether students or other audiences would change their behaviors as a result of reading the debt letter. From here, future research could explore whether relevant parties can read the debt letter, whether they would act upon the letter in any number of ways, and if the debt letter could include or exclude any information that would render the letter more readable or informative.

Third, the research team did not learn when debt letters were sent to students or how, as timing (time of year, time of day, day of week) and mode (email, text message, physical mail) may change how a student or audience may interact with and interpret the letter. Akin to prior studies related to the effect of debt letters (Darolia & Harper, 2018; McKinney, 2017; Stoddard et al., 2017; Taylor & Holthaus, 2020), there has not been a study which controls for specifically when a debt letter is delivered. Subsequently, it is difficult to assess whether students prefer to receive their letter over specific media or at specific times, rendering the letter more attractive to read. Moreover, institutions using different content management systems (CMSs) may have different capabilities regarding the NSLDS information exporting to letter format, possibly restricting what information can be included in debt letters and whether that information is up-to-date and accurate. Given these institutional uncertainties, it is difficult to assess the effectiveness of the debt letters in this study.

Implications

Results from this study hold much for future research, practice, and policy related to student financial aid and the communication of debt to student loan holders.

To begin, researchers should continue to investigate how student loan information is communicated to students. As previously detailed, the ED and FSA have made numerous attempts to simplify the financial aid application process and how students access their student loan information. However, research has continued to find that students and their support networks struggle to understand

many elements related to financial aid, including how to interpret their student loans and the best course of action to successfully repay them (Darolia & Harper, 2018; Marx & Turner, 2020; Taylor & Holthaus, 2020). Here, researchers could explore student preferences for student loan information communication and whether students prefer a debt letter over another form of communication, such as a phone call, text message, or other media (Castleman & Page, 2016).

This study found that many debt letters were likely incomprehensible by most college students of average English language reading ability, as the average debt letter in this study was written above the 14th grade reading level. This finding echoes prior work that found many debt letters were written at the 12th grade reading level or higher (Taylor et al., 2021). In a United States context, seniors in high school or secondary school may be expected to read and comprehend English at the 12th grade level, but data in this study suggests many first- and second-year college students (expected to read at the 13th or 14th grade level) would be unable to read their institution's debt letter. Additionally, many of the jargon terms in debt letters in this study may be difficult for readers to understand. From here, researchers could further investigate how institutions of higher education communicate debt to their students and whether this communication could be simplified and made to read at an appropriate level for college students and graduates.

Regarding practice, many debt letters in this study contained complex language and difficult sentences for the average college student to read and comprehend. Prior research articulated that financial aid-related information may be especially difficult for college students to read given the financial aid-related jargon in the communication, as well as the financial stress that a student may be under, contributing to lower reading comprehension abilities (Taylor, 2019a, 2019b). For example, consider this sentence excerpted from a debt letter in this study:

> Interest that accrues while you are enrolled, which must be paid first or capitalized (added to your debt), has not been projected here and therefore has not been included in these estimates.

This sentence is complex because it contains difficult jargon (*accrues* and *capitalized*) as well as a structure that produces a 15th-grade English reading comprehension level. This implies that practitioners could simplify the text and avoid jargon to render the information more intelligible. However, this sentence could be rewritten in simpler terms at a much lower reading level:

> These numbers are the best estimates available and many factors can impact your actual monthly repayment amount, including gained interest.

This rewrite is much easier for students to read and does not contain complex jargon that students may not understand. Additionally, this simplified sentence makes it clear that the student loan debt amount in the letter is an estimate and that the student should understand that other factors may impact the actual amount of debt they have and how to repay that debt. Although the term *interest* may still be considered jargon, it is a financial term that is likely difficult to replace with a synonym and is integrated into many other financial contexts (e.g., investing, credit, etc.). Here, this simplification demonstrates that simplified versions of financial aid information may not be ideal and are likely restrained by reliance on certain jargon

terms in broader financial contexts. Additionally, data in Tables 2 and 3 of this study make it clear that many debt letters estimate costs, do not often provide information about scholarships or other sources of funding, and some do not contain contact information for a student to get help understanding their debt letter. For these reasons, practitioners should write debt letters in simpler, shorter terms and always include contact information in the letter so a student can seek help if necessary.

Data from this study also make it clear that debt letters are written in a variety of ways and are in no way standardized from institution to institution. A student may receive a debt letter from their most recent institution, enroll elsewhere, and then receive a debt letter from a different institution containing drastically different information in a debt letter that could be written in a different way or delivered through different media (e.g., mail, email, text, etc.). Institutions should consider collaborating with the ED to compose a common debt letter—written in simple, short terms with actual payment amounts at the time of the letter's delivery—to ensure that students are receiving a clear, consistent message about their debt, no matter where they enroll and take on debt.

Finally, regarding policy, the ED should move beyond MPN additions and student loan acknowledgements to engage with NSLDS information and connect with students personally to deliver updated, accurate student loan debt amounts and payment options. ED has access to student contact information, including phone numbers, email addresses, and home addresses, and the ED should consider sending students accurate and timely notifications of their student loan debt, in addition to simplifying the NSLDS website for students and their support networks. Simply put, a student loan debt letter is a written document containing information that already exists in the NSLDS portal and to which every student with outstanding student loan debt has access. From here, policymakers ought to first simplify NSLDS to make it more accessible to students and their support networks, and then these policymakers should work with practitioners and the ED to simplify and standardize debt letters for all Title IV (federal student loan participating) institutions of higher education to use.

Yet, given the challenges that U.S. higher education—and global higher education—amid the COVID-19 pandemic, change may be hard to come by. As a result, perhaps now more than ever, institutions and ED must partner to simplify and standardize the student loan debt communication process. If these steps are not taken, students will likely continue to borrow money for college without understanding the short- and long-term impacts of their financial decisions and subsequent debt. This lack of understanding may further minoritize students, confusing the federal financial aid repayment process and restricting the postsecondary and post-postsecondary success of the future leaders of the United States.

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Z. W. Taylor, PhD, is an independent scholar who holds a PhD from The University of Texas at Austin. He has published over 120 peer-reviewed articles and chapters since 2017. Email: zt@utexas.edu

Karla Weber is the Communications Manager for the Office of Student Financial Aid at the University of Wisconsin-Madison. Her research interests center around financial aid communication best practices. Email: karla.weber@wisc.edu

Gretchen Holthaus is the Director of Graduate Studies at Wichita State University. Her research interests center around financial literacy in higher education. Email: gretchen.holthaus@wichita.edu

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RANKINGS AND THE IDENTIFICATION OF INEQUITIES WITHIN THE BRAZILIAN FEDERAL UNIVERSITY SYSTEM

W. E. Hewitt
University of Western Ontario, Canada

ABSTRACT

International and national university ranking exercises have attracted increasing criticism in recent years, as observers question the integrity of the methodologies employed, the influence of rankings on institutional decision making, and ultimately the utility of the exercise. At the same time, for stakeholders *per se* rankings can have beneficial effects, particularly in enhancing institutional recognition, attracting top faculty and researchers, as aids to student choice and decision-making, and stimulating program improvement. Another important effect—which has drawn scant attention in the literature to date—relates to the impact of rankings exercises in exposing unintended quality related inter-institutional anomalies within university ecosystems. In this study, the role of rankings in this regard are examined in the specific case of Brazil, through an investigation of regional inequities in that country's publicly funded federal university network.
Keywords: Brazil, universities, rankings, post-secondary findings, regional inequities

In recent years, university rankings have become a multi-million-dollar enterprise, attracting the attention of a broad range of actors within the academic system, from parents and prospective students, to faculty, university administrators and even national and regional governments. Among ranking exercises, a relatively small number of players now dominate international markets, including the QS World University Rankings ([QS] 2018), the Times Higher Education ([THE] 2018) rankings, and the Academic Ranking of World Universities ([ARWU] 2018). These are joined by a plethora of national and specialist rankings sponsored by government,

newspapers and magazines, not-for-profit organizations, and occasionally governments.

Often, the specific objectives of these exercises vary. For the most part, however, comparative assessments of institutional quality—employing both qualitative and quantitative methodologies—remain the primary objective, touching on core activities and competencies within the academic enterprise. Typically, these will include teaching and learning, research productivity and impact, international engagement, community involvement, as well as factors linked to perceived reputation.

Given the competitiveness inherent in externally directed institutional assessments of quality, rankings and their sponsors have attracted more than their share of critics. Methods of data quality, data quality, analysis, and presentation are frequently cited in comparison and critique of rankings quality. Yet, the popularity of rankings persists, insofar as they can and do provide critical insight for prospective students into the relative quality of target institutions, help institutions themselves to attract top talent, and provide important comparative data to national ministries of higher education, as they seek to ensure transparency, accountability. and justify investments across higher education networks. With respect to this latter benefit, rankings also provide valuable means for stakeholders—and taxpayers—to test government claims with respect to system quality and accessibility. This is particularly true in regard publicly funded systems, where taxpayers and students would reasonably expect uniformity in terms of program offerings and especially quality, right across the entire system array.

This study examines precisely how rankings help expose such system anomalies in the case of the federally funded university network in Brazil, a country of some 210 million people. One of the largest of its kind in the world, the Brazilian federal network is shown to possess considerable variation in assessed quality across the nation's five principal regions. This study further identifies the key factors that underly and work to maintain these, within a centrally funded network that ostensibly relies on highly evolved funding formulas to ensure system fairness in resource distribution.

BACKGROUND

Assessments of university quality have a long history. It was not until the 1980s, however, that serious attempts at systematic institutional rankings at the national and international level began to emerge. Since that time, in academic circles at least, rankings organizations such as THE, ARWU, and QS have become international powerhouses, attracting broad attention across stakeholders and even the general public (Marope & Wells, 2013).

Perhaps unsurprisingly, given the sources of rankings exercises (frequently in commercial enterprise), the competition they engender among institutions, and even their presumed influence over student decision-making and stakeholder perceptions of quality—rankings exercises have attracted significant criticism. Much of this focuses on the types of data that are collected. For example, critics have argued that

rankers tend to choose variables and or data that are relatively easier to collect and quantify as compared with what might actually matter in assessing academic quality (Hazelkorn, 2013; Liu, 2013). Measures of institutional quality linked to the numbers of resident faculty with doctoral degrees, for example, which are relatively easy to calculate, are almost invariably included in ranking designs, while others, such as support services offered to students, the quality of campus amenities, or access to public transit, are not (Maxwell, 2018). Compounding this bias are efforts undertaken by institutions with deeper pockets—either on their own, or with the help of consultants—to mine and massage readily available quantitative data in ways that directly influence ranking scores (Maxwell, 2018; Marope & Wells, 2013). Others have criticized the use of qualitative factors, particularly those related to assessments of institutional reputation that are rooted in individual impressions and may have little or no bearing on quality (Anowar et al., 2015; Liu, 2013). Further, Nyssen (2018) has pointed to the complete exclusion of some variables, particularly those associated with university contributions to local economic development. Similarly, Ordorika and Lloyd (2013) discuss the relative omission of factors assessing the role of post-secondary institutions in community service and health care provision, particularly where community-based services are lacking.

Other observers have focused on issues associated with data analysis. Both Maxwell (2018) and Bekhradnia (2016) for example, have pointed to limitations attributed to the use of two-dimensional ordinal ranking scales that occlude potentially wide variations across key variables within institutions, or between them, including variations in the quality of specific programs. In a similar vein, Anowar et al. (2015) have pointed out that frequently rankings fail to give proper credit to participating institutions when top ranked programs or research projects and successes are shared across universities and or other organizations. Finally, Bekhradnia (2016) has questioned the use and choice of specific *weighting factors* in the calculation of ratings that may favor some variables over others (i.e., research over community service).

Despite such criticisms, rankings remain as popular as ever, and across a broad range of stakeholders. Most obvious among these are students—and their parents—who frequently foot the bill for educational services. Indeed, both have become savvy consumers, weighing costs of tuition and living expenses against the likely gains of an education at a *top-ranked* institution (Buela-Casal et al., 2007; Hazelkorn, 2013). This is as true domestically, moreover, as it is internationally, as the popularity of study abroad activities has continued to grow in recent years. As of 2018, over five million students were attending institutions outside their own country annually (OECD, 2020). In making value for money decisions about attendance at one of the world's tens of thousands of universities, rankings can and do provide a critical resource where other sources of information may be limited (Sowter, 2013).

Students and their families are not the only avid consumers of published rankings. Universities themselves participate not only in the provision of institutional data, but actively seek access to the products of rankings. For example, rankings are often used by institutions for the purposes of recruitment—whether directed to students, post-doctoral fellows, or even faculty who are keen for employment at

reputable institutions. Rankings are also attractive as measures of quality and performance assisting appeals for donations from alumni and community supporters, as well as governments (Buela-Casal et al., 2007; Hazelkorn, 2013; Sowter, 2013).

For their own part, governments have also shown increasingly proclivity to use rankings for various ends. In many countries, rankings can and do provide input regarding strategic investment decisions, particularly where universities may be used to ensure delivery of regional or national priorities linked to economic development, health care, or international leadership in research and teaching (Marope & Wells, 2013). Ostensibly, they can also be used as a test of governments' ability to deliver on national post-secondary education systems that ensure consistency across networks or systems, and thus presumably reasonable levels of quality for citizens, regardless of where people may choose to study. This is particularly important in the case of publicly funded institutions, where citizens may have well-founded expectations that universities that are funded by their national governments or by sub-national units would be of uniform or reasonably uniform quality, regardless of their location or client-base. As rough proxies of institutional quality, rankings would help to establish this. Interestingly, however, this is a seldom studied aspect of the benefits of rankings exercises.

As a partial remedy to this deficiency, this study focuses on regionally based variations in assessed quality within Brazil's federally funded system of universities, as revealed by country's premier national university rankings exercise. Although all 63 of the federally funded universities examined are supported centrally from the national budgeting process using a formula with uniform inputs, ranking data reveal serious discrepancies between institutions that largely follow geographic patterns of affluence that largely define the nation (Bacha, 2012). This study attempts to both catalog these differences and to offer an assessment of the underlying structural features of the system that seemingly work to ensure its continuance.

The Brazilian University System

While the origins of the Brazilian post-secondary education system can be traced to the time of the country's independence from Portugal in 1822, it was not until the middle of the 20th century that the first 19 universities were fully established (Nader, 2017; Steiner, 2007). Significant expansion was not to occur until nearly twenty years later, following the military coup of 1964 and the implementation of a dictatorial regime that lasted until 1985. Strongly authoritarian and technocratic, the military government invested heavily in rapid economic development and education, including universities. As a result, post-secondary enrollments began to increase quickly during the dictatorship, as did the number and types of institutions themselves. These included public state universities, smaller *faculties*, private institutions, and a growing cohort of universities and training centers funded directly by the federal government itself. Such growth largely continued following the collapse of the regime in 1985 and a resumption of democratic governance. Today, Brazil's post-secondary system is one of the largest in the world, with approximately eight million students enrolled in over 2500 institutions of all types (Balbachevsky,

2013; Del Vecchio & Santos, 2016; Diniz & Goergen, 2019; Ministry of Education [MEC], 2017; Stallivieri, 2006).

Of these, however, only 197 are deemed by the MEC as full-fledged *universities*, accounting for half of all enrollments, at just over four million (see Table 1). The majority of these in turn, some 108, are publicly funded, operating at the federal, state, and municipal level, and are tuition free. Entry, however, is dependent upon student scores on the national university entry exam, the *Exame Nacional do Ensino Médio* (ENEM). All other universities are private, operating either as for-profit enterprises, or denominationally based not-for profits. In either case, such institutions depend wholly on tuition and other fees.

Table 1: Universities by Type and Enrollment, 2016

Type of University	Number	Enrollment
Federal	63	1,083,050
State	40	547,181
Municipal	5	49,248
Private	89	2,642,613
Totals	197	4,322,092

Note: MEC, 2017: Tabela 4.01; MEC, 2018

Resources available to universities of different types vary significantly. Relying as they do on student tuition and fees, the finances of private institutions are largely dependent upon market conditions and enrollments. Public institutions are another matter, but even here, levels of support can vary significantly. State and municipal institutions are largely dependent on transfers from corresponding levels of government and thus linked to budgetary priorities and regional income levels.

For its part, the federal university system—the single largest component of the publicly-funded array—was designed to mitigate this challenge, through the creation of a centrally-funded model that would ensure a measure of uniformity across states and regions regardless of local conditions. As part of the broader post-secondary system, the federal network has been guided by a multiplicity of federal laws and directives guiding its operations (and those of individual institutions) since 1968, when the network was first established. These initial directives were reinforced by guarantees contained in Brazil's democratic Constitution of 1988, the 1996 *Lei de Diretrizes e Bases* (Law of Directives and Foundations) and subsequent pieces of legislation—all intended to promote the establishment of an elite cadre of public, educationally autonomous institutions supporting the pursuit of knowledge and training, research, and community outreach of the highest caliber (Moreira et al., 2018; Souza et al., 2019). In further fulfilment of this national objective, the Brazilian government undertook a significant expansion of the system in the last two decades. Between 2003 and 2010, in fact, the number of federal universities increased from 45 to 59. By 2018, a total of 63 institutions were in place across Brazil, with campuses in operating both within and increasingly outside state capitals (Reestruturação e Expansão das Universidades Federais [REUNI], 2021).

As part of the federal budgeting process, and to manage resource allocation, the federal government had established in 1994 an algorithmic funding allocation model for federal universities based a number of key performance variables (Reis et al., 2017). These include the number of students at an institution, the number of professors, quality of physical infrastructure, educational levels of faculty, research output, the number of courses taught, and graduation success rates, among others. A 2005 revision contained an amendment to include two additional elements linked to operational and infrastructure requirements, respectively, and in 2010, considered factors related to commercialization of patents, and student-professor ratios. Also included in the calculation are the results of assessments of educational quality managed by the MEC's National System of Post-Education Evaluation (Sistema Nacional de Avaliação de Educação Superior-SINAES), and the Coordinating Body for Graduate Training (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior-CAPES), which monitor the quality of graduate level courses and research (Nader, 2016; Tenório & Andrade, 200). Still and all, even in the view of the Ministry of Education itself, which oversees the process, Brazil's federal university funding distribution model remains overwhelmingly based upon quantitative indicators, with quality assessments accounting for only 10 percent of the model ('MEC estuda', 2019). It should be noted as well that aside from federal transfers, federal universities have limited powers of income generation from local sources. Historically, based on latest data available, such income has been limited to no more than approximately 3.5 percent of total revenues (Stallivieri, 2006).

Ostensibly, funding models such as these have at their base an intention to ensure transparency, accountability, and fairness. To a considerable extent as well, they are designed to encourage maintenance of performance levels within institutions and thus ensure that quality education can be maintained across the system, and within each of Brazil's five major regions and 26 states. Consequently, Brazilian citizens and particularly students, might expect a generally equivalent quality of education within the federal system regardless of where they choose to study. This is in fact clearly stated within Brazil's 1988 constitution, which establishes the obligation the State to ensure "access to the highest levels of instruction, of research and of artistic creation, subject to the ability of each citizen" (Moreira et al., 2018, p. 140).

As will be shown in the following sections, in the Brazilian context, this has not generally been the case. Based upon analysis of findings from Brazil's national university rankings, the study reveals significant disparities in institutional performance—and thus arguably educational quality—across the federal system, largely associated with regional income levels.

DATA AND METHODS

Data informing this study were secured from several sources. The rankings data cited above were secured from the Folha de São Paulo which publishes each year Brazil's leading comprehensive national University Rankings (Rankings Universitário da Folha—RUF). The variables used to determine the rankings, the methodologies

employed, all the underlying data, and the final rankings themselves are made publicly available, and are used here with the permission of the *Folha*. The ranking is restricted to educational organizations classified by the MEC as universities (*universidades*), and with slight variation, includes all of the institutions listed in Table 1, including the 63 within the federal system.

The ranking exercise itself is conducted in a manner like the major global rankings (such as THE or QS) and adapted to the Brazilian reality in ways similar to other national rankings such as Maclean's (Canada), the U.S. News and World Report (US), and the Guardian (UK). The classification of institutions is based upon five criteria: academic research (42%), quality of teaching (32%), market impact (18%), innovation (4%) and internationalization (4%). The specific measures utilized are presented in Table 2, and each institution was assigned a score on each variable. A final score was then calculated out of 100, based on the sum of the partial scores for each variable which hen serves as the basis for the institutional rankings, numbered from 1 to 196.

Table 2: Ranking Criteria and Weights, Ranking Universitário Folha (RUF), 2018

Criterion	Weight (%)
Research	**42**
Total publications	7
Total citations	7
Citations per publication	4
Publications per faculty member	7
Citations per faculty member	7
Publications in national journals	3
Funding per student	3
Percentage of faculty considered productive by CNPq	2
Theses per faculty member	2
Teaching	**32**
National poll of university faculty	20
Percentage of faculty with Masters or Doctorate	4
Percentage of full and part-time faculty	4
Average *Enade* score of entering students	4
Market	**18**
National poll of company HR professionals	18
Innovation	**4**
Number of patents registered	2
Studies in partnership with industry	2
Internationalization	**4**
International citations per faculty member	2
Percentage of internationally co-authored publications	2

Note: Folha, 2019b

This information was supplemented with additional data on each institution not available from the RUF, including geographic location and levels of per capita income, institutional budgets and expenditures, total and program enrollments, demographic characteristics of students and teaching staff, and qualifications of faculty. These were secured from a variety of sources including the Brazilian Federal budget, the Ministry of Education, and the federal statistical agency, the *Instituto Brasileiro de Geografia e Estatística* (IBGE). Taken together, the dataset formed a very rich portrait of both the ranked institutions themselves and ranking factors linked to measures of educational quality. To further assess the relationships between these various factors, the data were analyzed using SPSS.

While this study refers to the larger set, or subsets of institutions, the focus in the analysis remains the 63 institutions that form the Brazilian federal university system. It is important to note that these institutions represent the entire population of federal institutions, and not a sample of a larger group. Consequently, descriptive statistics and the results of various analyses presented here directly describe the situation of the federal network as it currently exists, obviating the need to apply inferential statistics such as measures of significance.

RESULTS

As a first step in the analysis, the author examined the 2018 RUF results focusing on differences in scores across university types, presented in Table 3. Notably, there are significant differences in rankings across categories of institutions largely related to sources of funding. Publicly funded institutions, whether at the federal or state level, generally outperform municipally supported or private institutions by a fairly wide margin, with federal universities posting scores significantly above their state counterparts.

Table 3: Mean Performance Scores by Institutional Type, 2018

Type of University	N	Mean Score
Federal	63	62.73
State	38	47.16
Municipal	6	25
Private	89	39.87
Total	196	

Note: Folha, 2019a

Table 4 presents a closer examination of the top 20 performing institutions across Brazil by score, revealing some notable trends. To begin with, and as expected, virtually all of the top performing institutions are publicly funded, with the exception of two private institutions—both linked to Brazil's Catholic Church. Second, despite their lower performance on average, several state institutions are represented, including in the very top rank, suggesting a wide variation in the rankings

performance of universities in this category. Third, most of the institutions listed tend be geographically clustered in Brazil's South and Southeast regions which, as shown in Table 5, are among the wealthiest in Brazil. The sole exceptions are the Universidade de Brasília, in Brazil's Federal District (located in the Central-West), the Universidade Federal do Ceará, the Universidade Federal de Pernambuco, and the Universidade Federal da Bahia (all located in the Northeast). Not one university in the Northern region of Brazil makes the list.

Table 4: Top 20 Institutions in RUF Ranking, 2018

University	Level	RUF Rank
Universidade de São Paulo (USP)	State	1
Universidade Federal do Rio de Janeiro (UFRJ)	Federal	2
Universidade Federal de Minas Gerais (UFMG)	Federal	3
Universidade Estadual de Campinas (UNICAMP)	State	4
Universidade Federal do Rio Grande do Sul (UFRGS)	Federal	5
Universidade Federal de Santa Catarina (UFSC)	Federal	6
Universidade Federal do Paraná (UFPR)	Federal	7
Universidade Estadual Paulista Julio de Mesquita Filho (UNESP)	State	8
Universidade de Brasília (UNB)	Federal	9
Universidade Federal de Pernambuco (UFPE)	Federal	10
Universidade Federal de São Carlos (UFSCAR)	Federal	11
Universidade Federal do Ceará (UFC)	Federal	12
Universidade do Estado do Rio de Janeiro (UERJ)	State	13
Universidade Federal da Bahia (UFBA)	Federal	14
Universidade Federal de Viçosa (UFV)	Federal	15
Universidade Federal Fluminense (UFF)	Federal	16
Universidade Federal de São Paulo (UNIFESP)	Federal	17
Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS)	Private	18
Pontifícia Universidade Católica do Rio de Janeiro (PUC-RIO)	Private	19
Universidade Federal de Goiás (UFG)	Federal	20

Note: Folha, 2019a

A review of institutional scores for state and federal institutions within the entire RUF listing (see Table 5) provides further insight into differences across public institutions and regions. As expected, for almost every region of Brazil, federal

institutions outscore state universities, and by a fairly wide margin (see Table 6). The sole exception is the Southeast, where these two institutional types are essentially tied. It comes as little surprise, consequently, that the only state universities making the top 20 list come from this region, with three from the state of São Paulo alone.

Table 5: Regional Population Distribution and GDP per Capita, 2018

Region	GDP/Capita	Population (%)
North	R$19,204	18,182,253 (9)
Northeast	R$15,905	56,760,780 (27)
Central-West	R$39.312	16,085,885 (8)
South	R$36,312	29,754,036 (14)
Southeast	R$38,544	87,711,946 (42)
Total		208,494,900 (100)

Note: IBGE, 2019a: 9; IBGE, 2019b

Table 6: Mean Performance Scores for Federal and State Universities by Region, 2018

Region	Federal		State	
	N	Score	N	Score
North	10	40.74	5	21.54
Northeast	18	57.27	14	41.80
Central-West	5	72.9	3	38.91
South	11	68	9	53.88
Southeast	19	74.48	7	73.87
Total	63		38	

Note: Folha, 2019a; IBGE, 2019b

In some measure, these variances may be explained by differences in levels of funding to each type of institution in different regions of Brazil. As Table 7 reveals, per student funding provided by state governments in nearly all regions is considerably less than that provided by the federal government. The sole exception is Brazil's Southeast region, where funding levels for state universities exceed that provided to federal institutions and are nearly three times state funding levels exhibited for the North, Northeast, or Central-West.

Table 7: Mean Funding per Student at Federal and State Universities by Region, 2018

Region	Federal		State	
	N	Mean funding per student (R$)	N	Mean funding per student (R$)
North	10	27,066	5	18,008
Northeast	18	35,292	14	20,585
Central-West	5	29,508	3	19,209
South	11	49,525	9	36,256
Southeast	19	44,538	7	52,413
Totals	63	38,970	38	36,658

Note: GEOCAPES, 2017; MEC, 2018; INEP, 2019

For state universities then, the association between levels of state support for public higher education and performance on the RUF ranking is relatively clear. Arguably, states in wealthier regions of the country are well able to sustain elevated levels of operational and capital funding that provide a better quality of education for students, resulting in higher RUF scores.

Albeit less dramatically, as well as unexpectedly, this same argument also seems to hold in the case of federally funded institutions. As Tables 6 and 7 show, variations in RUF performance across federal institutions and regions are almost completely aligned with levels of federal funding per student; in other words, federal institutions in regions with higher levels of per student funding generally perform better than those in regions with lower funding. Referring back to Table 5, it is equally evident that these are the same regions with the lowest levels of income per capita. By contrast, the institutions located in the wealthiest regions of Brazil, with the highest levels of per student funding, perform best in the rankings.

This is a surprising result, given that unlike state universities, which depend on state-level resources, federal universities are part of one national network, and therefore should have equitable access to transfers from the federal treasury, regardless of where they are located. Yet, this is not the case, a fact that was publicly recognized as recently as 2019 by then Secretary of Higher Education at the MEC, Arnaldo Lima, Jr. Responding to a question regarding the need for supplementary funding at Brazil's federal universities, he positioned the main challenge with the system as one of equity: "We have an expenditure of R$75k per student at UNIFESP and UFRJ against R$30k in universities in the North and Northeast. It's not a question of going against UFRJ but going in favor of those who need more" ('MEC estuda', 2019). The question he deftly avoided, concerns why this should be so.

The answer lies in an essay dating to 1990, during the early days of the development of the federal funding model that now determines allocations. According to Paul and Wolynec (1990), the funding model was contemplated as a *one size fits all* proposition, imposing a rigidity that did not take account of regional

differences and circumstances" (p. 3). The natural consequence was a regional pattern of inequality in funding—and performance, as clearly reflected in the RUF scores.

Data from the 2018 Higher Education Census (*Censo da Educação Superior*)—the same source that is used to inform the federal funding algorithm—provides insight into precisely how the model works to the advantage of some regions over others. Table 8 presents an analysis of three critical performance variables. In the case of all three—specifically, levels of graduate enrollment, the percentage of faculty with advanced degrees, and the percentages of faculty engaged in research, respectively--federal universities in Brazil's North and Northeast regions demonstrate serious deficiency as compared to other, more prosperous regions in Brazil. With respect to graduate enrollment, masters and doctoral students represent less than 13 percent of the total student body. In the Southeastern and Southern states, graduate enrollments are more than double those in the North. Similar disparity is exhibited in the percentage of faculty with Ph.Ds. Where only about two-thirds or less of teaching staff at Northern and Northeastern institutions have earned doctoral degrees, this number reaches 80 and 84 percent respectively in the South and Southeast. Research performing faculty are similarly far more prevalent in the southern regions of Brazil than in the two northern regions. In sum, insofar as lower performance on these items is associated with some regions over others, their incorporation into the federal funding formula leads to obvious inequities across regions.

Table 8: Research Engagement Indicators (in percentages), 2018

Region	Graduate enrollment	Faculty with Ph.D.	Faculty active in research
North	9	56	30
Northeast	13	69	44
Central-West	15	72	53
South	18	80	57
Southeast	17	84	70

Note: GEOCAPES, 2017; MEC, 2018, INEP, 2019

These findings, in turn, point to the existence of a negative funding and performance loop affecting disproportionately institutions in the poorest regions of Brazil. On one hand, factors such as the absence of graduate programming and highly qualified faculty activity engaged in research seriously limit an institution's ability to score well within the federal funding algorithm. On the other, without sufficient funding, they are consequently unable to create new programs that attract top graduate students, nor to attract more highly qualified personnel that can influence not only RUF rankings, but future funding itself.

That is not to say that the system is immutable, as some movement has occurred. In fact, federal government funding allocation data for the years that the RUF ranking has been in existence (2012-2018) do show some modest levels of improvement in recent years. Specifically, as shown in Table 9, the increase in funding for federal universities in the North and Northeast has generally exceeded the national mean of

70 percent (not accounting for inflation). By contrast, funding for institutions in the other regions of Brazil has grown at a more modest rate, and all below the mean.

Table 9: Government Allocations to Federal Universities by Region, 2012 and 2018

Region	Allocation 2012 (R$)	Allocation 2018 (R$)	Increase (%)
North	2,199,246,130	3,814,191,723	73
Northeast	7,313,524,913	12,973,073,640	77
Central-West	2,996,820,956	4,928,528,803	64
South	5,235,150,373	8,848,348,555	69
Southeast	9,622,274,072	15,927,408,977	66
Totals	27,367,016,444	46,491,551,698	70

Note: Orçamento, 2013, 2019

At the same time, this appears to have had little direct effect on relative standings in the RUF rankings, as Table 10 reveals. Over the same six-year period, the average increase in overall scores for universities in the wealthier regions of Brazil has generally exceeded those posted for institutions elsewhere. Clearly, institutions in the North and Northeast have a considerable distance to go as yet before the slow cycle of gradual institutional upgrading and concomitant modest relative increases in federal funding can fundamentally alter the current structure of inequity.

Table 10: Mean Change in Performance Score, Federal Universities by Region between 2012-2018

Region	N	Mean Change
North	10	11.46
Northeast	18	14.73
Central-West	5	17.96
South	11	19.88
Southeast	19	20.08
Total	63	16.98

Note: Folha, 2019a

DISCUSSION

Over the last few decades many state and local governments have dramatically reduced funding for higher education. This has resulted in tuition inflation and a surge in student loan debt. Many states, including Florida, have also shifted the funding for undergraduate students away from need-based aid toward merit-based scholarships. These merit-based awards disproportionately benefit students who come from the highest SES households (Binder & Ganderton, 2004; Borg & Borg, 2007; Cornwell & Mustard, 2007; Heller, 2006; Stranahan & Borg, 2004). Florida Bright Futures

scholarships represent the greatest share of state grant aid for undergraduates, yet only half of the students entering college in Florida meet the qualifications. One could argue that FBF scholarship recipients enter college with greater academic abilities, based on their high school grades and SAT or ACT scores, as well as greater financial resources, based on receiving the scholarship awards as well as higher household incomes, on average. Do these advantages result in FBF scholarship recipients leaving college with lower student debt burdens? Based on our research, the answer to this question is, "It depends."

One of the advantages of our data is that over the period that our data were collected, all Florida Bright Futures Scholarship recipients were required to submit a FAFSA application; therefore, our data include a much broader income distribution since many high-income households that would not normally submit a FAFSA application did so in order to receive the scholarship. One factor that determines the answer to this question is the overall debt level that students accumulate by the time they graduate. For example, there is no significant difference in the amount of debt accumulated by FBF recipients and non-recipients in the lowest and highest ends of the debt distribution (the 10^{th}, 25^{th} and 90^{th} quantiles of overall student debt levels). However, among students in the upper mid-range of the debt distribution (the 50^{th} and 75^{th} debt quantiles), FBF recipients accumulate significantly *more* loan debt than otherwise equal non-recipients. In this case, the author suggests that the FBF scholarship creates an education-specific income effect inducing students to spend more on all goods including higher education when they receive the award. Our results also show that the Florida Pre-Paid College Plan, a similar in-kind higher education subsidy, has a comparable effect. Students that have pre-paid college tuition plans increase their educational investment by borrowing more than similar students without the pre-paid plans.

Household income is another factor that affects the debt accumulated by FBF scholarship recipients versus non-recipients. The author found that FBF recipients from higher income households choose to borrow more for college than FBF recipients from lower income households. FBF recipients from lower income households may have access to need-based scholarships, whereas students from higher income households do not. It may also be that FBF recipients from higher income households have expectations of a more expensive college experience that includes living on campus, studying abroad, and participating in campus social life, which requires more borrowing. Whatever the reason, this study's results show that even though merit-based scholarships are disproportionately received by higher income students, they have not disproportionately improved the debt burdens of these students relative to their lower income counterparts.

The author also examined the borrowing behavior of FBF recipients in response to changes in the FBF award amounts. The results show that students from lower income households ($55,000 and below) in the bottom half of the debt distribution (below the 50th quantile) did *not* significantly change their debt levels in response to additional FBF award amounts; however, the lower income ($55,000 and below) students in the top half of the debt distribution (50^{th} quantile and above) did significantly reduce debt as award amounts increased. Students from the highest

income households ($100,000) in the upper midrange of the debt distribution (50th and 75th debt quantiles) actually *increased* their student debt levels as their FBF awards got larger.

In summary, the model predicts that FBF recipients accumulate higher debt, on average, than similar students who did not receive the award. However, for students from the lowest income households and with the highest levels of debt, the FBF scholarship award does reduce the overall amount of debt they accumulate. This means that FBF scholarship recipients are at no significant advantage relative to non-scholarship recipients when it comes to student debt accumulation for students from high income households. However, in the specific case of low-income students with the highest debt levels, they do receive significant debt relief from their FBF scholarships.

The policy implications of this research are straight-forward. If states wish to use their merit scholarship programs to help reduce student debt burdens, they should target those scholarships at lower income households, perhaps by giving higher awards to low-income students and lower awards to high-income students.

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W. E. (Ted) Hewitt, PhD, is a Professor of Sociology at the University of Western Ontario, in London, Canada. He has published extensively on issue related to social movements, innovation systems and international cooperation for urban development in Latin America. A leading Canadian authority on Brazil, his work has appeared in monographs, edited works, and a range of academic journals including *Cities, Journal of Latin American Studies, Journal of Developing Areas, Third World Quarterly, and, Habitat International.* In 2018, he was named Grand Officer of the Rio Branco by Brazil's Ministry of Foreign Relations. *Email*: hewitt@uwo.ca

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Altering Expectations: Effects of Backloading Merit Scholarship Payments on Postsecondary Enrollment Choices

Katherine Kopotic
Saint Louis University

Jonathan N. Mills
The Coleridge Initiative

Evan Rhinesmith
Saint Louis University

ABSTRACT

While the popularity of state-financed merit-based scholarships has increased since the 1980s, policymakers struggle to maintain these programs because of growing costs. Some have tried to manage this tradeoff through eligibility changes or award amounts; however, little empirical research exists on the effectiveness of these changes. We add to the financial aid literature by determining if college enrollment responded to a 2013 restructuring of Arkansas's Academic Challenge Scholarship from equal annual awards to a backloaded system with progressively higher payouts to students who persisted. We identify no statistically significant impacts associated with the 2013 change; however, point estimates are generally negative. We believe this is the first study to examine if moving to a backloaded payout structure affects college enrollment.
Keywords: financial aid, merit scholarships, college enrollment, post-secondary institutions, difference-in-differences

The popularity of state-financed merit scholarships, which provide grant aid to students satisfying pre-specified academic requirements for attendance at higher education institutions, has dramatically increased since their inception in the 1980s. These programs are expensive, however, especially as more students meet their

qualifications. Several states have considered changes to program requirements or financial aid amounts to allow these popular programs to continue considering budget shortfalls. While there is a robust empirical literature demonstrating the ability of these programs to improve college access and attainment when introduced, few studies, if any, examine how *changes* to these programs impact students (e.g., Cornwell et al., 2005, 2006; Dynarksi, 2000; Henry & Rubinstein, 2002; Zhang et al., 2016). This study addresses this gap in the literature by determining whether a shift from an equal installment payment plan to a backloaded payment structure that provides increasing amounts as students persist through college impacts college enrollment.

Strong empirical evidence indicates positive returns to postsecondary attainment. A college education is associated with higher salaries, improved health, and a decreased likelihood of getting divorced (Lawrence, 2017; Wang, 2015). Additionally, the returns to postsecondary education have steadily increased in the United States' skills-based economy (Oreopoulos & Petronijevic, 2013). Nevertheless, while the college enrollment rate for 18-24 year-olds has consistently increased over the last two decades (National Center for Education Statistics, 2019a), many students fail to complete their degrees. As of 2017, only 60 percent of undergraduate students completed their bachelor's degree within six years. Attainment also varies significantly by institution type, with nearly 90 percent of students graduating within six years from selective four-year institutions, compared to only 31 percent of students graduating from open-admissions four-year institutions within six years (National Center for Education Statistics, 2019a).

Some attribute the uncertain link between enrollment and attainment to dramatically increasing costs of college. From 2000-2017, the inflation-adjusted average cost of attendance at public four-year institutions has increased from $12,000 to $19,000. Private four-year institutions experienced an increase from $30,000 to $41,000, and two-year institutions saw an increase from almost $7,000 to $10,000 over the same time period (National Center for Education Statistics, 2019b). These increasing costs can pose an important barrier to access and enrollment in college, as well as persistence and completion.

Financial aid, which seeks to reduce the upfront cost of college, is one of the most prevalent interventions used to increase both college access and attainment (Dynarski, 2008). Financial aid can take many forms, including loans--which provide borrowed funds while requiring repayment at a later date--or grants and scholarships--which directly subsidize the cost of college for the student (College Board, 2019). With the passage of the *Higher Education Act of 1965*, aid per student has nearly tripled over the last 60 years (Dynarski & Scott-Clayton, 2013; Ma & Pender, 2020). Federal grants, such as the Pell Grant, account for 60 percent of distributed aid, while grants from institutions of higher education account for 19 percent of aid. In 2017, over 80 percent of students enrolled in four-year institutions reported having some type of financial aid (National Center for Education Statistics, 2019c).

While the majority of financial aid is federally awarded, individual states also offer financial aid, typically in the form of merit-based scholarships. State-financed merit-based scholarships are grant aid programs that tie eligibility to student performance on standardized college readiness assessments, such as the SAT or ACT,

and high school performance, often measured by GPA. These programs can be contrasted with need-based grant aid, where eligibility is typically based on parental income. State-financed merit-based scholarships have become increasingly popular to both individual families and policymakers. State policymakers, for example, often promote these programs, arguing they can increase college enrollment, incentivize high-performing students to stay within the state, and promote and reward academic achievement through merit-based eligibility (Cornwell et al., 2005). As of 2015, 29 states had such programs (Legislative Fiscal Office, 2017).

Evaluations of state-financed merit-based scholarships suggest that these programs increase the likelihood of enrollment in postsecondary institutions and, in some cases, attainment. Rigorous quasi-experimental studies find such programs improve the likelihood of college attendance (Cornwell et al., 2006; Dynarski, 2003; Kane, 2003; Scott-Clayton, 2012), persistence past the first year of college (Bettinger, 2004; Castleman & Long, 2016), cumulative GPA (Scott-Clayton, 2012; Swanson & Ritter, 2020), and graduation (Bettinger et al., 2019; Dynarski, 2008; Scott-Clayton, 2012; Scott-Clayton & Zafar, 2019).

While the popularity of these programs has grown due to these positive effects, states have struggled to maintain funding as more students qualify for the awards. In Louisiana, for example, Governor John Bel Edwards attempted to eliminate $233 million in funding for the popular Taylor Opportunity Program for Students in 2018 in response to a budget shortfall (Crisp, 2018). Moreover, funds often run out before all qualified students receive their scholarships; a 2018 analysis by the Hechinger Report found that 900,000 eligible low-income applicants did not receive state-financed scholarships because states ran out of money (Kolodner, 2018).

States have modified their scholarships in response to constrained budgets in the hopes of maintaining their popular programs. For example, the Florida Legislature passed a bill that increased the minimum test score needed to qualify for the Bright Futures Scholarship Program, impacting graduating students starting college in 2021 (Mahoney, 2019). While other states have reduced award amounts or implemented more rigorous qualification requirements to shrink the pool of qualifiers, Arkansas decided to shift the award payout structure for its Academic Challenge Scholarship (ACS) from equal annual installments to a backloaded structure in 2013 (Kopotic, 2020). This change awards students progressively higher amounts as they persist through college, incentivizing completion. In theory, the new payout structure would directly benefit the state by increasing its return on investment through more college graduates. On the other hand, Arkansas's move to a backloaded ACS payout structure could disincentivize college enrollment by unambiguously increasing both the overall and initial cost of enrolling at a four-year institution. The overall award amount decreased from $18,000 to $14,000 over four years under the backloaded payout structure (Kopotic, 2020). Our study's goal is to determine how college enrollment in Arkansas was affected by this switch to a backloaded payout structure.

We estimate the impact of the change to Arkansas's scholarship program using a difference-in-differences design applied to state-level panel data on college enrollment available through the Integrated Postsecondary Education Data System (IPEDS). In effect, we estimate the impact of the payout change by comparing trends

in college enrollment in Arkansas to similar southern states before and after the switch to the backloaded structure.

In general, our analysis indicates no statistically significant impact on overall college enrollment or enrollment in four-year institutions resulting from the 2013 switch to a backloaded payout structure. While our results are inconclusive on the overall impacts of the policy change in Arkansas's merit scholarship, we do observe patterns that this change may have had negative impacts on students' willingness to enroll in college. Previous research on statewide merit scholarships in other settings has found that introducing programs similar to that in Arkansas can have a positive impact on students' postsecondary educational outcomes (Cornwell et al., 2005; Cornwell et al., 2006; Dynarksi, 2000; Zhang et al. 2013). However, our findings—while not statistically significant—suggest that dramatic changes in *how* funds are awarded and the amount of funding available can potentially adversely impact students. States should proceed with caution if considering similar changes.

The remainder of this paper is structured as follows. We begin with a detailed description of Arkansas's merit-based scholarship, the ACS, and subsequent alterations to its payout structure in 2013. We then review the current literature examining the impacts of merit-scholarships on postsecondary enrollment and attainment. Next, we detail our empirical methodology and present our results. We conclude with a discussion about the implications of our findings and policy relevance.

DESCRIPTION OF THE ACADEMIC CHALLENGE SCHOLARSHIP PROGRAM

The Arkansas Academic Challenge Scholarship (ACS) Program is a state-wide, broad-based merit scholarship program with multiple qualification standards. The program was originally created in 1991; however, the scholarship was not widely used until it was dramatically expanded in 2010 thanks to funding from Arkansas's first statewide lottery. The Arkansas Scholarship Lottery was approved by voters in November 2008, with the understanding that a portion of the proceeds would go to fund the ACS. Lottery tickets originally went on sale in the fall of 2009 and scholarships were awarded under the expanded program in fall 2010 (Mills, 2015).

ACS eligibility requirements have remained unchanged since its inception in 2010 and 2016, the time period examined in this study. To receive a scholarship, students must be an Arkansas resident for at least 12 months prior to enrolling in college, must either have a 2.5 high school GPA or score a 19 or higher on the ACT (or concordant score on an equivalent test), and graduate high school completing the standard *SmartCore* curriculum. The *SmartCore* requires four English language arts, four mathematics, three science, and three social studies credits, as well as half a credit each in oral communication, physical education, health and safety, and fine arts. An additional six credits in career or other content area are required for graduation. Finally, to receive the scholarship, students must fill out the FAFSA and complete an application (Arkansas Division of Higher Education, 2018).

The ACS additionally has requirements for on-going eligibility. Once awarded a scholarship, students must maintain at least a 2.5 GPA, enroll in at least 12 credit hours for their first semester, and 15 credit hours each semester thereafter, and must be continuously enrolled and working towards a terminal degree (Arkansas Division of Higher Education, 2018). The original ACS award was substantial. Qualified students enrolling in four-year institutions in 2010 received equal installments $5,000 per year, which roughly covered 95 percent of tuition at the state's flagship institution the University of Arkansas-Fayetteville, during the 2010-11 school year (National Center for Education Statistics, Integrated Postsecondary Education Data Systems, 2021a).

To date, over 500,000 scholarships have been awarded, totaling over $965 million in postsecondary financial aid (Arkansas Division of Higher Education, 2018). For the first cohort of recipients, students received up to $20,000 over a four-year period, covering roughly 90 percent of the cost of tuition at the state's flagship institution at the time (Mills, 2015). Table 1 describes how the ACS payouts have changed during the time period examined by this study.

While the award amount decreased slightly for fall 2011 applicants, the overall payout of $18,000 still was sufficient to cover 75 percent of tuition. The first major change to the ACS payout structure occurred for the fall 2013 applicant cohort, due largely to increased numbers of qualified applicants and falling lottery revenue (Beherec, 2013). Unlike previous cohorts, the fall 2013 applicant cohort received a significantly lower award amount in their first year and progressively increasing payouts throughout their college experience. The resulting total award amount decreased from $18,000 to $14,000 over a four-year period. While policymakers at the time argued that this change would incentivize enrollment and persistence, no previous empirical evidence exists which could support such claims. Our research addresses this gap in the literature.

Table 1: ACS Award Amounts by Year

Year (Fall)	Amount by Year	Four-Year School	Two-Year School
2010	All Years	$5,000	$2,500
2011 - 2012	All Years	$4,500	$2,250
2013-2015	Year 1	$2,000	$2,000
	Year 2	$3,000	
	Year 3	$4,000	
	Year 4	$5,000	

Source: Arkansas Department of Higher Education, 2018
(https://scholarships.adhe.edu/scholarships/detail/academic-challenge-scholarships)
Notes. "All Years" indicates that awards were paid out in equal installments to students attending four-year institutions for all four years.

LITERATURE REVIEW

Tangible barriers to college access can be broadly grouped into three categories: lacking financial resources, lacking information on how to enroll in college, and lacking preparation for college (Page & Scott-Clayton, 2016). We begin by briefly discussing interventions designed to address the information and preparation barriers. We then turn to the focus of our study: interventions attempting to address the financial barrier.

Information, or a lack thereof, can deter students from pursuing postsecondary education (Avery & Kane, 2014; Castleman & Page, 2014; Hamilton et al., 2018; Hoxby & Avery, 2012). Interventions aimed at providing students with information about the college application process can increase college application and enrollment rates (Barr & Turner, 2017; Hoxby & Turner, 2013; Page & Gehlbach, 2017). Furthermore, interventions with both informational and personal interaction have been shown to increase enrollment at selective institutions (Sanders, 2018).

In addition to informational barriers about the application process and pipeline between high school and college, students may face preparation barriers that prevent them from pursuing postsecondary education (Avery & Kane, 2014; Gonzalez et al., 2011; Hamilton et al., 2018). This could be particularly salient for would-be first-generation students, as they are less likely to take advanced placement courses compared to continuing generation students (Cataldi et al., 2018).

Policymakers and researchers have long considered financial constraints to be significant barriers to college access; and many financial aid programs attempt to reduce this burden. Since the passage of the *Higher Education Act of 1965*, aid amount per student has tripled (Dynarski & Scott-Clayton, 2013), which is unsurprising, as the theory of action is that financial aid for education can work to improve college attendance by reducing the overall cost of college (Dynarski, 2008).

Indeed, the availability of financial support led to over 83 percent of students in four-year institutions between 2010 and 2019 reported receiving some type of financial aid (National Center for Education Statistics, 2021b). Despite this increased availability in financial aid, the amount available has failed to keep pace with the rising cost of tuition at two- and four-year postsecondary institutions (Ma et al., 2020).

Financial aid can take several forms including loans, grants, and scholarships. Most financial aid is federally distributed, with institutional aid and state aid constituting 19 and five percent of distributed aid, respectively (College Board, 2013). While many financial aid programs have a need-based component, several states have aid programs based primarily on merit. These programs link financial aid with performance on standardized tests and high school GPA. One such program is the ACS, funded by the Arkansas state lottery. Similarly, the Georgia HOPE Scholarship and Florida Bright Futures Scholarship Program award financial aid based on merit. To qualify for the Georgia HOPE Scholarship, students must have at least a 3.0 high school GPA, and students qualifying for the Florida Bright Futures Scholarship Program must demonstrate a 3.0-3.5 high school GPA depending on the qualification tier (Dynarski, 2000; Zhang et al., 2013).

The Georgia HOPE Scholarship began distributing scholarship funds gained from the state-run lottery to in 1993. Similarly, the Florida Bright Futures Program began using funds from the state-run lottery in 1997. As these programs have become more established and these states have funneled greater amounts for students to use for college enrollment, researchers have used quantitative methods to analyze the impacts of these programs (e.g., Cornwell et al., 2005; Cornwell et al., 2006; Dynarksi, 2000; Zhang et al. 2013).

Research on the HOPE Scholarship Program has had a positive impact on college enrollment. Dynarski's (2000) analysis of the Georgia HOPE Scholarship uses a difference-in-differences approach to analyze the impact of the program's implementation on college attendance for middle- and upper-income students in Georgia, compared to their peers in surrounding states. Overall, this study finds that the HOPE scholarship increased college enrollment for Georgia students by seven to eight percentage points in comparison to surrounding states (Dynarski, 2000). The results suggest that for each additional $1,000 available in aid, the college matriculation rate in Georgia increases by three to four percentage points (Dynarski, 2000). However, these results suggest that the program may also widen the gap in attendance rates for White and Black students (Dynarski, 2000).

In other studies of the HOPE program, Cornwell et al. (2006), using a difference-in-differences design, find that the Georgia HOPE Program increased freshmen enrollment by nearly six percent, relative to other Southeastern states from 1988-97, with four-year colleges accounting for most of the gain. They conclude that the Georgia HOPE Program helped to keep students in state, and the reduction of students leaving the state for college accounted for over 60 percent of the increase in four-year enrollment.

Additionally, Cornwell et al. (2005) estimate the effects of the program on the course-taking behavior of HOPE recipients. Comparing in-state, HOPE-eligible enrollees to out-of-state enrollees at the University of Georgia, Cornwell et al. found that HOPE recipients enroll in fewer credit hours than their peers who were ineligible for the scholarship. Henry and Rubinstein (2002) examine whether the implementation of the HOPE Scholarship has altered educational quality in high school graduates, finding that the percentage of students earning a B average or higher in high school—thereby qualifying for the scholarship—increased from about 55 percent to 59 percent of graduates. Additionally, African American [sic] students qualifying have increased their average SAT scores by 20 points (Henry & Rubinstein, 2002).

Similarly, results from research on the Florida Bright Futures Scholarship shows overall positive impacts on enrollment. Using a regression-discontinuity, Zhang et al. (2016) find students who just meet the cutscore, and are therefore awarded a scholarship, were 3 to 10 percentage points more likely to enroll in a public four-year institution than their peers who fail to meet the eligibility requirement. The variation in the size of the impact is due to the program's varying award amount based on tier for which students qualify based on their achievement. Another study of the Bright Futures Scholarship from Zhang et al. (2013) finds that being awarded a scholarship yields a 22-percentage point increase in enrollment at four-year institutions and a 19-percentage point increase in enrollment at two-year institutions in Florida.

Overall, the literature suggests that financial aid, specifically in the form of merit-aid can increase enrollment at postsecondary institutions, however, there is a gap in the literature on how the construction of the payout structure can influence student choices. Typically, aid programs provide a consistent dollar amount while students are enrolled. While this was true of the ACS at the time of its expansion, we have shown that Arkansas program has undergone significant changes in both dollar amount and payout schedule since its inception. The research we present here seeks to fill this gap by first evaluating the impact of the ACS on postsecondary enrollment patterns in Arkansas, as well as the degree to which the shift in award payout structure affects subsequent student secondary enrollment behaviors in Arkansas. The results from Arkansas can serve as an example of *how* a state might provide aid to students, and whether initial dollar amount and the payout schedule are important for students' postsecondary enrollment expectations.

METHODOLOGY

We determine the impact of changing the award payout structure from equal installments to a backloaded payout system on postsecondary enrollment patterns in Arkansas using a difference-in-differences design (DD). The following sections detail our empirical strategy and the data used for this study.

Empirical Strategy

Ideally, we would estimate the impact of the ACS payout change in an experimental research setting by randomly assigning students to receive scholarship awards in either equal installments or via ACS's backloaded system. Comparisons between these two groups would accurately identify how disbursing money to students influences their decisions on where to enroll in college. Unfortunately, this ideal setting does not exist, as students must apply and qualify for the award and the state changed the policy for all students in a single year.

Using existing administrative data, we could attempt to estimate the enrollment impact of the ACS change by comparing the number of students enrolled in Arkansas postsecondary institutions before and after the 2013 change. Nevertheless, while this may provide an informative starting place, this naïve pre-post comparison would be misleading if college enrollments were increasing in all states over time due to a stronger college-going culture in the US generally. If this trend exists, college enrollments would likely increase regardless of how the ACS awards money. What is needed, therefore, is a method that will allow us to differentiate changes in Arkansas enrollments due to the ACS payout change from general trends in college enrollment.

Our empirical strategy is modeled on Cornwell et al.'s (2006) study of the Georgia HOPE program and Zhang et al.'s study of the Florida Bright Futures Scholarship program's effects on college enrollment, as these studies' use a similar approach intended to analyze the impacts of the introduction of a merit scholarship policy, like what we observe in Arkansas. Specifically, we use a difference-in-differences (DD) design to estimate the impact of the switch to a backloaded payout

structure by comparing changes in enrollment patterns within the state of Arkansas before and after 2013 to that of enrollment patterns in similar states whose students did not experience such a change in payout structure. In effect, the college enrollment trends of the comparison group states serve as our estimate of the counterfactual, or what would have occurred in Arkansas had the ACS payments not switched to a backloaded payout structure.

Our empirical model takes the following form:

$$\ln(E_{it}) = \delta_1(AR_i \times After2010_t) + \delta_2(AR_i \times After2013_t) + X'_{it}\beta + \gamma_i + \theta_t + \epsilon_{it} \quad (1)$$

where:

- E_{it} is enrollment in state *i* in year *t,*
- AR_i is an indicator taking on a value of 1 for Arkansas and 0, otherwise,
- $After2010_t$ identifies the period following the initial expansion of the ACS in 2010 by taking on a value of 1 when $t \geq 2010$ and 0 otherwise,
- $After2013_t$ identifies when the backloaded payout structure went into effect (equal to 1 when t$\geq$ 2013),
- X_{it} is a vector of covariates capturing state demographics and economic indicators,
- γ_i is a vector of state fixed effects,
- θ_t is a vector of year fixed effects, and
- ϵ_{it} is an error term accounting for nesting within states (Bertrand et al., 2003).

This model is a slightly augmented version of the standard DD model employed by Cornwell et al. (2006). Specifically, we include two interactions involving the Arkansas state identifier: $AR_i \times After2010_t$ and $AR_i \times After2013_t$. The first interaction identifies the general impact of the ACS expansion in 2010 on college enrollment in Arkansas, which is represented by δ_1. The second interaction term, $AR_i \times After2013_t$, identifies the parameter of interest in our analysis, δ_2: the differential impact on enrollment that occurred following the ACS change to a backloaded payout structure in 2013. Finally, the sum of δ_1 and δ_2 represents the general difference in enrollment in Arkansas following the switch to the backloaded payout structure relative to the period before 2010 (i.e., the pre-ACS expansion period). If, for example, the expansion of ACS in 2010 generally increased college enrollment afterward, but the switch to a backloaded payout structure made college attendance less attractive to students by increasing the overall cost of attendance, we would expect to observe $\hat{\delta}_1 > 0$, $\hat{\delta}_2 < 0$, and $\hat{\delta}_1 > (\hat{\delta}_1 + \hat{\delta}_2) > 0$.

Our preferred model controls for natural variation in enrollment trends explained by student demographics and economic conditions. Specifically, we account for changes in the population of potential college-going students by controlling for the number of high school graduates each year. We additionally control for state economic conditions, which have been found to influence the decision to attend college (Cornwell et al., 2006). These variables, along with state and year fixed effects, help us to isolate the specific effect of the ACS's payout structure change on college enrollment from other confounding factors affecting college enrollment trends in general.

DATA

The chief challenge facing any empirical analysis is the identification of an appropriate estimate for the counterfactual, or the way the world would have been in absence of the intervention. For our analysis, we use two groups of comparison states to proxy for Arkansas' counterfactual: the other member states of the Southern Regional Education Board (SREB) Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia and the states that border Arkansas—Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, and Texas . These comparison groups mirror those used in Cornwell et al. (2006), and for good reason: states in both groups share regional and economic similarities that make them suitable proxies for the Arkansas counterfactual.

The outcomes for this analysis—college enrollment data—are drawn from the National Center for Education Statistics' (NCES) Integrated Postsecondary Education Data System (IPEDS). Specifically, we collected state-level aggregate data on first-time resident enrollment for all postsecondary institutions as well as separately for public four-year, private four-year, and public two-year institutions for even years between 2004 and 2016. We limit our data to first-time, first-year residents to mirror ACS's residential requirement for eligibility. This requirement further limits our analysis to even years only, as NCES only requires institutions to report residential data in even years. We replicated our analysis for both comparison groups (SREB and Border States) using enrollment counts including non-residents for students enrolled full-time only (Tables A1 and A2) and full- and part-time (Tables A3 and A4). This allows us to additionally include odd-numbered years. In general, results are consistent across enrollment specifications.

Our analysis includes two covariates to control for extraneous factors that may explain pre-existing trends in college enrollment. First, we control for state economic conditions using the Federal Reserve Bank of St. Louis's Coincident Economic Activity (CEA) Index, which captures the expansion and contraction of state economies using data on employment trends, real earnings, unemployment rate, and the average weekly hours worked in manufacturing. An increase in the CEA Index is interpreted to mean the state economy is expanding, while a decrease represents a contraction in the state's economy.

Second, we control for high school graduation cohorts as they represent the primary pool of potential first-time college enrollees. We collected these data each year for each state in our sample from NCES's Digest of Education Statistics. NCES reports the actual high school graduation total for 2004 through 2013 and the projected high school graduation totals for 2014 through 2016. While, we would prefer using actual counts of high school graduates in our analysis, we use projections when no other data are available. Fortunately, a comparison of the projections with a separate data set containing information on all Arkansas high school graduates suggests the projections are fairly accurate. The projected headcount for Arkansas in 2010-11 was 28,440 high school graduates, the actual number of high school graduates for that year totaled 28,205.

Analytical Samples

Our analysis focuses on three time periods:

- Pre-ACS Expansion: Years 2003-2009
- Initial ACS Expansion: Years 2010-2012
- Change to Backloaded Payouts: Years 2013-2016

Table 2 provides descriptive statistics for Arkansas and the two comparison group samples—SREB and border states—in the three time periods indicated. Specifically, Table 2 displays the average enrollment figures for
Arkansas and each group of comparison states for each of the specified time periods, as well as the average number of high school graduates and average values of the local economic condition as captured by the CEA index.
Table 2 indicates that college enrollments in Arkansas, the SREB states, and Arkansas's border states generally increased between the Pre-ACS Expansion period (2003-2009) and the Initial ACS Expansion period (2010-2012). In contrast, we observe slight declines in average enrollment across all states in the time period following Arkansas's change to a backloaded payout structure (2013-2016). The number of high school graduates in Arkansas and both comparison groups, in contrast, progressively increases as we move forward from each time period. Finally, the economic conditions of Arkansas and each group of comparison states appear to be expanding, as evidenced by a generally increasing average CEA index value across all states over time.

An important requirement of any DD analysis is that the comparison group and treatment group share similar trends in the outcome of interest away from the discontinuity point (Bertrand et al., 2003). Figure 1 illustrates overall trends in logged enrollment for even years in Arkansas and the SREB states from 2004 to 2016 for all institutions, public four-year, private four-year, and public two-year institutions. The vertical lines at 2010 and 2013 show the implementation of the ACS and the change to the award payout structure, respectively. While the SREB states consistently have higher numbers of enrollees on average, their enrollment trends largely track those of Arkansas across all institution types. This provides some assurance for using the SREB states as a comparison group for Arkansas in the DD analysis.

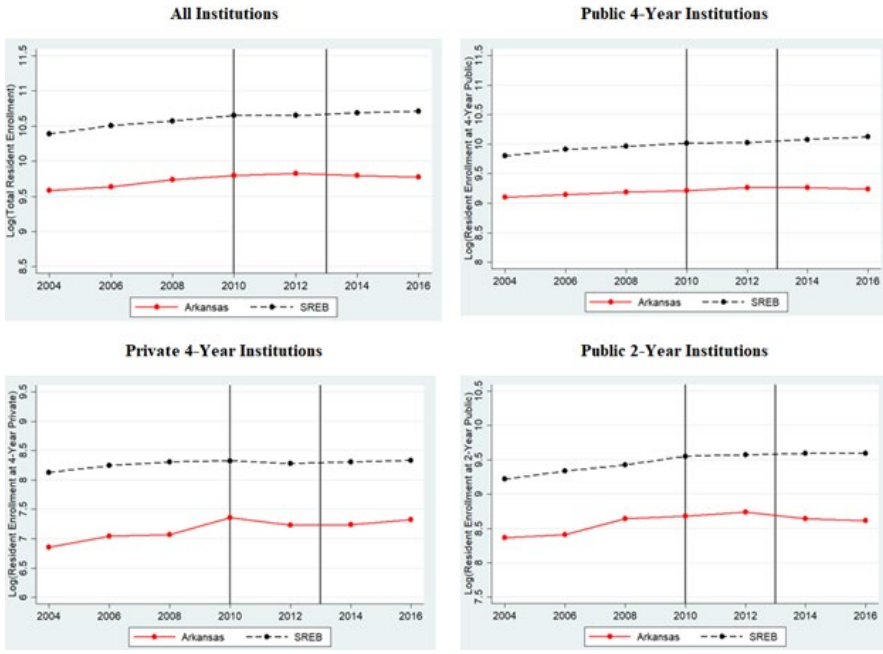
Table 2: Means and Standard Deviations of Variables

	2003-2009			2010-2012			2013-2016		
	Arkansas	SREB States	Border States	Arkansas	SREB States	Border States	Arkansas	SREB States	Border States
Full-time, first time freshmen									
All institutions	22,382	49,564	53,966	26,082	56,480	61,548	25,027	55,973	61,866
	(1,420)	(34,811)	(39,917)	(168)	(42,087)	(48,854)	(220)	(42,490)	(51,423)
4-year institutions	15,277	31,591	32,411	17,873	36,907	36,245	18,011	38,559	38,023
	(765)	(21,181)	(22,760)	(261)	(28,129)	(27,387)	(421)	(29,863)	(30,849)
2-year institutions	7,105	17,973	21,556	8,209	19,573	25,303	7,016	17,414	23,842
	(857)	(14,658)	(18,248)	(224)	(16,261)	(22,040)	(586)	(15,293)	(21,000)
Resident first-time undergraduates*									
All institutions	15,589	36,077	42,187	18,235	42,215	50,288	17,799	44,307	53,132
	(1,275)	(29,947)	(38,037)	(452)	(37,046)	(47,791)	(226)	(40,622)	(54,117)
4-year public	9,400	19,802	20,282	10,304	22,485	22,758	10,424	24,406	24,726
	(393)	(18,294)	(18,480)	(351)	(22,676)	(22,039)	(137)	(25,044)	(26,712)
4-year private	1,090	3,751	4,370	1,476	4,034	4,873	1,457	4,096	4,765
	(126)	(3,393)	(4,401)	(139)	(3,542)	(4,837)	(87)	(3,659)	(4,823)
2-year public	4,817	11,279	15,917	6,061	14,217	20,663	5,583	14,679	21,892
	(736)	(11,662)	(15,295)	(226)	(15,172)	(20,337)	(112)	(16,138)	(21,463)

	2003-2009			2010-2012			2013-2016		
	Arkansas	SREB States	Border States	Arkansas	SREB States	Border States	Arkansas	SREB States	Border States
	(902)	(58,601)	(78,598)	(109)	(68,457)	(94,182)	(818)	(74,461)	(102,537)
Coincident Economic Activity Index	141.44	145.68	140.35	152.2	152.78	148.84	166.25	174.77	167.68
	(6.11)	(13.43)	(14.99)	(3.40)	(17.75)	(20.98)	(6.59)	(24.15)	(28.34)

Note. Resident first-time undergraduates (FTUG) are restricted to students who graduated from high school in the previous 12 months. Resident FTUG available for even-numbered years only. SREB States: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. Border States: Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, and Texas. Standard deviations are noted in parentheses.

Figure 1: Trends in Log Enrollment for All, Public 4-Year, Private 4-Year, and Public 2-Year Arkansas and SREB Postsecondary Institutions, 2004-2016 Even Years



RESULTS

This section presents the results of our primary analysis. While we find that the expansion of the ACS in 2010 is associated with an initial increase in postsecondary enrollment in Arkansas, we generally do not identify statistically significant impacts of the 2013 shift to a backloaded payout structure on enrollment. The notable exception is for two-year institutions, which experienced significant declines in enrollment following the 2013 ACS payout change.

Table 3 presents the estimated impacts of both the implementation of the ACS lottery scholarship in 2010 and the change to the award payout structure in 2013 using the SREB comparison sample. Odd numbered columns present simple models that do not control for additional covariates and even-numbered columns include controls for state economic conditions and high school graduation cohorts. Each model includes state and year fixed effects. Estimated impacts of expanding the scholarship in Arkansas using lottery funds in 2010 relative to the pre-time period are presented in row 1 (*Arkansas x After 2010).* Row 2 (*Arkansas x After 2013*) is the focus of our

study: the estimated impacts backloading the ACS award payout structure above and beyond the impact of expanding the scholarship. Adding the two coefficients together, we are also able to see the impact of back-loading the payout structure relative to the Pre-Expansion period in 2010.

Our results indicate that the expansion of the ACS in 2010 is associated with a statistically significant five percent increase in enrollment in all Arkansas postsecondary institutions relative to the time period prior to the expansion. In contrast, there is no conclusive evidence to suggest that the subsequent change from equal annual installments to a backloaded award payout structure produced a significant change in enrollment rates in all postsecondary institutions throughout Arkansas. In general, the coefficient estimates suggest enrollment declined six percent compared to pre-ACS expansion levels following the switch to a backloaded structure; however, these estimates are not statistically significant at conventional levels. Combining the estimated effects of expanding the scholarship in 2010 and changing the award payout structure in 2013, we see that the backloaded award payout structure is associated with a one percent overall decrease in enrollment in Arkansas postsecondary institutions relative to the time period prior to the scholarship expansion.

Table 3 also presents estimated effects by institution type: public four-year, private four -year, and public two-year institutions. In general, the results for public four-year institutions in Arkansas mirror the results for total enrollment. Expanding the scholarship in 2010 is associated with a four percent increase in enrollment in public four-year institutions while backloading the payout structure is associated with a non-significant six percent decrease in public four-year institutions. The results for private four-year institutions indicate that the initial expansion of the ACS in 2010 yielded a sizeable jump in enrollment (23 percent), yet there is no noticeable change in enrollment due to the 2013 switch to backloaded payouts. Interestingly, the only case in which we observe that the 2013 payout change significantly impacted enrollment is for public two-year institutions. Specifically, our models indicate that the 2013 switch led to between 11 and 16 percent declines in enrollment at public two-year institutions. Combining the estimated effects, we see that the backloaded award payout structure is associated with an overall 10 percent decrease in enrollment in Arkansas public two-year institutions, compared to the time period prior to the ACS expansion.

Table 4 presents our analysis using the states that border Arkansas as the comparison group rather than the SREB states. Generally, we find similar results when comparing Arkansas to border states rather than SREB states, non-significant, negative impacts following the 2013 payout change. Because of this, we cannot say conclusively whether the post-2013 payout shift had a measurable impact on overall college enrollment decisions in Arkansas.

Table 3: Difference-in-Difference Estimates of the Impact of the ACS Expansion and Award Payout Change on Arkansas Enrollment, Compared to SREB States

	All Institutions		4 Year Public		4 Year Private		2 Year Public	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Arkansas x After 2010	0.0184	0.0488**	0.0189	0.0423	0.138***	0.226***	-0.0545	0.0553
	(0.0260)	(0.0225)	(0.0395)	(0.0253)	(0.0399)	(0.0473)	(0.0589)	(0.0444)
Arkansas x After 2013	-0.0815*	-0.0604	-0.0859	-0.0594	0.00555	-0.00833	-0.111**	-0.155*
	(0.0432)	(0.0460)	(0.0619)	(0.0513)	(0.0366)	(0.0452)	(0.0493)	(0.0799)
Covariates		Yes		Yes		Yes		Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	128	112	128	112	128	112	117	103
R-squared	0.985	0.987	0.978	0.979	0.985	0.986	0.992	0.994

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note. Unit of analysis is state-by-year. The dependent variable in all analyses is the natural log of resident first-time undergraduates (FTUG) who graduated from high school in the previous 12 months. Resident FTUG are only available for even-numbered years. *After 2010* takes on a value of 1 for the fall of 2010 and thereafter. *After 2013* takes on a value of 1 for the fall of 2013 and thereafter. *Covariates* are the CEA index (which captures state economic conditions) and the natural log of high school graduates in the previous spring. *SREB States* include Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. Standard errors account for nesting within states.

Table 4: Difference-in-Difference Estimates of the Impact of the ACS Expansion and Award Payout Change on Arkansas Enrollment, Compared to Border States

	All Institutions		4 Year Public		4 Year Private		2 Year Public	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Arkansas x After 2010	-0.000367	0.0301	-0.00705	0.0506	0.161*	0.214**	-0.0811	-0.0383
	(0.0524)	(0.0529)	(0.0589)	(0.0436)	(0.0699)	(0.0590)	(0.116)	(0.0917)
Arkansas x After 2013	-0.0432	-0.0326	-0.0101	-0.00427	-0.000910	0.0111	-0.175	-0.196
	(0.0513)	(0.0626)	(0.0364)	(0.0171)	(0.0465)	(0.0527)	(0.0941)	(0.138)
Covariates		Yes		Yes		Yes		Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	56	49	56	49	56	49	56	49
R-squared	0.980	0.986	0.985	0.990	0.989	0.994	0.953	0.958

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note. Unit of analysis is state-by-year. The dependent variable in all analyses is the natural log of resident first-time undergraduates (FTUG) who graduated from high school in the previous 12 months. Resident FTUG are only available for even-numbered years. *After 2010* takes on a value of 1 for the fall of 2010 and thereafter. *After 2013* takes on a value of 1 for the fall of 2013 and thereafter. *Covariates* are the CEA index (which captures state economic conditions) and the natural log of high school graduates in the previous spring. *Border States* include Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, and Texas. Standard errors account for nesting within states.

DISCUSSION

While the popularity of state-financed merit-based scholarships has increased since their creation in the 1980s, state policymakers struggle to maintain these programs in the face of growing costs. Some states have tried to manage this tradeoff through changes to program eligibility or award amounts; however, little empirical research exists that can speak to the effectiveness of these changes. This study adds to the financial aid literature by examining how one state's changes to the payout structure of its merit-scholarship program affects college enrollment and providing some evidence on how a policy decision altering the structure of a merit-aid scholarship program impacts college-intending students.

Using a difference-in-differences (DD) design comparing Arkansas to other southern states, we determine whether college enrollment responded to a 2013 restructuring of Arkansas' Academic Achievement Scholarship (ACS) from equal annual awards to a backloaded system which provided progressively higher payouts to students who continued to persist in college. To our knowledge, this is the first study to examine if moving to a backloaded payout structure affects college enrollment.

While we observe statistically significant increases in enrollment following the initial expansion of the ACS in 2010, our results do not indicate the 2013 payout change significantly impacted college enrollment. Specifically, we fail to identify statistically significant impacts to enrollment across all institutions as well as for both public and private four-year institutions following the 2013 payout change.

Despite the general finding of null effects, several findings are worth highlighting. First, we note a striking 23 percent increase in enrollment in Arkansas four-year private school institutions relative to other states following the initial expansion of the ACS in 2010. When comparing with results for other institutions, it appears that the result for private schools is the primary driver behind the observed significant impact of the ACS expansion on overall enrollment. It is possible that the initial scholarship award—which could be used at Arkansas private institutions—was sufficiently large enough to encourage students who otherwise were considering private schools outside the state to remain in Arkansas, as intended by the state aid program. In contrast, we observe no discernable impact following the 2013 payout change as the estimate is both nonsignificant and trivial in magnitude. The backloaded payout structure—which translated to a $4,000 drop in total payout over four years—may have represented a small deterrent to Arkansas students already intending to attend an in-state private institution because they were confident that they would complete their education in four years, as private non-profit institutions tend to have the highest four-year graduation rates among post-secondary institutions (National Center for Education Statistics, 2018). This is, however, only a speculation as our study cannot definitively answer this question. In addition, it should be noted that private school enrollment in Arkansas is generally quite low and thus more susceptible to fluctuations.

Second, we observe consistent evidence of a negative and statistically significant impact on enrollment for public two-year institutions in Arkansas relative to comparison states following the change in payout structure. While this finding is surprising given the payouts decreased slightly for two-year institutions, it is important to note the US Department of Education altered Pell Grant eligibility requirements that reduced the number of eligible students in 2012 (Mabel, 2017). If community college students in Arkansas were more adversely impacted by this policy change as prior research suggests (Katsinas et al., 2013), these students may be losing more than just the slight decrease in ACS dollars. While all students nationwide would be impacted by the Pell Grant change, this may have intensified the slight decrease in the ACS award experienced by community college students by decreasing the total aid available.

Finally, we caution that, while our findings generally do not indicate statistically significant impacts on college enrollment associated with the 2013 switch to a backloaded payout structure, the results suggest the potential for negative impacts. Specifically, the coefficient estimates are negative across most models and institution types. Moreover, there is evidence suggesting noticeable statistical noise in these estimations, as the reported standard errors are quite large. We therefore recommend that any state looking to implement a similar change to their merit-scholarship program should do so with caution, as there may be significant unintended consequences for students on the margin of enrolling in college. Future research will need to examine whether these changes to payout structure did in fact *pull* students through to finish their degrees at differential rates.

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APPENDIX

Table A1: Difference-in-Difference Estimates of the Impact of the ACS Expansion and Award Payout Change on Arkansas Enrollment, Compared to SREB States

	All Institutions		4 Year Institutions		2 Year Institutions	
	(1)	(2)	(3)	(4)	(5)	(6)
Arkansas x After 2010	0.0424***	0.0580***	0.0363	0.0512*	0.0296	0.106*
	(0.0142)	(0.0142)	(0.0331)	(0.0285)	(0.0501)	(0.0567)
Arkansas x After 2013	-0.0286*	-0.0178	-0.0279	-0.00753	-0.0198	-0.0670**
	(0.0145)	(0.0136)	(0.0164)	(0.0201)	(0.0276)	(0.0283)
Covariates		Yes		Yes		Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	256	208	256	208	256	208
R-squared	0.994	0.997	0.986	0.993	0.966	0.968

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note. Unit of analysis is state-by-year. The dependent variable in all analyses is the natural log of post-secondary enrollment for both residents and non-residents who were enrolled full-time. *After 2010* takes on a value of 1 for the fall of 2010 and thereafter. *After 2013* takes on a value of 1 for the fall of 2013 and thereafter. *Covariates* are the CEA index (which captures state economic conditions) and the natural log of high school graduates in the previous spring. *SREB States* include Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. Standard errors account for nesting within states.

Table A2: Difference-in-Difference Estimates of the Impact of the ACS Expansion and Award Payout Change on Arkansas Enrollment, Compared to Border States

	All Institutions		4 Year Institutions		2 Year Institutions	
	(1)	(2)	(3)	(4)	(5)	(6)
Arkansas x After 2010	0.0541*	0.0638**	0.0635	0.0828***	-0.0113	0.00285
	(0.0264)	(0.0183)	(0.0394)	(0.0188)	(0.0799)	(0.0832)
Arkansas x After 2013	-0.0244	-0.0212	-0.0216	-0.0201	-0.0871**	-0.0958*
	(0.0169)	(0.0136)	(0.0260)	(0.0265)	(0.0353)	(0.0404)
Covariates		Yes		Yes		Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	112	91	112	91	112	91
R-squared	0.991	0.996	0.990	0.995	0.973	0.977

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note. Unit of analysis is state-by-year. The dependent variable in all analyses is the natural log of post-secondary enrollment for both residents and non-residents who were enrolled full-time. *After 2010* takes on a value of 1 for the fall of 2010 and thereafter. *After 2013* takes on a value of 1 for the fall of 2013 and thereafter. *Covariates* are the CEA index (which captures state economic conditions) and the natural log of high school graduates in the previous spring. *Border States* include Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, and Texas. Standard errors account for nesting within states.

Table A3: Difference-in-Difference Estimates of the Impact of the ACS Expansion and Award Payout Change on Arkansas Enrollment, Compared to SREB States

	All Institutions		4 Year Institutions		2 Year Institutions	
	(1)	(2)	(3)	(4)	(5)	(6)
Arkansas x After 2010	0.0059	0.0190	-0.0026	0.0134	0.0142	0.0886
	(0.0183)	(0.0237)	(0.0416)	(0.0417)	(0.0577)	(0.0736)
Arkansas x After 2013	-0.0294	-0.0239	-0.0228	-0.000757	-0.0302	-0.0884**
	(0.0196)	(0.0195)	(0.0203)	(0.0223)	(0.0293)	(0.0403)
Covariates		Yes		Yes		Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	256	208	256	208	256	208
R-squared	0.993	0.995	0.981	0.988	0.963	0.964

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note. Unit of analysis is state-by-year. The dependent variable in all analyses is the natural log of total post-secondary enrollment (i.e., full and part time, not limited to residents). *After 2010* takes on a value of 1 for the fall of 2010 and thereafter. *After 2013* takes on a value of 1 for the fall of 2013 and thereafter. *Covariates* are the CEA index (which captures state economic conditions) and the natural log of high school graduates in the previous spring. *SREB States* include Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. Standard errors account for nesting within states.

Table A4: Difference-in-Difference Estimates of the Impact of the ACS Expansion and Award Payout Change on Arkansas Enrollment, Compared to Border States

	All Institutions		4 Year Institutions		2 Year Institutions	
	(1)	(2)	(3)	(4)	(5)	(6)
Arkansas x After 2010	0.0251	0.0377	0.0479	0.0692**	-0.0578	-0.0391
	(0.0289)	(0.0223)	(0.0420)	(0.0204)	(0.0802)	(0.0819)
Arkansas x After 2013	-0.0223	-0.0242	-0.0211	-0.0184	-0.0845*	-0.104
	(0.0204)	(0.0238)	(0.0273)	(0.0271)	(0.0348)	(0.0560)
Covariates		Yes		Yes		Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	112	91	112	91	112	91
R-squared	0.991	0.995	0.989	0.995	0.975	0.979

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note. Unit of analysis is state-by-year. The dependent variable in all analyses is the natural log of total post-secondary enrollment (i.e., full and part time, not limited to residents). *After 2010* takes on a value of 1 for the fall of 2010 and thereafter. *After 2013* takes on a value of 1 for the fall of 2013 and thereafter. *Covariates* are the CEA index (which captures state economic conditions) and the natural log of high school graduates in the previous spring. *Border States* include Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, and Texas. Standard errors account for nesting within states.

Katherine Kopotic, PhD, (she/her/hers) is the Manager of External Reporting in the Office of Institutional Research at Saint Louis University. Research interests include college ranking analysis, student interventions, and program evaluation. Email: katherine.kopotic@slu.edu

Jonathan N. Mills, PhD, (he/him/his) is a Research Scientist with the Coleridge Initiative. His research interests include financial aid, school choice, and research methods.. Email: jon.mills@coleridgeinitiative.org

Evan Rhinesmith, PhD, (he/him/his) is the Executive Director of the PRiME Center at Saint Louis University. His research interests include educational policy, postsecondary access and success, and research methods. Email: evan.rhinesmith@slu.edu