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Gender and Loans: Understanding Differences in Student Debt Burden

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Based on combined data from Baccalaureate & Beyond (B&B:16/17), Integrated Postsecondary Education Data System (IPEDS), and Barron's Profiles of American Colleges, this study utilizes zero-inflated beta regression methods and analyzes individual and institutional factors that predict debt burden by gender. Results show that women are less likely than men to have a zero debt burden one year after college graduation. Interaction effect tests show that the relationship between gender and zero debt burden differs by race/ethnicity. Additional analyses disaggregating the debt and earnings components indicate that women's salary is significantly lower than men's salary. The combined results of lower probability of zero debt and lower salary for women than for men are concerning and demonstrate gendered inequities within current systems. Policy attention is needed to address these issues.

Keywords: gender, women, equality, student loans, debt burden, higher education, bachelor's graduates

College costs have grown substantially, and over two-thirds of 2016 bachelor's students graduated with student loans (Ma et al., 2019; National Center for Education Statistics [NCES], 2019). Further, bachelor's graduates with student loans borrowed an average of $29,650—more than double the average amount 20 years ago ($12,750, adjusted for inflation; The Institute for College Access & Success, 2019). Despite growing loan totals, research shows that college degrees tend to generate a substantial economic return, making college participation worth the cost for many students (Akers & Chingos, 2016; Ma et al., 2019).

With the rise in borrowing, researchers have noticed disparities in student borrowing behaviors, debt burden, and loan repayment by socioeconomic status and race (Addo et al., 2016; Chan et al., 2019; Grinstein-Weiss et al., 2016; Jackson & Reynolds, 2013; Hillman, 2015; Scott-Clayton & Li, 2016). While some research also suggests systemic borrowing differences by gender (American Association of University Women [AAUW], 2017; Dwyer et al., 2013; Price, 2004; Saleh et al., 2017), results are mixed. Overall, data tend to show women taking out student loans more often, and greater amounts than men (AAUW, 2017). However, debt burden (a ratio of student debt and postgraduate earnings) may be a more important outcome given substantial evidence of a wage gap between men and women, especially for Women of Color (AAUW, 2018; Corbett & Hill, 2012; Hegewisch & Williams-Baron, 2017; U.S. Bureau of Labor Statistics [BLS], 2019; Xu, 2015). Although several studies on debt burden suggest that women graduates may experience higher debt burdens than men (Baker, 2019b; Chen & Wiederspan, 2014; Thomas, 2000), an analysis considering different predictors by gender has not yet been conducted.

Currently, the few studies available on debt burden examine factors that contribute to debt burden across all students (Baker, 2019b; Chen & Wiederspan, 2014; Price, 2004; Thomas, 2000). As a result, although there are gendered patterns in college attendance, field of study, and post-graduate outcomes (Ma & Savas, 2014; NCES, 2018)—especially earnings (Xu, 2015)—we know remarkably little about differential predictors of debt burden by gender, especially within recent cohorts of graduates. Thus, this study uses the NCES Baccalaureate and Beyond 2016/2017 dataset (B&B:16/17) to explore educational debt burden, defined as the ratio of monthly student loan payment amounts and monthly post-graduate salary among 2016 graduates one year after graduation based on gender. We also examine how key individual and institutional characteristics differentially predict debt burden by gender. The following questions guide our study:

1. To what extent does gender relate to debt burden of college graduates?

2. What student and institutional characteristics are significant in predicting college graduates' debt burden for women and men, respectively?

3. To what extent and in what direction do relationships between gender and debt burden vary by race/ethnicity, major field, institutional control and selectivity?

Literature Review

Before summarizing research that may explain gendered patterns in student borrowing and post-graduate earning, we start our literature review with a broad summary of women's participation in U.S. higher education over time. For the first two centuries of U.S. higher education, colleges only served young white Protestant men (Thelin, 2019). By the 1830s, women had begun to gain access to U.S. higher education via the formation of women's institutions and coeducation and, by the early 1900s, gender parity among students was reached (Goldin & Katz, 2011). However, the end of World War II and the introduction of the 1944 GI Bill skewed enrollment by gender, with men outnumbering women in U.S. colleges from the late 1940s until parity was reached again in the mid-1970s (Goldin et al., 2006; NCES, 1995).

Alongside women's growing enrollment in U.S. colleges over time, women also gained increasing access to the U.S. labor force. Women's participation the U.S. workforce rose rapidly in second half of the twentieth century, with women also beginning to gain access to fields and jobs once held exclusively by men (Goldin et al., 2006). By the 1970s, advancements in birth control and new federal protections for gender equality further supported women's autonomy and professional aspirations and opportunity (Goldin et al., 2006). While fewer than 35% of young women in the late 1960s expected to be working when they reached age 35, this figure had grown to 80% by the late 1970s (Goldin et al., 2006). By the late 1980s, women outnumbered men in U.S. colleges and, today, women comprise the majority of students at all degree levels (NCES, 1995, 2017). Women also represent the majority of U.S. workers today (BLS, 2022b), and are more likely than men to view a college degree as important to their economic success (Bartholomae et al., 2019).

Today, women comprise 57% of all bachelor's students (NCES, 2017). In non-profit higher education, women are not only more likely than men to enroll, but also more likely to complete bachelor's degrees, although men have higher completion rates in the for-profit sector (NCES, 2021). Due largely to the greater participation of women in U.S. higher education, by 2016, women held an estimated 64% of all student debt, a total of $833 billion (AAUW, 2017). Thus, despite women's progress in higher education, student debt has been referred to as a "women's issue" (AAWU, 2017), with evidence that women take out larger student loans then men, and earn lower salaries in the U.S. workforce, with important implications for loan repayment. Most research supports findings related to women's high borrowing rates and lower pay (Baker, 2019b; Chen & Wiederspan, 2014; Thomas, 2000), although there are exceptions (Price, 2004; Saleh et al, 2017). Below, we summarize literature that helps to explain these differential outcomes when it comes to student loans and earnings, including gendered patterns in college enrollment, major choice, and earnings, as well as findings from prior studies on undergraduate debt burden.

Institutional Characteristics by Gender

Despite women's progress in U.S. higher education participation, there are still notable enrollment differences between men and women. Women are disproportionately likely to attend private institutions, including for-profit institutions (NCES, 2018), with private institutions associated with higher student debt amounts (Hillman, 2015), and greater debt burden than public institutions (Chen & Wiederspan, 2014; Price, 2004). Private for-profits are also associated with high student loan default rates (Belfield, 2013; Looney & Yannelis, 2015). Women are also less likely than men to attend selective institutions (Ma & Savas, 2014), which are positively associated with labor market opportunity and post-graduate earnings (Giani, 2016; Oreopoulos et al., 2012; Thomas, 2000), and negatively associated with loan default (Looney & Yannelis, 2015).

Field of Study by Gender

While institutional characteristics matter, field of study tends to be a stronger predictor of labor market outcomes among graduates (Ma & Savas, 2014). In 2017, men comprised the majority of bachelor's graduates in engineering (78%) and business (53%) while women were the majority of graduates in health and health-related professions (84%), psychology (78%), and biological and biomedical sciences (61%; NCES, 2019). The most lucrative undergraduate fields, including engineering and computer science (Carnevale et al., 2015), are largely men-dominated (National Science Foundation [NSF], 2019) while women-dominated disciplines are associated with lower salaries, both immediately after graduation and long-term (Chen & Wiederspan, 2014; Carnevale et al., 2018; Ma & Savas, 2014).

Student Debt by Gender

Student debt is associated with a host of individual factors, especially socioeconomic status, age, and race. Existing research shows that low-family-income students take on greater student debt than higher-family-income peers (Chen & Wiederspan, 2014; Hillman, 2015; Houle, 2014) and first-generation students take on more debt than continuing-generation students (Chan et al., 2020; Chen & Wiederspan, 2014). Age is also associated with borrowing, with older students more likely to be financially independent and borrowing more (Looney & Yannelis, 2015). When considering race, Black students borrow more than all other racial groups, while Hispanic students are relatively less likely to borrow, and Asian students are the least likely to borrow of all groups (Chan et al., 2019; Hillman, 2015; Jackson & Reynolds, 2013; Scott-Clayton & Li, 2016).

While socioeconomic status, age, and race are consistently associated with student borrowing, the relationship between gender and student loans is less clear, especially since most available research is based on older data. Several studies found descriptive differences between men's and women's borrowing patterns among bachelor's graduates. Using the 1997 National Longitudinal Survey of Youth, Dwyer et al. (2013) found that 40% of undergraduate women at four-year institutions took out student loans, compared to 34% of men, with women averaging about $300 more in cumulative debt. Using the 2012 National Postsecondary Student Aid Study (NPSAS), the AAUW (2017) similarly found that 44% of undergraduate women borrowed compared to 37% of men, and women borrowed an average of about $400 more annually. In contrast, using B&B:93/97 data, Price (2004) found that women bachelor's graduates borrowed an average of about $1,925 less than men. Saleh et al. (2017) analyzed 2000-2012 NPSAS data and concluded that women averaged lower amounts of loans than men, although differences narrowed over time. Conflicting results demonstrate the current lack of clarity in understanding student loan borrowing patterns by gender, with direct implications for debt burden.

Postgraduate Earning by Gender

Regardless of borrowing patterns, women earn less than men at every education level (BLS, 2019) and in nearly all occupations (Hegewisch & Williams-Baron, 2017; Xu, 2015). Using B&B:93/03, Xu (2015) found that men earned 14% more than women one year after bachelor's graduation, and 30% more than women 10 years after graduation. These results are consistent with other sources suggesting the wage gap grows over time as workers age (AAUW, 2018; Blau & Kahn, 2017; BLS, 2019). Familial dynamics may be one reason for this shift, as women incur a wage penalty for getting married and having children whereas men see a wage benefit for the same experiences (Kim & Sakamoto, 2017; Xu, 2015, 2017). Additionally, even when men and women graduate with the same degrees in the same fields with comparable GPAs, men earn more (Xu, 2015). While the U.S. gender wage gap has generally improved over time, it has remained largely stagnant since 2004 (BLS, 2019). Given persistent gendered wage gaps, research examining graduate earnings (including debt burden, which uses salary in a ratio) must consider gender in a more critical way

than it has in the past, especially as more graduates take out loans and loan totals grow (Ma et al., 2019; NCES, 2019).

Debt Burden

Student borrowing behaviors and postgraduate salary both impact how loans affect graduates. Debt burden, or the ratio of debt to salary, is a metric that provides insight into a graduate's ability to repay loans and avoid default. Earnings are important in this ratio, as graduates with lower salaries are more susceptible to high debt burdens and difficulty repaying loans (Chapman & Lounkaew, 2015). Given women's lower salaries, and evidence that women may borrow more than men, women graduates may face a higher debt burden, with adverse implications for loan default, financial security, and general well-being (Chapman & Dearden, 2017). Studies examining predictors of student debt burden generally support this conclusion, finding that women's debt burdens tend to be greater than men's (Baker, 2019b; Chen & Wiederspan, 2014).

Three studies have used Baccalaureate and Beyond data to identify predictors of student debt burden among U.S. bachelor's graduates. Using B&B:93/94, Thomas (2000) found that graduates in humanities, graduates with low GPAs, and women all incurred significantly higher debt burdens than counterpart peers. Using B&B:93/97, Price (2004) found that graduates who came from low-income or middle-income families, who were Black, Hispanic, or who had attended private institutions had higher debt burdens than counterpart peers. While women were overrepresented among students with high debt burdens, gender did not significantly predict debt burden in Price's analysis. In Price's study, women borrowed an average of $1,925 less than men, but their salaries were also about $7,000 lower, illustrating the importance of gendered earning disparities.

Building on this work, Chen and Wiederspan (2014) analyzed B&B:00/01 data to identify predictors of debt burden one year after college graduation. Chen and Wiederspan found that graduates who come from low-income families, are first-generation, racially minoritized, hold degrees in humanities and social sciences, or who attended private institutions have greater debt burdens than counterpart peers. However, unlike Price (2004), Chen and Wiederspan found a significant relationship based on gender, concluding that women had a higher debt burden than men. Authors also found that women earn significantly less than men out of college, again contributing to women's disproportionate debt burden.

Using Texas state administrative data of bachelor's graduates who first enrolled from 2005-2009, Baker (2019b) found similar predictors of debt burden. Baker concluded that older students, Black students, first-generation students, financially independent students, those who take longer to complete degrees, and those who major in social sciences, humanities, and arts have greater debt burdens than counterpart peers. Despite finding that women held a lower cumulative debt than men, Baker found that women had a 13 percentage-point larger debt burden than men. Notably, Black women had higher debt burdens than women of all other racial groups, with racial differences driving overall outcomes based on gender. Baker also identified other predictors of debt burden by gender, finding that women with business majors had lower debt burdens than women in other disciplines (and compared to men who majored in business).

In conclusion, existing research suggests that men and women graduates may face differential debt burdens, with the gender pay gap as an important variable in this relationship. While this work identifies individual and institutional characteristics related to undergraduate debt burden, no research has assessed the relative importance of these predictors to women and men graduates separately. By addressing this gap, our study demonstrates how men and women graduates differentially borrow, earn, and experience debt burden. Understanding unique predictors reveals inequities within current systems and aids higher education policymakers in designing structures that better meet all students' needs.

Conceptual Framework

A critical feminist perspective (Bensimon & Marshall, 2000) and human capital theory (HCT; Becker, 1993) guide this work. Following the critical feminist perspective, we start with gender and analyze debt burden as a gendered experience (Shaw, 2004). This lens acknowledges that higher education systems and labor

markets have historically excluded and devalued women, with gendered gaps lingering over time (Carnevale et al., 2018; England, 2010). Across fields, women earn less than men with similar credentials (AAUW, 2018; Blau & Kahn, 2017; BLS, 2019; Corbett & Hill, 2012; Hegewisch & Williams-Baron, 2017; Xu, 2015), with women receiving an economic penalty for marriage and childbirth while men earn a salary premium for the same milestones (Kim & Sakamoto, 2017; Xu, 2015, 2017). The critical feminist lens supports our decision to center women within the analysis, which departs from work that does not consider unique experiences by gender, and where men are treated as the reference group, with women's experiences understood only in comparison (e.g., Baker, 2019b; Chen & Wiederspan, 2014; Price, 2004; Thomas, 2000), or excluded altogether as women's experiences may be "complicated by child birth and marriage" (Minicozzi, 2005, p. 418).

With the critical feminist perspective in mind, we also employ human capital theory, which is a more common framework for understanding student borrowing behaviors and post-graduate economic outcomes (Marginson, 2019). Human capital is defined by a person's productive capacities, including knowledge and skills, and HCT posits that investing in increasing one's human capital through education will result in long-term economic benefits (Becker, 1993). According to HCT, people make decisions that reduce costs and maximize happiness and utility, including productivity and earning opportunities. HCT therefore explains choices related to postsecondary participation, including college and major choice—decisions with implications for student loan borrowing and postgraduate earnings (Giani, 2016; Oreopoulos et al., 2012; Thomas, 2000).

Although HCT suggests that obtaining a bachelor's degree may result in increased human capital and associated economic benefits for most students, a critical feminist perspective explains that individual costs and benefits differ based on individual characteristics and social identities. Students attending private institutions (disproportionately women), for example, may accumulate greater student loan debt (Hillman, 2015), while students who complete degrees in disciplines like STEM (disproportionately men) may access greater economic capital (Carnevale et al., 2013). On its own, HCT falls short in explaining inequities in outcomes, such as the gender wage gap, which holds direct implications for debt burden (Marginson, 2019). Together, both frameworks allow us to examine the ways gender, in addition to other social identities such as socioeconomic status and race, mediate the effects of loan systems in the form of debt burden.

This Study

This study integrates HCT and a critical feminist perspective to examine the relationship between gender and undergraduate debt burden among baccalaureate degree recipients. Specifically, we use nationally representative data to test to what extent gender is associated with college graduates' debt burden after accounting for differences in demographics, college experience, and institutional characteristics. Based on our conceptual framework, we also explore whether the relationship between gender and debt burden varies by race/ethnicity, major, institutional control, and selectivity. Throughout our analyses, we employ a zero-inflated beta regression, which is appropriate for our outcome, a ratio variable containing zero.

Methods

This study uses combined data from Baccalaureate & Beyond (B&B:16/17), Integrated Postsecondary Education Data System (IPEDS), and Barron's Profiles of American Colleges. The B&B:16/17 survey is ideal for research on debt burden because it follows a nationally representative sample of graduates who completed requirements for a baccalaureate degree between July 1, 2015, and June 30, 2016. B&B:16/17 contains rich data on graduates' demographic characteristics, college experiences, and postgraduate debt and repayment patterns, allowing examination of debt burden approximately one year after bachelor's degree completion. IPEDS is a system of interrelated surveys of institutions and includes institutional characteristics, enrollment, student financial aid, and fiscal resources. Barron's Profiles of American Colleges provides measures of institutional selectivity.

Following the previous literature, the sample for the present study is restricted to students who (1) received a bachelor's degree during the 2015-16 academic year, (2) who were working full-time when the follow-up survey was conducted, and (3) who reported valid earnings data. Consistent with prior studies, to minimize the impact caused by outliers in self-reported earnings data, we excluded individuals who reported hourly earnings that were less than the federal minimum wage rate for 2016-17 and those with an annual salary of more than $500,000. The final sample is comprised of 6,150 bachelor's graduates from 941 four-year institutions.

Model Specification

In the current study, the dependent variable is defined as undergraduate debt burden measured by the ratio of a graduate's monthly student loan payments (federal and private) to gross monthly salary. This ratio variable is a continuous variable that contains zero, which allows our analyses to be more precise. Data on graduates' monthly loan payments and salary was collected in June 2017, approximately one year after bachelor's degree completion. Following previous studies (Chen & Wiederspan, 2014; Price, 2004; Thomas, 2000), this outcome is constructed to understand which students are struggling to repay loans and examine how various factors are associated with student debt burden. This outcome variable includes graduates who were enrolled in income-driven repayment plans, as well as those who paid off their loan balances within their first year. However, graduates who were in deferment or forbearance were not included in the sample due to the nature of the debt payment variable in the B&B dataset.

Consistent with the critical feminist perspective, our primary independent variable is gender identity, a newly defined gender variable in B&B:16/17. This new variable gave respondents seven gender identity and expression options including male, female, transgender (male-to-female), transgender (female-to-male), genderqueer or gender nonconforming, a different gender identity, or questioning or unsure. While we originally approached this study to take advantage of this variable and define gender in a more inclusive way (Garvey et al., 2019), the small number of respondents who indicated any of the gender identity options outside of male and female (51 cases) limited our analytic options. Ultimately, we had to exclude this small number of cases and recoded the gender identity variable into a dummy variable indicating "female" or not based on the B&B survey response options. Because the B&B:16/17 survey uses biological sex terms "female" and "male" in regard to gender identity, throughout this study we use "female" and "women" interchangeably, as well as "male" and "men."

The other independent variables in our model measure student and institutional characteristics identified in the reviewed literature and conceptual model. Student variables include demographic characteristics: age (a dummy variable indicating student age under/over 25, with over 25 as the reference group), race/ethnicity (dummy variables indicating Black or African American, Hispanic, Asian, and other, with the omitted group being White), first-generation student status (dummy variable measuring whether the student's parental education is below BA or not), family income while in college (log of family income, total income in 2014 for independent students or parents of dependent students), whether the student is considered a dependent of parents while in college (being independent is the reference group), and whether the student attended an institution within their resident state (attending an institution out of state is the reference group).

Based on existing literature and human capital theory, we also included college experience variables and institutional characteristics. College experience variables measure college GPA (in quartiles, with the lowest quartile as the reference group), and major field (social science or education, STEM, business, health, and other major, with the omitted group being humanities), as both variables have the potential to influence students' postgraduate economic opportunity. Because time to degree may influence student debt, we also included dummy variables indicating time between first entry into postsecondary education and bachelor's completion (four-to-six years and more than six years, with less than four years as the reference group).

Because institutional characteristics may also influence students' investment in higher education and human capital returns, we followed Chen and Wiederspan (2014) and included institutional factors such as

size (log transformed), control (private non-profit, private for-profit, with public as the reference category), selectivity (moderate selectivity, high selectivity, with the omitted group being lowest selectivity), whether an institution is urban or not, and the average ratio between institutional expenditure on grants and tuition revenue in the six years before students graduated from their undergraduate institutions. Similarly, the institution size variable takes the average institutional size in the six years before graduation.

Analytic Methods

To account for the nature of ratio/proportional dependent variable of undergraduate debt burden that contains zero, we use a zero-inflated beta regression (Ospina & Ferrari, 2012; Paolino, 2001; Smithson & Verkuilen, 2006). Beta regression is an extension of the generalized linear model approach. The beta distribution, which the beta regression model is based on, is flexible for modeling limited range data and can accommodate a broad range of distribution shapes such as unimodal, uniform, or bimodal distribution. When proportions data include a non-negligible number of zeros or ones, however, the beta distribution does not provide a satisfactory description of the data. The zero-one inflated beta regression analysis is thus desirable, since it combines the beta law to define the continuous component of the distribution and a Bernoulli distribution to define the discrete component. Because there are no ones in our data, we need to accommodate inflation only at zero and thus use zero-inflated beta regression methods.

The zero-inflated beta regression model consists of (1) the estimated probability that the outcome is equal to zero, and (2) the estimated distribution of when the outcome is greater than zero and less than one. The zero-inflated beta regression allows model calculations using heteroskedastic errors and easily accommodates asymmetric residuals. In addition, we used a sampling weight (BB01AWT), stratification (BB01ASTR), and clustered standard errors (bb17analpsu) for the complex survey design and multilevel data nature in the zero-inflated beta regression analyses. As this study did not aim to estimate components of variance that describe between-institution variation that is not explained by the covariates in our model, we did not fit a multilevel model. Instead, we adjusted for within-institution correlation using the clustered standard errors approach and estimated marginal relationships of the covariates with the outcome across all institutions. The software package used in the analyses is Stata.

Analytic Procedure

Before describing the analytic procedure, it is worth noting that missing values on most B&B:16/17 variables were imputed before the data were released (NCES, n.d.). Per Institute of Education Sciences policy regarding the use of the restricted B&B data, all sample and subsample sizes reported here are rounded to the nearest 10.

First, we completed descriptive analyses to understand debt burden as well as student and institutional characteristics in the sample. We also used the variance inflation tests (VIF) and found all VIF values range between 1.01 and 4.09, lower than the threshold of 10, which indicates no multicollinearity problems. Following that, we used zero-inflated beta regression to conduct a deeper examination of how gender is related to debt burden, controlling for other student and institutional characteristics. We then used zero-inflated beta regression on the female and male subgroups to estimate how the aforementioned covariates related to debt burden differently by gender. Next, to examine whether the relationship between gender and debt burden varied by college experience and institutional environment, we conducted interaction effect tests between gender and race/ethnicity, gender and major field, gender and institutional control, and gender and institutional selectivity. These interaction effects were considered based on the conceptual framework and prior literature that has shown gender differences in the participation in major fields and types of institutions which are connected to differential salary after graduation. Finally, given that debt burden is a ratio of debt and salary, we further examined gender gaps in debt burden by disaggregating this outcome into borrowing and earnings components.

Limitations

There are several limitations to this study. First, to avoid self-selection bias in full-time versus half-time employment, we followed existing research (Chen & Wiederspan, 2014; Zhang, 2008) and excluded sample members who were employed half-time or who were unemployed in 2017, many of whom may be women. Our sample only contains bachelor's graduates who worked full-time one year after graduation, which may underestimate the gender gap in debt burden. Second, data limitations impact our understanding of how institutional characteristics relate to debt burden. Although B&B provides information about a student's first and graduating institutions, other institutions are not included. Results for institutional effects apply to graduating institutions only. Third, existing research shows that the gender wage gap is lowest among young adults and widens with age (AAUW, 2018; Council of Economic Advisors [CEA], 2014), and analysis focused on 2016 bachelor's graduates one year after graduation likely underestimates gendered differences observed occur over time.

We were not able to take advantage of newly available B&B data with the non-binary gender category due to the small size of this third gender group. The dichotomous measures of gender identity, especially based on terminology associated with biological sex, limited the opportunity for analysis capturing students with diverse gender identities As we were ultimately unable to examine debt burden outcomes for gender non-conforming and transgender graduates based on small sample size, future research using other data or methodologies that enable a more inclusive definition of gender is needed (Garvey et al., 2019; Grant et al., 2011).

Finally, because B&B only includes college graduates, we were not able to explore gender differences in debt burden for students who dropped out of higher education before degree completion. This group may be especially suspectable to high debt burdens, having potentially accrued student loans without the benefit of the wage premium a college degree often provides (Chen & Wiederspan, 2014). In 2015 and 2016, 3.9 million undergraduates with federal student loan debt dropped out, with these students three times more likely to default on their loans compared to graduates (Barshay, 2017). Thus, results cannot be interpreted to be applicable for the overall debt burden in higher education.

Results

Descriptive Findings

As shown in Table 1, one year after graduation, bachelor's graduates' average debt burden ratio was 5.7%, and about 39.7% of the graduates did not accumulate any debt burden by that time. Descriptive statistics of total loan borrowed, monthly debt payment, and monthly salary are provided in Appendix A. Among those who accumulated debt burden, the average debt burden was 9.5%. Table 1 also reports the descriptive results of student and institutional characteristics as predictors in the model. Findings show that, among the 6,150 college graduates, 71.9% were younger than 25, 69.5% were White, 8.4% African American, 10.8% Hispanic, 7.0% Asian, 4.3% other race/ethnicity, 53.7% female, 46.3% male, and 39.3% first-generation status. During their graduating year, over half of the respondents were considered as financially dependent (59.2%), 73.7% attended resident-state institutions, 8.9% majored in humanities, 17.2% in social science or education, 26.3% in STEM, 23.7% in business, 12.8% in health, and 11.1% in other areas. 41.3% completed bachelor's degrees in less than 4 years, 31.0% finished within 4 to 6 years, and 27.8% took more than 6 years to graduate. Family income was log transformed and college cumulative GPA was recoded into quartiles.

Regarding institutional characteristics, 63.2% of sample members graduated from public institutions, 32.9% from private non-profit institutions and 3.8% from private for-profit institutions. 18.8% graduated from the least selective institutions, 64.2% from moderately selective institutions, and 17.1% from the most selective institutions. 59.1% of the institutions are located in urban areas, with the average ratio between institutional financial aid and tuition revenue 21.0%. Institutional size was log transformed.

Table 1

Descriptive Statistics for Model Variables (n=6,150)

	Mean	SE	Min.	Max.
Outcome (Ratio of monthly loan payments to gross monthly income)				
Debt Burden (ratio)	0.057	0.002	0	.989
Debt Burden (ratio is zero)	0.397	0.011	0	1
Debt Burden (ratio if not zero)	0.095	0.002	0.002	.989
Student Characteristics				
Age <25	0.719	0.013	0	1
White	0.695	0.012	0	1
Black	0.084	0.006	0	1
Hispanic	0.108	0.008	0	1
Asian	0.070	0.006	0	1
Other race	0.043	0.004	0	1
Female	0.537	0.010	0	1
Male	0.463	0.010	0	1
Log of family Income	10.359	0.047		
Dependent	0.592	0.014	0	1
First Generation Student	0.393	0.011	0	1
Attend an institution in the resident state	0.737	0.013	0	1
Log of total loans borrowed	6.707	0.116	0	12.08
Lowest Quartile of GPA	0.258	0.010	0	1
Middle Quartiles of GPA	0.518	0.010	0	1
Highest Quartile of GPA	0.224	0.009	0	1
Humanities	0.089	0.006	0	1
Social science or education	0.172	0.007	0	1
STEM	0.263	0.011	0	1
Business	0.237	0.009	0	1
Health	0.128	0.009	0	1
Other Major	0.111	0.006	0	1
Time-to-BA Degree < 4 years	0.413	0.014	0	1
4 years <=Time-to-BA Degree<=6 years	0.310	0.010	0	1
Time-to-BA Degree>6 years	0.278	0.012	0	1
Institutional Characteristics				
Public	0.632	0.022	0	1
Private non-profit	0.329	0.021	0	1
Private for-profit	0.038	0.007	0	1
Low selectivity	0.188	0.016	0	1
Moderate selectivity	0.642	0.024	0	1
High selectivity	0.171	0.022	0	1
Urban	0.591	0.025	0	1
Average ratio between institutional financial aid and tuition revenue	21.035	0.543	21.261	20.829
Average Log of size	9.289	0.058	9.371	9.214

Table 2

Descriptive Statistics for Model Variables by Gender

	Male	Female
Outcome (Ratio of monthly student loan payments to gross monthly income)		
Debt Burden (ratio)	0.052	0.061
Debt Burden (ratio is zero)	0.430	0.368
Debt Burden (ratio if not zero)	0.091	0.097
Predictors		
Student Characteristics		
Age <25	0.735	0.706
White	0.713	0.678
Black	0.060	0.106
Hispanic	0.103	0.112
Asian	0.083	0.060
Other race	0.041	0.045
Log of family Income	10.341	10.373
Dependent	0.602	0.582
First Generation Student	0.351	0.431
College Experience		
Attend an institution in the resident state	0.722	0.752
Lowest Quartile of GPA	0.322	0.203
Middle Quartiles of GPA	0.476	0.554
Highest Quartile of GPA	0.202	0.243
Humanities	0.081	0.098
Social science or education	0.132	0.206
STEM	0.367	0.173
Business	0.278	0.201
Health	0.040	0.204
Other Major	0.101	0.119
Time-to-BA Degree < 4 years	0.401	0.423
4 years <=Time-to-BA Degree<=6 years	0.341	0.283
Time-to-BA Degree>6 years	0.259	0.294
Institutional Characteristics		
Public	0.647	0.618
Private non-profit	0.318	0.341
Private for-profit	0.035	0.041
Low selectivity	0.175	0.199
Moderate selectivity	0.628	0.653
High selectivity	0.197	0.148
Urban	0.586	0.596
Average ratio between institutional financial aid and tuition revenue*	21.261	20.829
Average Log of size *	9.371	9.214

Note. Standard Errors are similar across the two samples and are not listed due to limited space.

In looking at the gender difference in debt burden (Table 2), we observed consistent gaps. In terms of average debt burden, female graduates had higher debt burdens (6.1%) than men (5.2%). In addition, the percentage of zero debt burden for female graduates (36.8%) was lower than male graduates (43.0%). Regarding student characteristics, more women belonged to racially minoritized groups than men, especially among Black graduates (10.6% of sample women were Black or African American, compared to 6.0% of men). Consistent with our literature review, women's degrees were disproportionately in health and social sciences.

Zero-Inflated Beta Regression: Gender and Debt Burden

Table 3 reports the results based on the zero-inflated beta regression on the whole sample, allowing us to understand the relationship between gender and debt burden. Results on this relationship were consistent: men were more likely than women to have zero debt burden (essentially, zero debt payment), although the amount of debt burden among those who had non-zero debt burden was not significantly different for men and women. Specifically, the results on zero debt burden (whether the proportion of monthly debt divided by monthly salary is zero or not) show that, for these female graduates, the odds of having zero debt burden were 15.3% smaller (OR = .847, $p < .05$) than the odds for men. The estimation of beta regression on the proportion of debt burden (debt burden ratio is greater than 0 and less than or equal to 1) reveals a non-significant gender difference in debt burden.

Zero-Inflated Beta Regression: Subgroup Analyses by Gender

To understand student and institutional characteristics that predict college graduates' debt burden for women and men, respectively, we conducted subgroup analyses using the same zero-inflated beta analysis approach. Regarding the estimation of debt burden being zero or not, the significant predictors from the results (Table 4) were mostly the same for men and women, except the findings on age, race/ethnicity, family income, time to degree, and the control, selectivity, and size of the institutions attended. Specifically, Black male graduates were less likely to have zero debt burden (OR=0.413, $p<0.01$) than White male graduates, while the likelihood of having zero debt burden was similar for Black and White women. The log of family income during college was significant and positively related to the odds of zero debt burden for men (OR=1.086, $p<0.01$), but not for women. Among female graduates, compared with graduating in less than 4 years, graduating in more than 6 years was negatively related to the odds of zero debt burden (OR=0.466, $p<.001$). Men who attended private non-profit (OR=0.643, $p<.05$) or moderately selective institutions (OR=0.597, $p<.05$) were less likely to accumulate zero debt burden, while women who attended private for-profit institutions were significantly less likely to have zero debt burden (OR=0.589, $p<0.05$).

When estimating the debt burden ratio being greater than zero and smaller than one, we found the results were similar for male and female college graduates on most predictors (Table 5), with slight differences for institutional control and size. Women who graduated from for-profit private institutions had a 25.3% higher debt burden ratio one year after graduation (relative proportion ratio, rpr, =1.253, $p<0.05$) compared to women who graduated from public institutions. Institutional control was not a significant predictor of debt burden for men. Attending a larger-sized institution was negatively related to debt burden ratio for men (rpr=0.926, $p<.05$).

Table 3

College Graduates' Debt Burden

	Debt Burden Zero or Not		Debt Burden>0 and <1	
	Odds Ratio	**Robust Std. Err.**	**Relative Prop. Ratio**	**Robust Std. Err.**
Demographic Characteristics				
Age <25	1.599**	0.164	0.966	0.081
Black	0.840	0.169	0.964	0.054
Hispanic	1.529**	0.136	0.931	0.047
Asian	2.655***	0.158	0.956	0.066
Other race	1.086	0.221	0.932	0.074
Female	0.847*	0.083	1.052	0.036
Log of family income	1.047*	0.020	1.007	0.006
Dependent	0.385***	0.146	1.022	0.068
First-generation student	0.707***	0.090	0.988	0.037
College Experience				
Attend an institution in the resident state	0.735**	0.093	1.024	0.043
Middle quartiles of GPA	1.324**	0.108	0.895**	0.042
Highest quartile of GPA	2.256***	0.128	0.842**	0.052
Social science or education	1.035	0.164	0.967	0.083
STEM	1.192	0.161	0.881	0.082
Business	0.999	0.172	0.858	0.096
Health	0.760	0.180	0.839*	0.093
Other Major	1.138	0.176	1.002	0.093
4 years <=Time-to-BA degree<=6 years	1.301**	0.105	1.029	0.044
Time-to-BA degree>6 years	0.620**	0.153	0.891	0.080
Institutional Characteristics				
Private non-profit	0.698**	0.138	1.107	0.053
Private for-profit	0.664*	0.196	1.232**	0.066
Moderate selectivity	0.702**	0.131	1.193***	0.049
High selectivity	1.057	0.185	0.981	0.075
Urban	1.022	0.092	1.032	0.034
Average ratio between institutional financial aid and tuition revenue	1.009	0.005	0.998	0.002
Average log of size	1.109	0.054	0.949**	0.019

Note. *p < 0.05. **p < 0.01. ***p < 0.001.

Table 4

Gender Differences: College Graduates' Debt Burden Being Zero or Not

	Male		Female	
	Odds Ratio	**Robust Std. Err.**	**Odds Ratio**	**Robust Std. Err**
Demographic Characteristics				
Age <25	2.102*	0.277	1.272	0.220
Black	0.413**	0.263	1.164	0.201
Hispanic	1.232*	0.225	1.780***	0.161
Asian	2.893***	0.253	2.366***	0.212
Other race	0.980	0.340	1.171	0.283
Log of family income	1.086**	0.027	1.017	0.026
Dependent	0.350***	0.218	0.402***	0.192
First-generation student	0.605***	0.136	0.780*	0.112
College Experience				
Attend an institution in the resident state	0.689**	0.144	0.759*	0.126
Middle quartiles of GPA	1.339	0.152	1.321	0.154
Highest quartile of GPA	2.163***	0.175	2.344***	0.180
Social science or education	0.986	0.244	1.106	0.221
STEM	1.114	0.236	1.302	0.212
Business	0.923	0.249	1.085	0.233
Health	0.620	0.334	0.851	0.220
Other major	1.161	0.267	1.145	0.232
4 years <=Time-to-BA degree<=6 years	1.343	0.157	1.237	0.141
Time-to-BA degree>6 years	0.824	0.248	0.466***	0.205
Institutional Characteristics				
Private non-profit	0.643*	0.218	0.727	0.167
Private for-profit	0.746	0.263	0.589*	0.248
Moderate selectivity	0.597*	0.200	0.787	0.152
High selectivity	0.855	0.275	1.332	0.211
Urban	0.851	0.130	1.222	0.109
Avg. ratio between institutional financial aid and tuition revenue	1.010	0.007	1.007	0.005
Average log of size	1.046	0.081	1.161*	0.061

Note. *p < 0.05. **p < 0.01. ***p < 0.001.

Table 5

Gender Difference: College Graduates' Debt Burden Being Greater Than Zero and Smaller Than One

	Male		Female	
	Relative Prop. Ratio	**Robust Std. Err.**	**Relative Prop. Ratio**	**Robust Std. Err.**
Demographic Characteristics				
Age <25	1.060	0.128	0.884	0.126
Black	1.000	0.102	0.929	0.065
Hispanic	0.959	0.077	0.899	0.060
Asian	0.893	0.097	0.972	0.095
Other race	0.973	0.143	0.863	0.081
Log of family income	1.007	0.009	1.005	0.008
Dependent	1.100	0.114	0.965	0.096
First-generation student	0.989	0.054	0.993	0.047
College Experience				
Attend a resident state institution	0.974	0.063	1.064	0.056
Middle quartiles of GPA	0.869**	0.053	0.927	0.059
Highest quartile of GPA	0.837*	0.073	0.847*	0.072
Social science or education	1.053	0.122	0.911	0.115
STEM	0.922	0.113	0.893	0.117
Business	0.959	0.123	0.791	0.134
Health	0.815	0.140	0.811	0.122
Other major	1.094	0.130	0.945	0.132
4 years <=Time-to-BA degree<=6 years	1.020	0.070	1.032	0.053
Time-to-BA degree>6 years	1.019	0.108	0.797	0.146
Institutional Characteristics				
Private	1.096	0.082	1.122	0.069
For-Profit	1.209	0.106	1.253*	0.087
Moderate selectivity	1.178*	0.080	1.188**	0.061
High selectivity	0.988	0.123	0.968	0.094
Urban	0.964	0.054	1.081	0.045
Average ratio between institutional financial aid and tuition revenue	0.998	0.003	0.998	0.002
Average log of size	0.926*	0.034	0.975	0.022

Note. *p < 0.05. **p < 0.01. ***p < 0.001.

Interaction Effect Tests

To determine whether the relationship between gender and debt burden varied by race/ethnicity, major, institutional control, and selectivity, we conducted interaction effect tests. Our results (Table 6) revealed only one significant interaction effect, between gender and race/ethnicity, and only with respect to the outcome component of zero-debt burden (essentially, zero debt). The model with this set of interaction effect terms improved the baseline model significantly ($p < 0.01$). To understand results, especially the interaction effects, we estimated the predicted probabilities of zero debt across racial/ethnic groups for men and women while holding the other regressors constant at specified values (for dummy variables) or at their

respective means (for continuous regressors) (Table 7). There are three conclusions we can draw from interaction effect tests and this simulation estimation. First, compared with other racial/ethnic groups, Black graduates had lower probabilities of zero debt, with 9.3% for males and 7.2% for females. Second, female graduates were less likely to have zero debt across all racial/ethnic groups. For example, among white students, female college graduates had a lower probability of zero debt (14.9%) than male graduates (18.9%), other factors being equal. A similar gender gap was evident among other racial/ethnic groups. Third, interaction effect tests showed that the relationship between gender and zero debt differed by race/ethnicity. Specifically, among non-Black graduates, women's probability of having zero debt was about 4 to 6 points lower than it was for men, while it was 2 points lower for Black women graduates than Black men peers (Table 7). In other words, the gender gap in the probability of having zero debt is slightly smaller among Black graduates. At the same time, Black graduates have the lowest probability of zero debt than all other groups.

Additional Separate Analyses on Debt and Earnings

Since the outcome variable of debt burden is a function of two dependent variables, monthly debt payment and salary, we conducted additional analyses on undergraduate borrowing, debt repayment, and earnings for women and men. In looking at cumulative undergraduate loans (including federal and private), a smaller percentage of women borrowed zero student loans compared to men in the sample. Among those who borrowed, women averaged $800 more than men ($33,157.110 vs. $32,313.520). In examining debt repayment, as reported earlier, a smaller percentage of women had zero monthly debt repayment than men (36.9% vs. 43.1%). Among those who had debt repayment, women paid a slightly larger amount of monthly student debt than men (1.7%), although the difference was not substantial ($304 vs. $300). Further analysis also revealed a large salary gap; women lagged behind men in monthly salary by 10.6% ($3,493 vs. $3,908).

To understand whether patterns still exist after controlling for other factors, we focused on college graduates with a non-zero debt burden and conducted additional analyses using log-linear regressions on monthly debt payment and earnings separately. Consistent with the descriptive results, regression analysis from the debt model revealed that the gender difference in the amount of debt payment was not statistically significant, while results from the earnings model show that women earned significantly lower salary than men ($\beta = -0.09$, $p<0.001$). Given results showing women's lower salary and lower probability of accumulating zero debt payment compared to men, women's postgraduate financial situation is concerning.

Table 6

College Graduates' Debt Burden: Interaction Effect Tests between Gender and Race

	Debt Burden Being Zero or Not		Debt Burden>0 and <1	
	Odds Ratio	**Robust Std. Err.**	**Relative Prop. Ratio**	**Robust Std. Err.**
Demographic Characteristics				
Age <25	1.592**	0.166	0.967	0.081
Black	0.443**	0.265	1.018	0.102
Hispanic	1.195	0.221	0.936	0.073
Asian	2.788***	0.242	0.880	0.093
Other race	0.956	0.345	0.973	0.138
Female	0.753**	0.098	1.058	0.046
Log of family Income	1.048*	0.019	1.007	0.006
Dependent	0.383***	0.145	1.021	0.068
First Generation Student	0.700***	0.090	0.989	0.037
College Experience				
Attend a resident state institution	0.730**	0.093	1.025	0.043
Middle Quartiles of GPA	1.321**	0.107	0.896**	0.042
Highest Quartile of GPA	2.256***	0.128	0.844**	0.052
Social science or education	1.035	0.164	0.972	0.084
STEM	1.184	0.161	0.884	0.082
Business	0.998	0.171	0.862	0.097
Health	0.762	0.179	0.842	0.094
Other Major	1.140	0.176	1.009	0.094
4 years <=Time-to-BA Degree<=6 years	1.293*	0.105	1.031	0.044
Time-to-BA Degree>6 years	0.616**	0.154	0.891	0.080
Institutional Characteristics				
Private non-profit	0.698**	0.137	1.107	0.053
Private for-profit	0.673*	0.195	1.231**	0.065
Moderate selectivity	0.709**	0.132	1.191***	0.049
High selectivity	1.067	0.186	0.981	0.075
Urban	1.028	0.092	1.031	0.034
Avg ratio between institutional financial aid and tuition revenue*	1.008	0.005	0.998	0.002
Average Log of size *	1.101	0.053	0.950**	0.019
Female * Black	2.609**	0.317	0.919	0.125
Female * Hispanic	1.586	0.262	0.990	0.093
Female * Asian	0.902	0.322	1.170	0.133
Female * Other Race	1.278	0.436	0.929	0.160

Note. *p < 0.05. **p < 0.01. ***p < 0.001.

Table 7

Predicted Probability of Zero Debt by Gender Conditional on Race/Ethnicity

Race/Ethnicity	Male	Female
White	18.90%	14.90%
Black	9.30%	7.20%
Hispanic	21.70%	17.30%
Asian	39.30%	32.80%
Other race/ethnicity	18.17%	14.32%

Table 8

Descriptive Statistics of Total Loan Borrowed, Monthly Debt Payment, and Salary by Gender

Variable	Male	Female
Total loan borrowed	32313.520	33157.110
Debt (if debt>0)	300.552	303.585
Log of debt	5.376	5.386
Earning	3907.717	3493.329
Log of earning	8.183	8.087

Discussion

This study provides a much-needed updated understanding of debt burden using U.S. national data, as prior research is based on samples of bachelor's graduates from 20+ years ago, despite significant changes in student borrowing patterns in recent decades (NCES, 2019). Additionally, despite overwhelming evidence of a gendered wage gap in the U.S. (e.g., BLS, 2019; Xu, 2015), and research suggesting that women borrow more than men (e.g., AAUW, 2017; Chen & Wiederspan, 2014), prior research has not critically examined the role of gender when investigating debt burden outcomes. This study responds to these gaps and is the first to focus on gendered differences in debt burden and differential predictors of debt burden for men and women bachelor's graduates using updated national data.

Results show that proportionately more women in the sample had student loans. Additionally, among borrowers, women borrowed more. Women were less likely to have zero debt burden and tended to have a larger debt burden ratio than men, although gender gaps among graduates with debt burden were marginally significant. One year after earning a bachelor's degree, women within our sample earned 10.6% less than men, which was an important driver in debt burden outcomes. Among women, subgroup analyses showed that women who attended private for-profit institutions were more likely to have a non-zero and higher debt burden than women who attended public institutions. Women who took more than 6 years to complete their degree were also more likely to have debt burden. Results also revealed important differences by race/ethnicity. Of all racial groups, Black graduates had the lowest probability of having zero debt. Black men graduates were more likely than white men to have debt burden (although this relationship was not observed among women). While women had lower probabilities of zero debt burden across racial groups, this gendered difference was smaller among Black graduates.

Higher education was historically created for men (Thelin, 2019) and, in many ways, women are still catching up. Although women comprise the majority of bachelor's students today (NCES, 2017), our findings support evidence that women are underrepresented in the most lucrative college majors and careers

(BLS, 2022a; Carnevale et al., 2015; NSF, 2019), borrow more than men (AAUW, 2017; Baker, 2019b; Chen & Wiederspan, 2014; Thomas, 2000), and earn lower salaries than men (AAUW, 2018; Corbett & Hill, 2012; Hegewisch & Williams-Baron, 2017; BLS, 2019; Xu, 2015). We add to the literature by further demonstrating that, one year after graduation, women bachelor's graduates are more likely than men to have a non-zero debt burden. These dynamics have critical implications for women's experiences in higher education and beyond; if women borrow just as much or more than men while also earning less, women will experience longer repayment schedules while being at higher risk for loan default, with adverse implications for financial security and overall wellbeing that extends long past college graduation.

While we found no significant difference between men and women in debt burden ratio among those with debt burden, this pattern may change over time beyond the first year. As our findings show, women earned 10.6% less than men just one year after their bachelor's graduation, a wage gap relatively lower than observed among graduates from 23 years ago (women bachelor's graduates in 1993 earned 14% less; Xu, 2015). However, we expect the gender wage gap to grow over time (AAUW, 2017; CEA, 2014), especially as traditional-age bachelor's graduates are unlikely to have reached marriage and childbirth milestones (Mathews & Hamilton, 2016; U.S. Census Bureau, 2019), which penalize women while benefitting men (Kim & Sakamoto, 2017; Xu, 2015). Future research may examine how gendered patterns of debt burden evolve over time, as our findings may represent the most financially equal point in men and women's postgraduate lives.

Another important insight from our findings is the racial differences by gender in debt outcomes. Our findings show that Black men are underrepresented among bachelor's graduates, and that this group has a lower probability of having a zero-debt burden than white men graduates. Gendered differences are also smaller between Black graduates than all other racial groups. Paired with the findings above, it is clear that current loan systems are inequitable for college graduates, with women and Black graduates disproportionately affected. Overall, 39.7% of the sample had a zero-debt burden, suggesting that they had no student debt repayment one year after graduation. Among those who had a non-zero debt burden, the average debt burden ratio was 9.5%, meaning that monthly student loan payments comprise 9.5% of gross monthly salary. Considering debt alongside earnings is important for understanding graduates' ability to repay loans, and their standard of living (Chapman & Dearden, 2017), As policymakers continue to consider changes to financial aid and student loan programs, issues of equity, like those revealed within this study, must be considered.

Implications for Policy and Practice

In recent years, the U.S. has seen an increasing number of postsecondary systems and states adopt free tuition policies (Perna & Leigh, n.d.), with evidence that free tuition policies may effectively promote women's postsecondary enrollment and attainment (Bartik et al., 2021; Gándara & Li, 2020), Because women tend to be more likely to borrow for college and earn less than men, widespread actions to make college more financially accessible, or to forgive existing student loans, or both, would likely reduce gendered differences in debt burden among college graduates. Such policy initiatives would also promote racial equity in postsecondary education, given our results showing that that Black graduates disproportionately experience debt burden compared to other racial groups.

Recent changes to expand student loan programs like income-driven repayment (IDR) and the Public Service Loan Forgiveness (PSLF) program is a hopeful start (U.S. Department of Education, 2022), since women disproportionately enter majors and careers in education and other non-profit industries (Carnevale et al., 2018). However, awareness of and participation in these programs remains relatively low (Anderson et al., 2018; Government Accountability Office, 2015). Overall, complex financial aid and loan forgiveness programs with high administrative burdens can be difficult for students to understand and successfully navigate (Boatman et al., 2014; Castleman et al., 2015; Dynarski et al., 2018; Dynarski & Scott-Clayton, 2006; Smith, 2021), further supporting the importance of reducing college costs in the interest of creating more equitable postsecondary systems.

Finally, to help students better understand their anticipated debt burden, postsecondary institutions are well-situated to provide support and information related to student loans and repayment that can reduce students' burden options, including programs like IDR and PSLF. As many students may not know how much money they have borrowed while in college (Brown et al., 2011), additional financial aid counseling may help current students to better understand their debt load, especially modules showing students' approximate monthly repayment amount based on their loans, a recommendation from Baker (2019a). Then, as students plan for post-graduate life, financial aid and career services offices may partner to share information about IDR and loan forgiveness programs associated with specific industries, positions, or regional needs such as teaching, or healthcare. However, just as broader changes are needed within current financial aid and student loan programs, the U.S. workforce must also ultimately be held accountable for providing equitable pay and supporting women through family transitions. As results of this study reveal, current systems do not equally meet all students' needs, and systemic change is needed to truly promote gender and racial equity, both in college and beyond.

Conclusion

Research that examines the ratio of debt compared to salary better captures how student loans affect college graduates (Chapman & Dearden, 2017). We observed that women were less likely to have zero debt while controlling for other factors. Black graduates tended to have the lowest zero debt probabilities of all racial groups, and the gender gap between Black men and women graduates group was smaller than other groups. Future research may be needed to further understand racial/ethnic gaps in debt burden and how they interact with gender in this outcome. Differences observed do not capture the experiences of all college graduates and must be carefully interpreted within this context. We expect that debt burden differences may change over time, perhaps exacerbating the gendered gaps that we already start to see within the current analysis. Although the debt burden ratio for those with debt larger than zero did not differ significantly by gender, we observed a significant gender gap in monthly salary. Strategies to make college more affordable so that students will take on less debt may include reducing tuition and other costs, enhancing financial aid, especially grant and scholarship aid, and are critical to promoting equitable access and post-graduate outcomes for all students.

Appendix A

Descriptive Statistics of Total Loan Borrowed, Monthly Debt Payment, and Monthly Salary

Variable	Mean	Std. Errors	Min	Max
Total loan borrowed	32,796.140	551.9184	98	17,7000
Debt (if debt>0)	302.839	7.579	9.000	3295.000
Log of debt	5.385	0.023	2.197	8.100
Earning	3,684.850	35.590	1,167.000	23,382.000
Log of earning	8.131	0.009	7.062	10.060

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