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The Debt Paradox: How Student Loans Simultaneously Enhance Earnings and Constrain Life Choices among College Graduates

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Abstract

The substantial growth in student loan debt has raised concerns about its impact on college graduates' post-college lives. Drawing on data from the Baccalaureate and Beyond Longitudinal Study (B&B:08/18), this paper examines the relationship between federal student loan debt and multiple post-graduation outcomes among bachelor's degree recipients over a ten-year period. Using ordinary least squares regression, Probit models, propensity score matching, and institutional fixed effects approaches, the analysis reveals a seemingly paradoxical relationship: higher student loan debt is associated with higher earnings but also with an increased likelihood of delaying major life decisions including home purchase, marriage, and childbearing. Additionally, graduates with higher debt are more likely to work outside their field of study, work more hours than desired, and pursue graduate education. These relationships vary substantially by gender, race/ethnicity, and field of study. The debt-earnings relationship is stronger for women than men and significant for White and Asian graduates but not for Black graduates. Fields with higher debt-to-income ratios show stronger associations between debt and delayed life decisions. These findings highlight the multifaceted impact of educational debt on graduates' lives and have important implications for higher education financing policies and student support services.

Keywords

Student Loan Debt, Higher Education, Earnings, Life Course Transitions

1. Introduction

The landscape of higher education financing in the United States has undergone a dramatic transformation over the past several decades, with an increasing reliance on student loans as the primary mechanism for funding postsecondary education. Total outstanding student loan debt has reached an unprecedented $1.75 trillion, affecting approximately 45 million borrowers (Federal Reserve Bank of New York, 2023). This shift represents a fundamental change in how Americans pay for college—transitioning from a system primarily supported by public subsidies and family contributions to one increasingly financed through individual borrowing. As college costs have outpaced inflation and family income growth, student loan debt has become an integral part of the higher education experience for many students, particularly those from middle and lower-income families (College Board, 2022).

The growing prevalence of student loan debt raises important questions about its broader implications for graduates' post-college transitions and life trajectories. While educational loans are designed to increase access to higher education and its associated economic benefits, mounting evidence suggests that debt burdens may influence graduates' economic behaviors, career choices, and major life decisions in complex and sometimes unexpected ways (Scott-Clayton, 2018; Chakrabarti et al., 2023; Agbonlahor, 2025a). Understanding these relationships is crucial not only for graduates managing their debt obligations but also for policymakers designing financial aid systems that effectively promote both educational access and post-graduation economic wellbeing.

The timing of student loan repayment is particularly significant, as it typically coincides with other important early adult transitions. Between ages 22 and 35, many young adults are establishing their careers, forming families, and making major financial commitments such as purchasing homes. Student loan obligations during this critical life stage may affect the timing, sequencing, and quality of these transitions (Addo, 2014; Houle & Berger, 2015). Furthermore, the impact of student loan debt may be unevenly distributed across demographic groups and fields of study, potentially exacerbating existing patterns of stratification and inequality (Scott-Clayton & Li, 2016; Goldrick-Rab et al., 2014; Agbonlahor, 2025b).

Despite growing concern about the potential consequences of rising student loan debt, empirical evidence on its specific effects remains mixed and sometimes contradictory. Some studies suggest that student loan debt negatively affects outcomes such as homeownership (Mezza et al., 2020), wealth accumulation (Elliott & Lewis, 2015), career choices (Rothstein & Rouse, 2011) and early career earnings (Weidner, 2016). Others find that debt may influence graduate school enrollment decisions (Millett, 2003), though the direction and magnitude of these effects vary across studies and populations. These divergent findings underscore the complex and multifaceted nature of the relationship between student loan debt and post-graduation outcomes, which may operate through multiple, sometimes offsetting pathways.

Much of the existing research on student loan debt has focused on short-term

outcomes or relied on cross-sectional data that cannot capture the evolving influence of debt over time. Longitudinal studies that track graduates over an extended period are essential for understanding how debt affects trajectories across multiple life domains. Additionally, few studies have comprehensively examined both economic outcomes (earnings, employment) and major life decisions (homeownership, family formation) within the same analytical framework, limiting our understanding of how debt influences the intersection between economic and personal life spheres.

The current study addresses these gaps by investigating the relationship between federal student loan debt and a range of post-graduation outcomes among a nationally representative sample of bachelor's degree recipients, followed over a ten-year period. Drawing on human capital theory, life course perspectives, and concepts of liquidity constraints and debt aversion, the analysis examines how student loan debt affects not only economic outcomes such as earnings and employment but also major life decisions including home purchase, marriage, and childbearing. Additionally, the research explores how these relationships vary across demographic characteristics, fields of study, and institutional contexts to identify potential patterns of inequality and stratification in the consequences of educational debt. Specifically, this study addresses four interconnected research questions:

1) How does federal student loan debt affect post-graduation earnings among bachelor's degree recipients?

2) What is the relationship between student loan debt and key life decisions such as home purchase, marriage, and childbearing?

3) To what extent does student loan debt influence employment decisions, including working outside one's field of study, working more hours than desired, and pursuing graduate education?

4) Do these relationships vary by demographic characteristics such as gender, race/ethnicity, and field of study?

These research questions are positioned within the broader context of understanding how educational financing affects post-college transitions and economic mobility among young adults. With the rising costs of higher education and increasing reliance on student loans, understanding these relationships is crucial for developing effective policies related to education financing, debt management, and young adult economic stability.

By examining these questions through multiple methodological approaches—including regression analysis, propensity score matching, and institutional fixed effects models—this study provides a nuanced and comprehensive assessment of how student loan debt shapes the post-college trajectories of recent graduates. The analysis leverages data from the Baccalaureate and Beyond Longitudinal Study (B&B:08/18), which follows bachelor's degree recipients from their graduation in 2008 through 2018, providing a ten-year window to observe outcomes. This longitudinal perspective captures both immediate post-graduation effects and longer-term consequences of educational debt, offering insights into how the influence of

debt may evolve as graduates progress through their careers and life courses.

The study makes several important contributions to the literature on student loan debt. First, the research examines a diverse range of outcomes spanning both economic domains and major life decisions, providing a more comprehensive assessment of how debt influences post-college life than studies focused solely on financial outcomes. Second, the use of a ten-year longitudinal dataset allows observation of outcomes well beyond the immediate post-graduation period, capturing longer-term consequences that may emerge as careers develop and life decisions unfold. Third, the analytical approach examines heterogeneity across demographic groups and fields of study, shedding light on potential inequalities in how debt affects different populations. Finally, by employing multiple analytical strategies and robustness checks, the study provides more reliable estimates of the relationship between debt and outcomes than studies using single methodological approaches.

Understanding the relationship between student loan debt and post-graduation outcomes has important implications for higher education policy and practice. As policymakers debate proposals ranging from targeted loan forgiveness to income-based repayment expansion to free college initiatives, empirical evidence on how debt affects graduates' lives is essential for designing effective interventions. Similarly, as institutions set tuition rates and develop financial aid packages, insights into the consequences of different financing approaches can inform more student-centered policies. At the individual level, students and families making educational financing decisions benefit from better information about the potential implications of borrowing for post-college life.

This study aims to contribute to these important conversations by providing robust empirical evidence on how student loan debt shapes the early adult transitions and economic trajectories of college graduates. By examining multiple outcomes across diverse populations, the research seeks to advance a more nuanced understanding of the complex relationship between educational debt and post-graduation life in contemporary America.

2. Literature Review

The rapid growth of student loan debt has stimulated extensive research examining its effects on post-graduation outcomes, yielding a diverse and sometimes contradictory body of evidence. This literature spans multiple disciplines—including economics, sociology, higher education, and public policy—and employs various methodological approaches and theoretical frameworks. The following review synthesizes key findings across several domains, identifies methodological challenges and gaps in existing research, and positions the current study within this broader literature.

2.1. Student Loan Debt and Labor Market Outcomes

Research on the relationship between student loan debt and labor market out-

comes has produced mixed findings. Several studies have identified a positive association between debt and early-career earnings. Weidner (2016) found that graduates with an additional $10,000 of debt have a 1% - 2% lower income one year after graduation, contradicting the assumption that debt motivates higher earnings. Similarly, Minicozzi (2005) observed that borrowers initially earned higher salaries but experienced slower wage growth over time compared to non-borrowers. Chapman (2016), using merit aid programs as an instrument for student loan debt, found that graduates who qualified for merit aid (and thus had lower debt) earned $6400 less annually than their higher-debt counterparts one year after graduation, suggesting that debt may lead to acceptance of higher-paying but potentially less satisfying positions.

However, other studies have found negligible relationships between debt and earnings. Zhang (2013) observed no significant association between undergraduate debt and early-career wages after controlling for demographic characteristics and institutional factors. Rothstein and Rouse (2011), using a natural experiment at a highly selective university, found that debt causes graduates to choose substantially higher-salary jobs and decreases the probability of taking lower-paid public interest jobs. Gervais and Ziebarth (2019) found that student debt leads to lower earnings soon after graduation, with effects dissipating over time. However, when properly accounting for causation, they find nonnegative effects on earnings.

The relationship between student loan debt and other labor market outcomes has received less attention. Luo and Mongey (2019) found that higher debt causes graduates to accept jobs with higher wages but lower job satisfaction, revealing a trade-off between financial compensation and non-pecuniary amenities in job choice. Field (2009) observed that debt affects career choices, with law school graduates' decisions being sensitive to debt burdens in ways consistent with psychological or social costs of debt. Krishnan and Wang (2018) found that student debt is negatively related to the propensity to start a firm, particularly larger and more successful ventures, suggesting that debt may constrain entrepreneurial activity.

These mixed findings may reflect variation in sample characteristics, methodological approaches, and time horizons across studies. Most research has focused on short-term earnings (within five years of graduation), with fewer studies examining longer-term patterns. Additionally, the relationship may vary across different segments of the student population, highlighting the importance of examining heterogeneity by demographic characteristics and educational contexts.

2.2. Student Loan Debt and Major Life Decisions

A growing body of research suggests that student loan debt may influence major life decisions, particularly regarding homeownership, marriage, and family formation. Multiple studies have examined the relationship between student loan debt and homeownership with mixed results. Mezza et al. (2020) found that a

$1000 increase in student loan debt was associated with a 1.8 percentage point reduction in the homeownership rate among young adults within five years of graduation. Cooper and Wang (2014) found that student loan debt is associated with significantly lower homeownership rates as well as with lower wealth holdings among young adults. However, Houle and Berger (2015) found limited evidence that student loan debt is responsible for declining young adult homeownership, with the association being substantively modest and entirely driven by the debtor-nondebtor comparison rather than debt amount among debtors.

Research on the relationship between student loan debt and family formation has yielded more consistent findings. Addo (2014) found that women with education loan debt are more likely than women without such debt to delay marriage and transition into cohabitation. Bozick and Estacion (2014) observed that each $1000 in student loan debt was associated with a 2% decrease in the likelihood of first marriage among female bachelor's degree recipients but found no significant effect for men. Gicheva (2016) found that higher student loan debt was associated with lower marriage rates among MBA students and GMAT registrants, with effects being stronger for younger individuals.

Regarding fertility decisions, Nau et al. (2015) found that student loan debt was associated with delayed childbearing among young women, particularly at very high levels of debt. These studies suggest that student loan debt may constrain certain life choices, but the magnitude and persistence of these effects vary across outcomes and populations. Furthermore, most existing research has relied on indirect measures of delay (comparing timing across groups with different debt levels) rather than direct self-reports of whether debt caused specific delays, potentially obscuring the perceived influence of debt on major life decisions.

2.3. Heterogeneity in the Effects of Student Loan Debt

Emerging research suggests that the effects of student loan debt may vary substantially across demographic groups and educational contexts. Examining racial/ethnic differences, Scott-Clayton and Li (2016) found that Black graduates had substantially higher debt burdens than White graduates and were more likely to experience difficulty repaying their loans. Addo et al. (2016) observed that parental wealth was protective against student loan debt for White young adults but not for Black young adults, with the black-white debt disparity being greatest at the highest levels of parental net worth. Houle and Addo (2019) found that Black young adults paid down student debt at a significantly slower rate than White young adults, leading to growing racial disparities in debt burden over time.

Gender differences have received less attention, but some evidence suggests variation in how debt affects men and women. Dwyer et al. (2013) found that moderate amounts of student loan debt were positively associated with college completion for both women and men, though the threshold where debt becomes counterproductive differed by gender. Davies and Lea (1995) examined student attitudes toward debt and found that men were more likely to be in debt than

women, though the specific mechanisms underlying gender differences in debt behavior require further investigation.

These findings suggest that the relationship between student loan debt and post-graduation outcomes is not uniform but varies across demographic groups and educational contexts. However, most existing studies examine one dimension of heterogeneity in isolation, limiting our understanding of how multiple factors may interact to shape the consequences of educational debt.

Despite growing interest in the effects of student loan debt, existing research faces several methodological challenges. First, selection effects complicate causal inference—individuals who take on more debt may differ from those who take on less debt in ways that also affect outcomes, such as family resources, academic preparation, or career aspirations (Looney & Yannelis, 2015). Second, most studies examine a limited range of outcomes, making it difficult to assess how debt influences the interconnections between economic and personal life domains (Quadlin & Rudel, 2015). Third, many studies rely on cross-sectional data or short follow-up periods, limiting our understanding of how the effects of debt evolve over time (Dettling & Hsu, 2018).

The current study addresses these challenges by 1) employing multiple analytical strategies, including propensity score matching and institutional fixed effects models, to address selection concerns; 2) examining a comprehensive range of outcomes spanning economic domains and major life decisions; 3) utilizing a ten-year longitudinal dataset to capture both short-term and longer-term consequences; and 4) investigating heterogeneity across demographic groups and fields of study to identify potential patterns of inequality. By addressing these methodological challenges and gaps in the literature, this study aims to provide a more comprehensive and nuanced assessment of how student loan debt shapes post-graduation outcomes among contemporary college graduates.

3. Theoretical Framework

The relationship between student loan debt and post-graduation outcomes can be effectively conceptualized through multiple interconnected theoretical perspectives. This study draws upon human capital theory, life course theory, and the concepts of liquidity constraints and debt aversion to develop a comprehensive framework for understanding how educational debt shapes economic trajectories and life decisions among young adults.

Human capital theory, first formalized by Becker (1964) and Schultz (1961), provides the foundational framework for understanding educational investment decisions. This theory conceptualizes education as an investment in productivity-enhancing skills and knowledge that increases an individual's future earnings potential. According to this perspective, individuals make rational decisions about educational investments by comparing the expected lifetime benefits (primarily higher earnings) against the costs (direct educational expenses, opportunity costs of foregone earnings, and psychological costs).

Student loan debt represents a financing mechanism that allows individuals to make human capital investments when they lack sufficient personal or family resources. In the classic human capital framework, access to educational loans should expand opportunity and lead to optimal investment in education, thereby enhancing lifetime earnings and economic wellbeing. However, this traditional framework assumes perfect capital markets, full information about future returns, and the absence of uncertainty—assumptions that rarely hold in reality. The theory predicts that debt-financed human capital investments should enhance productivity and earnings potential, though the effectiveness of these investments may vary across demographic groups and fields of study depending on market conditions and institutional factors.

Life course theory (Elder, 1994; Settersten, 2003) provides a developmental perspective for understanding how educational debt might influence major life transitions. This theoretical framework emphasizes the timing, sequencing, and interdependence of life events within historical and social contexts. Life course theorists have documented the emergence of extended and increasingly diversified pathways to adulthood, characterized by delayed transitions in domains such as residential independence, marriage, and parenthood (Furstenberg, 2010).

Student loan debt represents a financial obligation that may alter the timing and sequencing of these transitions. The life course perspective suggests that life transitions are interdependent—decisions in one domain (e.g., education financing) affect options and timing in other domains (e.g., homeownership, family formation). The life course framework also emphasizes how early adulthood represents a critical period for establishing economic trajectories, with potential long-term consequences for wealth accumulation and financial security. By potentially delaying homeownership, student loan borrowers may miss opportunities for wealth building through home equity, potentially contributing to long-term wealth disparities (Houle & Berger, 2015). Similarly, delayed family formation may have demographic implications, potentially contributing to declining fertility rates among educated young adults.

While human capital theory and life course perspectives provide valuable frameworks for understanding educational investment and life transitions, they do not fully capture the psychological and behavioral aspects of debt. Two additional theoretical concepts—liquidity constraints and debt aversion—provide complementary perspectives on how student loan debt might influence post-graduation outcomes.

Liquidity constraints theory suggests that debt obligations reduce disposable income and constrain subsequent financial decisions by limiting access to additional credit (Rothstein & Rouse, 2011). Even when total lifetime earnings increase as a result of education, the timing of payments creates potential constraints during early career stages when earnings are typically lower and debt obligations are beginning. These constraints may lead graduates with higher debt to prioritize immediate income over career fit or work-life balance, potentially resulting in de-

cisions to take jobs outside their field of study or work more hours than desired.

Debt aversion theory adds a psychological dimension, suggesting that individuals experience psychological costs from carrying debt burdens, beyond the financial costs of debt service (Field, 2009). This psychological burden may influence career and life decisions in ways that traditional economic models fail to capture. Debt aversion might explain why the impact of student loan debt on life decisions could persist even after controlling for income—the psychological weight of debt may influence life decisions independently of its effect on financial capacity. Together, liquidity constraints and debt aversion suggest that student loan debt influences life decisions and career choices in ways that extend beyond its impact on earnings, recognizing that debt represents not only a financial obligation but also a psychological burden that may influence decision-making and well-being in multiple life domains.

The potential differential impacts of student loan debt across demographic groups highlight the importance of considering how multiple social identities and contexts interact to shape educational and economic outcomes. Intersectionality theory (Crenshaw, 1991) emphasizes how social categories such as gender, race, and class interact to create unique experiences and structural constraints for individuals with multiple marginalized identities. The relationship between student loan debt and outcomes may vary by gender and race/ethnicity due to intersectional experiences and structural constraints.

Gender differences in the debt-earnings relationship may reflect gendered labor market dynamics, including differential returns to education and potentially different pressures to prioritize earnings to meet debt obligations in the context of gender pay disparities. Similarly, variation in the relationship between debt and earnings across racial and ethnic groups may reflect broader patterns of labor market discrimination and stratification that affect the earnings returns to education for different groups.

Field of study represents another important contextual factor, with both debt burdens and economic returns varying substantially across disciplines. The concentration of debt levels and debt-to-income ratios across fields highlights how disciplinary context may shape the economic consequences of educational debt. Fields with strong occupational linkages and higher earnings potential may provide greater capacity to manage debt burdens without significantly constraining life choices.

Drawing together these theoretical perspectives, this study proposes an integrated model for understanding the relationship between student loan debt and post-graduation outcomes. In this model, student loans represent a financial mechanism that enables human capital investment but also creates financial obligations and potential psychological burdens that persist into early career stages. These obligations interact with individual characteristics, labor market opportunities, and broader social contexts to shape economic trajectories and life choices.

The effects of student loan debt operate through multiple pathways: 1) a produc-

tivity-enhancing pathway, wherein debt-financed education increases skills and earnings potential; 2) a constraint pathway, wherein debt obligations limit financial flexibility and influence career decisions; and 3) a psychological pathway, wherein debt aversion shapes preferences and choices across multiple life domains. This integrated framework suggests that the relationship between educational debt and post-graduation outcomes may be complex and potentially contradictory, with debt simultaneously enhancing human capital while constraining financial flexibility and creating psychological burdens.

The framework also suggests that these relationships may vary across demographic groups and fields of study, as different individuals navigate the benefits and constraints of educational debt within different social and economic contexts. By drawing on these theoretical perspectives, this study contributes to a more nuanced understanding of how educational financing shapes post-college transitions and economic trajectories, with implications for education policy, student loan program design, and broader efforts to promote economic opportunity and mobility.

4. Methodology

4.1. Data and Sample

This study utilizes data from the Baccalaureate and Beyond Longitudinal Study (B&B:08/18), administered by the National Center for Education Statistics (NCES), a division of the U.S. Department of Education (2021). The B&B is a nationally representative, longitudinal study designed to track the educational and workforce experiences of individuals who have completed a bachelor's degree. The 2008-2018 cohort includes individuals who earned their bachelor's degrees during the 2007-08 academic year and were followed up in 2012 and again in 2018, providing a 10-year window into their post-baccalaureate outcomes.

The B&B:08/18 dataset includes detailed information on employment, earnings, graduate school enrollment, student debt, demographic characteristics, and various life outcomes such as family formation and housing decisions. The data was accessed under a restricted-use license granted by NCES, ensuring adherence to strict confidentiality and data security protocols.

For this study, the focus is limited to traditional-age college graduates, defined as those who completed their bachelor's degrees at age 25 or younger, tracking their outcomes over a ten-year period from 2008 (graduation year) to 2018. This longitudinal approach allows examination of both immediate and longer-term effects of student loan debt on career trajectories and life choices. After applying inclusion criteria and removing cases with missing values on key variables, the final analytic sample consists of 9750 respondents. This refined sample provides a robust basis for exploring patterns and disparities in post-college outcomes across different student debt levels.

4.2. Variables

The analysis incorporates a comprehensive set of variables to examine the rela-

tionship between student loan debt and various post-graduation outcomes. The dependent variables in the study fall into three main categories: labor market outcomes, life impact decisions, and career and educational choices. For labor market outcomes, the analysis examines total salary from all jobs in 2018, which was transformed using a natural logarithm to address the skewed distribution of income data. Student loan debt was log-transformed using ln(debt + 1) to accommodate graduates with zero federal student loan debt while preserving the logarithmic relationship for positive values. This approach maintains the full sample (N = 9750) and avoids selection bias that would result from excluding debt-free graduates, ensuring that findings represent the complete population of bachelor's degree recipients rather than only those who borrowed. The analysis also analyzes total weekly work hours across all jobs, employment in a job requiring a bachelor's degree (coded as a binary variable), and full-time versus part-time employment status. These variables allow assessment of multiple dimensions of labor market success beyond simple earnings measures.

The life impact decisions category encompasses three binary variables indicating whether graduates delayed major life choices due to education costs: delayed home purchase, delayed marriage, and delayed having children. These variables are particularly important for understanding how educational debt influences life course transitions and family formation among young adults, which have broader societal implications beyond individual economic outcomes.

For career and educational choices, the study examines whether graduates took jobs outside their fields of study, worked more hours than desired, enrolled in graduate education between bachelor's completion and the 2018 interview, and took jobs instead of pursuing further education due to financial constraints. These variables capture how student loan debt might constrain career development and educational advancement in ways that could have long-term implications for occupational trajectories and lifetime earnings.

While these measures rely on respondents' self-reported attributions of life decision delays to education costs, which may be subject to retrospective bias, they represent graduates' subjective assessments of how financial constraints influenced their choices—a theoretically relevant construct for understanding debt's psychological and behavioral effects. To partially address potential attribution errors, the analysis controls for current income levels.

The primary independent variable of interest is total federal student loan debt, measured as the cumulative amount of federal student loans accumulated by 2018. The analysis utilizes a logged transformation of this variable to address its skewed distribution and to facilitate interpretation of coefficients as elasticities in regression models. For some analyses, the study also creates a binary indicator for "high debt," defined as having above-median student loan debt in the sample, which allows comparison of outcomes between graduates with relatively higher versus lower debt burdens.

To isolate the relationship between student loan debt and the outcomes of interest, the models include a wide range of control variables. Demographic characteristics include gender (male or female), race/ethnicity (White, Black, Hispanic/Latino, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, Other, More than one race), and age measured at three time points: 2009 (one year after graduation), at graduation, and in 2018 (the final survey year). These variables help account for demographic differences that might influence both debt accumulation and post-graduation outcomes.

Academic background variables include field of study, categorized into ten groups: Computer/Information Sciences, Engineering/Engineering Technology, Biological/Physical Sciences, General Studies, Social Sciences (the reference category in regression models), Humanities, Health Care, Business, Education, and Other Applied fields. The analysis also controls for institutional selectivity, categorized as Very selective, Moderately selective, Minimally selective, Open admission, or not public or private non-profit 4-year. Additionally, the analysis includes a binary indicator for parents' highest education level, which identifies first-generation college students. These academic variables help account for differences in educational experiences and institutional contexts that might influence both debt levels and post-graduation outcomes.

For models predicting earnings and life impact decisions, the study also includes employment-related factors such as total hours worked (a continuous variable) and whether the job requires a bachelor's degree (a binary variable). These variables help isolate the direct effect of student loan debt from employment characteristics that might mediate the relationship between debt and outcomes.

4.3. Analytical Approach

The study employs a multi-method analytical strategy to examine the relationships between student loan debt and various outcomes, beginning with comprehensive descriptive statistics to understand the distribution of student loan debt, salaries, and key demographic variables across the sample. These descriptive analyses are stratified by major field, gender, and race/ethnicity to identify potential patterns in the data before moving to more complex modeling approaches. The analysis calculates means, standard deviations, minimum and maximum values for continuous variables, and frequency distributions for categorical variables to provide a thorough understanding of the sample characteristics. All descriptive statistics and sample sizes reported are unweighted and rounded. Survey weights were applied for all inferential analyses (regression models, significance tests) to ensure national representativeness and account for the complex survey design.

For bivariate analyses, the study conducts chi-square tests to examine associations between the "high debt" indicator and binary outcomes such as delaying major life decisions. These tests allow determination of whether significant dif-

ferences exist in life impact decisions between graduates with above-median debt and those with below-median debt. For continuous outcomes like weekly work hours, t-tests compare means between high-debt and lower-debt graduates, providing an initial assessment of whether debt levels are associated with work intensity.

The core of the analytical approach consists of multivariate regression models that allow examination of the relationship between federal student loan debt and outcomes while controlling for potentially confounding factors. For continuous dependent variables, specifically logged salary and total work hours, the analysis estimates Ordinary Least Squares (OLS) regression models. The semi-logarithmic specification for the salary models (with logged salary as the dependent variable) allows interpretation of coefficients on independent variables as percentage changes in salary, which is particularly useful for the student loan debt variable, which is also logged. This specification facilitates interpretation of the coefficient as an elasticity—the percentage change in salary associated with a one percent change in student loan debt.

For binary outcomes, including delayed home purchase, delayed marriage, delayed childbearing, working outside one's field of study, working more than desired, and graduate enrollment, the study employs Probit regression models. These models are appropriate for binary dependent variables and allow estimation of the probability of the outcome as a function of the independent variables. The analysis calculates marginal effects at the means of the independent variables to facilitate interpretation, as these represent the change in probability of the outcome associated with a one-unit change in the independent variable, holding other variables constant at their means.

To examine whether the relationship between student loan debt and outcomes varies by demographic characteristics, the study estimates separate regression models by gender (male versus female) and by race/ethnicity (White, Black, Hispanic/Latino, Asian, and other groups). These subgroup analyses allow identification of potential heterogeneity in how student loan debt influences post-graduation outcomes across different demographic groups, which has important implications for understanding the differential impact of educational financing policies.

As a robustness check, the analysis uses propensity score matching (PSM) to compare outcomes between graduates with above-median debt and those with below-median debt. This approach helps address potential selection bias by comparing individuals who are similar on observable characteristics but differ in their debt levels. The study matches individuals based on race, gender, field of study, work hours, parents' education, and institutional selectivity, and then compares salary outcomes between the matched groups. This provides an alternative estimate of the debt-earnings relationship that helps address concerns about selection on observable characteristics.

To account for unobserved institutional characteristics that might influence both student loan borrowing and post-graduation outcomes, the research estimates institutional fixed effects models. These models control for all time-invariant characteristics of the institutions attended, whether observed or unobserved, allowing isolation of the relationship between student loan debt and outcomes from institutional factors that might confound this relationship. This approach provides a more conservative estimate of the debt-earnings relationship, as it relies on within-institution variation in debt and outcomes.

All analyses are conducted using Stata, with appropriate adjustments for the complex survey design of the B&B data. For all regression models, the study computes robust standard errors to account for heteroskedasticity in the error terms, ensuring valid statistical inference. The combination of these analytical approaches—descriptive, bivariate, multivariate regression, subgroup analyses, propensity score matching, and fixed effects models—provides a comprehensive assessment of the relationship between student loan debt and post-graduation outcomes, with attention to potential heterogeneity, selection bias, and unobserved confounders.

5. Results

5.1. Descriptive Statistics

The sample includes 9,750 bachelor's degree recipients who completed their degrees at age 25 or younger. In terms of demographic distribution, 57.15% of the sample is female, and 42.85% is male. Regarding race/ethnicity, 74.7% are White, 6.8% are Black or African American, 8.1% are Hispanic or Latino, 7.1% are Asian, and smaller percentages represent other racial/ethnic groups (**Table 1(a)**).

The most common fields of study in the sample are Biological/Physical Sciences (23.42%), Other Applied fields (13.57%), Social Sciences (12.87%), Business (11.01%), and Humanities (10.31%). The average age of respondents at graduation was 22.35 years, and by 2018 (the final survey year), they had reached an average age of 33.03 years (**Table 1(a)**).

Regarding student loan debt, the average total federal student loan amount was $39,750.69, with substantial variation across the sample (SD = $58713.19). The amount of debt varies considerably by field of study, with Biological/Physical Sciences graduates having the highest average federal loan debt ($75524.11), followed by Social Sciences ($41615.06) and Humanities ($34687.85). Computer/Information Sciences ($17615.92), Engineering/Engineering Technology ($19856.58), and Business ($21435.46) graduates had notably lower average debt levels (**Table 6**).

In terms of employment outcomes, the mean annual salary in 2018 was $80238.82 (SD = $57117.52), and graduates worked an average of 41.93 hours per week. 85.26% of graduates were employed full-time, and 76.79% reported being in jobs that required a bachelor's degree. Regarding STEM employment, 13.97%

were in STEM occupations, 20.77% were in health occupations, and 65.26% were in non-STEM fields (Table 1(a)).

Table 1. Descriptive statistics: Continuous variables.

(a)

Variable	Mean	Std. Dev.	Min	Max
Age in 2018	33.03	1.15	29	36
Age at graduation	22.35	1.11	18	25
Total weekly hours (all jobs)	41.93	11.91	1	80
Total federal student loans ($)	39750.69	58713.19	0	539,962
Annual salary in 2018 ($)	80238.82	57117.52	754	500,000

(b)

Variable	Percentage
Race/Ethnicity	
White	74.7
Black or African American	6.8
Hispanic or Latino	8.1
Asian	7.1
American Indian or Alaska Native	0.3
Native Hawaiian/Pacific Islander	0.3
Other	0.2
More than one race	2.5
Gender	
Female	57.15
Male	42.85
Field of Study	
Computer/Info Sciences	3.7
Engineering/Engineering Technology	8.8
Bio/Physical Sciences	23.4
General Studies	2.1
Social Sciences	12.9

Continued

Humanities	10.3
Health Care	5.7
Business	11.0
Education	8.5
Other Applied	13.6
Employment Status	
Full-time employment	85.26
Job requires a bachelor's degree	76.79
STEM Employment	
STEM occupation	13.97
Health occupation	20.77
Non-STEM occupation	65.26
Life Impact Outcomes	
Delayed home purchase	39.84
Delayed marriage	17.87
Delayed having children	26.99
Took job outside field of study	32.95
Worked more than desired	39.73

(a) Note: N = 9750. Descriptive statistics are unweighted and based on the Baccalaureate and Beyond Longitudinal Study (B&B:08/18) sample of traditional-age college graduates (completed bachelor's degree at age 25 or younger). (b) Source: U.S. Department of Education, National Center for Education Statistics, 2008/18 Baccalaureate and Beyond Longitudinal Study (B&B:08/18).

5.2. Student Loan Debt and Labor Market Outcomes

5.2.1. Income and Earnings

The relationship between federal student loan debt and earnings was examined through multiple regression models, controlling for demographic characteristics, field of study, and employment factors. Results from Table 2, Model 1 indicate a positive and statistically significant relationship between student loan debt and earnings. Specifically, a 1% increase in federal student loan debt is associated with a 0.00458% increase in total salary ($p < 0.01$). When additional controls for parent education, institutional selectivity, and job requirements are added in Table 2, Model 2, the coefficient remains positive but decreases slightly to 0.00312% ($p < 0.05$). The institutional fixed effects model (Table 2, Model 3), which accounts for

unobserved institutional characteristics, shows an even stronger relationship with a coefficient of 0.00706% ($p < 0.001$).

This seemingly counterintuitive positive relationship may reflect several underlying mechanisms: those with higher student loan debt may have attended more selective institutions or programs with better employment prospects, may work more hours to service their debt, or may prioritize higher-paying jobs over other job characteristics.

Student loan debt also shows a significant positive relationship with total weekly work hours. According to the work hours model in Table 2, a 1% increase in federal student loan debt is associated with a 0.101-hour increase in weekly work hours ($p < 0.001$). This suggests that graduates with higher debt loads may work more hours to meet their financial obligations, including debt repayment.

Table 2. OLS regression results for logged annual salary and weekly work hours.

Variable	Model 1	Model 2	Model 3	Work Hours
	Log Salary	Log Salary	Log Salary	Weekly Hours
Key Independent Variable				
Log of total federal student loans	0.00458***	0.00312**	0.00706***	0.101***
	(0.00135)	(0.00131)	(0.00155)	(0.0284)
Demographic Characteristics				
Female	−0.144***	−0.150***	−0.137***	−4.055***
	(0.0128)	(0.0122)	(0.0152)	(0.261)
Black or African American	−0.138***	−0.120***	−0.128***	−0.529
	(0.0224)	(0.0214)	(0.0260)	(0.494)
Hispanic or Latino	−0.0702***	−0.0620***	−0.0712***	−1.048**
	(0.0223)	(0.0214)	(0.0242)	(0.444)
Asian	0.178***	0.138***	0.0732***	−0.156
	(0.0265)	(0.0253)	(0.0273)	(0.488)
American Indian or Alaska Native	−0.165	−0.149	−0.206*	0.353
	(0.119)	(0.108)	(0.116)	(0.11)
Native Hawaiian/Pacific Islander	−0.0500	−0.0638	−0.0898	−2.703
	(0.114)	(0.106)	(0.113)	(1.99)
Other	0.0287	0.0511	−0.0108	−1.372
	(0.120)	(0.119)	(0.161)	(2.05)
More than one race	−0.0768**	−0.0639*	−0.0955**	2.283***
	(0.0361)	(0.0346)	(0.0389)	(0.842)

Continued

Field of Study				
Computer/Information Sciences	0.258***	0.275***	0.254***	−1.058**
	(0.0335)	(0.0319)	(0.0398)	(0.540)
Engineering/Engineering Tech	0.309***	0.262***	0.270***	0.647
	(0.0239)	(0.0226)	(0.0306)	(0.476)
Bio/Physical Sciences	0.133***	0.104***	0.096***	1.172***
	(0.0207)	(0.0196)	(0.0242)	(0.411)
General Studies	−0.00336	0.0203	−0.036	−0.513
	(0.0424)	(0.0378)	(0.0693)	(0.766)
Humanities	−0.187***	−0.157***	−0.196***	0.291
	(0.0237)	(0.0224)	(0.0385)	(0.539)
Health Care	0.175***	0.177***	0.088***	−3.656***
	(0.0259)	(0.0246)	(0.0292)	(0.570)
Business	0.127***	0.152***	0.114***	1.577***
	(0.0229)	(0.0219)	(0.0356)	(0.448)
Education	−0.235***	−0.237***	−0.256***	0.0233
	(0.0227)	(0.0216)	(0.0403)	(0.583)
Other Applied	−0.0932***	−0.0457**	−0.092***	0.725
	(0.0214)	(0.0204)	(0.0358)	(0.453)
Employment and Institutional Factors				
Total weekly hours (all jobs)	0.0238***	0.0225***	0.0235***	—
	(0.000789)	(0.000735)	(0.000783)	—
Parents' highest education	—	−0.0317***	−0.0434***	−0.276
(0 = Bachelor's or higher)	—	(0.0113)	(0.0127)	(0.242)
Very selective institution	—	0.152***	0.328***	1.640**
	—	(0.0365)	(0.0886)	(0.833)
Moderately selective institution	—	0.0591*	0.326***	0.623
	—	(0.0354)	(0.0894)	(0.820)
Minimally selective institution	—	−0.00352	—	1.127
	—	(0.0406)	—	(0.894)
Open admission institution	—	−0.0436	—	0.534
	—	(0.0465)	—	(0.50)

Continued

Job requires bachelor's degree	—	0.389***	—	2.110***
	—	(0.0144)	—	(0.333)
Constant	10.10***	9.803***	10.13***	40.67***
	(0.0400)	(0.0521)	(0.0708)	(0.970)
Model Statistics				
N	9750	9750	9750	9750
R-squared	0.300	0.369	0.285	0.0554
Model Specification	OLS	OLS w/ Institutional Controls	Fixed Effects	OLS

(a) Note: N is unweighted and rounded. Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. The dependent variable is the natural logarithm of total salary from all jobs in 2018. Social Sciences is the reference category for field of study, White is the reference category for race/ethnicity, and Not public or private non-profit 4-year is the reference category for institutional selectivity. Model 3 includes institutional fixed effects. (b) Source: U.S. Department of Education, National Center for Education Statistics, 2008/18 Baccalaureate and Beyond Longitudinal Study (B&B:08/18).

5.2.2. Propensity Score Matching Analysis

The propensity score matching analysis provides additional evidence of the relationship between debt and labor market outcomes by addressing potential selection bias. This approach compares graduates with similar observable characteristics who differ primarily in their debt levels, helping to isolate the causal effect of debt on earnings.

Table 3, Panel A presents the logistic regression results for treatment assignment (having above-median student loan debt). The model reveals significant predictors of high debt status. Black or African American graduates are substantially more likely to have above-median debt (coefficient = 1.043, $p < 0.001$), as are female graduates (coefficient = 0.152, $p < 0.001$). Graduates in certain fields are significantly less likely to have high debt, including those in Computer/Information Sciences (coefficient = −0.985, $p < 0.001$), Engineering/Engineering Technology (coefficient = −0.734, $p < 0.001$), and Business (coefficient = −0.780, $p < 0.001$) compared to Social Sciences graduates. Students attending more selective institutions are also less likely to have high debt levels.

The treatment effects analysis, presented in Table 3, Panel B, shows that graduates with above-median student loan debt have approximately 9.6% higher salaries compared to similar graduates with below-median debt (ATT = 0.096, $p < 0.05$). This result reinforces the finding that higher student loan debt is associated with higher earnings. The propensity score matching approach helps address potential selection bias by comparing graduates with similar observable characteristics who differ primarily in their debt levels. The persistent positive relationship suggests several potential mechanisms may be at work. First, graduates with higher debt may feel compelled to prioritize higher-paying positions over other job char-

acteristics such as work-life balance, job satisfaction, or geographic preferences in order to service their debt obligations. Second, as demonstrated by the work hours analysis, these graduates work significantly more hours per week, which directly contributes to higher annual earnings. Third, the debt-earnings relationship may reflect underlying differences in educational investments, where students who borrowed more may have attended more expensive institutions with stronger alumni networks, better career services, or enhanced signaling value to employers. Finally, graduates with substantial debt may be more motivated to pursue additional professional development, certifications, or job changes that lead to salary increases, viewing career advancement as essential for debt repayment rather than optional for career satisfaction.

Table 3. Propensity score matching results—impact of high student debt.

Panel A: Logistic Regression for Treatment Assignment (High Debt)					
Variable	Coefficient	Std. Error	z	$p > \|z\|$	[95% Conf. Interval]
Race/Ethnicity					
Black or African American	1.043***	0.094	11.13	0.000	[0.859, 1.226]
Hispanic or Latino	0.111	0.078	1.41	0.157	[−0.043, 0.264]
Asian	−0.007	0.085	−0.08	0.938	[−0.172, 0.159]
American Indian/Alaska Native	0.850*	0.439	1.94	0.053	[−0.011, 1.712]
Native Hawaiian/Pacific Islander	0.346	0.406	0.85	0.394	[−0.450, 1.143]
Other	−0.044	0.461	−0.09	0.925	[−0.947, 0.859]
More than one race	−0.153	0.135	−1.14	0.255	[−0.418, 0.111]
Gender					
Female	0.152***	0.046	3.28	0.001	[0.061, 0.243]
Field of Study					
Computer/Information Sciences	−0.985***	0.132	−7.47	0.000	[−1.243, −0.727]
Engineering/Engineering Tech	−0.734***	0.095	−7.75	0.000	[−0.919, −0.548]
Bio/Physical Sciences	0.345***	0.073	4.72	0.000	[0.202, 0.489]
General Studies	−0.297*	0.153	−1.95	0.052	[−0.596, 0.002]
Humanities	−0.182**	0.087	−2.11	0.035	[−0.352, −0.013]
Health Care	−0.013	0.106	−0.12	0.905	[−0.220, 0.195]
Business	−0.780***	0.088	−8.91	0.000	[−0.952, −0.609]
Education	−0.300***	0.092	−3.26	0.001	[−0.480, −0.120]
Other Applied	−0.513***	0.082	−6.29	0.000	[−0.674, −0.353]

Continued

Employment and Controls					
Total weekly hours	0.009***	0.002	5.05	0.000	[0.006, 0.013]
Parents' education (0 = Bachelor's+)	0.366***	0.044	8.40	0.000	[0.280, 0.451]
Institutional Selectivity					
Very selective	−0.723***	0.155	−4.67	0.000	[−1.027, −0.420]
Moderately selective	−0.789***	0.152	−5.17	0.000	[−1.087, −0.490]
Minimally selective	−0.878***	0.166	−5.30	0.000	[−1.203, −0.553]
Open admission	−0.899***	0.194	−4.65	0.000	[−1.279, −0.520]
Constant	0.308*	0.184	1.68	0.094	[−0.052, 0.668]
Model Statistics					
Number of observations	9750				
LR χ^2 (23)	707.46				
Prob > χ^2	0.0000				
Log likelihood	−6401.83				
Pseudo R^2	0.0524				

Panel B: Treatment Effects on Outcomes

Outcome	Treated	Controls	Difference	S.E	t-stat
Log Total Salary 2018					
Unmatched	11.109	11.062	0.047*	0.014	3.45
ATT	11.109	11.013	0.096**	0.040	2.40

Panel C: Sample Composition

Treatment Assignment	On Support	Total
Untreated	4820	4820
Treated	4930	4930
Total	9750	9750

(a) Note: N is unweighted and rounded. Treatment is defined as above-median federal student loan debt. Reference categories: White (race/ethnicity), Male (gender), Social Sciences (field of study), Not public or private non-profit 4-year (institutional selectivity). *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. (b) Source: U.S. Department of Education, National Center for Education Statistics, 2008/18 Baccalaureate and Beyond Longitudinal Study (B&B:08/18).

5.3. Student Loan Debt and Life Impact Decisions

The analysis reveals substantial effects of student loan debt on major life decisions.

Overall, 39.84% of graduates reported delaying home purchase, 17.87% delayed marriage, and 26.99% delayed having children due to education costs (Table 1(b)). Chi-square tests comparing graduates with above-median debt to those with below-median debt show striking differences in these life decisions. Graduates with high debt are significantly more likely to report delaying home purchase (50.53% vs. 28.56%, $\chi^2 = 506.75$, $p < 0.001$), marriage (23.17% vs. 12.46%, $\chi^2 = 190.18$, $p < 0.001$), and childbearing (34.44% vs. 19.39%, $\chi^2 = 279.90$, $p < 0.001$).

Multivariate probit regression analysis, controlling for demographic characteristics, field of study, and income, confirms these strong relationships (Table 4). A 1% increase in federal student loan debt is associated with a 2.53 percentage point increase in the probability of delaying home purchase ($p < 0.001$), a 1.28 percentage point increase in the probability of delaying marriage ($p < 0.001$), and a 1.81 percentage point increase in the probability of delaying childbearing ($p < 0.001$).

Importantly, these effects persist even after controlling for current income levels, suggesting that the influence of student loan debt on life decisions extends beyond its impact on earnings. The relationship between income and delaying life decisions is negative, as expected, with higher incomes associated with lower probabilities of delay. However, the magnitude of the income coefficient is smaller than that of student loan debt, highlighting the substantial role that debt plays in these decisions.

Field of study also shows significant associations with life impact decisions according to Table 4. Compared to Social Sciences graduates (the reference category), those in Computer/Information Sciences, Engineering/Engineering Technology, Health Care, Business, and Education are significantly less likely to delay home purchase, marriage, and children. This pattern may reflect differences in career trajectories, earnings potential, or values across fields of study.

Table 4. Probit regression models predicting life impact decisions (Marginal Effects).

Variable	Delayed Home Purchase	Delayed Marriage	Delayed Children
Key Independent Variable			
Log of total federal student loans	0.0253***	0.0128***	0.0181***
	(0.0011)	(0.0010)	(0.0011)
Demographic Characteristics			
Female	−0.0101	−0.0226***	0.0122
	(0.0107)	(0.0085)	(0.0098)
Black or African American	0.0104	0.0437***	−0.0234
	(0.0194)	(0.0160)	(0.0170)
Hispanic or Latino	0.0539***	0.0476***	0.0335**
	(0.0182)	(0.0150)	(0.0169)

Continued

Asian	0.0314	0.0805***	0.0094
	(0.0195)	(0.0172)	(0.0181)
American Indian or Alaska Native	−0.0326	0.0052	−0.0118
	(0.0895)	(0.0698)	(0.0865)
Native Hawaiian/Pacific Islander	0.1599	0.1163	−0.0252
	(0.0993)	(0.0908)	(0.0868)
Other	0.1113	0.0510	0.0483
	(0.1080)	(0.0881)	(0.0976)
More than one race	0.0219	0.0094	0.0197
	(0.0308)	(0.0238)	(0.0288)
Field of Study			
Computer/Info Sciences	−0.1379***	−0.0373	−0.0644**
	(0.0289)	(0.0228)	(0.0265)
Engineering/Engineering Tech	−0.1380***	−0.0716***	−0.0884***
	(0.0214)	(0.0163)	(0.0192)
Bio/Physical Sciences	−0.0231	0.0075	0.0127
	(0.0171)	(0.0139)	(0.0158)
General Studies	−0.0335	−0.0043	0.0190
	(0.0356)	(0.0296)	(0.0342)
Humanities	0.0210	0.0062	0.0355*
	(0.0207)	(0.0169)	(0.0194)
Health Care	−0.0925***	−0.0345*	−0.0357
	(0.0244)	(0.0195)	(0.0224)
Business	−0.1038***	−0.0501***	−0.0519***
	(0.0201)	(0.0157)	(0.0183)
Education	−0.0791***	−0.0465***	−0.0372*
	(0.0216)	(0.0169)	(0.0197)
Other Applied	−0.0366*	−0.0146	−0.0131
	(0.0192)	(0.0155)	(0.0176)
Employment and Institutional Factors			
Total weekly hours (all jobs)	0.0019***	0.0019***	0.0018***
	(0.0005)	(0.0004)	(0.0004)

Continued

Parents' highest education (0 = Bachelor's or higher)	0.0099	0.0210***	0.0182**
	(0.0100)	(0.0080)	(0.0092)
Very selective institution	−0.0865**	−0.0580**	−0.0510
	(0.0346)	(0.0289)	(0.0324)
Moderately selective institution	−0.0893***	−0.0471*	−0.0326
	(0.0340)	(0.0285)	(0.0318)
Minimally selective institution	−0.0752**	−0.0468	−0.0353
	(0.0371)	(0.0309)	(0.0346)
Open admission institution	−0.1048**	−0.0393	−0.0454
	(0.0435)	(0.0364)	(0.0405)
Log of total salary from all jobs in 2018	−0.0188**	−0.0145**	−0.0117
	(0.0086)	(0.0067)	(0.0078)
N	9750	9750	9750
Pseudo R-squared	0.0540	0.0405	0.0387
Chi-squared	639.2	324.9	393.7
p-value	0.000	0.000	0.000

(a) Note: N is unweighted and rounded. Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Coefficients represent average marginal effects. Social Sciences is the reference category for field of study, White is the reference category for race/ethnicity, and Not public or private non-profit 4-year is the reference category for institutional selectivity. (b) Source: U.S. Department of Education, National Center for Education Statistics, 2008/18 Baccalaureate and Beyond Longitudinal Study (B&B:08/18).

5.4. Student Loan Debt and Career Choices

Initial bivariate analysis reveals significant differences in career choices between graduates with high versus low debt burdens. Chi-square tests comparing graduates with above-median debt to those with lower debt show striking patterns. Graduates with above-median debt are significantly more likely to report taking a job outside their field of study (37.52% vs. 28.29%, $\chi^2 = 94.07$, $p < 0.001$), working more than desired (48.71% vs. 30.55%, $\chi^2 = 335.69$, $p < 0.001$), and taking a job instead of pursuing further education (27.63% vs. 22.02%, $\chi^2 = 41.06$, $p < 0.001$).

Multivariate Probit regression analysis, controlling for demographic characteristics, field of study, and institutional factors, confirms these relationships (Table 5). A 1% increase in federal student loan debt is associated with a 1.29 percentage point increase in the probability of taking a job outside one's field of study ($p < 0.001$), a 2.09 percentage point increase in the probability of working more than desired ($p < 0.001$), and a 0.35 percentage point increase in the probability of enrolling in graduate education ($p < 0.001$).

Field of study shows significant associations with these career outcomes even

after controlling for debt levels. Engineering and Engineering Technology graduates are significantly less likely to work outside their field of study (12.08 percentage points lower probability) or work more than desired (11.86 percentage points lower probability) compared to Social Sciences graduates. In contrast, Humanities graduates are more likely to work outside their field (9.34 percentage points higher probability) and work more than desired (4.46 percentage points higher probability). These patterns likely reflect differences in the specificity of skills, labor market demand, and career paths across fields.

Table 5. Probit regression models predicting career choices (Marginal Effects).

Variable	Job Outside Field	Worked More Than Desired	Graduate Enrollment
Key Independent Variable			
Log of total federal student loans	0.0129***	0.0209***	0.0035***
	(0.0011)	(0.0011)	(0.0008)
Demographic Characteristics			
Female	0.0037	0.0272***	−0.0029
	(0.0101)	(0.0107)	(0.0084)
Black or African American	0.0982***	0.0403**	0.0095
	(0.0192)	(0.0195)	(0.0135)
Hispanic or Latino	0.0402**	0.0251	−0.0210
	(0.0174)	(0.0182)	(0.0148)
Asian	0.0591***	0.0074	−0.0134
	(0.0195)	(0.0197)	(0.0161)
American Indian or Alaska Native	0.1558*	−0.0753	—
	(0.0922)	(0.0876)	—
Native Hawaiian/Pacific Islander	0.2361**	0.2395**	−0.0945
	(0.0987)	(0.0911)	(0.1028)
Other	0.0245	0.1290	−0.0807
	(0.1021)	(0.1115)	(0.1093)
More than one race	0.0574*	0.0130	0.0056
	(0.0299)	(0.0311)	(0.0219)
Field of Study			
Computer/Info Sciences	−0.0560*	−0.0386	−0.0357
	(0.0286)	(0.0298)	(0.0328)

Continued

Engineering/Eng Tech	−0.1208***	−0.1186***	0.0074
	(0.0208)	(0.0213)	(0.0193)
Bio/Physical Sciences	−0.0882***	−0.0046	0.0200*
	(0.0164)	(0.0169)	(0.0124)
General Studies	0.0245	−0.0727**	−0.0229
	(0.0355)	(0.0346)	(0.0313)
Humanities	0.0934***	0.0446**	−0.0002
	(0.0205)	(0.0206)	(0.0155)
Health Care	−0.1764***	0.0146	0.0183
	(0.0214)	(0.0249)	(0.0186)
Business	−0.0497**	−0.0633***	−0.0055
	(0.0196)	(0.0200)	(0.0182)
Education	−0.1102***	−0.0167	0.0354**
	(0.0200)	(0.0216)	(0.0145)
Other Applied	0.0250	0.0067	−0.0471***
	(0.0188)	(0.0191)	(0.0173)
Employment and Institutional Factors			
Total weekly hours (all jobs)	0.0025***	0.0044***	−0.0008**
	(0.0004)	(0.0005)	(0.0003)
Parents' highest education (0 = Bachelor's or higher)	0.0318***	0.0354***	−0.0262***
	(0.0096)	(0.0100)	(0.0082)
Very selective institution	−0.0340	−0.0590*	0.2131***
	(0.0318)	(0.0347)	(0.0520)
Moderately selective institution	0.0037	−0.0180	0.1940***
	(0.0312)	(0.0341)	(0.0517)
Minimally selective institution	0.0162	0.0111	0.1804***
	(0.0343)	(0.0372)	(0.0533)
Open admission institution	0.0468	0.0264	0.1547***
	(0.0408)	(0.0438)	(0.0576)
Log of total salary from all jobs in 2018	−0.1254***	−0.0426***	0.0627***
	(0.0081)	(0.0086)	(0.0064)
N	9750	9750	6110

Continued

Pseudo R-squared	0.0681	0.0506	0.0580
Chi-squared	773.5	613.1	256.0
p-value	0.000	0.000	0.000

(a) Note: N is unweighted and rounded. Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Coefficients represent average marginal effects. Social Sciences is the reference category for field of study, and White is the reference category for race/ethnicity. The sample size for graduate enrollment is smaller due to missing data. (b) Source: U.S. Department of Education, National Center for Education Statistics, 2008/18 Baccalaureate and Beyond Longitudinal Study (B&B:08/18).

These findings suggest that graduates with higher student loan debt may prioritize immediate employment and income over job fit with their educational background. They are also more likely to work more than they desire, potentially to meet financial obligations including debt repayment. The positive relationship with graduate enrollment may reflect a strategy of further education to enhance earning potential or temporarily defer loan repayment.

5.5. Variations by Field of Study

The impact of student loan debt on life decisions and career choices varies substantially by field of study. Descriptive analyses reveal that graduates in Biological/Physical Sciences, Humanities, and Social Sciences are most likely to report delaying major life decisions due to education costs. For instance, 46.17% of Humanities graduates reported delaying home purchase, compared to only 29.64% of Computer/Information Sciences graduates and 29.35% of Engineering/Engineering Technology graduates (Table 6).

These differences align with variations in debt levels and debt-to-income ratios across fields. According to Table 6, Biological/Physical Sciences graduates have both the highest average federal student loan debt ($75,524.11) and the highest average debt-to-income ratio (1.14), followed by Humanities (0.89) and Social Sciences (0.84) graduates. In contrast, Computer/Information Sciences (0.27) and Engineering/Engineering Technology (0.34) graduates have much lower debt-to-income ratios.

Regression analyses controlling for demographic characteristics, institutional selectivity, and employment factors confirm that field of study moderates the relationship between student loan debt and outcomes. For example, according to Table 4, the negative coefficient for Engineering/Engineering Technology in the Probit model for delayed home purchase indicates that these graduates are 13.80 percentage points less likely to delay home purchase compared to Social Sciences graduates, even after controlling for debt levels and income.

5.6. Gender Differences

Gender differences in the relationship between student loan debt and outcomes are substantial. According to Table 7, Panel A, the positive association between student loan debt and earnings is stronger and more statistically significant for females ($\beta = 0.0073$, $p < 0.001$) compared to males ($\beta = 0.0034$, $p < 0.10$). This sug-

gests that female graduates may respond differently to student loan debt burden, perhaps by prioritizing higher-paying jobs or working more hours when faced with greater debt. However, females earn approximately 13.7% less than males on average, after controlling for field of study, work hours, and other factors.

Table 6. Federal student loan debt and debt-to-income ratio by field of study.

Field of Study	Mean Federal Student Loans ($)	Median Federal Student Loans ($)	Mean Debt-to-Income Ratio	Delayed Home Purchase (%)	Delayed Marriage (%)	Delayed Children (%)	Job Outside Field (%)
Computer/Info Sciences	17615.92	14250.00	0.27	29.64	16.34	20.22	27.70
Engineering/Eng Tech	19856.58	14828.50	0.34	29.35	12.18	17.98	19.95
Bio/Physical Sciences	75524.11	33562.00	1.14	45.77	22.65	32.19	28.87
General Studies	34256.17	17125.00	0.64	40.87	18.27	29.81	40.87
Social Sciences	41615.06	22521.00	0.84	44.66	19.30	28.39	38.04
Humanities	34687.85	19125.00	0.89	46.17	19.60	31.54	48.36
Health Care	33064.62	21625.00	0.61	34.48	14.88	24.86	19.42
Business	21435.46	15125.00	0.43	31.87	13.89	21.62	30.48
Education	23939.69	18417.00	0.62	35.79	13.91	24.79	29.38
Other Applied	27485.92	17125.00	0.62	40.89	17.99	27.14	42.03
Total	39750.69	—	0.74	39.84	17.87	26.99	32.95

(a) Note: (N = 9750) is unweighted and rounded. Debt-to-income ratio is calculated as total federal student loans divided by annual salary in 2018. All percentage values represent the proportion of graduates within each field who reported the specified outcome. (b) Source: U.S. Department of Education, National Center for Education Statistics, 2008/18 Baccalaureate and Beyond Longitudinal Study (B&B:08/18).

Table 7. OLS Regression Models Predicting Logged Annual Salary by Gender and Race/Ethnicity.

Panel A: Gender Subgroup Analysis		
Variable	Males	Females
Log of total federal student loans	0.0034*	0.0073***
	(0.0020)	(0.0018)
Race/ethnicity controls	Yes	Yes
Field of study controls	Yes	Yes
Total weekly hours	0.0157***	0.0285***
	(0.0012)	(0.0010)
Parents' education	−0.0737***	−0.0292*
	(0.0177)	(0.0153)
Institutional selectivity controls	Yes	Yes

Continued

Constant	10.38***	9.58***
	(0.0848)	(0.0677)
N	4180	5570
R-squared	0.1948	0.3407

Panel B: Race/Ethnicity Subgroup Analysis

Variable	White	Black	Hispanic	Asian
Log of total federal student loans	0.0049***	0.0051	0.0090*	0.0123**
	(0.0015)	(0.0062)	(0.0052)	(0.0054)
Gender control	Yes	Yes	Yes	Yes
Field of study controls	Yes	Yes	Yes	Yes
Total weekly hours	0.0244***	0.0198***	0.0254***	0.0161***
	(0.0009)	(0.0026)	(0.0027)	(0.0035)
Parents' education	−0.0504***	−0.0694	−0.0336	−0.0443
	(0.0133)	(0.0434)	(0.0431)	(0.0514)
Institutional selectivity controls	Yes	Yes	Yes	Yes
Constant	10.00***	9.81***	9.72***	10.38***
	(0.0649)	(0.1817)	(0.1656)	(0.2389)
N	7280	670	790	690
R-squared	0.3270	0.2645	0.2975	0.1664

(a) Note: N is unweighted and rounded. Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. The dependent variable is the natural logarithm of total salary from all jobs in 2018. All models include controls for field of study (with Social Sciences as the reference category) and institutional selectivity. The race/ethnicity subgroup analysis for American Indian/Alaska Native, Native Hawaiian/Pacific Islander, Other, and More than one race is not reported due to small sample sizes, but is available upon request. (b) Source: U.S. Department of Education, National Center for Education Statistics, 2008/18 Baccalaureate and Beyond Longitudinal Study (B&B:08/18).

Regarding life impact decisions, Table 4 shows that females are 2.26 percentage points less likely to delay marriage due to education costs compared to males, after controlling for debt levels and income. This gender difference may reflect varying priorities or societal expectations regarding marriage timing. No significant gender differences were found in the probability of delaying home purchase or childbearing. In terms of career choices, Table 5 indicates that females are 2.72 percentage points more likely to report working more than desired compared to males, suggesting that the burden of student loan debt may translate differently into work behaviors across genders.

5.7. Racial/Ethnic Differences

Racial/ethnic differences in outcomes and the impact of student loan debt are also evident. According to Table 2, Black graduates earn approximately 12.0% less than White graduates, even after controlling for field of study, institutional selectivity, work hours, and student loan debt. Hispanic/Latino graduates earn approximately 6.2% less. These disparities underscore broader patterns of labor market inequality.

The relationship between student loan debt and earnings varies by race/ethnicity. As shown in Table 7, Panel B, the coefficient for student loan debt is statistically significant for White ($\beta = 0.0049$, $p < 0.01$), Hispanic/Latino ($\beta = 0.0090$, $p < 0.10$), and Asian ($\beta = 0.0123$, $p < 0.05$) graduates, but not statistically significant for Black graduates, suggesting that the pathways through which debt influences labor market outcomes may differ across racial/ethnic groups, potentially reflecting broader labor market inequalities.

Regarding life impact decisions, Table 4 shows that Hispanic/Latino graduates are 5.39 percentage points more likely to delay home purchase and 4.76 percentage points more likely to delay marriage compared to White graduates, after controlling for debt levels and income. Asian graduates are 8.05 percentage points more likely to delay marriage. These differences may reflect varying cultural norms, family resources, or housing market constraints across racial/ethnic groups.

5.8. Institutional Selectivity and Parental Education

Institutional selectivity shows significant associations with outcomes. According to Table 2, Model 2, graduates from very selective institutions earn approximately 15.2% higher salaries compared to those from less selective institutions, even after controlling for demographic characteristics, field of study, and student loan debt. However, Table 4 shows they are also 8.65 percentage points less likely to delay home purchase, suggesting that the benefits of attending selective institutions extend beyond earnings to influence life decisions.

Parent education level, a proxy for socioeconomic background, also shows significant associations with outcomes. According to Table 2, Model 2, first-generation college students (those whose parents did not complete a bachelor's degree) earn approximately 3.17% less than their peers with college-educated parents, after controlling for other factors. Table 4 shows they are also 2.10 percentage points more likely to delay marriage and 1.82 percentage points more likely to delay having children due to education costs, suggesting that the impact of student loan debt may be more pronounced for students from less advantaged backgrounds.

5.9. Robustness Checks

To ensure the robustness of the findings, the study conducted several additional analyses. The propensity score matching analysis presented in Table 3 comparing graduates with above-median debt to those with below-median debt confirms the positive relationship between student loan debt and earnings (ATT = 0.096, $p <$

0.05). This approach helps address potential selection bias in the relationship between debt and outcomes.

The institutional fixed effects model (Table 2, Model 3), which accounts for unobserved characteristics of the institutions attended, also confirms the positive relationship between student loan debt and earnings ($\beta = 0.00706$, $p < 0.001$). This suggests that the observed relationships are not driven by institutional factors that might influence both debt levels and post-graduation outcomes.

These robustness checks, along with the consistent patterns observed across multiple analytical approaches, strengthen confidence in the main findings regarding the relationship between student loan debt and post-graduation outcomes.

6. Discussion

This study examined the relationship between federal student loan debt and a range of post-graduation outcomes among bachelor's degree recipients, followed over a ten-year period from 2008 to 2018. The findings reveal a complex picture of how educational debt shapes economic trajectories and life decisions, with important implications for theory, policy, and practice.

A central finding of the analysis is the seemingly paradoxical relationship between student loan debt and earnings—higher debt was associated with higher earnings, even after controlling for demographic characteristics, field of study, and institutional factors. This positive relationship aligns with the productivity-enhancing pathway in the theoretical framework, wherein debt-financed human capital investments increase skills and earnings potential. The association may reflect several mechanisms: graduates with higher debt may prioritize higher-paying jobs, work more hours, or select into fields with greater earnings potential to manage their debt obligations. The stronger debt-earnings relationship for women compared to men, and for White and Asian graduates compared to Black and Hispanic/Latino graduates, suggests that the productivity-enhancing effects of debt-financed education operate differently across demographic groups, potentially reflecting broader patterns of labor market stratification.

However, while student loan debt was positively associated with earnings, it also significantly increased the likelihood of delaying major life decisions including home purchase, marriage, and childbearing. This finding aligns with the constraint pathway in the theoretical framework, wherein debt obligations limit financial flexibility and influence life choices beyond their impact on income. The persistent effect of debt on life decisions, even after controlling for current earnings, suggests that these constraints operate through mechanisms beyond current financial capacity—potentially including psychological burden, future financial uncertainty, or limited access to additional credit. These findings support life course theory's emphasis on the interconnectedness of life transitions, as decisions in one domain (education financing) ripple through other domains (homeownership, family formation).

The finding that debt effects on life decisions persist even after controlling for income provides strong support for debt aversion theory, which suggests that individuals experience psychological costs from carrying debt burdens beyond the financial costs of debt service. This psychological dimension helps explain why the psychological weight of debt may influence life decisions independently of its effect on actual financial capacity. Debt aversion may create a psychological burden that shapes preferences and decision-making across multiple life domains, leading graduates to delay major life transitions even when their current income might technically support such decisions. The psychological pathway represents a crucial but often overlooked mechanism through which educational debt influences post-graduation outcomes. Unlike the productivity-enhancing and constraint pathways, which operate primarily through economic mechanisms, the psychological pathway suggests that debt creates mental and emotional burdens that influence behavior in ways that traditional economic models fail to capture.

The differential impact of student loan debt across fields of study provides further insights into the mechanisms through which debt influences outcomes. Fields with stronger occupational linkages and higher earnings potential (e.g., Engineering, Computer Science) showed weaker relationships between debt and delayed life decisions, and graduates in these fields were less likely to work outside their field of study despite similar debt burdens. This pattern suggests that the constraint effects of student loan debt are moderated by labor market conditions in specific fields, with greater constraints experienced in fields where debt-to-income ratios are higher and occupational pathways less defined.

The findings regarding racial/ethnic differences in the debt-outcome relationship underscore the importance of considering how educational debt intersects with broader patterns of stratification. While White and Asian graduates showed positive associations between debt and earnings, Black graduates did not, suggesting that debt-financed human capital investments may yield lower returns for these groups. Additionally, Hispanic/Latino graduates were more likely to delay home purchase and marriage due to educational costs compared to White graduates with similar debt levels, potentially reflecting differences in family resources, housing market constraints, or cultural factors affecting the perceived burden of debt.

These empirical patterns align with the integrated theoretical framework, which proposed that student loan debt operates through multiple pathways: 1) a productivity-enhancing pathway, wherein debt-financed education increases skills and earnings potential; 2) a constraint pathway, wherein debt obligations limit financial flexibility and influence life choices; and 3) a psychological pathway, wherein debt aversion shapes preferences across life domains. The simultaneous presence of positive earnings effects and negative effects on life decisions supports this multi-pathway model and helps explain the sometimes contradictory findings in previous research.

6.1. Policy and Practical Implications

The findings have several important implications for higher education policy and practice. First, the significant relationship between student loan debt and delayed life decisions suggests that the current approach to financing higher education may impose substantial non-financial costs on graduates. While education loans effectively enable college access, they may also constrain post-graduation life options in ways that standard human capital models fail to capture. Policymakers should consider these broader effects when designing financial aid systems and loan repayment programs.

Second, the heterogeneous effects of student loan debt across demographic groups and fields of study highlight the importance of targeted approaches rather than one-size-fits-all policies. Income-based repayment programs may be particularly valuable for graduates in fields with lower earnings and higher debt-to-income ratios, where debt constraints appear strongest. Similarly, additional support for Black and Hispanic/Latino borrowers, who appear to receive lower earnings returns on their educational investments, may help address disparities in the consequences of debt.

Third, the stronger association between debt and earnings for women compared to men suggests that debt may motivate women to pursue higher-paying employment opportunities, potentially counteracting gender disparities in pay. However, this comes with the trade-off of women being more likely to report working more hours than desired. Policies that promote gender equity in labor markets might help women achieve comparable earnings without requiring these compensatory behaviors.

Fourth, the significant impact of institutional selectivity on outcomes—with graduates from more selective institutions earning higher salaries and being less likely to delay major life decisions—highlights the importance of expanding access to high-quality institutions, particularly for students from disadvantaged backgrounds. Merit aid policies that draw high-achieving, low-income students away from more selective institutions may have unintended negative consequences for their long-term outcomes.

For higher education institutions, the findings suggest the importance of comprehensive financial education and debt counseling that addresses not only the management of loan repayment but also the potential broader implications of debt for post-graduation life. Particularly in fields with higher average debt-to-income ratios, students would benefit from realistic information about how their debt burdens might affect various life decisions, helping them make more informed borrowing choices.

6.2. Limitations and Future Research

While this study provides valuable insights into the relationship between student loan debt and post-graduation outcomes, several limitations should be acknowledged. First, despite the use of multiple analytical approaches to address selection

concerns, causal inference remains challenging in the absence of experimental variation in debt levels. While this study employs multiple analytical approaches including propensity score matching and institutional fixed effects models to address selection concerns, these methods cannot fully eliminate potential bias from unobserved characteristics such as individual ability, motivation, or family wealth that may influence both borrowing decisions and post-graduation outcomes. The relationships identified should therefore be interpreted as associations rather than definitive causal effects.

Second, the analysis focuses exclusively on federal student loans and does not account for other forms of educational debt such as private loans, credit card debt used for educational expenses, or family loans. These additional sources of financing may also influence post-graduation outcomes but operate through different mechanisms than federal loans due to varying terms and repayment structures.

Third, while the ten-year follow-up period is longer than many previous studies, it may still not capture the full lifecycle effects of student loan debt. Some consequences, particularly for wealth accumulation and retirement preparation, may emerge later in the life course as debt obligations persist and early adult decisions compound over time.

Future research could address these limitations by examining longer-term outcomes, incorporating broader measures of educational debt, and exploring additional mechanisms through which debt influences post-graduation life. Research on how recent policy changes, such as expanded income-based repayment options and temporary loan payment pauses during the COVID-19 pandemic, affect the relationship between debt and outcomes would also be valuable. Additionally, qualitative studies exploring how graduates conceptualize and navigate the influence of debt on their decision-making processes could provide deeper insights into the psychological and social dimensions of educational debt that are difficult to capture in quantitative analyses.

In conclusion, this study contributes to understanding of how student loan debt shapes the post-college transitions and economic trajectories of recent graduates. By documenting both the productivity-enhancing effects of debt-financed education on earnings and its constraining effects on major life decisions, the research highlights the complex and multifaceted nature of educational debt in contemporary American society. As policymakers, institutions, and individuals navigate the evolving landscape of higher education financing, these insights can inform more effective approaches to promoting both educational access and post-graduation wellbeing.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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