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Mortgage Risk and Disparate Impact Associated With Student Debt

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Abstract

Student debt payments represent a barrier to homeownership because student loan debt increases the difficulty in qualifying for a mortgage and decreases the amount of income available to sustain homeownership. Yet student loans are different from other types of debt, such as automobile loans and credit card debt, because student loans represent a direct investment in human capital, and higher educational attainment is associated with higher lifetime earnings. To explore the effect of student loan debt in mortgage performance, the authors disaggregate the back-end debt-to-income ratio commonly used in mortgage underwriting into payments on mortgage, student debt, and other debt. The authors find that the presence of student debt is associated with a lower *risk of mortgage default, all else equal. However, while disaggregating debt ratios improves the ability to assess default risk and could expand overall access to credit, it also increases the disparate impact on most non-White borrowers.*

Introduction

Federal student loan debt is owed by over 43 million borrowers with an average outstanding balance of over $37,000 (Hanson, 2022). Many borrowers view student loan debt as a significant barrier to major lifetime milestones, including homeownership.

Several researchers have examined the relationship between student loan debt and homeownership; however, no researchers to the authors' knowledge have examined the effect of student loan debt on mortgage performance. Understanding the relationship between student loan debt and timely mortgage payments is important because student debt payments affect the "back-end" debt-to-income (DTI) ratio, a common risk factor in mortgage underwriting. The DTI ratio is the sum of all required monthly debt payments as a share of the borrower's income but does not distinguish between types of nonmortgage debt. Payments on student loans are traditionally treated the same as consumer debt in mortgage underwriting.

However, student debt may instead be considered an investment in human capital. Graduates earn significantly more than workers that did not attend college. On the other hand, the net wealth premium associated with higher education has declined, possibly due to the increasing cost of college being financed with rising student debt (Emmons, Kent, and Rickets, 2019). To the extent that student debt also hinders qualifying for a mortgage, it also indirectly limits borrowers from the wealth-building potential of homeownership (Stegman, Quercia, and Davis, 2007).

To explore the effect of student loan debt in mortgage performance, the authors disaggregate the back-end DTI ratio commonly used in mortgage underwriting into payments on mortgage, student, and other debt. Findings show that student debt is associated with a *lower* risk of default overall. This finding is likely because student debt is correlated with higher educational attainment, which is not observed or used in mortgage underwriting. Obtaining a college or graduate degree increases the potential income of the borrower. Borrowers with student debt that do not graduate likely experience the worst outcomes.

However, while disaggregating debt ratios improves the ability to assess default risk and could expand overall access to credit, it also increases the disparate impact on most non-White borrowers. As with the debate over the progressiveness of student debt forgiveness,[1] the disparate impact of student debt in mortgage underwriting is complicated. Black borrowers are more likely to have student debt than White borrowers, but Hispanic and other minority borrowers are less likely. Therefore, discounting student debt in underwriting increases the likelihood of approval for Black and White borrowers but not Hispanic and others relative to the baseline of only using the overall DTI ratio.

Literature Review

The literature on student loan debt and economic outcomes is broad. The presence and accumulation of student loan debt is shown to affect numerous milestones and economic

[1] For example, Looney (2022) argues student debt forgiveness is regressive, whereas Perry, Steinbaum, and Romer (2021) argue it is not. See also Leonhardt (2018).

outcomes. Studies have found, for example, that student loan debt is associated with delayed marriage (Bozick and Estacion, 2014; Gicheva, 2011; Stone, Van Horn, and Zukin, 2012) and childrearing (Nau, Dwyer, and Hodson, 2015; Sieg and Wang, 2017).

Another relevant strand of the literature looks at the relationship between student loan debt and the financial health of borrowers post-schooling, such as repayment difficulties. Using the 2007–2009 Survey of Consumer Finances, Elliott and Nam (2013) find lower net worth for those with high student loan debt, and Thompson and Bricker (2014) find families with student loans more likely to be 60 or more days late paying bills. In addition, the research consistently finds high student loan debt is not a strong predictor of repayment difficulties (Baum and Johnson, 2016; Dynarski and Kreisman, 2013). Instead, high student loan debt is associated with higher levels of degree attainment and completion. A recent study from Baum and Looney (2020) found that those with professional and doctorate degrees, only 3 percent of the population sampled, held 20 percent of the outstanding student loan debt.

In the context of homeownership, the relationship between student loan debt and homeownership is also well examined. However, the findings are mixed between studies finding no relationship between student loan debt and homeownership (Velez, Cominole, and Bentz, 2019; Zhang, 2013), and others finding a negative relationship between student loan debt and homeownership (Bleemer et al., 2017; Mezza et al., 2016; Miller and Nikaj, 2018). The conflicting results are likely explained by two factors. First, student loan debt is not randomly assigned, and selection into student loan debt and homeownership are correlated. Studies have addressed this concern through instrumental variables (Houle and Berger, 2015; Mezza et al., 2020; Velez, Cominole, and Bentz, 2019). The second concern is omitted variables. Dynarski (2016) and Miller and Nikaj (2018) find degree completion to be an important consideration.

The literature on student loan debt is extensive. Prior studies find a direct relationship between student loan debt and adult milestones such as marriage, childrearing, and homeownership. Although the student loan literature is informative, this article may be the first to examine the relationship between student loan debt and mortgage performance.

Data

To conduct the analysis, the authors obtained information on borrower characteristics and loan performance from the National Mortgage Database (NMDB). The NMDB program is administered by the Federal Housing Finance Agency (FHFA) and combines credit attributes and performance data from a 1-in-20 sample of residential first lien mortgages from one of the three primary credit bureaus with administrative records and information from the Home Mortgage Disclosure Act.

The authors examined owner-occupied home purchase mortgages originated between 2014 and 2018 and observed performance through 2019, ending before the COVID-19 pandemic. Observations are restricted to loans with at least one borrower with a credit score and where the reported back-end DTI ratio used in underwriting is greater than or equal to the sum of the mortgage and any student debt payments reported to the credit bureau. Borrowers with student debt are defined as any nonzero student debt balances when the mortgage was originated. The

student debt payment is defined as the median nonzero student debt payment between the two quarters prior to and after origination for those with a nonzero student debt balance at origination.

These parameters result in a sample of roughly 800,000 loan borrowers, of whom 29 percent had student debt at the time of origination. Exhibit 1 provides descriptive statistics on the loans and borrowers. Non-Hispanic White borrowers account for nearly three-fourths of all borrowers. Exhibit 2 shows Black borrowers are more likely to have student debt than White borrowers, but other minority groups are less likely. This pattern among mortgage borrowers by race and ethnicity reflects a similar distribution of debt among recent graduates. For example, among 2015–16 bachelor's degree recipients, 86.3 percent of Black graduates still owed on federal student loan debt 12 months after completion—compared to 70.1 percent of Hispanic graduates, 67.7 percent of White graduates, and 43.9 percent of Asian graduates (National Center for Education Statistics, 2021).

Exhibit 1

Descriptive Statistics

	No Student Debt		With Student Debt		All
	Non-Hispanic White	All Other	Non-Hispanic White	All Other	
Share of Loans	52.4	18.3	22.2	7.1	100.0
DTI Ratio (%)	35.1	38.4	37.5	40.8	36.7
	(10.1)	(9.8)	(9.1)	(9.0)	(9.9)
Front-End	21.4	25.6	20.5	23.5	22.1
	(9.3)	(9.9)	(7.8)	(8.5)	(9.2)
Student			3.7	3.3	1.0
			(3.4)	(3.3)	(2.4)
Credit Score	734	718	719	699	725
	(66)	(66)	(59)	(60)	(65)
CLTV Ratio (%)	82.3	85.5	89.3	91.2	85.1
	(19.5)	(17.0)	(14.2)	(12.8)	(17.9)
ARM (%)	19.7	20.4	16.3	14.1	18.8
Term≤15 (%)	31.7	26.8	22.0	17.7	28.2
Default Rate (%)	12.3	14.4	11.8	16.6	12.9

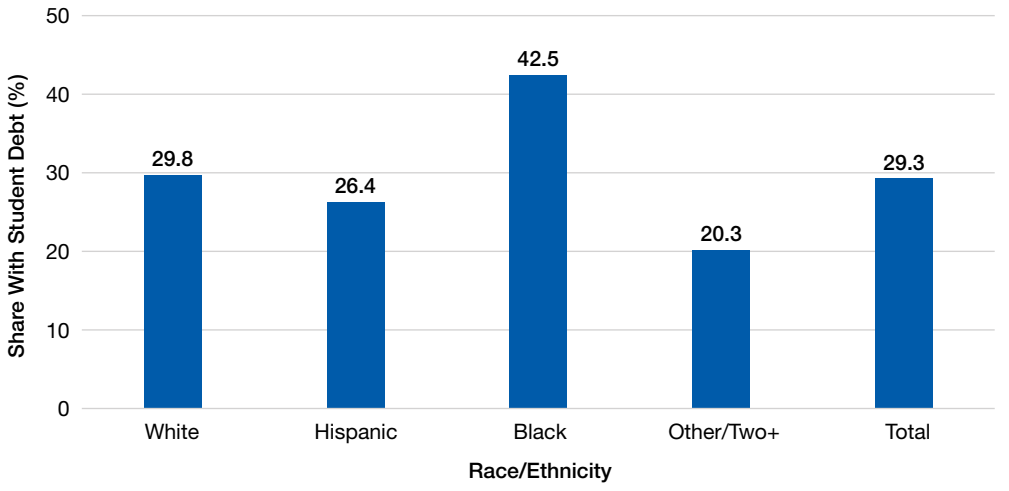
ARM = adjustable-rate mortgage. CLTV = combined loan-to-value. DTI = debt-to-income.

Note: Standard deviation is indicated using parentheses.

Source: National Mortgage Database

Exhibit 2

Share of Mortgage Borrowers With Student Debt by Race/Ethnicity



Source: National Mortgage Database

The average back-end DTI ratio is nearly 37 percent. Student debt payments account for roughly 3.6 percent of borrower income on average. Borrowers with student debt have higher overall DTI ratios even though the share of income devoted to mortgage payments is lower, which suggests student debt is constraining housing consumption. Borrowers with student debt also have lower credit scores and higher combined loan-to-value (CLTV) ratios than borrowers without student debt.

Methodology

To explore the effect of student loan debt in mortgage performance, the authors define default as the first instance of a 90-day delinquency in the mortgage tradeline and utilize a Cox proportional hazard model. The Cox proportional hazard model is defined as—

$$\lambda(t) = \lambda_0(t)e^{f(x)}$$

$$f(x) = \beta\Omega + \gamma DTI + \delta STD$$

Where λ_0 is an unspecified baseline hazard, and Ω represents a vector of common underwriting factors at loan origination, including credit score, CLTV ratio, and binary indicators of adjustable interest rates and loan terms less than or equal to 15 years. *STD* represents a binary indicator of a nonzero student debt balance in the quarter in which the mortgage was originated. *DTI* represents various formulations of the debt-to-income ratio. In addition to the commonly used overall back-end DTI ratio, the authors also include separate ratios for mortgage principal, interest, tax, and insurance payments (payment-to-income [PTI] ratio) and student debt payments relative to income (STDTI ratio). The remaining back-end DTI ratio excludes these subcomponents when they are included directly as separate explanatory variables.

The linear combination of observation values and the estimated coefficients from these specifications are then used to create risk scores that can be evaluated for predictiveness of default and disparate impact with respect to race and ethnicity. The authors use Kolmogorov-Smirnov (KS) statistics to summarize both impacts. The statistic is computed as the maximum difference in the empirical distribution functions of two subpopulations, F_1 and F_2, based on the linear combination of borrower characteristics and estimated coefficients.

$$F(x) = \frac{1}{n}\sum_{i=1}^{n} 1(X_i \le x)$$

$$KS = \max[F_1(x) - F_2(x)]$$

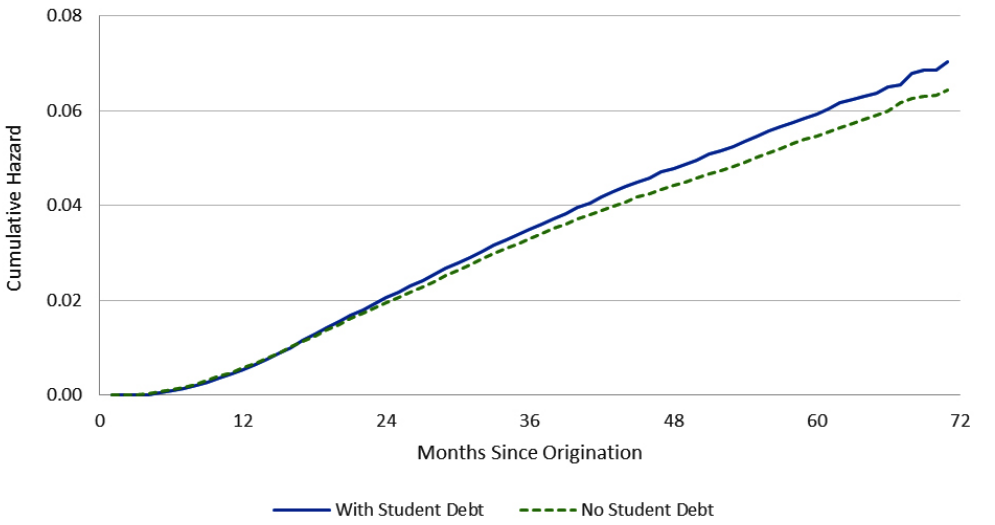
For evaluating the predictiveness of difference specifications, F_1 is the empirical distribution of mortgages that did not default within 24 months of origination, and F_2 is the distribution of loans that defaulted. The maximum difference is referred to as the *Risk KS* statistic. For evaluating disparate impact, F_1 is the empirical distribution of non-Hispanic White borrowers, and F_2 is the distribution of other racial or ethnic groups. The maximum difference is referred to as the *Race KS* statistic.

Findings

Exhibit 3 shows the cumulative default hazard by whether the borrowers have any student debt. Overall, student debt is associated with a slightly higher cumulative default hazard.

Exhibit 3

Cumulative Default Hazard



Source: National Mortgage Database

Hazard Model

Exhibit 4 presents select results of the Cox proportional hazard model of default related to student debt and DTI ratio. As expected, higher credit scores and shorter loan terms are associated with lower default risk, whereas higher CLTV ratios are associated with greater risk. Controlling for these risks, a 1-percentage-point increase in the back-end DTI ratio is associated with roughly a 2-percent increase in the likelihood of default.

Exhibit 4

Cox Proportional Hazard Model

	(1)	(2)	(3)	(4)	(5)	(6)
Any Student Debt		0.8974***		0.9533**		1.1240***
		(0.0134)		(0.0145)		(0.0225)
DTI Ratio†	1.0211***	1.0216***	1.0124***	1.0129***	1.0143***	1.0139***
	(0.0008)	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Front-End			1.0319***	1.0318***	1.0318***	1.0320***
			(0.0009)	(0.0009)	(0.0009)	(0.0009)
Student					0.9769***	0.9618***
					(0.0032)	(0.0044)
Credit Score	0.9840***	0.9840***	0.9839***	0.9839***	0.9840***	0.9840***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
CLTV Ratio	1.0112***	1.0115***	1.0105***	1.0106***	1.0108***	1.0106***
	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Term≤15	0.7864***	0.7817***	0.8530***	0.8489***	0.8419***	0.8474***
	(0.0244)	(0.0242)	(0.0264)	(0.0263)	(0.0260)	(0.0262)
ARM	0.5486***	0.5452***	0.5630***	0.5612***	0.5567***	0.5585***
	(0.0382)	(0.0380)	(0.0392)	(0.0391)	(0.0388)	(0.0389)
AIC	14127671	14126530	14117171	14116959	14113836	14113056
χ^2	30492***	30639***	32274***	32289***	32630***	32759***

AIC = Akaike information criterion. ARM = adjustable-rate mortgage. CLTV = combined loan-to-value. DTI = debt-to-income.

** Statistically significant at the 0.050 level. ** Statistically significant at the 0.010 level. *** Statistically significant at the 0.001 level.*

† = back-end DTI ratio excluding components directly included.

Note: Standard errors are shown in parentheses.

Source: National Mortgage Database

The second column includes a binary indicator of whether the borrower has any student debt at the time of origination. The estimated hazard ratio indicates borrowers with student debt are associated with a 10-percent *reduction* in the likelihood of default, all else equal.

The third and fourth columns disaggregate the back-end DTI ratio into the front-end DTI ratio (PTI ratio) and the remainder; this reveals that a 1-percentage-point increase in the share of income devoted to the mortgage payment increases the likelihood of default more than a 1-percentage-point increase in share of income devoted to other forms of debt. Having student debt is still associated with a small but statistically significant reduction in the likelihood of default (fourth column).

The fifth and sixth columns further disaggregate the back-end DTI ratio into the front-end ratio, the STDTI ratio, and the remainder. A higher share of income devoted to student debt payments is associated with a *decrease* in the likelihood of default.

NMDB provides the overall DTI ratio as reported in the administrative data. The PTI ratio is the escrow payment reported by the credit bureau with some imputation by FHFA. As a robustness check, the authors replace these ratios with the median overall debt and escrow payments only as reported by the credit bureau data, comparable to how student debt payments are computed. The results shown in appendix A are substantively similar.

Kolmogorov-Smirnov Statistics

The linear combination of borrower characteristics and estimated coefficients presented in exhibit 4 can be converted into measures of predicted risk. Exhibit 5A plots the cumulative distribution of loans that defaulted within 24 months and all other loans by the risk score derived from the first specification. Borrowers that defaulted generally have higher risk scores than borrowers that did not. The maximum difference between the two cumulative distributions (Risk KS statistic) is 55.1 percentage points.

Exhibit 5B is a similar chart showing the cumulative distributions for non-Hispanic White borrowers and borrowers of all other races and ethnicities. Based on their risk factors, White borrowers have lower average levels of predicted risk. The maximum difference between the two cumulative distributions (Race KS statistic) is 13.0 percentage points.

Exhibit 5

Cumulative Distributions and Kolmogorov-Smirnov Statistics (1 of 2)

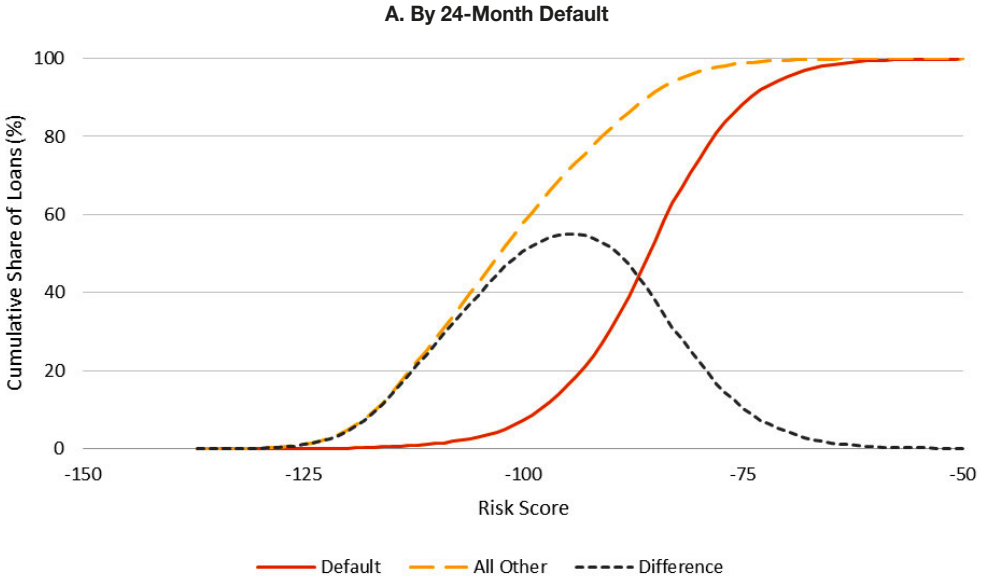
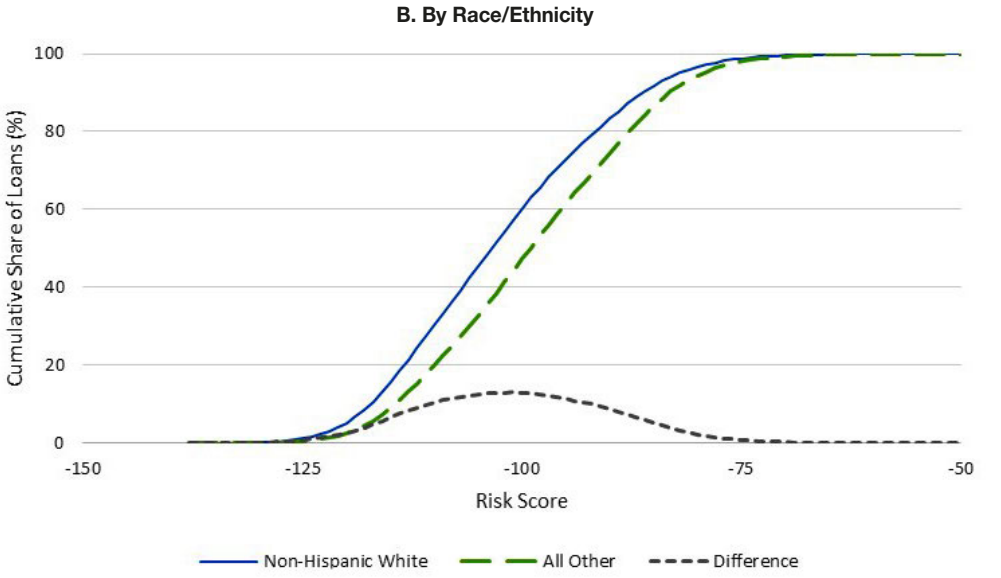


Exhibit 5

Cumulative Distributions and Kolmogorov-Smirnov Statistics (2 of 2)



Source: National Mortgage Database

Risk and Race KS statistics are found for scores derived from each of the six specifications shown in exhibit 4. In addition, seventh and eighth scores are computed using the fifth and sixth specifications, respectively, except excluding components related to student debt (that is, any student debt indicator and student debt payment to income ratio). These scores represent scenarios in which student debt is not included in DTI ratio calculations at all. The overall results are reported in the first two columns of exhibit 6 and displayed in exhibit 7A with the Risk KS on the x-axis and the Race KS on the y-axis. Disaggregating back-end DTI ratio into mortgage payments, student debt payments, and other debt payments improves the predictiveness of the derived risk score, exhibited by higher Risk KS statistics. However, the improvement in predictiveness comes with greater disparate impact, exhibited by higher Race KS statistics. Disaggregating DTI ratio but excluding student debt from the risk score (that is, not *rewarding* borrowers spending a high share of income on student debt) actually reduces its predictiveness.

Exhibit 6

Risk and Race Kolmogorov-Smirnov Statistics

Non-Hispanic White Versus	All Others		Hispanic		Black	
Score	(1) Risk	(2) Race	(3) Risk	(4) Race	(5) Risk	(6) Race
1	55.10	13.00	54.75	20.32	55.97	30.86
2	55.26	13.24	54.93	20.62	56.07	30.70
3	55.37	14.26	54.77	21.62	56.16	31.43
4	55.45	14.34	54.83	21.74	56.20	31.29
5	55.60	14.61	55.11	22.13	56.51	31.17
6	55.50	14.55	54.96	22.06	56.45	31.28
7	55.51	14.38	54.92	21.80	56.32	31.35
8	55.49	14.39	54.92	21.83	56.31	31.32

Notes: Scores 1–6 are based on the specifications shown in exhibit 4. Scores 7 and 8 are based on the fifth and sixth specifications, respectively, but do not include components related to student debt.

Source: National Mortgage Database

Exhibit 7

Risk and Race Kolmogorov-Smirnov (1 of 2)

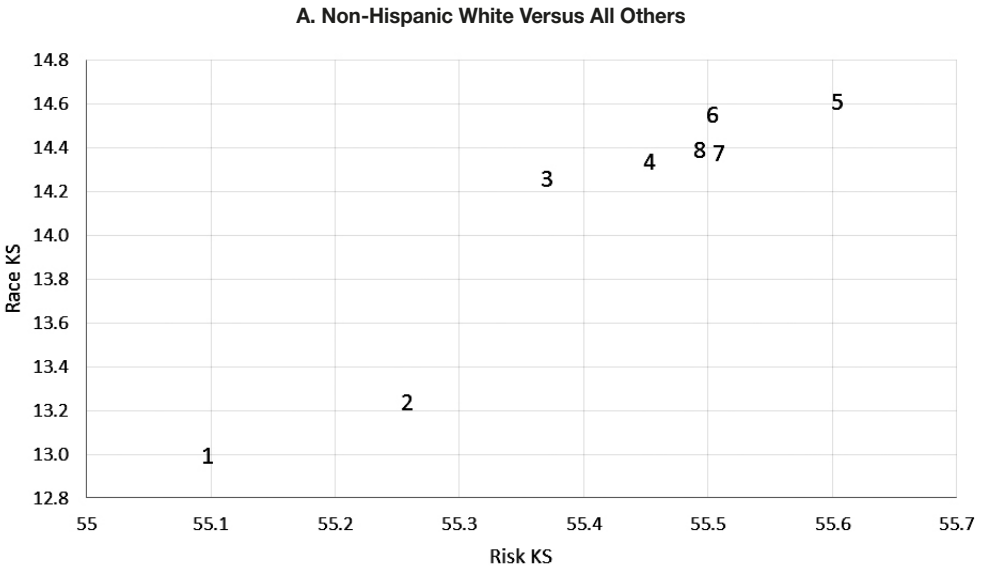
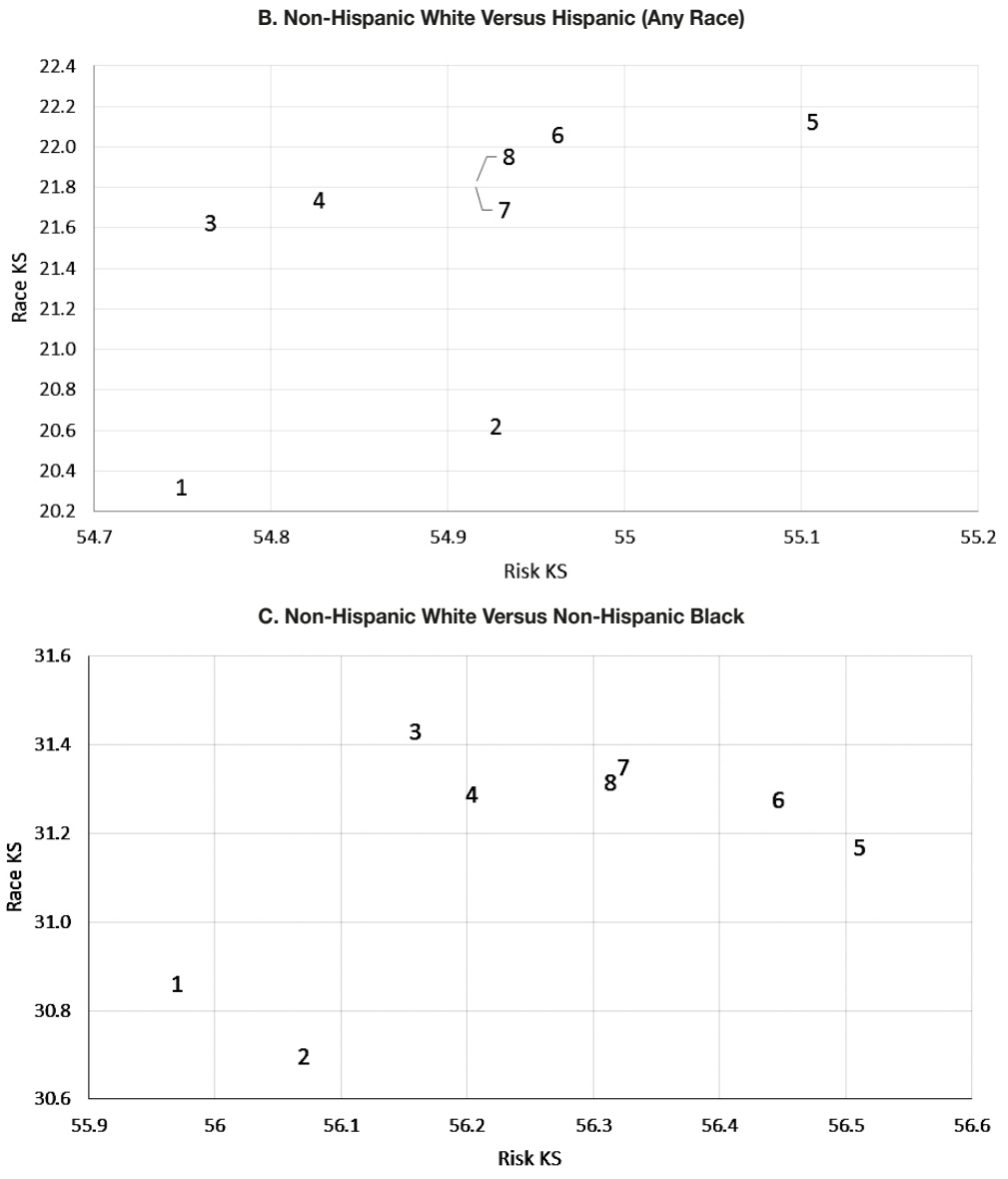


Exhibit 7

Risk and Race Kolmogorov-Smirnov (2 of 2)



KS = Kolmogorov-Smirnov statistic.
Source: National Mortgage Database

Exhibit 7B and the third and fourth columns of exhibit 6 show the KS statistics when comparing non-Hispanic White and Hispanic borrowers only. The results are similar (disaggregation improves predictiveness but worsens disparate impact), and the Race KS statistics are all notably higher.

Exhibit 7C and the fifth and sixth columns of exhibit 6 show similar statistics comparing non-Hispanic White and Black borrowers only. The Race KS statistics are even higher; however, disaggregating student debt from the nonhousing DTI ratio reduces disparate impact on Black borrowers relative to White borrowers.

Approval Rates

Measuring the differences in score distributions by race does not account for how a more predictive underwriting model allows a lender to approve more borrowers. Because the marginal borrower is more likely to be a minority borrower, this extensive margin may help offset any disparate impact.

Exhibit 8A shows the share of loans that could be approved while keeping the cumulative average predicted 24-month default rate at 1 percent or less. Exhibit 8B shows the change in number of approvals relative to the first specification. As expected, a more predictive model allows more borrowers to be approved while maintaining the same overall level of risk. However, the effects are heterogeneous: more White and Black borrowers are approved when the DTI ratio is disaggregated but fewer Hispanic and Other borrowers are approved. This pattern mirrors the differences in the share of borrowers with student debt.

Exhibit 8

Approval

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Approval Rate (%)								
White	92.4	92.4	92.7	92.7	92.8	92.8	92.7	92.7
Hispanic	86.7	86.6	86.1	86.1	86.0	86.0	86.1	86.1
Black	78.5	78.9	78.4	78.6	79.0	78.8	78.6	78.6
Other/Two+	95.3	95.4	95.2	95.2	95.2	95.2	95.2	95.2
Total	91.1	91.2	91.3	91.3	91.4	91.4	91.3	91.3
B. Change in Approvals (%) Relative to (1)								
White		0.06	0.35	0.36	0.43	0.43	0.39	0.39
Hispanic		– 0.11	– 0.65	– 0.68	– 0.76	– 0.71	– 0.68	– 0.68
Black		0.55	– 0.11	0.16	0.74	0.41	0.14	0.17
Other/Two+		0.04	– 0.16	– 0.13	– 0.14	– 0.14	– 0.14	– 0.13
Total		0.06	0.17	0.19	0.26	0.25	0.21	0.21

Note: Approval rates assuming overall cumulative average predicted 24-month default rate of 1 percent or less.
Source: National Mortgage Database

Conclusions

Student loan debt is held by a significant number of Americans. Further, researchers have shown student loan debt to be associated with delays in marriage, childrearing, and homeownership. Although student loan research is broad, this article may be the first to look at the relationship between student loan debt and mortgage performance.

Student loan debt is included in most mortgage underwriting. Traditionally, student loan debt is not differentiated from other types of debt, including auto and credit card, in the underwriting process. One could reasonably argue that student loan debt is distinct from other types of debt because it represents an identifiable investment in human capital that is associated positively with future earnings.

This article analyzes the effect of student debt on mortgage performance using data from NMDB. The authors find that student loan debt is associated with a lower risk of delinquency. The results are robust to several specifications of student loans, including separate ratios for mortgage principal, interest, tax and insurance payments, and student debt payments relative to income. The finding is consistent with the hypothesis that student debt and obtaining a college or graduate degree increases the potential income of the borrower. Borrowers with student debt that do not graduate likely experience worse outcomes.

The authors also look at the disparate impact of student debt in mortgage underwriting, finding that because of variations in the presence and burden of student loan debt by race and ethnicity, discounting student loan debt in underwriting would increase the likelihood of approval for Black and White borrowers but not Hispanic and others relative to the baseline of only using the overall back-end DTI ratio.

The findings of this article are an important first step in understanding the relationship between student loan debt and mortgage performance. The results suggest that student loan debt is distinct from other forms of debt, and mortgage underwriting would benefit from separate treatment. Policy changes, however, to the traditional treatment of student debt should carefully consider disparate impact.

Appendix A

Exhibit A-1

Cox Proportional Hazard Model, Credit Bureau Debt-to-Income

	(1)	(2)	(3)	(4)	(5)	(6)
Any Student Debt		0.8932***		0.9535**		1.1318***
		(0.0132)		(0.0147)		(0.0227)
DTI Ratio†	1.0152***	1.0156***	1.0076***	1.0080***	1.0098***	1.0096***
	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Front-End			1.0266***	1.0263***	1.0257***	1.0261***
			(0.0008)	(0.0008)	(0.0008)	(0.0008)
Student					0.9703***	0.9546***
					(0.0032)	(0.0043)
Credit Score	0.9836***	0.9837***	0.9837***	0.9837***	0.9838***	0.9838***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
CLTV Ratio	1.0112***	1.0114***	1.0108***	1.0109***	1.0110***	1.0108***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Term≤15	0.7855***	0.7816***	0.8463***	0.8422***	0.8339***	0.8396***
	(0.0243)	(0.0242)	(0.0262)	(0.0261)	(0.0258)	(0.0260)
ARM	0.5683***	0.5657***	0.5709***	0.5698***	0.5672***	0.5686***
	(0.0396)	(0.0394)	(0.0398)	(0.0397)	(0.0395)	(0.0396)
AIC	14108182	14106939	14099969	14099764	14096339	14095468
χ^2	33004***	33290***	33414***	33558***	34242***	34299***

AIC = Akaike information criterion. ARM = adjustable-rate mortgage. CLTV = combined loan-to-value. DTI = debt-to-income.

** Statistically significant at the 0.050 level. ** Statistically significant at the 0.010 level. *** Statistically significant at the 0.001 level.*

† = back-end DTI ratio excluding components directly included.

Note: Standard errors shown in parentheses.

Source: National Mortgage Database

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