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Graduate Student Loan Performance and Implications for the New Federal Lending Limits

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Abstract

This report examines the historical performance of federal graduate student borrowers and its implications for the new federal lending limits for graduate borrowers. Combining enrollment records with credit bureau data and program-level earnings, we measure three-year default among federal graduate borrowers who entered repayment between 2011 and 2016. Students whose borrowing exceeded the new limits defaulted more often than others, but loan size alone is a coarse signal of repayment risk. Pre-enrollment credit scores are the strongest predictor of default among the factors we examine, followed by the credential pursued and the median earnings of a program's past graduates. Among borrowers with low or no credit scores, who are unlikely to qualify for traditional private loans, those in high-earning programs default at far lower rates than those in lower-earning ones. These patterns suggest that information on program outcomes, considered alongside credit history, may help identify lower-risk borrowers among students whose credit records alone would limit their access to private credit.

1. Introduction

Graduate student borrowing has grown substantially over the past two decades, both in aggregate and per borrower, and now accounts for nearly half of all annual federal student loan disbursements (Monarrez and Matsudaira, 2023; Looney et al., 2020). As high graduate debt levels become increasingly common, concerns have been raised about weak labor market outcomes at many programs that entail substantial borrowing, putting both students and taxpayers at risk from unaffordable debts (Denning and Turner, 2025; Black et al., 2023).

These concerns and others motivated new limits on federal graduate borrowing enacted in the One Big Beautiful Bill Act of 2025 (P.L. 119-21) (OBBBA), also known as the Working

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Families Tax Cuts Act. This legislation adopted new annual and cumulative limits on federal Direct Loans for graduate borrowers and abolished the Graduate PLUS (Grad PLUS) loan program. Before the new law, under Grad PLUS, graduate students without recent serious derogatory items in their credit files could borrow up to the full cost of attendance set by colleges.[1] These new loan limits pursue three objectives: to curb "reckless" borrowing at levels unlikely to be repaid; to shift more graduate lending to private lenders who would have an incentive to direct loan dollars to programs with better labor market, and therefore repayment, outcomes; and to put downward pressure on tuition (U.S. Congress, House, 2025; U.S. Department of Education, 2026d).

Recent analyses, including our own previous report, show the new limits will bind for many borrowers. If recent borrowing patterns continue, the new caps will bind for an estimated one-third of new federal student loan borrowers, creating a total financing gap of $8 billion to $10 billion per year once the loan limits are fully phased in (Monarrez et al., 2025).[2] These borrowers—up to a half million per year once the limits fully phase in—will likely seek loans from private lenders for the additional funds beyond what they can borrow from the federal government to pay for their education, or change their plans for graduate study.

How will this new mix of federal and private financing for graduate studies affect who will be likely to access sufficient credit to fund their studies? And will private lenders direct student loans to borrowers likely to have better repayment outcomes more effectively than the federal programs they replace? There is surprisingly little evidence that exists to ground such a forecast, since very little is known about the repayment outcomes for graduate borrowers or the factors that predict those outcomes. Our previous report used credit score data for federal graduate loan borrowers to estimate the fraction of them that would likely be unable to qualify for private student loans based on sharp eligibility thresholds currently used by many lenders.

This report builds on that analysis.

First, we provide the first systematic evidence on how graduate student loan performance varies with the characteristics of borrowers, loans, and the institutions and programs that borrowers attend. We combine anonymized postsecondary enrollment records with anonymized credit bureau records for a subsample of the Federal Reserve Bank of New York Consumer Credit Panel/Equifax Data that was matched to those enrollment records, augmented with data on program-level earnings from past students. We then measure

[1] OBBBA also mandated new limits for Parent PLUS loans, though it kept the program itself in place. Matsudaira et al. (2025) analyzes the share of students and loan volume likely affected by these new graduate and parent loan limits.

[2] Students enrolled when the limits took effect in July 2026 remain exempt while they stay in the same program. The estimates in our 2025 report refer to the period after the limits fully phase in, likely three to four years after they take effect.

three-year default and delinquency rates for recent graduate borrowers and analyze how they vary with key characteristics of individuals and programs of study that might be used to allocate credit in the post-Grad PLUS world.

Second, a key concern with the withdrawal of federal credit availability highlighted in our earlier report is that about 40 percent of graduate students who rely on federal loans have no credit history or have subprime credit scores. Such students are unlikely to qualify for private loans without a creditworthy cosigner. Some observers hope that an increase in the use of "forward-looking" underwriting—that is, underwriting based on forecasts of students' future earnings, rather than prior credit history and income at time of application—may allow these students to access credit to attend programs with strong labor market returns. We consider the usefulness of several potential proxies for borrowers' future incomes and repayment behavior, such as the level and field of study of the credential pursued and the earnings of a program's past graduates. By doing this, we broaden our analyses to assess the potential for this type of underwriting to expand access to private loans for graduate education for students who might not be able to secure credit based on their own credit history alone.

1.1 Previous research on graduate student loan repayment

A large empirical literature examines who repays federal student loans and who does not (Yannelis and Tracey, 2022, provides a review of this literature). Most studies center on undergraduate or overall borrowing and find that repayment problems are concentrated among borrowers who have small balances, did not complete a credential, or attended for-profit and other open-access institutions. Much of the historical rise in defaults reflected changes in who borrows rather than a broad deterioration in repayment (Looney and Yannelis, 2024). Graduate borrowing has received comparatively little attention, and the question at the center of our analysis—how well federal government and key private sector underwriting criteria can predict low-performing loans—has gone largely unexamined (Lochner and Monge-Naranjo, 2016).

The evidence that does bear on graduate borrowing points in two directions that motivate our analysis. First, research finds that the borrowers with the largest balances tend to default the least, presumably because of the correlation between debt balances and years of schooling completed, and therefore labor market earnings (Looney and Yannelis, 2019). Second, the returns to graduate credentials are quite high on average but strikingly uneven across fields, credentials, and institutions attended. This suggests that both debt loads and repayment prospects may vary sharply within the graduate population (Altonji and Zhu, 2025; Georgetown University Center on Education and the Workforce, 2024; Denning and Turner, 2025).

Against this backdrop, the new limits could shift financing toward a private student

loan market that has historically underwritten on borrower creditworthiness, repayment capacity (e.g., the ratio of debt to current income), and cosigner guarantees rather than on characteristics related to future earnings potential (Consumer Financial Protection Bureau, 2012). The new loan limits have brought the consideration of forward-looking underwriting to the fore, as traditional underwriting risks leaving many students without access to credit.

We bring evidence specific to the graduate borrower population to this discussion. By examining which characteristics observed at loan origination may help to more accurately predict future repayment outcomes, this paper fills a gap the existing literature, focused on undergraduate borrowing and aggregate default trends, has largely left open.

2. Data and measurement

Our analysis draws on a novel anonymized matched dataset compiled by the Federal Reserve Bank of Philadelphia's Consumer Finance Institute. These data combine anonymized postsecondary enrollment and completion records from the National Student Clearinghouse (NSC) with anonymized credit bureau records from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax Data (CCP) (Lee and van der Klaauw, 2010; Monarrez et al., 2025). The CCP is an anonymized 5 percent sample of individuals with a credit file; a subsample of three-fifths of its primary consumers, in effect a random 3 percent sample of all credit bureau files, was submitted to the NSC for a double-blind match with its educational history records. This means that, for millions of consumers present in the CCP, we have near-universal coverage of any recent postsecondary enrollment (institution, field, credential, and enrollment dates) and credential completion, in addition to the rich credit characteristics, borrower age (based on year of birth), and geographic location found in the CCP. We classify each loan as federal or private using a combination of loan-level and servicer-level data together with market patterns related to eligibility for the COVID-19 federal student loan payment pause; for more detail on this approach, see Monarrez et al. (2025).

We measure borrower creditworthiness by a type of credit score available in the CCP: the Equifax Risk Score (Risk Score, or Score). For each borrower, we use the Risk Score measured two quarters before the start of the relevant graduate enrollment spell, so that it is unaffected by mechanical effects of enrollment-related loan originations and better approximates the credit score that would have been available for underwriting decisions at the time of loan application. We categorize borrowers into Score bands based on industry convention: no Score or thin file, deep subprime (300–579), subprime (580–619), near prime (620–669), prime (670–739), and super prime (740–850).[3] We also use the CCP data

[3]Table 2 and Figure 4 split prime into 670–689, 690–709, and 710–739, and super prime into 740–769 and 770–850.

to measure federal borrowing amounts, estimating both annual and cumulative federal borrowing over the enrollment spell, and borrowers' subsequent repayment outcomes.

We study the repayment outcomes of federal graduate student loan borrowers grouped into repayment entry cohorts. Repayment entry cohorts consist of graduate borrowers with federal loans whose first quarter in active repayment following their graduate enrollment spell falls between 2011 and 2016. Their federal graduate loan performance is then observed quarterly over a three-year window, such that the most recent cohort (those entering repayment at any point during 2016) is observed for a full three years before the COVID-19 federal student loan payment pause began in March 2020.[4] Every statistic we report from the NSC-matched data rests on at least 30 borrowers, so no table or figure cell is suppressed, with one exception: Appendix Table A2 does not show default rates for field subgroups of fewer than 30 borrowers.

Throughout, an academic "program" is defined as the combination of the specific institution (measured by six-digit Office of Postsecondary Education ID (OPEID) number), credential level (Master's, Professional, Doctoral, or Grad Cert/Other: graduate certificates and other graduate enrollment not classified in the first three), and field of study (measured by two- or four-digit Classification of Instructional Programs (CIP) number) in which a borrower was enrolled. For example, a Master's degree in accounting at Rutgers University is one graduate program.

As a proxy for a student's prospective earnings that lenders might use in underwriting, we group borrowers by the median earnings of past graduates of their program, from the U.S. Department of Education's (ED's) College Scorecard (U.S. Department of Education, 2026b). Our measure is the median earnings of the program's graduates five years after completion. Where that figure is unavailable, we use the median earnings four years after completion, scaled up by the median ratio of five-year to four-year earnings in the same two-digit CIP field.[5] Both measures describe the same graduates, those who completed in award years 2014–15 and 2015–16, the most recent cohorts observed before the pandemic.[6] Each program therefore has one earnings value, the same for all of our repayment cohorts. We then sort programs into 12 earnings groups: Deciles 2 through 9 are one group each,

[4] Repayment of federal student loans is deferred during enrollment and a grace period; origination and repayment entry can be several years apart. Grouping borrowers by repayment entry observes each of them over the same first three years of required payments. A repayment status reported while the borrower is enrolled, or in the quarter enrollment ends, does not mark repayment entry.

[5] Both series are in constant 2025 dollars, using the Consumer Price Index for All Urban Consumers (CPI-U) annual averages from the U.S. Bureau of Labor Statistics: Five-year values are multiplied by 1.1023 and four-year values by 1.1905. The five-to-four-year ratio is the median among borrowers whose program reports both measures, estimated for each of the 25 two-digit CIP fields with at least 30 such borrowers; other fields use the overall median, 1.0342. Values suppressed by ED for privacy are treated as missing. Program earnings are available for 69.7 percent of borrowers.

[6] These completers finished their programs during the later years of our repayment-entry window. When a loan is made, the most recent published program earnings generally describe completers from seven or more years earlier. Program median earnings are highly correlated across successive completer cohorts.

and the lowest and highest deciles are each split in two. Where coarser groups are needed, we pair the eight middle deciles and keep the lowest and highest deciles whole, for six groups.[7] In other analyses, we evaluate other proxies for students' post-college outcomes, including their field of study and degree level.

We measure borrower default and delinquency cumulatively over the first three years (12 quarters) in repayment, focusing on the loans taken out during the graduate enrollment spell. In other words, a borrower is counted as defaulted if any of their federal graduate loans are in default at any point within 12 quarters of repayment entry, and as delinquent if any are 90 or more days past due (including loans in default) within the same window.

Finally, as in Monarrez et al. (2025), we consider whether a borrower's loan origination would have exceeded the new annual borrowing caps: $20,500 per year for most graduate students and $50,000 per year for students enrolled in certain programs classified as "professional." A borrower is "above the limit" when their average annual federal borrowing over the graduate enrollment spell exceeded the applicable annual cap for their program of study. Table 1 also reports the share whose cumulative federal borrowing exceeded the applicable cumulative cap ($200,000 for professional programs and $100,000 for all others).

Before presenting any results, we emphasize that the aim of this study is to describe the main patterns in the repayment outcomes of recent federal graduate borrowers. An inescapable limitation of our analysis is that we are able only to characterize how the outcomes of loans made in the past vary with key loan, borrower, and program characteristics conditional on the loan origination, loan program, and business cycle environments those borrowers faced.

It is important to remember another institutional detail when comparing the past with the present or future. Private lending has been extremely limited since PLUS loans were uncapped for graduate students in 2006. As a result, the loans we study are overwhelmingly federal loans, which are not underwritten on ability to repay and come with access to generous income-driven repayment plans and other accommodations that allowed borrowers to avoid delinquency and default in circumstances such as unemployment or low earnings. In the post-Grad PLUS era, many federal loans will be replaced by private loans, likely without access to comparable accommodations, and facing different economic environments. Consequently, we urge caution when simply extrapolating our estimates of delinquency and default for particular types of borrowers. We expect the main patterns we document below across loans, borrowers, and programs to hold nevertheless.

[7] Program earnings are national figures, not adjusted for regional differences in prices or earnings. Borrowing amounts and the loan limits are in nominal dollars.

3. How does graduate loan performance vary by loan and borrower characteristics?

Because little is known about the performance of graduate student loans, we begin with an overview. We provide a description of the performance of graduate loans, focusing on the share of borrowers that experience either default or delinquency on their graduate loans within three years of repayment entry. The impact of the new federal graduate loan limits and the likely increased private sector role in financing graduate education will depend on how repayment outcomes differ based on key factors that are likely to be used to allocate credit by public and private lenders. The influence of these factors on loan outcomes will affect (1) which borrowers will be able to access sufficient credit, (2) the loan outcomes for borrowers able to secure graduate loans, and (3) who pursues graduate education, and in which field.

We first present differences in loan performance by loan size, the main criterion that will be used to limit access to federal graduate student loans by the ED after the OBBBA.[8] We then present default and delinquency outcomes by credit score, the primary metric traditionally used in underwriting most private loans (usually in combination with other credit history factors and recent income history).

Overall, recent cohorts of graduate student loan borrowers appear to be relatively high performing, with much lower rates of default and delinquency compared with undergraduate loans. Our data show that among graduate borrowers entering repayment on their loans between 2011 and 2016, 4.1 percent defaulted within three years and 12.6 percent experienced delinquency of 90 or more days past due. Data from the College Scorecard provide both points of confirmation and comparison: Among institutions with data available (representing about 85 percent of all borrowers entering repayment), the three-year default rate for graduate borrowers entering repayment in 2016 and 2017 was 3.2 percent. This figure is somewhat below our own measure, as expected, since the earlier repayment entry cohorts in our data include riskier borrowers enrolling during and shortly after the Great Recession. For comparison, the default rate on undergraduate loans for the same cohorts in the College Scorecard was 11.4 percent, over three and a half times higher than for graduate loans.

3.1 Loan performance by loan size

As noted above, the new federal loan limits will permit most graduate students to borrow up to $20,500 per year, or up to $50,000 per year if they are enrolled in a professional

[8] Federal student loans are not underwritten on ability to repay. PLUS borrowers must, however, pass an adverse credit history check: no recent delinquency of 90 or more days, no accounts in collection, and no major derogatory event such as default, bankruptcy, or foreclosure. See Cellini et al. (2020) on how the adverse credit history check has changed over time.

program.[9] As illustrated in Table 1, these new limits will likely bind for many students who borrow federal loans. In our sample, 27.8 percent of borrowers originated loans over either the new annual or new cumulative limits, with an average of $22,640 borrowed in excess of the annual cap for their credential. The table shows that the annual caps are most likely to bind—only 2.2 percent of all federal borrowers exceed the cumulative limit without also exceeding the annual one. In the remainder of the report, we classify borrowers as above the limits if their average annual borrowing exceeds the annual cap for their credential. Borrowing amounts have risen since borrowers in our sample were enrolled, such that estimates of the number of borrowers affected and the amount of loan volume over the fixed caps using more recent data would be higher than reported here (see, for example, Monarrez et al., 2025).

Table 1: Average annual federal graduate borrowing distribution and share above the OBBBA limits, by credential.

	Average annual borrowing						
Credential	$1–20.5K (%)	$20.5–50K (%)	$50–75K (%)	Over $75K (%)	Above annual cap (%)	Above annual or cumulative cap (%)	Mean excess over annual cap ($)
All borrowers	70.0	21.6	5.0	3.4	25.6	27.8	22,640
Master's	75.0	19.3	3.5	2.1	25.0	26.8	20,621
Professional	37.4	37.8	14.2	10.6	24.8	27.5	28,912
Doctoral	63.7	23.1	7.3	5.9	36.3	41.5	29,731
Grad Cert/Other	79.4	14.1	3.0	3.5	20.6	21.2	29,146
Observations: 61,029 borrowers							

Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Annual federal borrowing is measured as *average annual* borrowing over the enrollment spell (total federal borrowing during enrollment divided by the number of years enrolled). "Above annual cap": above $20,500 ($50,000 in professional programs). "Above annual or cumulative cap" adds borrowers above only the cumulative cap ($100,000; $200,000). The dollar column is the mean excess over the annual cap among the 15,648 borrowers above it; annual and cumulative excesses are in different units and are not summed.

Do graduate students with borrowing levels above these new limits differentially struggle to repay their loans? As shown in Figure 1, they do: Default rates (Panel A) are about twice as high above the limits (6.5 percent) as below them (3.3 percent) overall. Default rates are also higher above the limits than below them in Master's and Professional programs, but about the same above and below the limits in Doctoral programs. In Professional programs, where individual borrowing levels tend to be the highest, default rates are the lowest among the credential types for both those borrowing above and below the lending limits: Default rates are 1.5 percent for those borrowing under $50,000 per year and 3.3

[9] The OBBBA and ED's 2026 regulations define "professional" programs. A court has since stayed enforcement of that definition, temporarily extending the higher limits to more programs; ED is contesting the ruling. We use the definition in the published regulations, as in our previous report. If the challenge succeeds, more programs will qualify for the higher limits, and our estimates will overstate the share of borrowers affected.

percent for those borrowing above that limit. Moreover, the default rate of 3.3 percent for Professional students borrowing above their limit is (slightly) lower than the default rates we observe for those students borrowing below the limits established for Master's programs (3.5 percent) or Doctoral programs (4.1 percent).

Panel B of Figure 1 shows the share of borrowers with any delinquency in the three years after entering repayment. The prevalence of delinquency is about three to four times higher than default, but the patterns across degrees and borrowing levels are similar.

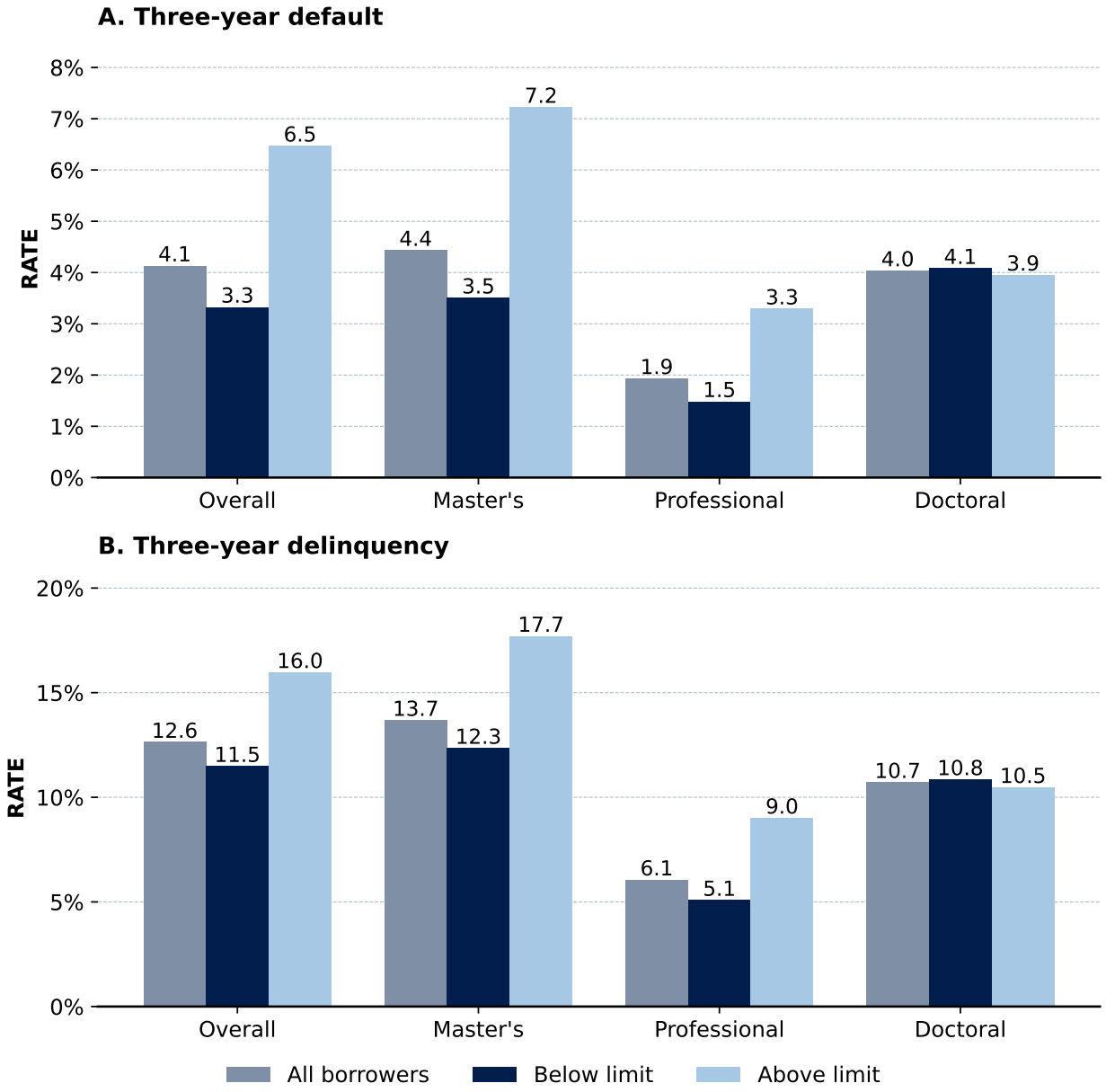
This pattern is consistent with earlier research on student loans: Borrowers with larger balances differ from those with smaller balances in ways that can be positively correlated with their ability to repay. In this context, Professional students tend to borrow significantly more than Master's students but also tend to earn substantially more. These patterns lead to differences in the relationship between loan size and loan performance, as shown in Figure 2. Figure 2 is a richer version of Figure 1, showing the relationship between more granular loan size categories (increments of $5,000, with the bins around the $20,500 limit set to separate borrowers above and below it) and loan default rates. As the figure shows, for any given amount of borrowing, default rates among Doctoral and Professional borrowers tend to be lower than those among Master's degree borrowers. Moreover, for Doctoral and Professional degree borrowers, default rates are mostly stable as borrowing levels increase. Cell counts for this figure are in Appendix Table A1; a three-year delinquency version of Figure 2 is available as Appendix Figure A1.

To summarize, default rates are higher for Master's students with borrowing levels above the $20,500 cap, and Master's students make up most borrowers. But default rates are generally low for those pursuing Doctoral and Professional degrees. These borrowers have much higher levels of borrowing, but their default rates remain relatively low even above the limits (3.9 percent for Doctoral and 3.3 percent for Professional borrowers). As a result of these patterns, borrowers above the annual limits account for only 40.1 percent of all defaulters. This is higher than the share of borrowers that have loans over the limits (25.6 percent) but still represents a minority of federal borrowers that default on their loans.

3.2 Loan performance by credit history characteristics

Most private student loans are underwritten on the basis of either a student's or a cosigner's recent credit history and current income. These underwriting criteria are "backward looking" because they rely on information about borrowers' past observed credit market behavior to predict their likelihood of repaying any new loans. In our previous report, we demonstrated that about 40 percent of graduate borrowers with loan amounts capped by the OBBBA limits are likely to have difficulty obtaining traditional private student loans. This is because they have either a sparse credit record or a Risk Score below 670—a threshold commonly used as a limit below which private lenders are unlikely to issue a

Figure 1: Three-year default and delinquency rates for graduate borrowers below vs. above the OBBBA limits, overall and by credential.

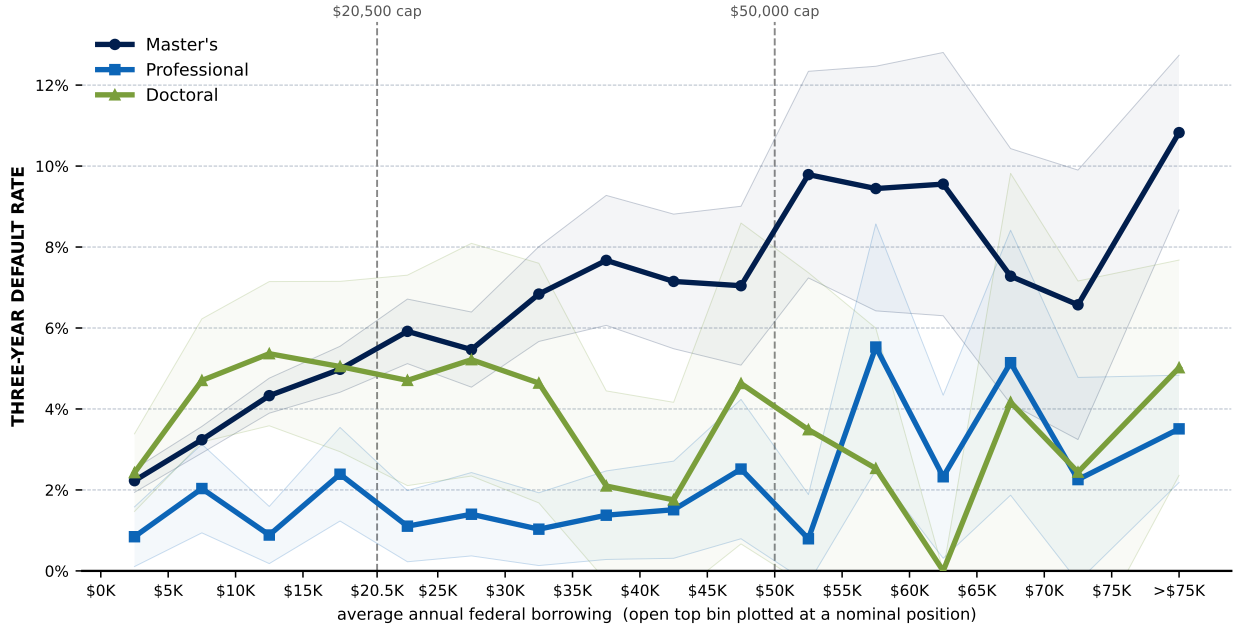


Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Bars: all borrowers in the group, those at or below the annual cap, and those above it. Panel A: three-year default; Panel B: three-year delinquency; vertical scales differ. "Overall" is the full sample and includes Grad Cert/Other, which has no separate group.

loan to an applicant without a creditworthy cosigner.[10]

[10] An industry report suggests that bank lenders are likely to require a credit score above 660 for loans over $10,000 (Consumer Bankers Association, 2026). This is similar to the median threshold of 670 reported by lenders in another recent survey (Zhang and Granville, 2026).

Figure 2: Three-year default rates for graduate borrowers by annual loan size, by credential.



Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Annual federal borrowing is measured as *average annual* borrowing over the enrollment spell (total federal borrowing during enrollment divided by the number of years enrolled). Bins are $5,000 wide, except $15–20.5K and $20.5–25K, which break at the $20,500 cap; the open top bin (over $75K) is plotted at a nominal position. Shaded bands are 95 percent confidence intervals. Cell counts are in Appendix Table A1.

In this section we present evidence about the performance of loans issued to borrowers in different Risk Score ranges to assess how closely measures of creditworthiness correlate with graduate student loan repayment outcomes.

Table 2 shows the default and delinquency rates, again measured over three years after repayment entry, for graduate borrowers in our sample entering repayment between 2011 and 2016 in each Risk Score category. As described previously, we categorize borrowers into Score bands based on industry convention: no Score or thin file, deep subprime (300–579), subprime (580–619), near prime (620–669), as well as three categories for prime (670–739), and two categories for super prime (740–850) borrowers. These finer categories allow us to provide more detail for the two Score ranges that contain the largest mass of borrowers. We note that about 13.1 percent of graduate borrowers in our repayment entry cohorts have no or a thin credit file two quarters before the graduate enrollment spell, and 35.7 percent have Risk Scores below 670.[11]

Table 2 shows that Risk Score is a strong predictor of loan outcomes: Three-year default

[11] These shares are higher than in our earlier report, which covered borrowers enrolling in 2015–2024. The difference mainly reflects the enrollment cohorts covered and the requirement that borrowers enter repayment; the earlier report's cohorts also include borrowers whose Scores rose during the pandemic-era payment pause when delinquencies on eligible federal student loans were not reported.

Table 2: Three-year default and delinquency rates for graduate borrowers by pre-origination Risk Score.

Risk Score	Borrowers (%)	Three-Yr Default (%)	Three-Yr Delinquency (%)
300–579	13.4	12.4	35.9
580–619	7.9	8.3	24.3
620–669	14.4	4.7	15.3
670–689	8.7	3.1	9.7
690–709	9.5	2.4	6.8
710–739	13.9	1.3	4.8
740–769	11.1	0.7	3.0
770–850	7.9	0.5	1.9
Thin File/No Risk Score	13.1	2.6	7.9
All	100.0	4.1	12.6
Observations: 61,029 borrowers			

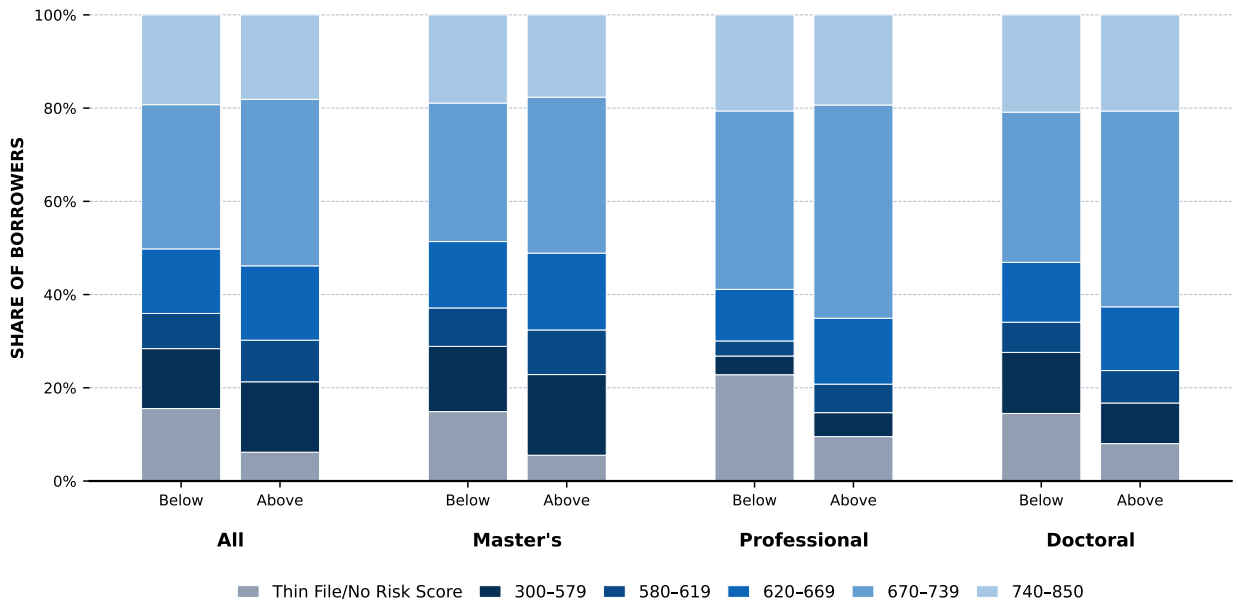
Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Risk Score: the Equifax Risk Score two quarters before enrollment begins. Thin File/No Risk Score: no Score, or a file too thin to score.

and delinquency rates decrease monotonically as the borrowers' Risk Scores increase. Two further patterns stand out. First, borrowers with a thin or no credit file before origination have loan outcomes similar to those of borrowers with Risk Scores of 690–709, consistent with a mix of lower- and higher-risk borrowers among those without a Score. Second, the default rates of graduate borrowers are low overall. Even for borrowers with Risk Scores in the deep subprime category (300–579), the 12.4 percent default rate is only slightly higher than the overall rate for all undergraduate borrowers of 11.4 percent noted above. That said, any comparison between undergraduate and graduate federal student loan performance must take into account that graduate students are more likely to benefit from accommodations such as income-driven repayment plans, because their larger balances make them more likely to qualify for reduced payments under these plans.

Graduate borrowers above the new limits are not markedly worse ex-ante credit risks than those below them. Figure 3 shows that the pre-origination Risk Score distributions are similar on either side of the limits: The share of prime-or-better borrowers (670 and above) is about 50 percent below the limit and 54 percent above it. Above-limit borrowers have somewhat fewer thin or missing credit files (borrowers with thin or missing files have relatively favorable default outcomes relative to all borrowers, Table 2). The new federal student loan limits therefore do not appear to bind to a meaningfully greater degree on less ex-ante creditworthy borrowers.

In Figure 4 below, we show three-year default rates of borrowers by both their pre-origination Risk Score and whether they borrowed above the new loan limits. Within Risk Score ranges, borrowers above the limits have substantially higher default rates (up to 2.6

Figure 3: Risk Score distribution for graduate borrowers below vs. above the OBBBA limits, by credential.

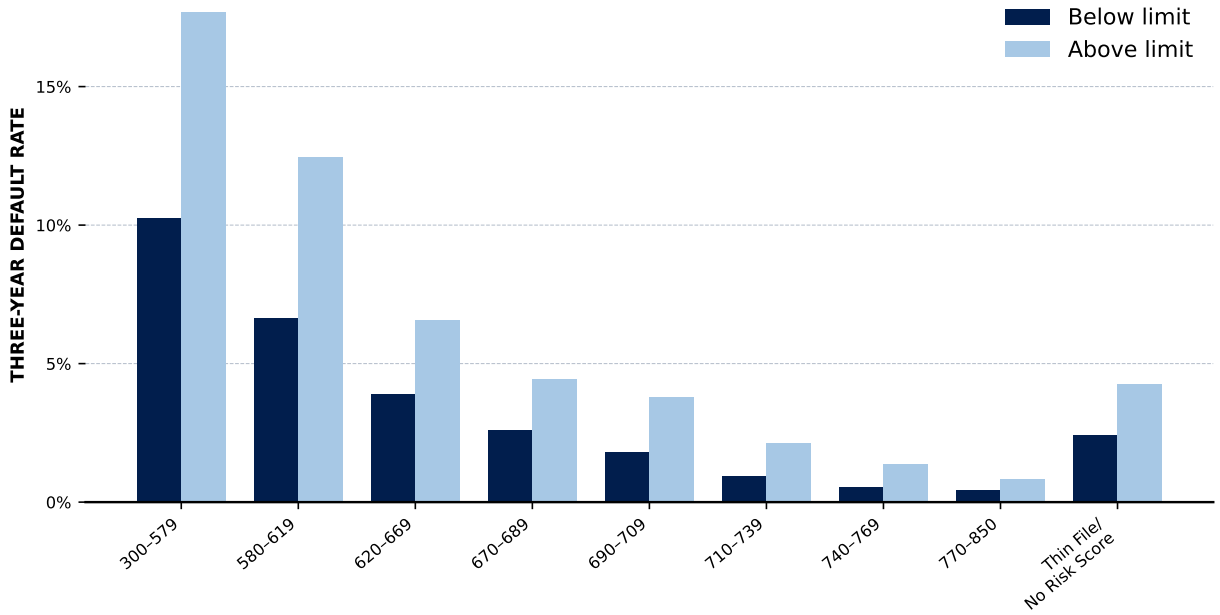


Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Each bar is the Risk Score composition of one group and sums to 100 percent; in each panel, the left bar is below-limit and the right bar above-limit borrowers. Each of the five Risk Score bands is a union of Table 2's bands.

times as high) in every Risk Score category. Measured in percentage points, however, the gap is small at higher Scores, 2.0 points or less at 670 and above, and larger below 670, between 2.7 and 7.5 points.

Among borrowers with Risk Scores below 670, those with loans above the new limits (about 10.3 percent of our full sample) are of particular interest since they both will likely suffer a loss of access to credit from the federal government and are unlikely to receive a private loan based on traditional underwriting criteria. Above-limit graduate borrowers with Risk Scores in the 620–669 band ("near prime" borrowers) have default rates of 6.6 percent, while above-limit borrowers in the 580–619 band (or "subprime" borrowers) default at 12.4 percent, nearly twice as high, and higher than the overall default rate for all undergraduate borrowers. For above-limit borrowers in the lowest band, 300–579, the three-year default rate stands at 17.7 percent. Borrowers above the loan limits with thin or no credit history have outcomes closer to those with Risk Scores in the 670–739 than the 620–669 category.

Figure 4: Three-year default rates for graduate borrowers below vs. above the new OBBBA limits, by Risk Score.



Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Table 2's eight Risk Score bands, with Thin File/No Risk Score at the right.

4. How does loan performance vary by program of study characteristics?

In the previous section, we showed that there are many borrowers who will likely have their borrowing constrained by the new OBBBA limits but may lack the credit characteristics to qualify for private loans without a creditworthy cosigner: the 7,224 above-limit borrowers with a Risk Score below 670 or no Risk Score, 11.8 percent of our full sample and 46.2 percent of above-limit borrowers.[12] This group contains sizable segments of borrowers with historically moderate default rates, in the 5 to 10 percent range. In this section we explore the extent to which "forward-looking" signals of borrowers' future labor market earnings, based on the characteristics of their graduate program, can help identify lower-risk borrowers among this group and so potentially expand the set of students able to access nonfederal credit.

4.1 Credential level and institution sector

Loan performance varies systematically with the credential of the program of graduate study and the sector of the postsecondary institution attended. As shown in Table 3,

[12]Borrowers with high Risk Scores may still fail traditional underwriting criteria if their pre-origination income cannot support the requested loan. We do not observe income and so cannot identify these borrowers; we focus on above-limit borrowers with low or no Risk Scores.

three-year default and delinquency outcomes are lowest among Professional degree programs (approximately 1.9 and 6.1 percent, respectively, across all sectors) and highest among graduate certificate and Master's borrowers. The more pronounced contrasts are by institutional sector: Borrowers at private for-profit institutions default at approximately 7.3 percent and are delinquent at approximately 24.5 percent, roughly double the corresponding rates at public institutions (3.7 and 10.7 percent, respectively) and private not-for-profit institutions (3.7 and 11.1 percent, respectively). These differences are present within each credential level but are greatest (in a relative sense) among Doctoral programs.

Table 3: Three-year default and delinquency rates for graduate borrowers, by institution sector and credential level.

Sector	Credential	Of sample (%)	Of federal volume (%)	Three-year default (%)	Three-year delinquency (%)
Public	Master's	34.7	25.7	4.0	11.7
	Professional	5.6	8.8	1.8	5.2
	Doctoral	3.3	3.3	3.4	8.3
	Grad Cert/Other	1.4	1.1	4.4	12.8
	All credentials	45.0	39.0	3.7	10.7
Private not-for-profit	Master's	32.9	33.3	4.0	12.2
	Professional	5.6	11.6	1.9	6.4
	Doctoral	2.9	4.3	2.5	7.4
	Grad Cert/Other	0.9	0.9	4.5	14.3
	All credentials	42.3	50.2	3.7	11.1
Private for-profit	Master's	11.4	9.4	7.0	24.1
	Professional	0.3	0.5	4.5	15.9
	Doctoral	0.9	0.8	10.9	29.9
	Grad Cert/Other	0.2	0.1	12.4	37.2
	All credentials	12.7	10.9	7.3	24.5
All three sectors		100.0	100.0	4.1	12.6
Observations: 60,906 borrowers					

Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. The 60,906 borrowers with a recorded institution control; the 123 without one are excluded. "Of sample" and "Of federal volume" are shares of these borrowers and of their federal borrowing.

4.2 Field of study and program-level earnings

Earnings outcomes differ markedly across fields of graduate study, and fields with higher earnings, such as medicine or dentistry, carry lower repayment risk than fields with lower earnings, such as theology or music. In some fields, however, students have widely disparate earnings outcomes depending on the particular institution they attended. Figure 5 illustrates this for eight fields, among them Master's in Social Work (MSW), Professional law (JD), and Pharmacy (Pharm D.) programs. The dots shown for each credential repre-

sent the median earnings outcome for graduates who received federal aid and graduated from a particular institution. Overlaid on these dots, for each credential type, the shaded band illustrates the interquartile range (the range between the 25th and 75th percentile values) of individual earnings among graduates (who received federal aid) of these programs, with a bar at the median of individual earnings. The sample includes individuals who completed their degrees in award years 2017–18 and 2018–19, with individual earnings measured three years after graduation and program medians four years after, from publicly available ED data. The data show that interquartile ranges for both MSW and Pharm D. programs are relatively narrow and very different from one another; a Pharm D. graduate with a 25th percentile earnings outcome earns far more than an MSW graduate with a 75th percentile outcome, for example. Among JD graduates, the range is much broader and overlaps the ranges for the other two degrees.

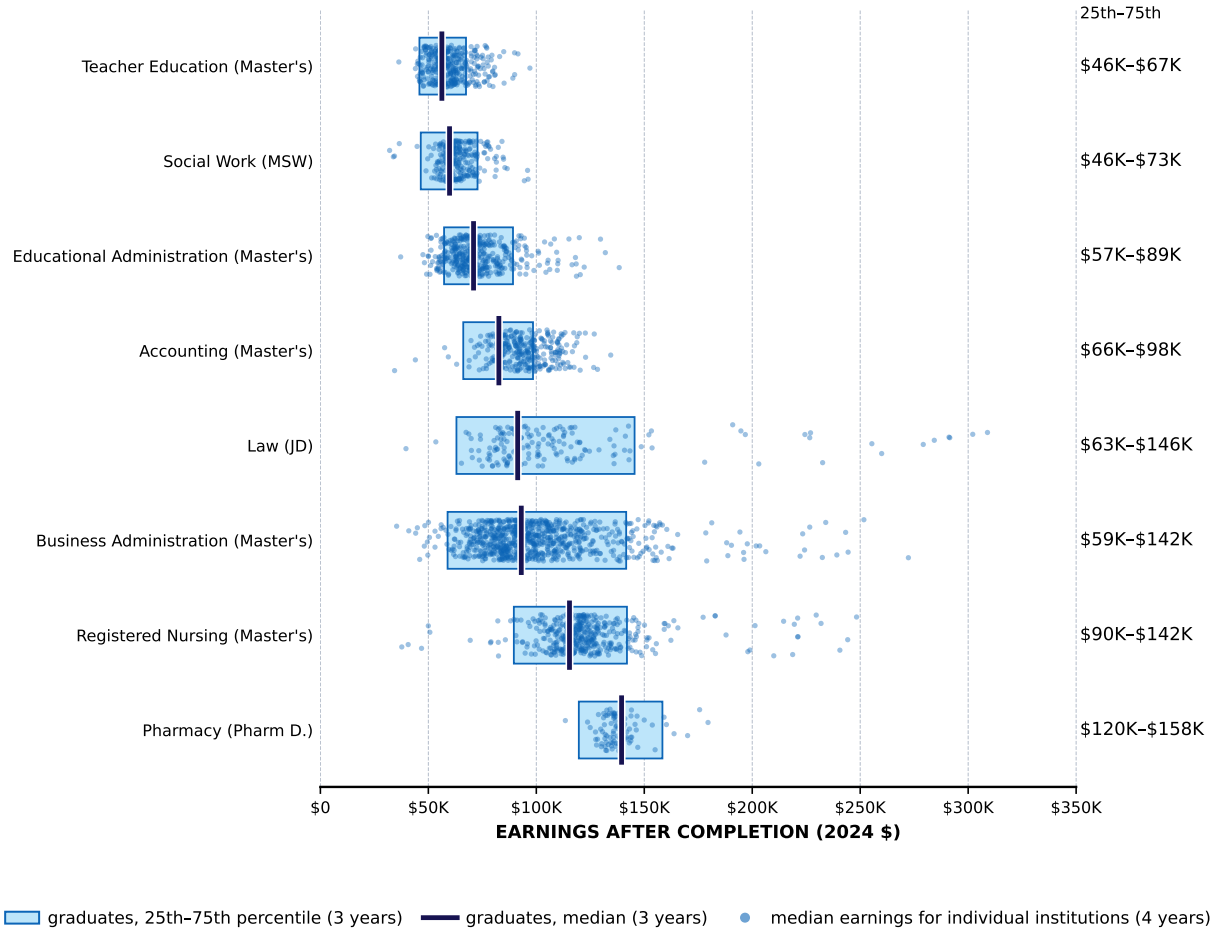
Differences in median earnings across fields suggest that field of study may be a useful predictor of earnings and therefore loan outcomes. Within fields, the program-level medians show a few institutions whose graduates earn substantially more or less than is typical, and this variation is much more pronounced in some fields (e.g., law) than others. In such fields, information specific to the institution a student attended may help to further distinguish higher- and lower-risk borrowers. Below, we explore how loan outcomes vary across field of study and credential level and by specific programs' earnings.

Table 4 shows three-year repayment outcomes grouping borrowers by the field of study for which they borrow, reporting fields at the four-digit Classification of Instructional Programs (CIP) code[13] level. Table 4 lists, for each credential level, the five four-digit CIP fields with the most loan volume estimated to be above the new OBBBA loan limits (expressed as a share of the total) based on an analysis of ED administrative data for federal borrowers enrolled between 2020 and 2023 by Matsudaira et al. (2026). Appendix Table A2 reports the other fields with at least 50 borrowers in our sample. The 15 fields reported in Table 4 account for 68 percent of the estimated loan volume over the limits, and therefore most of the likely new market for nonfederal lending.

Three-year default rates vary widely across fields, from about 1 percent or less in fields such as professional dentistry and doctoral programs in rehabilitation and therapy, to well above the sample average in several education, counseling, and psychology fields. The fields where most loan volume will be capped are high-earnings fields like medicine, dentistry, law, and other health professions where default rates are generally low; the five most affected fields all have three-year default rates below 2.5 percent. Several smaller fields have higher default rates. Appendix Table A2 shows that, among the largest programs ranked by loan volume over the limits, Master's programs in liberal arts (8.8 percent),

[13]See https://nces.ed.gov/ipeds/cipCode/browse.aspx?y=56 for details on this classification system.

Figure 5: Earnings dispersion for graduate students by field of study and across institution-specific programs, for eight fields.



Source: Authors' calculations using public U.S. Department of Education data: the AHEAD program earnings file (U.S. Department of Education, 2026c) (earnings three years after completion, working and not working, 2017–18 and 2018–19 completers, by six-digit CIP and credential level), the AHEAD 2026 Program Performance Data (U.S. Department of Education, 2026a) (by institution, four-digit CIP and credential level), and the College Scorecard *Field of Study* data (U.S. Department of Education, 2026b). *Notes:* Bands: 25th to 75th percentile of individual earnings three years after completion, 2017–18 and 2018–19 Title IV completers not enrolled, zero earnings included; vertical bar: median. Each band is the largest six-digit CIP code in its field and credential (share of the field's published completers): social work 44.0701 (99.1 percent), law 22.0101 (100), pharmacy 51.2001 (99.4), business administration 52.0201 (86.7), registered nursing 51.3801 (46.0), educational administration 13.0401 (70.9), teacher education 13.1202 (29.7), accounting 52.0301 (92.5). Dots: each institution's program median earnings four years after completion, same cohorts, working and not enrolled (`md_earn_wne_p4`); 86 to 793 institutions per row; suppressed programs omitted. Rows: law, social work, and pharmacy, plus the five graduate four-digit field-by-credential cells with the most Scorecard programs reporting five-year median earnings. Law and pharmacy are first professional degrees; the others are Master's. 2024 dollars (CPI-U), as published.

drama and theatre arts (8.0 percent), history (7.4 percent), psychology (7.6 percent), and theological studies (6.4 percent) all have default rates about one and a half or more times the overall average. These higher default fields tend to have modest borrowing levels with relatively little loan volume above the new limits.

Finally, we relate loan outcomes to the earnings of the specific programs students enroll in. As described previously, the earnings measures we use reflect the median earnings of

Table 4: Three-year default rates for graduate borrowers by credential level and below v. above new OBBBA limits, selected fields of study.

Field of study (CIP-4)	National share of capped volume (%)	Three-year default, overall (%)	Three-year default, above limit (%)	Three-year default, below limit (%)
Master's				
Allied Health Professions	7.1	1.7	1.2	2.3
Business Admin. & Mgmt.	4.7	5.0	8.2	4.0
Registered Nursing	4.6	2.6	3.6	2.3
Social Work	3.2	4.1	5.8	3.0
Clinical/Counseling Psych.	2.6	6.5	11.0	4.7
These five	22.3	4.4	6.5	3.5
Professional				
Medicine	17.9	2.4	2.0	2.5
Dentistry	8.4	1.0	2.4	0.0
Law	5.6	1.9	3.9	1.2
Pharmacy	2.9	1.7	4.2	1.5
Chiropractic	1.1	3.2	5.9	2.2
These five	36.0	2.0	3.4	1.5
Doctoral				
Rehab. & Therapy	7.0	0.1	0.3	0.0
Registered Nursing	2.2	3.1	4.0	2.7
Educational Admin.	0.4	4.1	4.4	4.0
Education, General	0.3	6.3	12.9	4.2
Business Admin. & Mgmt.	0.2	7.5	5.0	8.8
These five	10.1	2.5	2.2	2.7
Observations: 20,961 borrowers in fields shown				

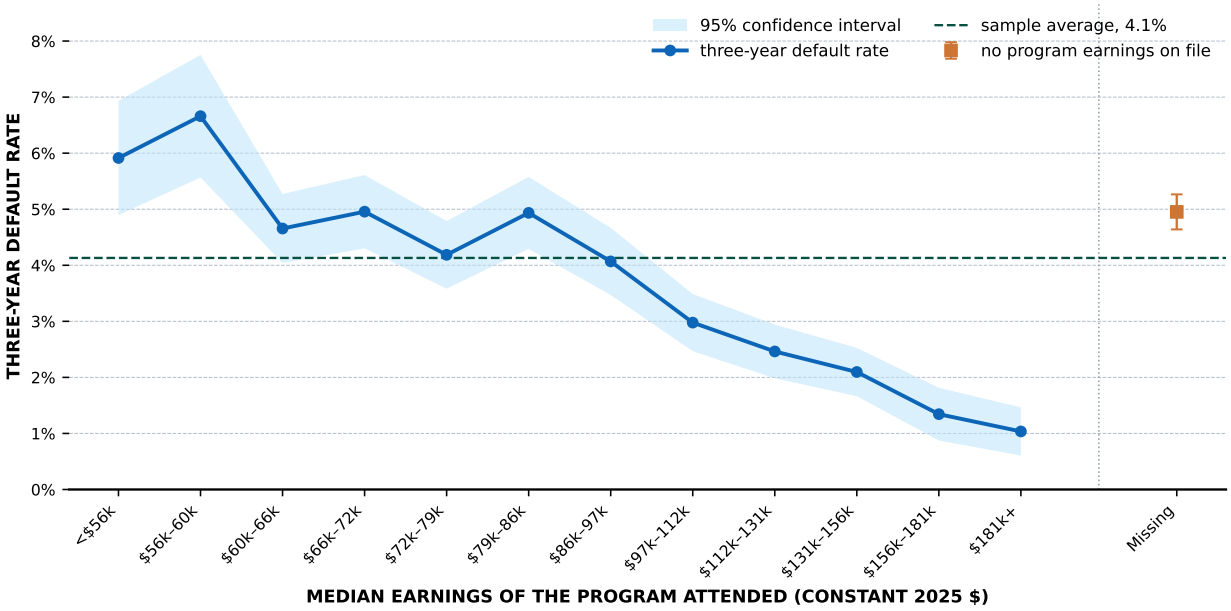
Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. First column: the field's share of national federal graduate loan volume above the new limits, all credentials, from a tabulation by the Postsecondary Education & Economics Research (PEER) Center, American University, by four-digit CIP (2020) and credential. Each credential shows its five fields with the largest national share among fields with at least 30 borrowers in our sample. PEER's 51.12 (medicine) includes osteopathic and podiatric medicine, which are separate fields in our sample (osteopathic medicine is Doctoral). PEER's veterinary medicine (01.80) is not matched to our 51.24. Default columns use our sample. "These five": the summed national share and the pooled default rate.

program graduates who completed in award years 2014–15 and 2015–16, observed five years later in calendar years 2020 and 2021, as proxies for program quality. The premise is that the earnings of a program's past graduates signal what its future graduates are likely to earn, and therefore their ability to repay a newly originated loan.

The relationship between loan performance and median program earnings is depicted in Figure 6, with borrowers grouped into approximate deciles of graduate program median earnings. This figure shows that three-year default rates change little across programs with median earnings up to about $86,000 and fall steadily above that level. Borrowers enrolled in programs where an earnings estimate is unavailable (generally because the

program has few graduates) have default rates only slightly above the full sample average of 4.1 percent.

Figure 6: Three-year default rates for graduate borrowers, by program earnings groups.



Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Program earnings: the College Scorecard *Field of Study* median for the program attended (U.S. Department of Education, 2026b), constant 2025$. Twelve groups: earnings deciles, with the bottom and top deciles split at the 5th and 95th percentiles ($56,000 and $181,000). *Missing* (30.3 percent of the sample): no earnings on file.

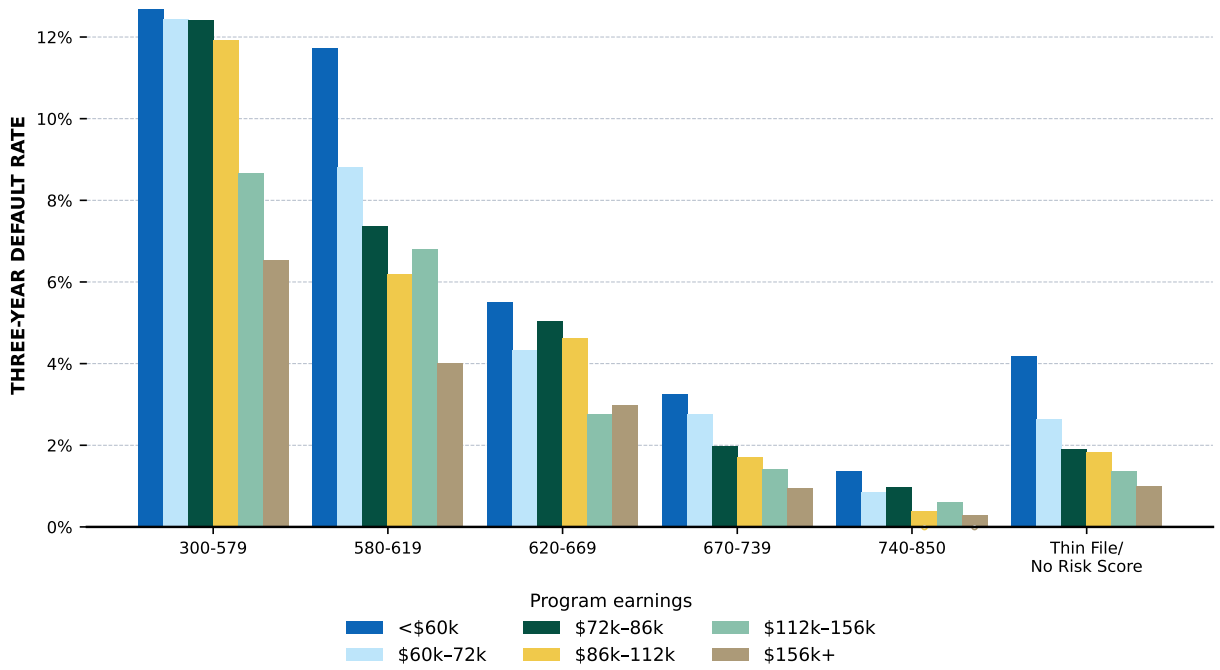
4.3 How does graduate loan performance vary by program of study and credit characteristics?

We bring together borrower characteristics and program of study characteristics to show how default varies with program earnings conditional on credit score, and vice versa. Figure 7 shows the relationship between program earnings categories and three-year default for borrowers in different pre-origination Risk Score bands. Default rates decline with program earnings for all credit groups, although in the 300–579 and 620–669 bands they change little until program earnings reach about $112,000. Measured in percentage points, the decline is largest in the two lowest bands, and the gap in default between those with high versus low Risk Scores diminishes among borrowers in programs with higher earnings.[14]

In Appendix Figure A2, we show the distribution of borrowers by pre-origination Risk Score within median program earnings deciles. That analysis shows that borrowers with higher Risk Scores tend to be concentrated in programs with higher earnings. Borrowers

[14]Three-year delinquency declines with program earnings more consistently across Risk Score bands; see Appendix Figure A3.

Figure 7: Three-year default rates for graduate borrowers, by Risk Score band and program earnings group.



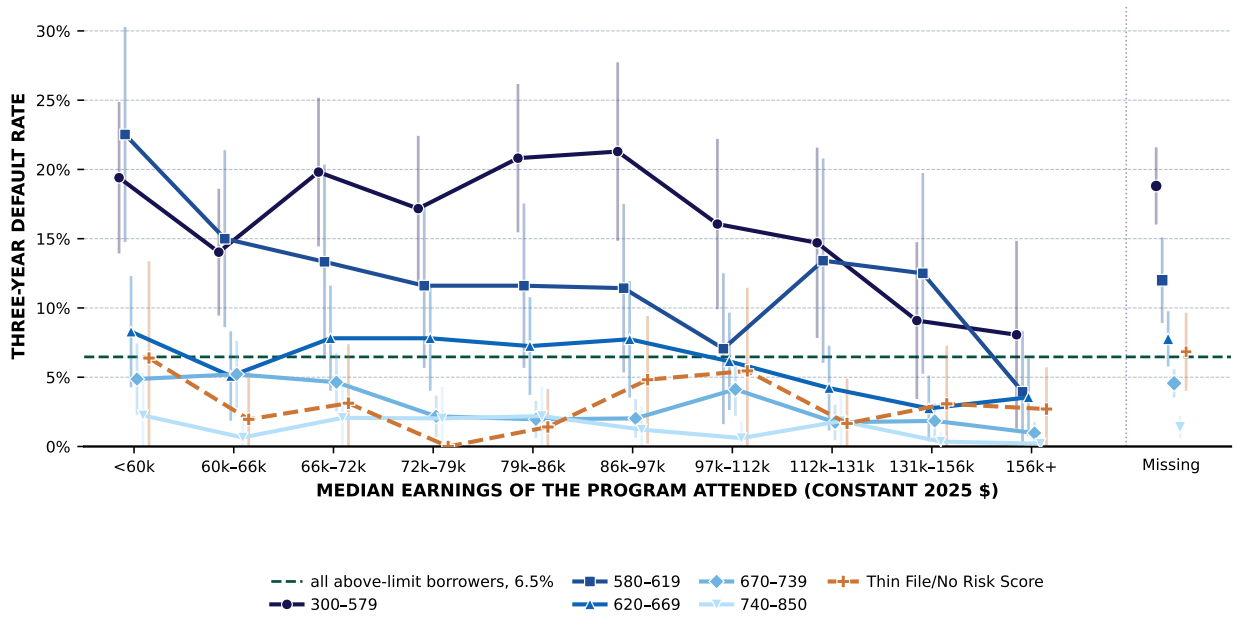
Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Three-year default by Risk Score band and program-earnings group. Earnings groups: the bottom decile (under $60K), the top decile ($156K or more), and the eight middle deciles in four pairs. Thin File/No Risk Score is its own band; borrowers with no earnings match are not plotted.

without a Risk Score are also somewhat more common in higher-earning programs (about 14 to 16 percent of borrowers in programs with median earnings above $86,000, versus 10 to 12 percent below). As a result, the bivariate relationships between default and both Scores and program earnings reflect the influence of the other factor.

To examine how the relationship between credit scores and program earnings might affect which borrowers are able to access private loans, Figure 8 shows the same relationship as Figure 7, but limited to borrowers with average annual borrowing amounts that are above the new OBBBA limits. Among this group borrowing over the limits, we again see the same patterns as before: Default rates decline with program earnings for all groups, except borrowers in the super prime category (740–850), where default rates remain between 1 and 2 percent regardless of program earnings.

Notably, however, in the highest earnings category (programs where median earnings are above $156,000), default rates for borrowers in both the subprime (580–619) and near prime (620–669) bands fall to 3.9 percent or less, below those of prime borrowers in lower-earning programs. This suggests the potential usefulness of program earnings for identifying

Figure 8: Three-year default rates for above-limit graduate borrowers, by program earnings decile and Risk Score band.



Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. The sample is the 15,648 borrowers above the new limits. Earnings deciles as in Figure 6, without the 5th and 95th percentile splits. Thin File/No Risk Score is a separate line. *Missing*, right of the dotted line: no earnings on file. Faded vertical lines are 95 percent confidence intervals; series are offset slightly along the horizontal axis.

low-risk borrowers with Risk Scores below the thresholds normally used to screen out overly risky applicants for private loans.

5. How might the use of forward-looking signals of borrower's ability to repay alter who can access credit?

As noted above, a significant fraction—as high as 40 percent—of recent federal student loan borrowers had thin or no credit history or had credit scores so low that nonfederal lenders relying on more traditional underwriting criteria would be highly unlikely to extend them credit without a creditworthy cosigner. Some lenders have recently considered using more "forward-looking" factors related to the borrower's field of study, degree level, and other characteristics of their educational program as potential additional criteria (to credit history) for assessing the borrower's likelihood of repaying a loan. The foregoing analyses suggest that data on students' field of study and the typical earnings of past graduates of their program may indeed provide useful information about their future likelihood of repaying their loans, especially among lower-score students. We illustrate this using the data we have assembled.

We design a simple exercise that builds on the results in previous sections to give a coarse indication of how many borrowers with low or no Risk Scores who are affected by the new loan limits fall in lower-risk groups once program earnings enter the assessment of default risk.

First, we group borrowers above the new limits by their Risk Score band and the earnings decile of their program, then we calculate three-year default rates for borrowers in each cell. The resulting three-year default rates were already presented in Figure 8 and are also reported in Appendix Table A3. We then use the observed three-year default rates in each Score $\times$ program earnings cell as a proxy for the likely default risk associated with borrowers who share these characteristics. We ask what share of borrowers with a Risk Score below 670 or no Risk Score fall in cells whose default rate is at or below a given tolerance. For simplicity, an entire cell (that is, all above-limit borrowers in a particular Score band and program earnings category) is "screened in" so long as the cell's observed three-year default rate is at or below a particular threshold. We emphasize that this exercise is for exploratory purposes only: It describes how observed default varies across these cells and is not a model of how credit would actually be extended.

We consider three-year default rate tolerance thresholds in 1-percent increments from 4 percent to 10 percent and calculate the share of above-limit borrowers with low or no Risk Scores who would be "screened in" under that tolerance threshold. We also present selected characteristics of the screened-in individuals, such as their share of the loan volume over the new limits, their mean Risk Score, and their three-year default and delinquency rates.

Table 5 summarizes the results of this exercise. The share of constrained borrowers screened in by considering program earnings ranges from about 12.5 percent at a tolerance of 4 percent to over half at a tolerance of 10 percent. At the highest tolerance, the screened-in borrowers have a three-year default rate of 6.0 percent and a delinquency rate of 16.0 percent. In practice, higher-risk borrowers would likely face higher interest rates, and whether they could afford them or even choose to accept them is unclear. These numbers should be seen as an illustration of potential supply, given a specified risk tolerance, and not as equilibrium values.

These results are exploratory: They suggest how much program-level outcomes (e.g., earnings) might add to creditworthiness-based criteria in identifying lower-risk borrowers among those constrained by the new OBBBA limits and their low or missing Risk Scores. They should not be interpreted as full-blown predictions informed by a careful evaluation of potential changes to underwriting or pricing models. That is for at least two reasons. First, we do not have the full data currently used in private loan decisions. Most notably, we do not have the borrower's income at origination, which would likely be included in

the baseline models for a private student loan decision. Second, our illustration is not the same exercise as developing an operational underwriting or pricing process consistent with federal and state law (e.g., fair lending regulations).

Still, we can and do use standard credit risk modeling techniques to characterize the relative importance of the data we do have, and in what combinations those data can be used, to better sort between loans that are likely to be repaid and those that aren't (see Appendix B). At a very high level, that analysis suggests that creditworthiness (including pre-enrollment Risk Score), field of study (and type of degree), and median program earnings all contribute significantly to the precision of default predictions.

Table 5: Borrowers screened in at a tolerated rate of observed three-year default at the Risk Score by program earnings category level, among graduate borrowers above the new limits and with a Risk Score below 670 or no Risk Score.

			Characteristics of screened-in borrowers		
Tolerated default rate for Risk Score × program earnings cell	Share borrowers screened in (%)	Share of the group's loan volume over the new limits (%)	Mean Risk Score	Three-year default (%)	Three-year delinquency (%)
4.0	12.5	13.7	639	2.7	9.3
5.0	15.9	17.2	641	3.0	10.2
6.0	19.2	20.2	643	3.4	11.1
7.0	26.5	27.2	644	4.3	11.6
8.0	47.7	47.7	644	5.8	15.2
9.0	51.0	50.9	641	5.9	15.7
10.0	52.4	52.4	637	6.0	16.0
No screening	100.0	100.0	585	11.0	26.7
N	7,224				

Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Population: the 7,224 borrowers above the new limits with a Risk Score below 670 (6,256) or no Risk Score (968). A borrower is screened in when the observed three-year default rate of their cell in Appendix Table A3 (Risk Score band by program-earnings decile or missing earnings, above-limit panel) is at or below the row's tolerance, in percent. Mean Risk Score: borrowers with a Score. Share of loan volume over the new limits: excess of average annual borrowing over the annual cap. Final row: the population without screening.

6. Discussion

This report documents how three-year default and delinquency among federal graduate borrowers entering repayment between 2011 and 2016 vary with loan size, pre-origination Risk Score, credential, institution sector, field of study, and the earnings of prior graduates of the borrower's program. Historically, borrowers whose federal borrowing exceeded the new OBBBA limits defaulted about twice as often as those below them (6.5 percent versus 3.3 percent), though not among Doctoral borrowers. Risk Scores strongly predict default, yet within the lowest Score bands and among borrowers without a Score, default falls

sharply with program earnings, and some above-limit borrowers with subprime Scores in high-earning programs default at lower rates than prime borrowers in lower-earning programs.

Nonetheless, our analysis carries certain limitations. Our estimates are based on an analysis of the performance of federal graduate loans, which carry income-driven repayment plans and other accommodations, made under the economic conditions these cohorts faced; they should not simply be treated as forecasts of how private loans to similar borrowers would perform. We also do not observe the income measures used in underwriting, and our program earnings measure pertains to earlier cohorts of graduates.

We also caution that interest rates (which could vary widely based on observable borrower, loan, and program criteria) are likely to be high for the riskiest borrowers. This may affect the take-up of expensive loans and, if the loan is taken out, the resulting repayment burden faced by the borrower. In addition, access to some amount of credit is not equivalent to access to the full amount of credit a student needs to fund their education. Some students may be approved for $5,000 per year in nonfederal loans but need $20,000 to be able to attend, or may be offered the full loan amount needed but at a high interest rate. Our estimates of the share of constrained borrowers therefore may ultimately understate the true loan gaps.

Two themes emerge from our analysis, relevant to graduate lending generally and to the funding gaps created by the new federal limits specifically.

First, although average annual borrowing above the new loan limits does correlate with higher default, the caps are a blunt instrument for screening out low-performing borrowers relative to other factors we considered. Because loan limits bind on the dollar amount borrowed, they exclude substantial borrowing with good default outcomes above the caps while leaving in substantial borrowing with poor default outcomes below the caps in place. Loan limits are a far coarser signal of loan performance than either creditworthiness or program characteristics. Targeting access to federal credit on a richer set of criteria, such as field of study and credential, program earnings, and credit scores alongside the adverse credit history standard already included in the Grad (and Parent) PLUS program, would distinguish higher- from lower-risk borrowers more sharply than loan size alone (Appendix B).

Second, pre-origination measures of creditworthiness (such as credit scores) alone understate the expected creditworthiness of borrowers in high-earning programs once their loans ultimately enter repayment. Among borrowers with comparable, lower (or no) credit scores, those enrolled in programs with strong earnings records default far less than their relatively low score would imply. A loan program that screens on credit history alone therefore treats these borrowers as poor risks and forgoes potentially low-default lending

to such students. Some of this effect is mechanical because student loans are a unique consumer loan product—taking on the debt creates an expected increase in income and employment stability, both of which are known to ultimately lead to better loan repayment outcomes. Just as lenders estimate revenue and expenses for new business they fund, underwriters of student loans might consider historical program-level outcomes as indicators of a student's expected future repayment capacity and not be constrained by retrospective factors alone. Using earnings outcomes of prior borrowers, in particular, has the advantage of also helping to loosen the debt-to-income constraints in the context of lending to borrowers whose current income is unlikely to support the required loan balance for an expensive program but a measure of their expected future income might. As discussed previously, any consideration of using these forward-looking factors should be done methodically and within the default modeling decisioning framework lenders and other funders already employ; our results can serve as motivation and an informative starting point for such explorations.

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Appendix A. Additional Tables & Figures

Table A1: Federal graduate borrowers, by average annual borrowing bin and credential.

Annual borrowing	All borrowers	Master's	Professional	Doctoral
$0–5K	11,977	10,052	592	989
$5–10K	12,939	11,141	639	744
$10–15K	10,091	8,501	677	615
$15–20.5K	6,857	5,642	670	416
$20.5–25K	4,252	3,363	543	255
$25–30K	3,090	2,305	500	230
$30–35K	2,514	1,784	485	194
$35–40K	1,655	1,056	436	143
$40–45K	1,457	923	397	114
$45–50K	1,098	653	318	108
$50–55K	872	521	252	86
$55–60K	670	360	217	79
$60–65K	606	314	215	68
$65–70K	490	261	175	48
$70–75K	391	213	133	41
Over $75K	2,070	1,016	741	259
Total	61,029	48,105	6,990	4,389
Observations: 61,029 borrowers				

Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Cell counts for Figures 2 and A1, which plot the three credential series; "All borrowers" includes Grad Cert/Other and is not plotted.

Table A2: Three-year default rates for graduate borrowers, by field of study (for those with at least 50 borrowers, excluding those already shown in Table 4, ranked by loan volume above the new limits).

Field of study (CIP-4)	Of volume over the limit (%)	Three-year default, overall (%)	Three-year default, above limit (%)	Three-year default, below limit (%)
Master's				
Teacher Ed. (levels)	2.5	5.5	10.5	4.3
Public Health	1.8	1.8	2.8	1.2
Rehab. & Therapy	1.6	1.3	2.1	0.9
Educational Admin.	1.5	5.4	9.4	4.5
Education, General	1.4	5.6	14.3	3.6
Teacher Ed. (subjects)	1.4	4.9	10.2	3.6
Accounting	1.4	2.2	5.9	1.5
Mental/Social Health Svcs.	1.3	6.0	6.6	5.8

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Table A2 (continued)

Field of study (CIP-4)	Of volume over the limit (%)	Three-year default, overall (%)	Three-year default, above limit (%)	Three-year default, below limit (%)
Special Education	1.3	5.2	10.8	4.0
Law	1.2	2.6	1.2	–
Business/Commerce, General	1.2	2.3	5.0	1.3
Student Counseling	1.1	4.3	6.9	3.6
Communication Disorders	1.1	1.3	2.0	1.0
Public Administration	1.1	4.8	7.2	4.0
Health & Medical Admin.	1.1	3.9	7.3	2.6
Intl. Relations & Security	1.0	0.9	0.9	1.0
Psychology, General	0.9	7.6	12.5	5.8
Human Resources Mgmt.	0.9	4.4	11.0	2.5
Curriculum & Instruction	0.9	5.5	13.1	4.1
Architecture	0.8	3.2	5.4	2.2
Library Science & Admin.	0.8	2.7	5.4	1.5
Criminal Justice & Corr.	0.8	4.4	6.0	3.9
Film/Video & Photo. Arts	0.7	3.6	4.1	2.7
Drama/Theatre Arts	0.7	8.0	9.2	7.1
Fine and Studio Arts	0.7	7.0	11.0	4.5
Legal Res. & Adv. Studies	0.6	1.4	2.1	–
Journalism	0.6	3.4	5.7	1.5
Mgmt. Sci. & Quant. Meth.	0.6	2.7	6.1	1.0
Sports, Kinesiology & PE	0.5	4.9	10.5	3.6
Finance & Financial Mgmt.	0.5	3.7	4.4	3.4
Communication & Media	0.5	4.3	7.1	3.1
Rhetoric & Composition	0.5	5.7	7.9	4.7
Design and Applied Arts	0.4	2.1	3.1	1.2
Music	0.4	5.9	7.0	5.5
Public Policy Analysis	0.4	5.4	10.4	3.0
Human Services, General	0.4	5.3	11.4	3.8
Liberal Arts & Sciences	0.3	8.8	17.9	6.0
Biological Sciences, Other	0.3	0.0	0.0	–
Natural Resources Conserv.	0.3	2.8	10.0	0.9
Taxation	0.3	0.8	0.0	1.2
Biology, General	0.3	6.1	13.0	4.2
Education, Other	0.3	4.5	2.8	5.0
Theological Studies	0.3	6.4	19.6	3.8

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Table A2 (continued)

Field of study (CIP-4)	Of volume over the limit (%)	Three-year default, overall (%)	Three-year default, above limit (%)	Three-year default, below limit (%)
History	0.3	7.4	7.7	7.4
Urban & Regional Planning	0.3	0.8	2.2	0.0
Political Science & Govt.	0.2	7.5	15.2	4.1
Ecology & Evolution	0.2	3.4	–	5.9
Economics	0.2	3.3	5.9	2.3
Computer & Info. Sciences	0.2	2.2	0.0	2.8
International Business	0.2	0.0	0.0	0.0
Information Science	0.2	3.0	4.5	2.5
English Lang. & Literature	0.2	5.1	8.2	4.4
Public Relations & Advert.	0.2	3.1	2.9	3.1
Area Studies	0.2	8.6	–	8.1
Mgmt. Information Systems	0.2	5.6	8.1	5.1
Psychology, Other	0.2	7.6	–	6.2
Teaching ESL/EFL	0.2	1.4	–	1.7
Marketing	0.2	1.6	3.0	1.0
Arts & Media Management	0.2	4.9	–	5.3
Business & Mgmt., Other	0.1	0.0	–	0.0
Sociology	0.1	7.8	–	7.4
Human Development & Family	0.1	5.8	–	6.1
IT Admin. & Management	0.1	0.8	–	0.9
Civil Engineering	0.1	0.5	–	0.0
Peace & Conflict Studies	0.1	3.2	–	0.0
Criminology	0.1	6.9	–	4.3
Instructional Media Design	0.1	4.2	–	3.2
Anthropology	0.1	1.2	–	1.5
Geography and Cartography	0.1	10.0	–	9.8
Romance Languages	0.1	9.4	–	4.8
Computer Science	0.1	0.0	–	0.0
Multi/Interdisc. Studies	0.1	6.4	–	4.8
Biomedical Engineering	0.1	1.3	–	0.0
Mechanical Engineering	0.1	1.2	–	1.3
Statistics	0.1	1.8	–	2.2
Social Sciences, Other	0.1	1.9	–	2.2
Electrical Engineering	0.1	3.5	–	3.2
Engineering-Related Fields	0.1	1.2	–	0.0

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Table A2 (continued)

Field of study (CIP-4)	Of volume over the limit (%)	Three-year default, overall (%)	Three-year default, above limit (%)	Three-year default, below limit (%)
Public/Social Svcs., Other	0.0	3.2	–	2.1
Geological & Earth Sci.	0.0	1.4	–	1.5
Mathematics	0.0	2.7	–	3.0
Industrial Engineering	0.0	3.5	–	3.9
Chemistry	0.0	3.4	–	1.9
Engineering, General	0.0	0.0	–	0.0
Professional				
Veterinary Medicine	0.5	0.3	0.0	0.4
Clinical/Counseling Psych.	0.2	3.2	–	2.5
Optometry	0.2	0.0	–	0.0
Theological Studies	0.0	3.8	–	3.8
Doctoral				
Osteopathic Medicine	3.0	0.8	0.5	2.0
Psychology, General	0.2	3.5	–	3.4
Curriculum & Instruction	0.2	3.0	–	1.8
Communication Disorders	0.1	0.0	–	0.0
Chemistry	0.0	4.0	–	4.3
Borrowers in the fields listed: 28,950; denominator for share of volume over the limit: 53,913				

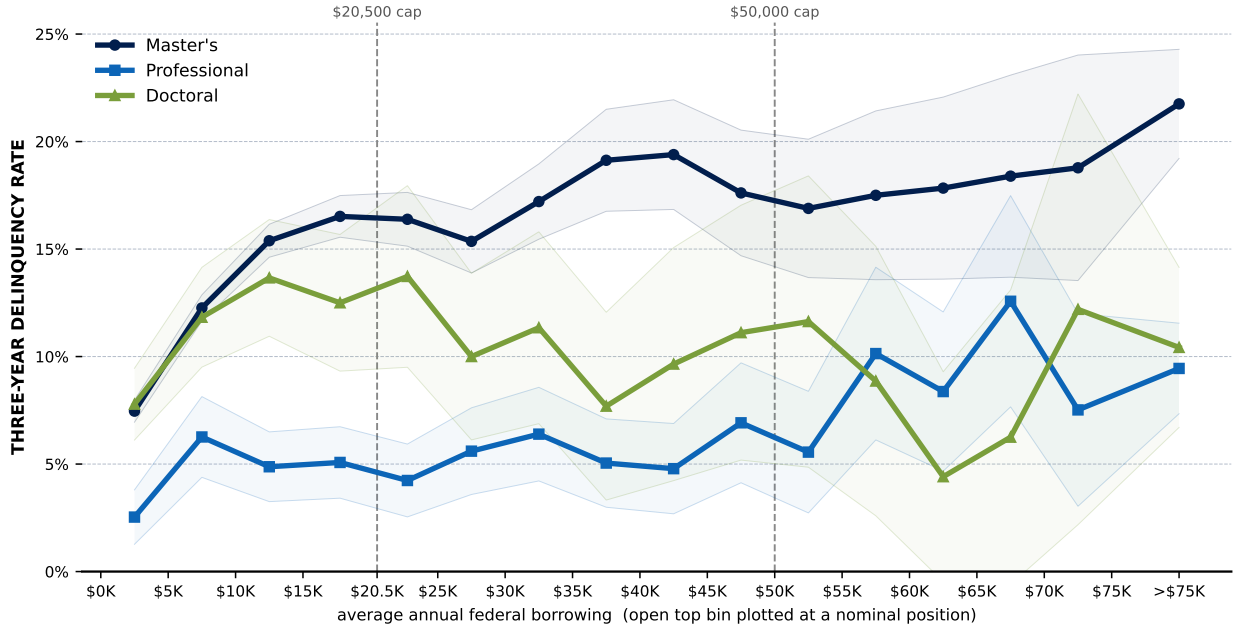
Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Four-digit fields with at least 50 borrowers not shown in Table 4, ranked by share of the $301.5 million above the applicable annual cap borrowed by the 53,913 Master's, Professional, and Doctoral borrowers with a recorded four-digit field. Default rates for subgroups with fewer than 30 borrowers are suppressed (40 cells).

Table A3: Three-year default rates for graduate borrowers, by program earnings category, Risk Score band, and below v. above new OBBBA limits.

	Program earnings	300–579	580–619	620–669	670–739	740–850	Thin File/ No Risk Score
Above the new limits	<$60k	19.40	22.52	8.29	4.87	2.25	6.38
	$60k–$66k	14.03	15.00	5.08	5.21	0.65	1.96
	$66k–$72k	19.81	13.33	7.81	4.64	2.07	3.12
	$72k–$79k	17.17	11.61	7.81	2.18	2.03	0.00
	$79k–$86k	20.81	11.61	7.25	1.96	2.20	1.41
	$86k–$97k	21.29	11.43	7.74	2.03	1.22	4.82
	$97k–$112k	16.06	7.06	6.15	4.13	0.61	5.45
	$112k–$131k	14.71	13.41	4.22	1.75	1.83	1.67
	$131k–$156k	9.09	12.50	2.75	1.85	0.35	3.08
	$156k+	8.06	3.95	3.55	0.97	0.20	2.70
	Missing	18.81	12.00	7.77	4.57	1.39	6.84
Below the new limits	<$60k	10.46	8.02	4.43	2.75	1.18	3.94
	$60k–$66k	11.35	5.41	3.58	1.66	0.36	3.09
	$66k–$72k	9.57	8.47	3.35	2.31	1.04	2.17
	$72k–$79k	9.79	4.78	4.56	1.03	0.50	2.87
	$79k–$86k	9.69	6.61	3.42	2.87	0.80	1.29
	$86k–$97k	8.35	6.64	4.30	1.63	0.53	2.06
	$97k–$112k	10.43	3.02	3.26	0.67	0.00	0.76
	$112k–$131k	7.84	4.05	2.33	1.12	0.45	0.76
	$131k–$156k	6.32	3.31	2.58	1.33	0.50	1.68
	$156k+	5.26	4.05	2.56	0.92	0.32	0.67
	Missing	11.58	8.45	4.70	1.70	0.37	3.62
Observations: 61,029 borrowers							

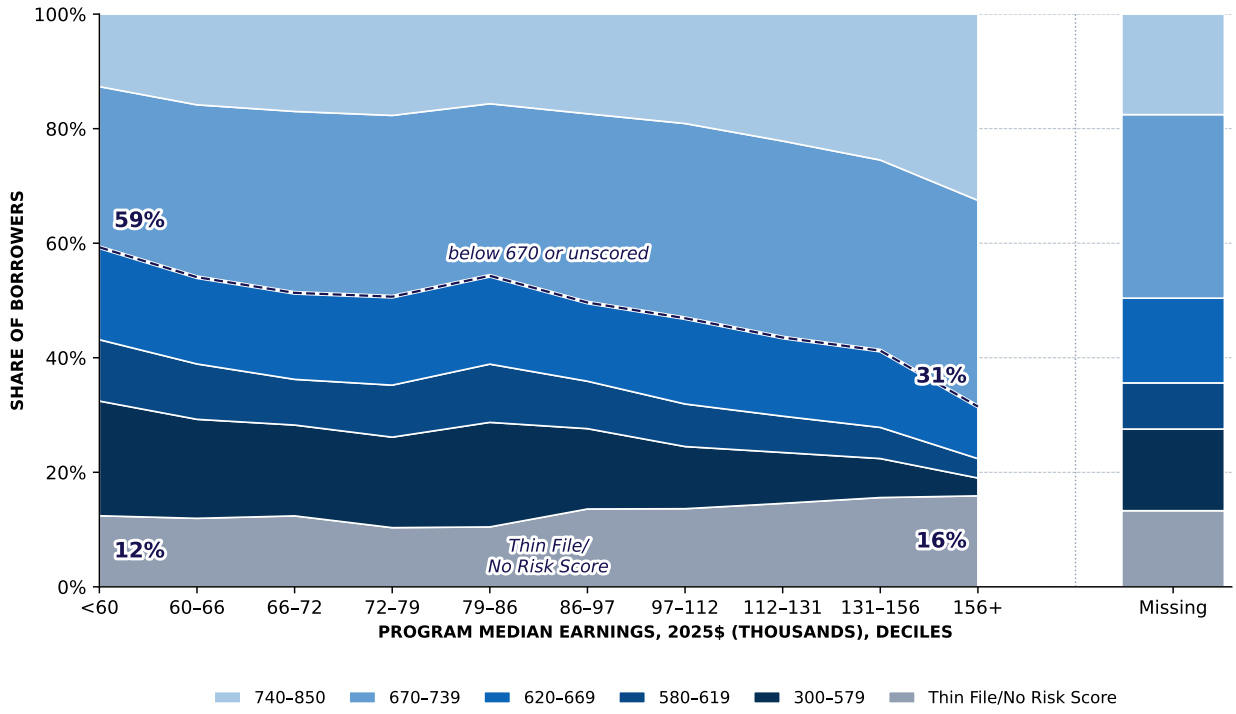
Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Observed three-year default rate, in percent. Rows: deciles of program median earnings (constant 2025 dollars), with *Missing* for no earnings on file; columns: Risk Score bands; panels: above and below the new limits.

Figure A1: Three-year delinquency rates for graduate borrowers, by average annual loan size and credential.



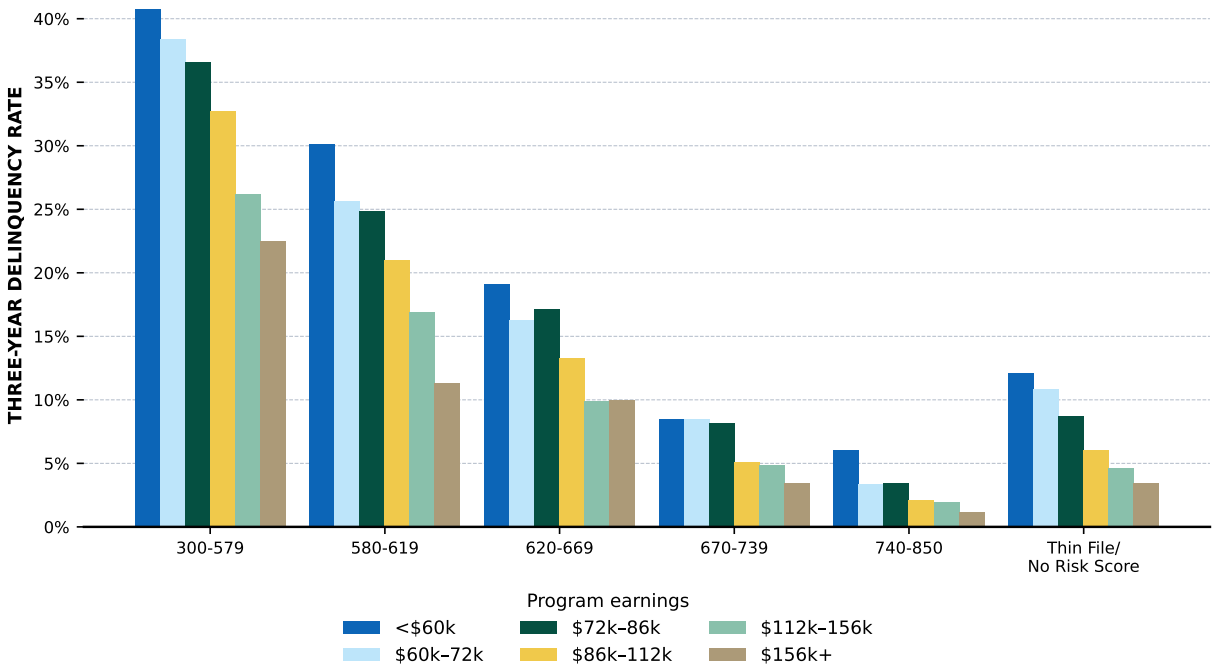
Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Three-year delinquency; bins and population as in Figure 2. Cell counts: Appendix Table A1.

Figure A2: Graduate borrowers by pre-origination Risk Score and program earnings decile.



Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Each column is the Risk Score composition of one program-earnings decile and sums to 100 percent; bands are shaded dark to light as the Score rises, and Thin File/No Risk Score is a separate category. Dashed line: share below 670 or unscored, 59 percent in the lowest decile and 31 in the highest; the Thin File/No Risk Score share is 12 and 16 percent. Spearman rank correlation of program earnings and Risk Score: 0.212. *Missing*, at the right: no earnings on file.

Figure A3: Three-year delinquency rates for graduate borrowers, by pre-origination Risk Score band and program earnings group.



Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Three-year delinquency by Risk Score band and program-earnings group; cells, groups, and bands as in Figure 7.

Appendix B. Predictive accuracy incorporating forward-looking underwriting criteria

We assess more formally how much each of the factors examined in the body of the report contributes to predicting default. These factors are (1) creditworthiness (pre-enrollment Risk Score and knockout criteria, proxied by the Grad PLUS adverse credit standard), (2) loan size groups, (3) field of study $\times$ degree level groups, and (4) program earnings categories. We model the probability that a borrower defaults within three years of entering repayment as a function of characteristics observable at origination, estimated by logistic regression. We estimate models using the four blocks of predictors each on its own, then pairwise, then in groups of three, and finally all four in the same specification. This allows us to draw conclusions about the incremental predictive power of each factor depending on the baseline set of included factors.

We estimate each specification out of sample by five-fold cross-validation; the sample is partitioned into five equal folds stratified on the default indicator, and each borrower's predicted default probability comes from a model fit on the other four folds, so no borrower's prediction uses their own record. This rewards predictive accuracy over in-sample fit. From each specification, we obtain a predicted default probability for each borrower. We then summarize how accurately those predictions separate defaulters from nondefaulters with two measures of predictive accuracy: the area under the ROC curve (AUC) and the share of default variability explained by the factors.[15]

The results of this exercise are summarized in Appendix Table B1. As expected, creditworthiness factors are by far the strongest single predictor, with an AUC of 0.74 compared with others (loan size 0.56, program earnings 0.58, and credential level $\times$ field of study 0.59). Creditworthiness paired with one of the other factors predicts default better than creditworthiness alone, raising the AUC to at most 0.76 with one added factor and 0.77 with two or three. Specifications without creditworthiness perform considerably worse, reaching at most an AUC of 0.65 with loan size, credential $\times$ field of study, and program earnings categories all included. This means that a) creditworthiness continues to be very important to accurately predicting default, and b) program-level factors can aid predictive accuracy for our set of baseline models. How useful program-level measures are to a given lender would depend on its existing underwriting criteria, its borrower population, and its regulatory constraints.

Appendix Figure B1 compares the predictive accuracy of selected factor combinations.

[15] The receiver operating characteristic (ROC) curve plots, across all classification thresholds, the share of defaulters classified as high risk against the share of nondefaulters so classified. The area under it (AUC) is the probability that a randomly chosen defaulter receives a higher predicted risk than a randomly chosen nondefaulter: 0.5 is chance, 1.0 is perfect ranking, and 0.75 means three times in four. Variation explained is one minus the ratio of the mean squared prediction error to the variance of the default indicator, an out-of-sample analogue of the R^2.

For each model, we sort borrowers into deciles of predicted default probability, from least likely to default (first decile) to most likely (last decile), and calculate the actual (observed) three-year default rate for each decile. A perfect algorithm would have actual three-year default rates of 0 percent in deciles 1 through 9, and 41 percent in decile 10 (the overall default rate is 4.1 percent). Instead, all of our specifications have false negatives for moderate-risk borrowers (positive defaults for deciles 1–9) and false positives for the riskiest borrowers (default rates below 41 percent in the top decile).

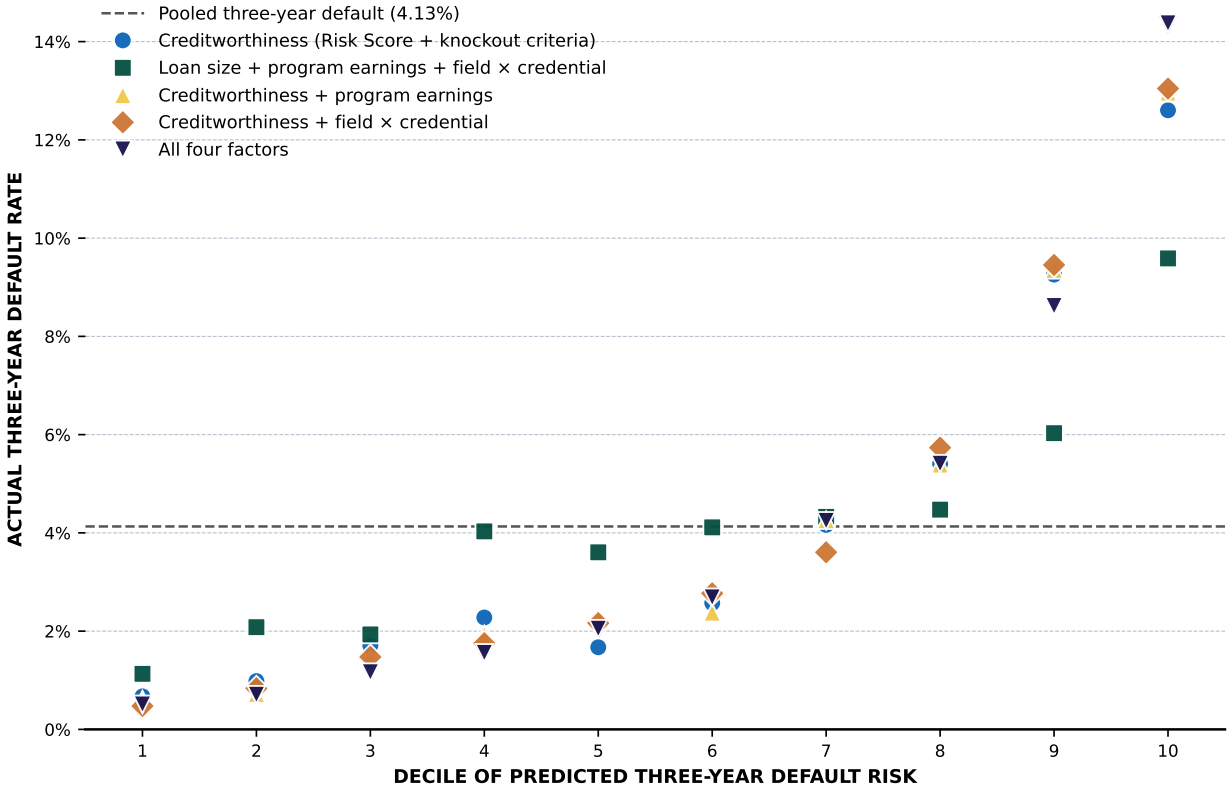
The relative performance of the selected specifications we consider in Figure B1 mirrors the predictive accuracy measures from Table B1 above. The fullest specification (all four factors) performs the closest to the "perfect" algorithm: lowest actual default rates in lower prediction deciles and highest default rate in the top prediction decile. The model without creditworthiness performs particularly poorly. It places many defaulters in the middle deciles, and its actual default rate is not monotonic: The default rate is lower for borrowers in the 3rd prediction decile than in the 2nd and lower in the 5th than in the 4th.

Table B1: Predictive accuracy for three-year default for graduate borrowers, by predictor combinations.

Risk Score & adverse credit history test	Loan size	Program earnings categories	Credential × field of study categories	ROC AUC	Variation explained (%)	Pseudo-R^2 (McFadden)
Each predictor individually						
•				0.742	3.7	0.094
	•			0.559	0.3	0.008
		•		0.585	0.4	0.014
			•	0.593	0.4	0.014
Two predictors						
•	•			0.754	4.2	0.102
•		•		0.754	3.8	0.098
•			•	0.755	3.9	0.099
	•	•		0.628	0.9	0.026
	•		•	0.634	1.1	0.028
		•	•	0.613	0.6	0.020
Three predictors						
•	•	•		0.766	4.4	0.109
•	•		•	0.768	4.6	0.111
•		•	•	0.757	3.9	0.101
	•	•	•	0.652	1.4	0.036
All four predictors						
•	•	•	•	0.770	4.6	0.112
Observations: 61,029 borrowers						

Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Each row is a logistic regression model predicting three-year default; • marks the predictor blocks included. Predictions are out of fold: five-fold cross-fitting, stratified on default, with each fold predicted by a model estimated on the other four. ROC AUC: area under the receiver operating characteristic curve (0.5 chance, 1 perfect ranking). Variation explained: one minus the ratio of the mean squared prediction error to the variance of default. McFadden pseudo-R^2: one minus the ratio of the out-of-fold log likelihood to that of a model predicting each fold's training default rate. Blocks: Risk Score and adverse credit history test (five Risk Score bands, no Score, adverse-credit flag); loan size (average annual borrowing in four bins cut at \$20,500, \$50,000, and \$75,000); program earnings (Figure 7's six groups and missing); credential × field of study (two-digit CIP by credential; groups under 100 borrowers or five defaulters pooled into the largest field of their credential; 38 groups).

Figure B1: Actual three-year default rates for graduate borrowers, by decile of predicted three-year default risk, for five sets of borrower and program characteristics.



Source: Authors' calculations using anonymized data from the Federal Reserve Bank of New York Consumer Credit Panel/Equifax (CCP) matched to National Student Clearinghouse (NSC) educational-history records. *Notes:* Federal graduate borrowers; repayment-entry cohorts 2011–2016; three-year outcomes. Actual three-year default rate by decile of out-of-fold predicted risk, for five logistic regression models from Table B1 estimated by the same five-fold cross-fitting. Horizontal line: pooled rate, 4.13 percent. "Knockout criteria": the adverse-credit flag. ROC AUC and PR AUC (area under the precision-recall curve), in legend order: creditworthiness 0.742, 0.099; loan size, program earnings, and field × credential 0.652, 0.076; creditworthiness and program earnings 0.754, 0.104; creditworthiness and field × credential 0.755, 0.109; all four factors 0.770, 0.127.



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