Strategic Default on Student Loans*

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Abstract

Student loans finance investments in human capital. Incentive problems arising from lack of collateral in human capital investments have been used to justify the differential bankruptcy and other recovery treatment of student loans, despite a lack of empirical evidence of strategic behavior on the part of student borrowers. This paper uses policy induced variation in non-repayment costs, that is unrelated to liquidity, to test for a strategic component to the non-repayment decision. The removal of bankruptcy protection and increases in wage garnishment reduce borrowers' incentives to default, providing evidence for a strategic model of non-repayment. The results suggest that reintroducing bankruptcy protection would increase loan default by 18%, and eliminating administrative wage garnishment would increase default by 50%. Consistent with strategic behavior on the part of borrowers, the incentive effects of bankruptcy are larger for borrowers with large balances, and smaller for very low and high income borrowers. The results provide novel evidence that strategic behavior plays an important role in student loan repayment.

Keywords: Student Loans, Loan Repayment, Human Capital, Strategic Default, Bankruptcy

JEL Classification: D14, G18, H52, H81, J24, I23,

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1 Introduction

The student loan default rate more than doubled between 2000 and 2014, with nearly 8 million borrowers holding $121 billion in defaulted student loans in 2016 (Department of Education, 2016). The volume of outstanding student loan debt stood at over $1.2 trillion in 2016, surpassing all other consumer debt, save mortgages. Student loans are used to finance investments in human capital. Loans used to finance human capital investments differ from loans to finance tangible assets, as the students themselves cannot serve as collateral. Given incentive problems exacerbated by a lack of collateral, concerns that student borrowers will avoid repaying loans even when they are able to meet their commitments, or strategic default, have been central to the design of student loan programs. When strategic considerations are small, bankruptcy is an effective means of providing insurance and smoothing consumption. However when strategic default considerations are important, then other policies such as income based repayment or allowing student borrowers to deduct interest payments may be more effective means of smoothing consumption for student borrowers. Despite theoretical work and policy relevance, there has been little empirical work testing for and quantifying the importance of strategic behavior in student loans.

Student loans differ from other consumer loans in the United States as today it is nearly impossible to discharge these loans in bankruptcy. Bankruptcy protection or debt relief provides borrowers with insurance in the face of adverse outcomes and can increase aggregate consumption. On the other hand, borrower protections may change student borrowers' incentives and induce borrowers with the ability to repay into default. This strategic behavior can cause lenders to incur losses and increase the price of credit. Borrowers' strategic behavior in the face of collateral constraints is key to evaluating and designing repayment programs for human capital investments.

The trade-off between the consumption smoothing value of borrower protections, and increased borrowing costs due to strategic behavior motivates several unique features of the treatment of student loan debt. For example, student loans are one of the only types of household debt in the United States that are exempted from bankruptcy protections, and strategic considerations played a large role in the design of these provisions. Bankruptcy protection trades off consumption smoothing benefits with the cost of increased default leading to more expensive borrowing (Dobbie and Song, 2015; Dobbie et al., 2015; Fay et al., 2002). Policy makers have long assumed that strategic behavior on the part of borrowers is a threat to the functioning of student loan programs, despite limited evidence of the magnitude or even presence of such effects. For example, the Report of the Commission on the Bankruptcy Laws of the United States (1973) noted both strategic concerns and lack of empirical evidence stating that "*Easy availability of discharge from educational loans threatens the survival of existing educational loan programs ... The most serious abuse of consumer bankruptcy is the number of instances in which individuals have purchased a sizable quantity of goods and services on credit on the eve of bankruptcy in contemplation of obtaining a discharge. Evidence of the number of such instances was not obtainable.*" Despite their importance and concern among policymakers,[1] empirical evidence on strategic default in student loans is lacking. This paper presents evidence on the cost of strategic defaults in student loans.

[1] See the Report of the Commission on the Bankruptcy Laws of the United States (1973) and National Bankruptcy Review Commission (1997) for background on the policy debate regarding borrower protections. There is an active and ongoing debate among policy makers about student loan discharge. For example, Senators Durbin, Franken and Harkin introduced the *Fairness for Struggling Students Act of 2013*, which failed but would have offered increased bankruptcy protection to student borrowers. In 2015 the White House also made a push to reintroduce some bankruptcy protections.

The main challenge in identifying strategic behavior is that strategic defaults are unobserved, and borrowers are incentivized to mask their behavior as inability to repay their loans (Guiso et al. (2013)). This paper circumvents this challenge by using policy induced variation in repayment incentives that is unrelated to borrowers' ability to pay. Using federal administrative data, the paper presents new evidence that student borrowers behave strategically. Removing bankruptcy protection and seizing defaulted borrowers' wages reduces loan default, despite having no effect on borrowers' current assets or cash on hand.

This paper overcomes the challenge of strategic default being unobserved by using policy induced variation in non-repayment costs to test for strategic behavior by borrowers. The test relies on the fact that the policy reforms varied borrowers' costs of default, *without changing borrowers' ability to pay.* If borrowers do not behave strategically, and default due to inability to repay their obligations, varying borrowers' incentives without changing cash on hand will have no effect on repayment behavior. The tests provide evidence of strategic behavior, and increasing non-repayment costs reduces loan defaults.

The variation in repayment incentives comes from reforms that varied bankruptcy protection and wages seized in the event of default. The intuition behind the test is that the reforms affected borrowers' outcomes in the event of default, and thus their incentives, without affecting borrowers ability to pay prior to defaulting. In other words, the reforms do not affect borrowers' current assets, but they do change borrowers' future assets in the event of default for a subset of borrowers. The first reform used exploits the removal of bankruptcy protection for student borrowers in 1998. Unlike other forms of consumer debt in the United States, student loans are now almost completely non-dischargeable in bankruptcy.[2] Prior to 1998, student loans were dischargeable in bankruptcy after seven years in repayment. In 1998, student loans were made almost completely non-dischargeable. This reform is exploited, comparing individuals who reached their seventh year of repayment right before or after 1998. Those that reached their seventh year of repayment prior to 1998 were able to discharge their loans in bankruptcy, while those that reached their seventh year after 1998 did not have discharge available.

The results indicate evidence of strategic default by borrowers– borrowers with bankruptcy protection available are approximately .25 percentage points (18%) more likely to default on their student loans, despite similar repayment environments and cash on hand. The difference-in-difference estimates rely on a parallel trends assumption: in the absence of the removal of bankruptcy protection, borrowers who reached their seventh year of repayment before and after 1998 would have trended similarly. Graphical evidence provides support for this assumption, and that the results are in line with the timing of the reform. For cohorts that had bankruptcy protection available, they are no more likely to default in years when bankruptcy discharge is unavailable prior to their seventh year. For the same group of borrowers, when bankruptcy protection is available they are significantly more likely to default in comparison to borrowers with discharge unavailable in the same year.

Evidence from a 2006 reform that affected wages seized in the event of default presents similar evidence of strategic behavior. Defaulted student loan borrowers are subject to wage garnishment in the event of default since 1991, and unlike other consumer debts student loan borrowers can face garnishment without a court order. Wage garnishment effectively collateralizes a borrowers' human capital,

[2]Student loan borrowers must prove *undue hardship* to discharge their loans in bankruptcy. This standard is very difficult to meet, and fewer than .001% of borrowers successfully meet this standard and succeed in filing for bankruptcy (Iuliano, 2012). See appendix A.2 for further discussion of student loan bankruptcy.

reducing a borrowers' incentives to default. Only wages above a threshold are subject to seizure through wage garnishment. The 2006 reform increased the rate at which wages are seized by 50%. Borrowers above and below wage garnishment thresholds are compared before and after 2006, and borrowers subject to increased penalties after the reform are significantly less likely to default, despite no changes to liquidity. An additional $10,000 in garnishable income leads to a .8 percentage point (15%) decrease in default rates. Graphical evidence is consistent with the timing of the reform, and borrowers above and below the thresholds follow similar trends prior to the reform.

The analysis concludes by presenting various placebo and robustness tests. The placebo and robustness estimates indicate that the results are not driven by sample selection or groups being on different trends. The placebo reforms (1) simulate a placebo bankruptcy reform in a repayment year during which all borrowers are unable to discharge loans, (2) simulate a placebo bankruptcy reform in the year of the reform, but comparing two groups of unaffected borrowers, (3) simulate a reform at half the garnishment threshold, restricting the sample to unaffected borrowers and (4) simulate a garnishment reform in a year during which there was no reform. These placebo reforms result in null estimates, indicating that the effects are not driven by violations of the identifying common trends assumption. The robustness tests vary the sample specification and years included. In both cases, the placebo and robustness tests provide evidence that the identification strategy is valid and the results are not driven by preexisting trends or particular cohorts.

This paper makes three primary contributions. First, this paper presents new evidence on strategic responses to incentives in student loan repayment. Policy has been made under the assumption that strategic behavior is widespread in the student loan market, despite limited empirical evidence on the issue. Second, the paper introduces a new source of variation to test for strategic incentives in the student loan market, and introduces empirical strategies exploiting policy reforms that varied borrowers' incentives, bankruptcy protection and disposable income. These policy reforms can potentially be used to study a number of questions and outcomes relating to the effects of bankruptcy protection and administrative wage garnishment. Finally, this paper presents direct evidence on the effect of policy reforms in the student loan market, and quantifies the costs of these reforms. Quantifying these costs is especially important given the ongoing debate about reintroducing bankruptcy protection in the student loan market.

The results exploiting the variation in bankruptcy protection joins a literature on the determinants of the consumer bankruptcy decision. This reform differs from those studied in most existing work and focuses on a very different and policy relevant context, as students loans are one of the only forms of consumer debt in the United States that are almost completely non-dischargeable in bankruptcy. As mentioned earlier, student loans differ from other types of consumer loans subject to bankruptcy protections in that student borrowers tend to lack access to assets that can be used as collateral. Despite the different policy treatment of student loans, there is little work on whether strategic incentives differ in this market. Classic studies such as Fay et al. (2002) and Gross and Souleles (2002) have found evidence that bankruptcy protections affect repayment decisions. Recent studies such as Li et al. (2011), Botsch et al. (2012) and Darolia and Ritter (2015) have focused on the impact of the the 2005 Bankruptcy Abuse and Consumer Protection Act (BAPCA) on repayment incentives.

The results of this paper for the student loan market complement a literature on home mortgage

loans, which generally finds evidence of strategic default behavior for these collateralized loans. Ronel et al. (2010) find that negative home equity is a trigger for mortgage defaults. Ghent and Kudlyak (2011) find that borrowers are twice as likely to default in non-recourse states, and are more likely to default in lender-friendly procedures. Guiso et al. (2013) use survey evidence and find that moral beliefs are associated with strategic default behavior and Melzer (2016) shows that debt overhang plays an important part in repayment decisions. Meyer et al. (2014) use a mortgage modification court settlement and find evidence of strategic behavior. Li et al. (2011) and Botsch et al. (2012) find that the 2005 BAPCA reform caused mortgage defaults to rise.

Despite the fact that investments in human capital during college are among the largest expenditures that households make in the United States (Souleles, 2000) there has been much less work on strategic default in student loans. Theoretical work dating to Becker (1964) and Friedman and Kuznets (1945) has focused on borrowing to finance human capital investment. More recent work has shown that in the presence of strategic default behavior, incomplete insurance for borrowers investing in human capital is optimal (Gary-Bobo and Trannoy, 2015; Lochner and Monge-Naranjo, 2011, 2016). Chatterjee and Ionescu (2012) and Ionescu (2011) focus on the insurance value of bankruptcy protection in student loans. The results in this paper are most closely related to Darolia and Ritter (2015), who find no evidence of strategic behavior using the 2005 bankruptcy reform which affected private student loans. The reform they study is different from the one studied in this paper as it changed the supply of credit for private borrowers, who also face risk based interest pricing unlike in the government student loan market.

The results have important implications for the design of repayment programs, and particularly how much insurance should be provided to borrowers. Testing for a strategic component in the default decision is important in evaluating policy responses to hidden actions. Increasing the costs of default trades off the insurance value of defaulting on debt at the expense of moral hazard, driving up costs for other borrowers (Dobbie and Song, 2015; Fay et al., 2002). If the moral hazard effects stemming from strategic non-repayment are large, raising default costs to substantially lower non-repayment will push down borrowing costs. On the other hand, if there are small or no strategic effects, then raising default costs decreases the insurance value of default without substantially affecting non-repayment. Moral hazard stemming from student borrowers behaving strategically has been used by policy makers to justify current features of federal student loan programs, such as the exemption from bankruptcy discharge, with little supporting evidence.

The efficient design of a student loan program, including bankruptcy provisions, has important implications for aggregate output and tax policy. The tax code is an important tool used to smooth consumption for student loan borrowers, for example, interest payments are tax deductible for lower income borrowers. The presence of strategic default can motivate these provisions, along with repayment programs such as income based repayment, as using the bankruptcy code to smooth consumption has significant fiscal and other costs if bankruptcy protection induces borrowers into default. This paper adds to work done by Looney and Yannelis (2015) on the aggregate impact of changes in borrower characteristics, in analyzing the direct fiscal consequences of changes in student loan repayment policies. Student loans finance high return investments in human capital (Avery and Turner, 2012; Beyer et al., 2015; Hoxby and Turner, 2013) and any increases in earnings due to human capital investments directly

affect earnings and thus income tax revenue. Moreover, bankruptcy discharge has been shown to have direct effects on earnings (Dobbie and Song, 2015), which impacts tax revenue and public finances.

The rest of this paper is organized as follows. Section 2 discusses strategic default and repayment incentives. The section then proceeds to discuss policy reforms that affect borrowers' repayment incentives, and describes how these reforms can be used to test for strategic behavior on the part of borrowers. Section 3 discusses the administrative student loan and tax data used in the paper. Section 4 presents the main results of the paper, and shows that removing bankruptcy protection and varying repayment incentives led to a strategic response by student loan borrowers. Section 5 shows that the main results are robust, and presents a number of placebo tests. Section 6 concludes and offers suggestions for further research.

2 Strategic Default

In this section, the theoretical framework behind strategic default is outlined, and then the two policy reforms that are used in the paper are discussed. The two reforms altered bankruptcy protections and the amount of wages that can be seized in the event of default. The remainder of the section discusses how the policy reforms are used in a difference-in-difference framework. This approach generates variation in repayment costs that does not affect liquidity, and uses this variation to test for strategic default.

2.1 Theoretical Framework

Under a strategic model of default, borrowers are more likely to default if their financial benefit from defaulting is higher (Fay et al., 2002; Meyer et al., 2014; Guiso et al., 2013). The primary alternative to a strategic default model is a repayment burden or liquidity model, in which households are hit with adverse events or shocks and become unable to meet obligations due to liquidity constraints. The two views are not mutually exclusive, and the presence of strategic behavior does not rule out defaults due to adverse shocks. Understanding the underlying model of default is important in designing repayment systems, as the insurance provided by bankruptcy protection can increase borrowing costs in the presence of strategic default behavior. A simple test for the presence of strategic behavior is that, in the absence of any changes in liquidity, changes in repayment incentives will affect repayment behavior.

The cost of default, denoted $C(B_{it}, \kappa_t)$, depends on the availability of bankruptcy protection B_{it} for individual i at time t and wage garnishment rate κ_t. If bankruptcy discharge under liquidation is available in period $t \in B_{it}$, then borrowers can give up wealth above the bankruptcy exemption level and avoid garnishment. The cost of bankruptcy is given by the borrowers' wealth W_{it} above the bankruptcy exemption level E_{it}. The cost must be positive, as borrowers do not receive additional benefit from filing for bankruptcy if their wealth falls below the exemption level. If bankruptcy protection is unavailable in period $t \notin B_{it}$, then borrowers must forfeit a portion κ_t of their wages R_{it} above the garnishment threshold $\overline{Inc}$. The cost of defaulting when bankruptcy protection is unavailable is given by the amount garnished, $\kappa_t * \max[R_{it} - \overline{Inc}, 0]$. The total cost of default is thus given by

$$C(B_{it}, \kappa_t) = \begin{cases} \kappa_t * \max[R_{it} - \overline{Inc}, 0] & \text{if} \quad t \notin B_{it} \\ \max[W_{it} - E_{it}, 0] & \text{if} \quad t \in B_{it} \end{cases} \tag{1}$$

Under a strategic model of default, individuals repay their loans if the repayment amount is less than the cost of default, $\rho(L_{it}) \leq C(B_{it}, \kappa_t)$. Note that $\rho(L_{it})$ signifies the amount that an individual must repay on their loan balance L_{it}. Non-repayment costs $C(B_{it}, \kappa_t)$ are weakly decreasing in the availability of bankruptcy B_{it} in year t for individual i and weakly increasing in the wage garnishment rate κ_t. Bankruptcy discharge availability differs for individuals and years as historically student loan bankruptcy discharge in the United States has differed for repayment cohorts in the same year. Under a strategic model of default, individuals are more likely to default if their financial benefit from defaulting increases. Household i's financial benefit from defaulting in period t is given by

$$FinBen_{it} = \begin{cases} \max[\rho(L_{it}) - \kappa_t * \max[R_{it} - \overline{Inc}, 0], 0] & \text{if} \quad t \notin B_{it} \\ \max[\rho(L_{it}) - \max[W_{it} - E_{it}, 0], 0] & \text{if} \quad t \in B_{it} \end{cases} \tag{2}$$

$FinBen_{it}$ is always weakly greater than zero since a strategic individual will not stop making payments if the garnished amount is greater than monthly payments. Both changes in bankruptcy protection and the wage garnishment rate κ_t will affect $FinBen_{it}$. If loans can be discharged in bankruptcy, the financial benefit is given by the value of payments less wealth above the bankruptcy exemption E_{it}. If the wage garnishment rate κ_t increases, $FinBen_{it}$ will decrease and a strategic individual will be less likely to enter into default. Garnishment effectively collateralizes the loan, which mitigates incentive problems (Jaffee and Russell, 1976; Stiglitz and Weiss, 1981) and allows contract enforcement (Calomiris et al., 2016). If student loans are made more difficult to discharge in bankruptcy, the effects are similar and strategic individuals with low levels of wealth will be more likely to default if bankruptcy exemptions are increased.

The non-strategic view of student loan default is that students enter into default due to unanticipated adverse events, such as poor labor market outcomes. Under a non-strategic view of student loan default, an increase in the financial benefits of default will not directly affect non-repayment. There is an empirical challenge in identifying strategic default motives, since a naive regression of non-repayment on financial benefits will conflate the financial benefits of default with the effect of higher earnings on repayment. If earnings R_{it} are higher, non-strategic individuals may be better able to make payments and less likely to default. This challenge can be circumvented by using variation in repayment incentives that is unrelated to earnings or cash on hand.

The difficulty in identifying strategic defaults arises from the fact that such defaults are unobservable– defaulters do not announce their motivation and strategic defaulters are incentivized to mask their behavior as inability to repay their loans. A key implication of the framework illustrated above is that, in the absence of changes to liquidity, changes in incentives will affect repayment behavior. If individuals do not default strategically, and instead default only due to repayment burden shocks and liquidity constraints, then changes to repayment incentives that do not affect cash on hand will have no effect on repayment. The remainder of this section illustrates how policy induced variation in repayment incentives– that crucially is unrelated to liquidity– can be used to test for a strategic component in the default decision.

2.2 Reforms Affecting Repayment Incentives

The rising costs and returns to education have increased demand for student loans substantially since 1990 (Avery and Turner, 2012; Hoxby, 2009). The total volume of outstanding student loans passed $1 trillion in 2010, overtaking credit card debt to become the largest source of non-mortgage household debt in the US. The National Defense Education Act in 1958 was the first federal student loan program, and federal student loan programs were expanded in 1965 with the passage of the Higher Education Act. In the early 2010s, over 90% of student loans were disbursed through federal lending programs, the largest of which is the Stafford loan program. Approximately 40% of households with a head under age 35 carry student loan debt. Congress sets borrowing limits, interest rates and flexible repayment options. The limits vary by dependency status and tenure, and change periodically. The standard repayment plan has students repay their loans in ten years over a fixed monthly installment.

Figure 1 shows student loan default rates over time, as well as the introduction of wage garnishment and the removal of bankruptcy protection. The time series shows that introducing wage garnishment and removing bankruptcy protection coincided with a period of falling student loan default rates. The remainder of this section discusses administrative wage garnishment and student loan bankruptcy, and shows how policy reforms can be used to determine whether these reforms impacted student loan default in a causal manner.

2.2.1 Removal of Student Loan Bankruptcy Discharge

Prior to 1976, the bankruptcy treatment of student loans was similar to other forms of consumer loans and dischargeable in bankruptcy. Student borrowers could file for bankruptcy to discharge their loans through Chapter 7 (liquidation) or restructure their debts in bankruptcy through Chapter 13 (reorganization).[3] In 1976 government student loans were precluded from discharge for the first five years of repayment via regulations, which were codified into law in 1978. Strategic default was used to justify this change.[4] In 1990 the time period was changed from 5 to 7 years, as part of an amendment to the Crime Control Act of 1990. This change was also premised on concerns regarding strategic default posing a threat to borrowing programs, despite a lack of empirical evidence.[5] In 1998 The Higher Education Amendments of 1998 removed bankruptcy discharge for student loans after seven years in repayment, and made student loans almost entirely non-dischargeable.[6] The law took effect on October 7, 1998 and thus borrowers who reached their seventh year of repayment before the reform had discharge available, while borrowers who reached their seventh year of repayment after the reform were unable to discharge their students loans in bankruptcy.

[3] Other codes exist for municipalities and firms. Chapter 9 applies exclusively to municipal bankruptcy. See Ivashina et al. (2016) for a discussion of Chapter 11, which applies to firm reorganization. White (2011) provides an overview of personal and corporate bankruptcy law.

[4] The Report of the Commission on the Bankruptcy Laws of the United States (1973) noted strategic concerns stating, "*Easy availability of discharge from educational loans threatens the survival of existing educational loan programs.*"

[5] The National Bankruptcy Review Commission (1997) noted that *"The objective of a loan guarantee program is to enhance the availability of credit which the private lending market alone cannot or will not provide... Student loans must remain presumptively nondischargeable... This view is premised on the notion that if student loans are dischargeable, professional students will flock in droves to the bankruptcy system."*

[6] There are rare cases in which students loan borrowers can prove *undue hardship* and discharge student loans. See appendix A for more on student loan bankruptcy.

Strategic behavior on the part of borrowers has figured prominently in the debate on bankruptcy protection for student borrowers. For example, in response to a question about the first restrictions on bankruptcy discharge President Jimmy Carter said: *"One of the things that has endangered the entire college aid program has been the deliberate cheating by college students off the taxpayers when they signed a contract, 'If you will lend me money to get my college education, I will repay it and let that money go to help another student.' And because of a loophole in the law, many students would finish college and immediately declare bankruptcy so they would not have to repay the loan. I don't have any sympathy for a student who does that on purpose. And I think we ought to do everything we can to collect those loans when they've been made in good faith and received in good faith, because the ones who suffer are the taxpayers in general and also other students who could benefit if that first student did his or her duty."*[7]

Table 3 indicates that the reform had a substantial impact on bankruptcy discharge availability and filings. The second column of table 3 shows the fraction of individuals filing for bankruptcy in their eighth repayment year, by repayment cohort. The third column shows the fraction of individuals who successfully discharge their loans in bankruptcy. Prior to the reform, a little under half of all student loan bankruptcy filings resulted in discharge in the eighth repayment year. The table indicates that successful discharge petitions fall almost to zero after the reform, and that attempts to file also fell by more than 85% during the time period. Appendix A.2 provides further information on bankruptcy discharges during the time period studied.

2.2.2 Wage Garnishment Reforms

Limited commitment problems are especially prevalent in education investments, because human capital serves as poor collateral (Becker, 1964; Friedman and Kuznets, 1945; Lochner and Monge-Naranjo, 2011). Prior to the introduction of wage garnishment, student loans were effectively uncollateralized. Wage garnishment effectively collateralizes a portion of a borrowers' future earnings, which can serve to mitigate incentive problems related to strategic default.

Wage garnishment for defaulted student loans was introduced in 1991, after an amendment to the Higher Education Act instituted under the Emergency Unemployment Compensation Act of 1991. Through the wage garnishment process, employers are ordered to withhold wages above a threshold and send them to the loan holder to collect on defaulted student loans. Initially 10% of disposable income could be garnished by the federal government to collect on defaulted student loans.[8] Wages can be garnished to collect on student loans without a court order, unlike garnishment for many other debts. In 2006 this rate was increased to 15% of disposable income by the Deficit Reduction Act of 2005. This reform differentially affected borrowers with wages above and below garnishable levels. Borrowers with income above garnishment thresholds saw the amount they would pay in the case of default increase by 50%, while borrowers with incomes below thresholds would continue to avoid garnishment in default.

The default and wage garnishment processes are described in detail in appendix A. In addition to wage garnishment, tax refunds can also be withheld and assets can be frozen or seized to collect on

[7] Jimmy Carter: *Bangor, Maine Remarks and a Question-and-Answer Session at a Town Meeting* , February 17, 1978. The American Presidency Project.

[8] Due to data limitations, this reform is not studied as borrowers' income is not available until 1998.

defaulted student loans. As was the case with student loan bankruptcy protections, strategic behavior on the part of the borrower featured prominently in public discussions of wage garnishment and withholding tax refunds.[9]

2.3 Empirical Strategy

The key challenge in studying strategic defaults is that such defaults are unobservable events. While default is observable, borrowers who default strategically are incentivized to hide their motives and hence cannot be distinguished from borrowers who are unable to repay their loans. To overcome this challenge, policy induced variation in repayment incentives is generated using reforms in the availability of bankruptcy and wage garnishment. The test exploits the fact that while repayment incentives changed for different groups of borrowers who were affected by policy thresholds, financial circumstances did not change differentially for those affected and unaffected by the reform. The reforms affect borrowers' *incentives to repay*, but they do not affect cash on hand or *ability to pay*.

2.3.1 Bankruptcy Reform

This subsection shows how the 1998 removal of bankruptcy protection is used to generate variation in repayment incentives unrelated to cash on hand, in order to test for a strategic component to the default decision. The non-dischargeability of student loans in bankruptcy was initially for a set number of years into repayment. Prior to November 1998, student borrowers could discharge loans in bankruptcy after seven years in repayment. Thus only cohorts that entered repayment prior to 1991 had discharge available. To examine the effects of bankruptcy protection on repayment incentives, I restrict the sample to the cohorts three years immediately before and after the reform and estimate variants of a difference-in-difference specification.

$$\pi_{it} = \alpha_i + \alpha_t + \sum_{y=0}^{T} \beta_y \mathbb{1}[y = t] * \mathbb{1}[C < 1991]_i + \alpha_1 X'_{it} + e_{it} \tag{3}$$

where π_{it} is an indicator of default on a student loan by individual i in repayment year t. α_t are year fixed effects, α_i are cohort or individual fixed effects, $\mathbb{1}[C < 1991]_i$ is an indicator of whether an individual belonged to a cohort that was eligible for bankruptcy protection, $\mathbb{1}[y = t]$ is an indicator of this time period being a particular repayment year, and e_{it} is an error term. The year α_t fixed effects net out factors related to repayment over time, for example borrowers are more likely to default early in their repayment history. Individual fixed effects α_i capture individual specific time invariant factors, such as the repayment year or family background of borrowers. The coefficient β_y estimates the difference in default rates between cohorts able and unable to discharge their student loans in bankruptcy in each year.

[9] For example, President Ronald Reagan noted during the *1988 Legislative and Administrative Message: A Union of Individuals* on January 25, 1988 that *"While we do our part to help finance college education, students must do their part and act responsibly. Most do, many do not. The taxpayers will spend over $1.6 billion this year to pay off student defaults... Policies addressing this problem include: providing better information to students on their duties when they borrow and when their debts are due; use of the IRS to take money owed out of tax refunds; use of collection agencies and litigation to go after the worst offenders."* and *"Over at the Department of Education, for example, we found that many individuals –some in high-paying jobs– simply ignored pleas that they repay their long-overdue student loans. Our efforts to crack down have paid off."*

If β_y is positive post 1998, this is evidence of strategic default as borrowers in the treatment cohorts are responding to the availability of bankruptcy protection by defaulting on their student loans.

The coefficients β_y identify the effect of bankruptcy protection on repayment under a common trends assumption that, in the absence of the bankruptcy reform, cohorts would have trended similarly. The assumption does not rule out shocks that would affect repayment, for example relating to business cycles, however the assumption is that the shocks would affect individuals from pre-1991 and post-1991 cohorts identically. The assumption has the testable implication that in repayment years during which both groups are bankruptcy ineligible, the groups should trend similarly. Figure 2 provides evidence that this assumption is not violated, as there is not a differential effect for individuals who were able or unable to discharge their loans prior to the seventh repayment year.[10]

Figure 2 provides support for the common trends assumption by showing new defaults for the treatment and control groups in each repayment year, before individuals in the treatment group can file for bankruptcy. The solid series shows the average of the three cohorts that entered repayment prior to 1991, and the dashed series shows the three cohorts that entered repayment following 1991. The two series track each other closely until the sixth year in repayment, when they diverge and non-repayment rates increase for the group that could discharge loans in bankruptcy after the sixth year. There is no significant pre-trend before the pre-1991 cohorts are able to discharge loans in bankruptcy, at which point non-repayment increases providing evidence of a strategic component to the repayment decision.

Figure 3 shows new defaults prior to the seventh year for repayment cohorts between 1987 and 1994. The figure again provides supporting evidence for the common trends assumption, with cohorts trending similarly in each repayment year. There is a strong downward trend, as new defaults decrease as graduates move further away from their initial date of repayment. There are a number of reasons why we might see this pattern, for example incomes tend to increase as graduates gain more experience, or graduates may learn more about the repayment process and ways to avoid default. Further evidence for the common trends assumption is provided in section 4, as well as appendix table A.1 which shows the pre-trend for each individual cohort.

2.3.2 Garnishment Reform

This subsection shows how changes in the rate at which wages of defaulted borrowers are garnished can be used to generate variation in repayment incentives. If borrowers weigh the costs and benefits of default and default strategically, then wage garnishment should have an effect on loan non-repayment. On the other hand, if borrowers lack agency and purely default due to large repayment burdens, and are unable to make commitments, then changes in incentives due to wage garnishment that do not affect liquidity should have no effect on default behavior.

Prior to 2006, up to 10% of defaulted borrowers' wages above an income threshold could be garnished. In 2006 this amount was raised to 15%. The policy change can be exploited to estimate the effect of wage garnishment on non-repayment. The sample is restricted to individuals below 200 percent of the wage garnishment threshold, three years after entering repayment. The following specification is used

[10]The results are also robust to using the share of the initial balance repaid as an outcome measure, rather than defaults, as is show in appendix table A.6. Appendix tables A.2 and A.3 also show that the results are robust to probit and logit variants of equation 3.

to estimate the effect of garnishment on repayment behavior:

$$\pi_{it} = \alpha_i^1 + \alpha_t^2 + \omega_1[Inc > \overline{Inc}]_{it} + \sum_{y=0}^{T} \omega_y[Inc > \overline{Inc}] \times \mathbb{1}[Post2006]_{it} + \alpha_2 X'_{it} + v_{it} \tag{4}$$

where π_{it} is an indicator of default on a student loan by individual i in year t, α_i^1 are individual fixed effects, α_t^2 are fiscal year fixed effects, $\mathbb{1}[Post2006]_t$ is an indicator of whether or not the year is after 2006 and $Income > \overline{Inc}_{it}$ is garnishable wages above the income threshold $\overline{Inc}$, and v_{it} is an error term.

The coefficients ω_y gives the effect of the 5% increase in default on garnishment under the assumption that in the absence of the increase in the garnishment amount, repayment would have trended similarly for individuals just above and below the garnishment threshold. The intuition behind this strategy exploits the fact that repayment incentives change for individuals with income above $\overline{Inc}$ in 2006, but remain unchanged for individuals below the threshold. It is important to keep in mind that under the assumption, repayment burdens do not change differentially for each group in 2006, while repayment incentives do, so a test for the presence of strategic incentives is equivalent to a test of the null that ω_y is equal to zero.

The identifying assumption is a common trends assumption similar to that in the preceding section. In other words, individuals just above and below the threshold would have trended similarly in the absence of the garnishment rate increase. Figure 5 provides supportive evidence of this assumption, indicating that prior to the reform there was no differential effect of income above the garnishment threshold, controlling for income and earnings.[11]

3 Data

This section discusses the main data source used in the paper, the National Student Loan Data System which is linked to administrative tax data from the Compliance Data Warehouse. The section then discusses sample construction. Further information on the data is presented in appendix B.

3.1 Data Sources

The main data source used in this paper is the National Student Loan Data System, henceforth NSLDS. The NSLDS is a large administrative database of all federally guaranteed student loans awarded under Title IV of the Higher Education Act of 1965, and is the main data source used by the Department of Education to administer federal student loan programs. The system was created to assist federal agencies with running federal student loan programs. The vast majority of student loans in the United States are disbursed through various federal programs, with 92% of the $75 billion disbursed in student loans during the 2011-2012 academic year being through federal programs.[12] New loans are by law

[11] Appendix figure A.3 shows that there is no sorting on earnings for low income borrowers. Appendix tables A.4 and A.5 also show that the results are robust to probit and logit variants of equation 4. The results are also robust to using the share of the initial balance repaid as an outcome measure, rather than defaults, as is show in appendix table A.7.

[12] Prior to 2005 the number of private student loans not guaranteed by the federal government was extremely low. In the late 2000s over 90% of originated student loans were disbursed directly by the federal government. In the past two decades, the fraction of students taking on direct private student loans has varied between less than 1% prior to the 1994-1995 academic year to a high of 14% in the 2007-2008 academic year.

reported to the NSLDS within 30 days of disbursement. The nature of the administrative database minimizes concerns about biases arising from measurement error or sample selection in this study. The NSLDS contains detailed information on borrowing, loan eligibility, loan history and repayment. The NSLDS also contains detailed demographic information on borrowers and their parents from the Free Application for Federal Student Aid, or FAFSA, as well as Pell grant records. Data from the NSLDS is available from 1969 to the present day. As of January 2014, the NSLDS contained more than 31.7 billion records concerning 84,629,538 students who took out 386,943,660 student loans. The main analysis sample consists of a 4% panel of the NSLDS that is used by the United States Department of the Treasury for budgeting and policy analysis. To ensure consistency and ascertain that student borrowers can be followed over time, the sample was drawn using permutations of the last digits of social security numbers.

The NSLDS has been matched to IRS data from the Compliance Data Warehouse, henceforth CDW, as well as information on school selectivity from Barron's Profile of American Colleges (2008). The CDW data is an administrative panel of income and earnings. The CDW data contains various information from W-2 forms, such as income, earnings and number of dependents, as well as Schedule C individual tax returns. CDW data is available from 1998 to the present day. The Barron's Profile of American Colleges (2008) classifies institutions based on their fraction of applicants admitted into six broad selectivity groups: non-competitive, less-competitive, competitive, very competitive, highly competitive and most competitive based on the fraction of applicants admitted. Further information on the data sources, as well as detailed summary statistics and patterns in student borrowing over several decades, is available in Looney and Yannelis (2015).

3.2 Sample Construction

The main analysis uses two primary datasets built from the sample of the NSLDS, one for the approach using variation in student loan bankruptcy protection, and another using the introduction of wage garnishment. Placebo and robustness tests modify the dataset construction slightly as discussed in section 5, mainly by the years in the sample. Both data sets are constructed similarly, although there are differences in sample construction and selection according to how the reforms affected borrowers and the timing of loan repayment. Table 1 provides descriptions of the main analysis variables used.

In the dataset used for the bankruptcy analysis, each observation is a loan year. There are 1,291,574 loans from 501,903 individual borrowers in the full sample. Cohorts are defined by the year in which an individual entered repayment. For example, borrowers in the 1991 cohort entered repayment on their student loans in 1991. The analysis sample includes cohorts between 1987 and 1994. The treatment cohorts entered repayment between 1987 and 1990, while the control cohorts entered repayment between 1991 and 1994. Repay dates are constructed using the date that a loan last entered repayment. For each cohort, the first two repayment years are dropped as are repayment years after the eleventh year in repayment.[13] After all sample restrictions, there are 9,041,018 loan-year observations in the main bankruptcy analysis sample. The left three columns of table 2 present summary statistics regarding the

[13]Borrowers are able to enter into default after almost one year (nine months). Borrowers can also defer loan repayment in the face of unemployment or economic hardship for a fixed period of time after entering repayment. The standard student loan repayment plan is a ten year repayment plan.

analysis sample.

The bankruptcy reform under the Higher Education Amendments of 1998 (P.L. 105-244) took effect on October 7, 1998. Years in repayment are defined for each year prior to and after October 7, 1998, and are the difference between the date the reform took effect and the date that a loan entered into repayment. The main outcome variable is an indicator of whether a loan goes into default in a particular year prior to or after the reform taking effect. Default dates are constructed using the first date that a loan defaults. A loan enters into default if a payment is more than 270 days late. Loan servicers are required to report defaults to the NSLDS within 90 days of a loan entering into default.

For the dataset used for the wage garnishment analysis, each observation is a person year. There are 96,394 borrowers in the full sample, which consists of borrowers that had student loans between 2001 and 2010. The treatment is defined as income above the garnishment threshold, and the sample is restricted to individuals who earned within 150% of the garnishment threshold three years after entering repayment. The post period is defined as years after 2006. The top 1% of the treatment is winsorized. After all sample restrictions, there are 687,545 individual-year observations in the main analysis sample for the wage garnishment reform. The right three columns of table 2 present summary statistics regarding the garnishment analysis sample. Given the nature of the sample construction, and that the garnishment threshold applies to low income borrowers, the sample tends to have slightly lower income and come from lower income families than most borrowers. Borrowers also tend to disproportionally come from for-profit and community colleges, which account for the majority of defaults.[14]

Figure 6 shows the income density of borrowers, broken down by institution type on the left and default status on the right. The figure shows income two years into repayment, for borrowers who first entered repayment in 2006 when the wage garnishment reform took effect. The figure indicates that the lower income borrowers included in the sample are largely the policy relevant group of borrowers more prone to loan default. The black vertical line corresponds to 150% of the poverty line, which corresponds roughly to the threshold for being included in the sample. The figure indicates that a sizable fraction of defaulters tend to have low incomes. Borrowers at for-profits and community colleges, who account for roughly half of defaults (Looney and Yannelis, 2015), also tend to have lower incomes.

Demographic data and other data is obtained from the NSLDS, the FAFSA and the CDW. Earnings and income are obtained from the CDW. Total income contains all household income sources, including spousal income. Information on filing status and the number of dependent children is used to determine poverty thresholds. Loan balances and Pell grant recipient status are obtained from the NSLDS.[15] School types refers to the institution control of the last institution attended and is obtained from the NSLDS. Demographic information from the FAFSA is obtained from the first FAFSA that a student filed and is recorded. If information is missing in a particular year, it is filled in using demographic information from the prior year when available, and if unavailable from the following year. School selectivity information is obtained from Barron's Profile of American Colleges (2008). Barron's selectivity measures are commonly used measures of college selectivity based on the fraction of students the schools admit. Barron's classifies schools in terms of selectivity based on six categories, not com-

[14] See Fairlie et al. (2014) for a study that focuses on the community college system.

[15] Pell grant receipt is determined by a student's Expected Family Contribution, or EFC, which is a number that the Department of Education uses to determine a family or individual's ability to pay for college. The EFC is a function of family income and other variables. Effectively, Pell grant receipt is a measure of students coming from lower income backgrounds.

petitive, less competitive, competitive, very competitive, highly competitive, most competitive. Schools classified as non-competitive are those that are "not competitive" and very selective schools are those that are classified as "very, highly or most competitive" by Barron's.[16]

4 Results

This section presents the main analysis results, first for the bankruptcy reform and then for the wage garnishment reform and evaluates the identifying difference-in-difference assumptions. Both approaches indicate significant evidence of strategic behavior, with removing bankruptcy protection and increasing amounts that can be garnished reducing default rates.

4.1 Bankruptcy

Table 4 shows difference-in-difference estimates of the effect of removing bankruptcy protection on default rates. The results provide strong evidence that removing bankruptcy protection lowered default rates. In other words, student borrowers respond strategically to incentives generated by bankruptcy reform. The table shows estimates of variants of equation 3. The coefficient β_y is denoted *PostXDischargeable*, and estimates the difference in default rates between cohorts able and unable to discharge their student loans in bankruptcy. Column one presents a simple difference-in-difference, including only indicators for the post period and belonging to the treatment group that is able to discharge loans in bankruptcy. The estimates indicate that individuals with bankruptcy protection available are .262 percentage points more likely to default than borrowers who have discharge unavailable in bankruptcy. The coefficient is highly significant, at the .01 level.

The rest of the table shows that the result is robust to changes in the specification and the inclusion of controls, providing further evidence that borrowers respond strategically to the availability of bankruptcy protection. Column (2) adds in year and cohort fixed effects, as well as controls for institutional selectivity. The cohort fixed effects control for time invariant differences between cohort, while the year fixed effects capture annual effects that affect all borrowers, such as economy wide shocks or changes in the legal repayment environment. The estimates again indicate that those with bankruptcy protection available are .291 percentage points more likely to default, and the coefficients are again highly significant at the .01 level. Column (3) adds in school control type, and column (4) adds in both school control type and institution selectivity controls. In both cases the coefficient on *PostXDischargeable* is of similar magnitude and significant at the .01 level.

Perhaps unsurprisingly, students from more selective institutions and 4-year institutions are less likely to default. Students at non-selective institutions, as well as students at for-profit and community colleges are more likely to default, which is consistent with previous studies such as Knapp and Seaks (1992), Lochner and Monge-Naranjo (2014) and Looney and Yannelis (2015). Column (5) includes additional controls for high income borrowers, Pell recipient status which indicates coming from a low income family, children, multiple defaults and grad school borrowing. Graduate borrowers are less likely to default, and Pell recipients and borrowers who attended Historically Black Colleges and Universities are more likely to default. The results are again very similar to those in other columns, with borrowers

[16] More information on school selectivity rankings is available in appendix B.

in the treatment cohorts being .249 percentage points more likely to default following the reform. The coefficient is again significant at the .01 level.

Column (6) adds in individual fixed effects, which control for all time invariant unobservable factors that are specific to individuals. The inclusion of individual fixed effects deals with any concerns of time-invariant omitted variables that differ between the treatment and control groups potentially biasing the results. The results including individual fixed effects indicate that treatment individuals with bankruptcy protection available are again more likely to default on loans, and the coefficient is again significant at the .01 level. The results in table 4 provide strong evidence that borrowers strategically respond to the availability of bankruptcy protection, and that removing bankruptcy protection lowers default rates.

Figure 4 shows the difference-in-difference estimates over time, and indicates that the timing of the effect is consistent with the availability of bankruptcy having an effect on loan repayment. The figure shows estimates of equation 3, which the treatment cohort indicator interacted with each time period. Each point estimate shows the difference between treatment and control cohorts in a particular year. The dashed lines around the point estimates depict a 99% confidence interval. The dashed vertical line depicts the seventh year of repayment, in which treatment cohorts are able to discharge their loans in bankruptcy. Consistent with the timing of the reform, there is no significant difference in defaults in years preceding bankruptcy availability. Following the seventh year of repayment, treatment cohorts are significantly more likely to default on their loans. The graphical evidence in figure 4 provides support for the identifying common trends assumption, and shows that the timing of the observed difference is consistent with the timing of bankruptcy availability.

4.2 Garnishment

Table 5 shows that borrowers with lower household incomes are more likely to default. The table shows household income and the fraction of borrowers ever defaulting for the cohort that entered repayment in 2010, the most recent cohort for which earnings are available four years after entering repayment.[17] Almost half of borrowers with family incomes between 10 and 20 thousand dollars default within four years of entering repayment, while fewer than five percent of borrowers with a family income of between 120 and 130 thousand dollars default within four years of entering repayment. Some of this difference could be driven by incentive effects of wage garnishment, but there are numerous channels through which income can affect loan repayment. To isolate the effects of wage garnishment, table 6 estimates the model outlined in section 2.3, comparing borrowers with similar income levels affected and unaffected by the wage garnishment increase in 2006.

Table 6 shows difference-in-difference estimates of the effect of the increase in wage garnishment on default rates. The results again indicate the presence of strategic behavior, and borrowers subject to wage garnishment react to the increase in wages seized in default following the 2006 reform. The table shows estimates of variants of equation 4. Coefficient ω_y, denoted by *PostXGarnishableEarnings*, gives the effect of an additional $10,000 in garnishable income following the 2006 reform, which increased the wage garnishment rate by 50%. Column (1) presents a simple difference-in-difference, including only indicators for the post period and treatment, which is income above the garnishment threshold.

[17] This table focuses on borrowers in a particular repayment cohort to avoid effects of the Great Recession. Results are similar for other cohorts.

The sample is restricted to twice the garnishment threshold.[18] The results indicate that an additional $10,000 in income above the garnishment threshold following the reform reduces default rates by .917 percentage points. The coefficient is significant at the .01 level. The result is consistent with borrowers behaving strategically, and responding to changes in the costs of default.

Columns (2)-(6) show that the results are robust to changes in specification and the inclusion of controls. Column (2) adds in controls for institutional selectivity, as well as year and cohort fixed effects. The cohort fixed effects capture time invariant cohort effects, while the year fixed effects capture temporal effects that affect all borrowers in each year. The point estimate of -.829 percentage points is similar to that in column (1), and not different at conventional significance levels. Column (3) adds in institution type controls, while column (4) controls for both school type and institution selectivity. In both cases the coefficients are quite similar to those in columns (1) and (2), and significant at the .01 level. Consistent with the estimates in table 4 and previous studies, borrowers from for-profits and community colleges are more likely to default on loans.

Column (5) adds in demographic controls for graduate school attendance, children, attending a historically black college, and Pell grant recipiency. When controls are included, the coefficient on *PostXGarnishableEarnings* is -.00853, indicating that an additional $10,000 in garnishable earnings leads to a .853 percentage point decrease in new defaults. The estimates are similar to those in the previous columns, and significant at the .01 level, indicating that the effect of wage garnishment is robust to the inclusion of controls. Students who attend graduate school are less likely to default, and student who attend historically black colleges or come from low income families and receive Pell grants are more likely to default.

Column (6) includes individual fixed effects. The individual fixed effects control for all time invariant individual specific unobservable factors, which guards against the concern that time-invariant omitted variables might differ between the treatment and control groups and bias the results. The point estimates in column (6) indicate that an additional $10,000 in garnishable earnings leads to a .546 percentage point decrease in new defaults. The magnitude of the effect is slightly smaller than in column (5), and the effect is significant at the .01 level. Overall, the results in table 6 provide strong evidence that borrowers strategically respond to the incentives generated by changes in wages that can be seized in the event of default, despite no changes to liquidity and cash on hand.

Figure 5 shows the wage garnishment difference-in-difference estimates over time. The timing of the effect is consistent with the timing of the 2006 reform. The figure shows estimates of equation 4, where the treatment is interacted with each time period before and after the 2006 reform. Each point estimate shows the additional effect of income above the garnishment threshold relative to individuals with income below the garnishment threshold. The baseline year is 2002. The dashed lines around the point estimates depict a 99% confidence interval. The dashed vertical line shows 2006, the year in which the wage garnishment rate was increased by 50%. Consistent with the identifying difference-in-difference assumption, there is no significant pre-trend and borrowers with income above and below the garnishment threshold trend similarly before and after the reform. Following the increase in the garnishment rate, individuals with income above the garnishment threshold are less likely to default on their loans relative to individuals with income below the threshold. The evidence presented in figure 5 is consistent

[18] Appendix A provides further institutional information regarding wage garnishment.

with the timing of the wage garnishment reform, and provides further evidence that individuals with income above and below the garnishment threshold trended similarly in terms of defaults prior to the reform.

4.3 Heterogeneity

Table 4.3 presents results similar to the previous two sections, interacting the treatment with controls for Pell grant recipiency, income and the loan balance. The heterogeneity analysis presents further evidence that the channel through which the reforms impacted loan non-repayment was strategic behavior. We observe smaller effects of the reform for borrowers from low income families, who may be more likely to face liquidity constraints. In addition, the bankruptcy reform had a much smaller impact on high earning borrowers, who likely had incomes above state bankruptcy exemptions. Finally the bankruptcy reform had a larger impact for borrowers with large balances, who have higher monthly payments and incentives to discharge debt.

The first six columns show specifications of equation 3, analogous to the first columns of table 4. The final four columns show specifications of equation 4 analogous to the first columns of 6. Columns (1) and (2) and (7) and (8) interact the treatment with an indicator of Pell grant receipt. The Pell grant program is the largest federal student grant program for low income students, and students who receive Pell grants tend to come from low income families. The results from the bankruptcy reform indicate that the effect of the bankruptcy reform is smaller for borrowers who receive Pell grants. This is consistent with borrowers from low income families engaging in less strategic behavior, and default in this group being driven largely by liquidity effects.

Columns (3) and (4) interact the treatment with an indicator of a borrower earning more than $100,000.[19] The effect of the bankruptcy reform is smaller for these households, which is consistent with bankruptcy rules in the United States, which provides fewer incentives for high incomes households to enter into the bankruptcy system. Most states have income thresholds above which discharge is unavailable under Chapter 7, and high income borrowers are more likely to have assets that can be liquidated in bankruptcy. Finally, columns (5) and (6) and (9) and (10) interact the treatment with the outstanding balance, measured in $10,000s. The results indicate that the effect of the bankruptcy reform is larger for borrowers with larger loan balances. This result is consistent with the results being driven by the strategic behavior of borrowers. Borrowers with larger loan balances face larger monthly payments, and hence have great incentives to seek bankruptcy due to the benefits of successful discharge.

4.4 Costs of Policy Reforms

Bankruptcy protection trades off consumption smoothing benefits with the cost of increased default leading to more expensive borrowing (Dobbie and Song, 2015; Dobbie et al., 2015). Optimal policy crucially depends on whether there is a strategic response to consumer bankruptcy protection. In the absence of strategic motivation, increasing bankruptcy costs is strictly welfare reducing since the insurance value of default decreases without a corresponding decrease in borrowing costs. While a full welfare analysis and computing the insurance benefit of bankruptcy protection is beyond the scope of this paper, it is possible

[19] Note that there are no borrowers with incomes above $100,000 in the garnishment sample due the window taken around the garnishment threshold.

to estimate the cost of allowing bankruptcy discharge under plausible assumptions. Similarly, estimates can be made for the effects of wage garnishment, which also reduces the insurance value of default. This estimate can serve as a benchmark for social planners–the social planner's social welfare function would need to value insurance provided by bankruptcy protection more than the cost of allowing discharge.

There is ongoing debate regarding the presence and strength of strategic responses to bankruptcy reform in various consumer loan markets. Fay et al. (2002) find evidence of strategic behavior of households in making bankruptcy decisions, Li et al. (2011) find evidence of a strategic response to bankruptcy protection in mortgage loans and Domowitz and Sartin (1999) find that legal changes affect consumer bankruptcy decisions. Athreya et al. (2012) study the relationship between bankruptcy and informal delinquency. Chatterjee and Ionescu (2012) and Ionescu (2011) focus on the insurance value of bankruptcy protection in student loans. In this study, bankruptcy protection and wage garnishment are shown to induce a strategic response on the part of borrowers.

In 2013 the median earnings of a borrower three years into repayment was approximately $40,000 and wages above $15,080 can be fully garnished. The estimates from the garnishment reform suggest that a $10,000 increase in garnishable earnings leads to a .853 percentage point decrease in new defaults. Assuming that the effect is constant over time, this suggests that reducing the wage garnishment rate from the current 15% to 10% would increase three year student loan default rates by 2.13 percentage points, or almost 20%. If the effect is also linear, the estimates suggest that eliminating wage garnishment would increase the three year cohort default rate by over 50%, or by 6.4 percentage points to 18.2 percent. The estimated default rate with no wage garnishment is quite close to default rates prior to the introduction of wage garnishment in 1991. Wage garnishment is the primary form of recovery on defaulted student loans, and if these defaulted loans are not recovered the additional default would cost $72 billion on the existing federal student loan debt of $1.2 trillion, in addition to loss of recovery on already defaulted loans.

The estimates in the previous section suggest that removing bankruptcy protection in the seventh year of repayment increases the probability of default by .25 percentage points, or approximately 18% in the repayment years after the seventh year. Assuming a similar effect today, this would suggest a 1.65 percentage point increase in cumulative student loan default rates, leading to $20 billion in discharged loans if the defaults induced by bankruptcy protection were dishcharged. Assuming that new defaults increase by approximately 18% each year, which is consistent with figure 2, and assuming a cumulative cohort default rate of 25%[20] this would lead to $54 billion of debt discharged if full bankruptcy protection were introduced, and assuming that the additional defaults were successful in discharging their debt.

5 Robustness and Placebo Results

This section strengthens the main analysis presented in section 4.1 and 4.2 by presenting robustness and placebo estimates. The robustness estimates vary the main analysis sample, and show the results are not driven by the particular repayment or sample years selected. The placebo estimates simulate reforms among groups or time periods when there was no variation in repayment incentives, and no effect is

[20]This is a conservative estimate. See Looney and Yannelis (2015) for a discussion of default rates in recent years

found in these circumstances indicating that the results are not driven by pre-existing trends. Both the robustness and the placebo estimates strengthen the main results and indicate that student loan borrowers respond strategically to repayment incentives.

5.1 Robustness

This subsection presents several robustness checks, which serve to verify that the main results hold in different samples. For the bankruptcy and garnishment reform samples, this section shows that the results are robust to, (1) dropping observations furthest below the policy reform cutoffs, (2) dropping observations furthest above the policy reform cutoffs, (3) dropping observations near the policy cutoffs, (4) dropping the first repayment or fiscal year in the sample and finally, (5) dropping the last repayment or fiscal year in the sample. The results strongly indicate that the results presented in section 4 are robust to alternative specifications, and are not driven by sample selection or particular cohorts or outliers.

Table 8 presents the main robustness results. For each robustness check, the specifications are included with and without demographic controls, analogous to columns (2) and (5) in tables 4 and 6. The inclusion of fixed effects and controls is denoted beneath each column. The top panel presents robustness results for the bankruptcy reform. The first two columns drop the first cohort included in the main analysis sample, the 1987 cohort. The estimated coefficient is slightly smaller than in the main results, but remains highly significant at the .01 level. Columns (3) and (4) drop the last cohort included in the analysis sample, the 1994 cohort. The coefficients become slightly larger and again are significant. Columns (5) and (6) drop cohorts near the reform threshold, the 1990 and 1991 cohorts, as these cohorts may have not had time to file for bankruptcy. The results are again significant and are very close in magnitude to the main results. Columns (7) and (8) drop the first repayment year included in the sample. Finally, columns (9) and (10) drop the final repayment year included, in the analysis, the tenth repayment year. Overall the results indicate that the bankruptcy reform results are robust to alternative specifications.

The bottom panel of table 8 presents robustness checks for the wage garnishment reform. These checks are analogous to the robustness specifications in the panel above for the bankruptcy reform. Columns (1) and (2) drop observations with earnings below half the garnishment threshold. The magnitude of the effect is slightly larger than in the main results presented in table 6, and remains significant at the .01 level both when controls are included and excluded. Columns (3) and (4) drop observations above 125% of the garnishment threshold (in the main sample observations above 150% of the threshold are dropped.) The results are again highly significant and the observed drop in defaults is larger than in the main results. Columns (5) and (6) drop observations between 90 and 110% of the garnishment threshold, in the unlikely case that tax records are measured with error which could potentially attenuate the observed effects. The effects in this specification are significant and magnitudes are similar to the main results. Columns (7) and (8) drop the first year in the sample, 2001, and columns (9) and (10) drop the last year in the sample, 2010. In both cases the results are similar in magnitude to the main results and significant. The results from the bottom panel of table 8 indicate that the wage garnishment results are robust. The next section provides further evidence of the robustness of the results by simulating several placebo bankruptcy and garnishment reforms. These reforms assist in evaluating the identifying common trends assumption, and indicate that the results are not driven by the treatment and control

groups being on different trends prior to the enactment of the reforms.

5.2 Placebo Results

The difference-in-difference analysis presented in section 4 is underlined by a common trends assumption. A potential concern for the results is that they are driven by different cohorts or borrowers above and below income thresholds on different default trends. Section 4 presented graphical evidence supporting the common trends assumption, showing that prior to the reforms the treatment and control groups trended similarly. This section provides further evidence of the identifying the assumption by simulating placebo reforms. This section first simulates two placebo bankruptcy reforms. In the first reform, a bankruptcy reform is simulated that affects borrowers in their fifth year of repayment, when all cohorts are unable to discharge loans in bankruptcy. In the second reform, the analysis is restricted to the control cohorts and the treatment cohorts are defined as those entering repayment in 1991 and 1992. All cohorts are unable to discharge their loans in bankruptcy in their seventh year. If the main results in section 4 were driven by differential trends in the treatment and control cohorts, rather than strategic behavior due to the removal of bankruptcy protection, the placebo simulations could generate effects on default.

The section next simulates two wage garnishment reforms. In the first reform, a garnishment reform is simulated in 2003, three years prior to the actual reform. The sample is restricted to observations before 2006, to avoid contamination from the actual reform. In the second placebo reform, a garnishment reform is simulated in 2006 that takes effect at a cutoff half the value of the actual cutoff. The sample is restricted to individuals below the garnishment cutoff, again to avoid contamination. If the main results in section 4 were driven by differential trends among college-goers who earn different amounts, rather than strategic behavior due to changes in default costs, the placebo reforms could pick up effects on default.

Table 9 shows the placebo analysis. The left four columns simulate placebo bankruptcy reforms, while the right four columns simulate placebo wage garnishment reforms. The left four columns indicate that the placebo bankruptcy reforms estimate precise zeros. Columns (1) and (2) show the placebo reforms with a simulated reform in the fifth repayment year and comparing the 1991 and 1992 cohorts to the 1993 and 1994 cohorts, respectively. The specifications are analogous to column (1) in table 4, with full controls. Columns (3) and (4) add in fixed effects, analogous to column (5) in table 4. In both cases the estimates are statistically insignificant, very close to zero and we can rule out effects of the magnitude seen in table 4. The right four columns simulate placebo wage garnishment reforms. The wage garnishment placebo results also estimate precise zeros. Columns (5) and (6) show, respectively, the placebo reforms with a simulated reform in 2003, three years prior to the actual reform, and simulating a reform at a cutoff 50% below the garnishment thresholds. The first placebo sample is restricted to observations prior to 2006, to avoid contamination form the actual reform. The second placebo is restricted to individuals below the cutoff, again to avoid contamination from the actual reform. Columns (5) and (6) include controls analogous to column (5) in table 6. The result indicate no effect of the placebo reform on earnings. Columns (7) and (8) present similar results, and in both cases the results are statistically insignificant and close to zero.

Overall, the placebo reforms provide support for the identifying common trends assumption. More-

over, the placebo estimates can rule out certain endogeneity concerns. If the results in the main analysis were driven by cohorts being on different trends, or borrowers on different income threshold being on different trends, then we would expect to see effects of placebo reforms. This is not the case, and the simulated placebo reforms generate precise zeros, which is consistent with the observed effects in section 4 being driven by strategic behavior on the part of borrowers.

6 Concluding Remarks

This paper provides evidence of strategic default in student loans. Student loans differ from other forms of household debt, as human capital is particularly difficult to collateralize. Despite a lack of empirical evidence, strategic behavior has long been used by policy makers to justify policies unique to the student loan market, such as exemption from bankruptcy discharge and defaulted borrowers facing wage seizures without a court order. This paper fills this gap, using policy-induced variation in non-repayment costs to circumvent the fact that strategic default is unobservable, and to provide evidence of strategic behavior among student borrowers. More directly, the study shows that removing bankruptcy protection and increasing wage garnishment reduce non-repayment rates.

Despite evidence of strategic incentives, there remain important unanswered questions about the design of student lending programs and borrowers' incentives. In particular, it remains unclear whether the particularly harsh student loan bankruptcy regime is optimal given tradeoffs. Strategic behavior has been shown in many other consumer loan markets, such as the mortgage market, yet mortgage loans remains dischargeable in bankruptcy. While this study provides evidence that strategic behavior is important in the student loan context, the estimates are similar to those for mortgage loans (Ghent and Kudlyak, 2011; Meyer et al., 2014; Ronel et al., 2010) and personal bankruptcy decisions (Fay et al., 2002; Botsch et al., 2012; Li et al., 2011). This suggests that strategic considerations in the student loan market may not differ significantly from other consumer loan markets, despite concerns arising from a lack of collateral in human capital investments.

This study makes a step in quantifying the parameters relevant to tradeoffs between insurance provision and borrowing costs by quantifying defaults induced by more generous borrower protections. The presence of strategic behavior in the repayment decision suggests that policies such as income based repayment and tax-based interest deductions for low income borrowers may have advantages in consumption smoothing and insurance provision when compared to using the bankruptcy code. Consumption smoothing has important implications for welfare (Baker, 2014; Berger et al., 2016; Gourinchas and Parker, 2002; Souleles, 1999). Future work should focus further on the tradeoff between student borrower incentives and providing borrowers with insurance in the face of adverse outcomes, and wage garnishment collateralizing human capital investments through future income streams, thus mitigating strategic incentives. Moreover, while wage garnishment collateralizes student loans and can mitigate strategic incentives, it also functions in a similar fashion to a tax and may induce borrowers to earn less in the future.

References

Athreya, K., J. Sánchez, X. S. Tam, and E. R. Young (2012). Bankruptcy and delinquency in a model of unsecured debt. *Federal Reserve Bank of St. Louis Working Paper*.

Avery, C. and S. Turner (2012). Student loans: Do college students borrow too much–or not enough? *Journal of Economic Perspectives 26*(1), 165–92.

Baker, S. R. (2014). Debt and the consumption response to household income shocks. *Stanford University Working Paper*.

Barron's Profile of American Colleges (2008). *Barron's Educational Series, Inc., Great Neck and Woodbury, NY*.

Becker, G. (1964). Human capital: A theoretical and empirical analysis. *Columbia University Press*.

Berger, D., N. Turner, and E. Zwick (2016). Stimulating housing markets. *Working Paper*.

Beyer, H., J. Hastings, C. Neilson, and S. Zimmerman (2015). Connecting student loans to labor market outcomes: Policy lessons from Chile. *American Economic Review 105*(5), 508–13.

Botsch, M., B. Iverson, and D. Smith (2012). Subprime foreclosures and the 2005 bankruptcy reform. *Federal Reserve Bank of New York Economic Policy Review 18*(1), 47–57.

Calomiris, C., M. Larrain, J. Liberti, and J. Sturgess (2016). How collateral laws shape lending and sectoral activity. *Journal of Financial Economics*, forthcoming.

Chatterjee, S. and F. Ionescu (2012). Insuring student loans against the financial risk of failing to complete college. *Quantitative Economics 3*(3), 393–420.

Darolia, R. and D. Ritter (2015). Do student loan borrowers opportunistically default? evidence from bankruptcy reform. *Federal Reserve Bank of Philadelphia Working Papers 15*(17).

Department of Education (2014). Student loans overview. *Fiscal Year 2014 Budget Proposal*.

Department of Education (2016). Quarterly student aid report. *Federal Student Aid Portfolio*.

Dobbie, W., P. Goldsmith-Pinkham, and C. Yang (2015). Consumer bankruptcy and financial health. *Unpublished Mimeo*.

Dobbie, W. and J. Song (2015). Debt relief and debtor outcomes: Measuring the effects of consumer bankruptcy protection. *American Economic Review 105*(3), 1272–1311.

Domowitz, I. and R. L. Sartin (1999). Determinants of the consumer bankruptcy decision. *Journal of Finance 54*(1), 403–420.

Downs, D. and P. T. Xu (2015). Commercial real estate, distress and financial resolution: Portfolio lending versus securitization. *The Journal of Real Estate Finance and Economics 51*(2), 254–287.

Fairlie, R., F. Hoffman, and P. Oreopoulos (2014). A community college instructor like me: Race and ethnicity interactions in the classroom. *American Economic Review 104*(8), 2567–91.

Fay, S., E. Hurst, and M. White (2002). The consumer bankruptcy decision. *American Economic Review 92*(3), 706–718.

Friedman, M. and S. Kuznets (1945). Income from independent professional practice. *NBER Books*.

Gary-Bobo, R. and A. Trannoy (2015). Optimal student loans and graduate tax under moral hazard and adverse selection. *Rand Journal of Economics 46*(3), 546–576.

Ghent, A. C. and M. Kudlyak (2011). Recourse and residential mortgage default: evidence from us states. *Review of Financial Studies 24*(9), 3139–3186.

Gourinchas, P.-O. and J. A. Parker (2002). Consumption risk over the life-cycle. *Econometrica 70*(1), 47–89.

Gross, D. B. and N. S. Souleles (2002). An empirical analysis of personal bankruptcy and delinquency. *The Review of Financial Studies 15*(1), 319–347.

Guiso, L., P. Sapienza, and L. Zingales (2013). The determinants of attitudes toward strategic default on mortgages. *The Journal of Finance 68*(4), 1473–1515.

Hoxby, C. (2009). The changing selectivity of american colleges. *Journal of Economic Perspectives 23*(4), 95–118.

Hoxby, C. and S. Turner (2013). Expanding college opportunities for high-achieving, low income students. *Stanford Institute for Economic Policy Research (SIEPR) Discussion Paper 12*(14).

Ionescu, F. (2011). Risky human capital and alternative bankruptcy regimes for student loans. *The Journal of Human Capital 5*(2), 153–206.

Iuliano, J. (2012). An empirical assessment of student loan discharges and the undue hardship standard. *American Bankruptcy Law Journal 86*(495-526), 495.

Ivashina, V., B. Iverson, and D. Smith (2016). The ownership and trading of debt claims in chapter 11. *Journal of Financial Economics 119*(2), 316–335.

Jaffee, D. and T. Russell (1976). Imperfect information, uncertainty and credit rationing. *The Quarterly Journal of Economics 90*(4), 651–666.

Knapp, L. G. and T. G. Seaks (1992). An analysis of the probability of default on federally guranteed student loans. *The Review of Economics and Statistics 74*(3), 404–411.

Li, W., M. White, and N. Zhu (2011). Did bankruptcy reform cause mortgage defaults to rise? *American Economic Journal: Economic Policy 3*, 123–147.

Lochner, L. and A. Monge-Naranjo (2011). The nature of credit constraints and human capital. *American Economic Review 101*(6), 2487–2529.

Lochner, L. and A. Monge-Naranjo (2014). Default and repayment among baccalaureate degree earners. *CIBC Working Paper Series* (2014-1).

Lochner, L. and A. Monge-Naranjo (2016). Student loans and repayment: Theory, evidence and policy.

Handbook of the Economics of Education (5).

Looney, A. and C. Yannelis (2015). A crisis in student loans? how changes in the characteristics of borrowers and in the institutions they attended contributed to rising loan defaults. *Brookings Papers on Economic Activity* (Fall), 1–68.

Lucas, D. and D. Moore (2010). Guaranteed versus direct lending: The case of student loans. *Measuring and Managing Federal Financial Risk*.

Melzer, B. T. (2016). Mortgage debt overhang: Reduced investment by homeowners at risk of default. *Journal of Finance* (forthcoming).

Meyer, C., E. Morrison, T. Pikorski, and A. Gupta (2014). Mortgage modification and strategic behavior: Evidence from a legal settlement with countrywide. *American Economic Review 104*(9), 2830–57.

National Bankruptcy Review Commission (1997). Final report.

Report of the Commission on the Bankruptcy Laws of the United States (1973). Final report. *House Commission*.

Ronel, E., , N. S. Souleles, S. Chomisengphet, D. Glennon, and R. Hunt (2010). What triggers mortgage defaults? *American Economic Review 100*(2), 490–94.

Souleles, N. (1999). The response of household consumption to income tax refunds. *American Economic Review 89*(4), 947–958.

Souleles, N. S. (2000). College tuition and household savings and consumption. *Journal of Public Economics 77*(2), 185–207.

Stiglitz, J. and A. Weiss (1981). Credit rationing in markets with imperfect information. *American Economic Review*, 393–410.

White, M. (2011). Corporate and personal bankruptcy law. *Annual Review of Law and Social Science 7*.

Figure 1: Default Rates Over Time

This figure shows two-year cohort default rates between 1984 and 2012. The two-year cohort default rates are defined as the fraction of individuals who default within two years of their loans entering repayment. The black dashed lines show, respectively, the introduction of wage garnishment in 1991 and student loans being made completely non-dischargeable in 1998. Prior to 1998 student loans become dischargeable in bankruptcy after seven years in repayment. All data comes from a 4% random sample of the NSLDS.

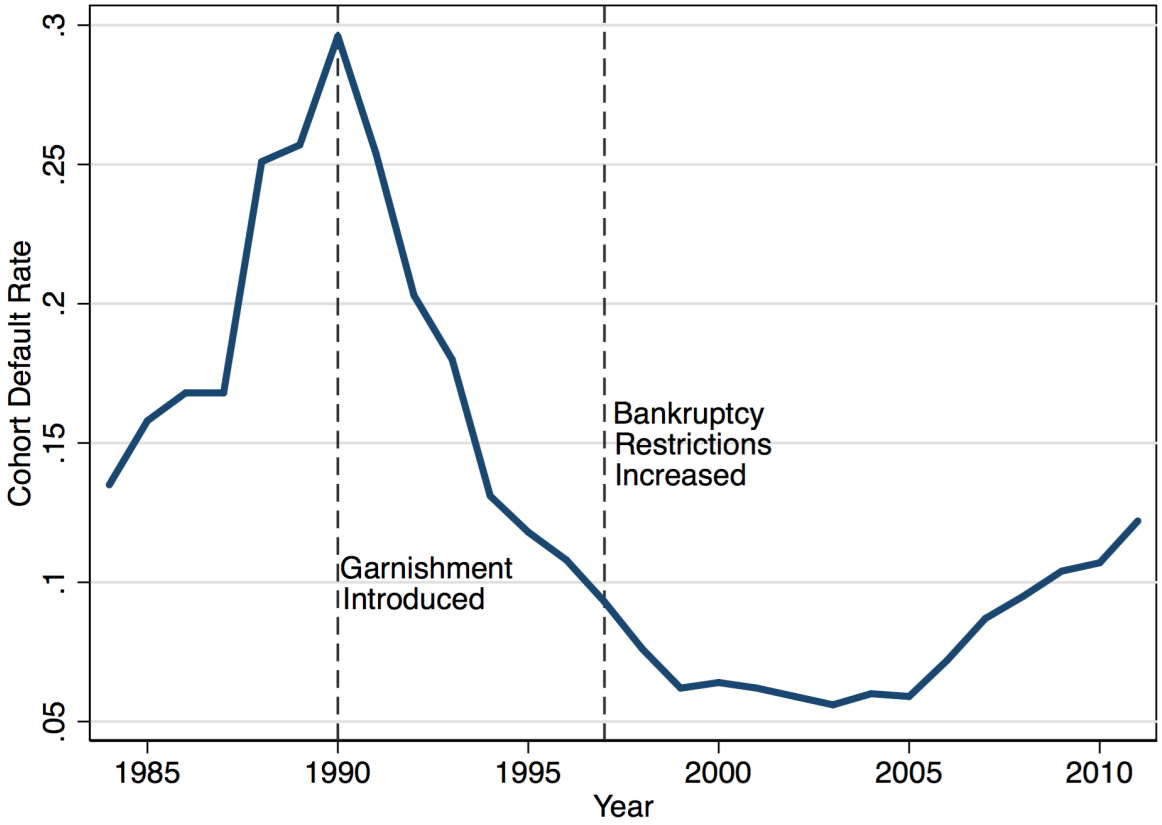

Figure 2: New Defaults Over Time

This figure shows the fraction of individuals defaulting in each year after repayment. The horizontal axis denotes the year in which a loan is in repayment. The treatment cohorts, shown by the solid line, entered repayment between 1987 and 1990, before seven years prior to 1998 and are able to discharge loans in bankruptcy. The control cohorts, shown by the dashed line, entered repayment between 1991 and 1994, after seven years prior to 1998 and are unable to discharge loans in bankruptcy. The vertical dashed line shows the 1998 student loan bankruptcy reform, under which student loans were made non-dischargeable in bankruptcy. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. Prior to 1998 student loans were dischargeable in bankruptcy after seven years in repayment. All data comes from a 4% random sample of the NSLDS.

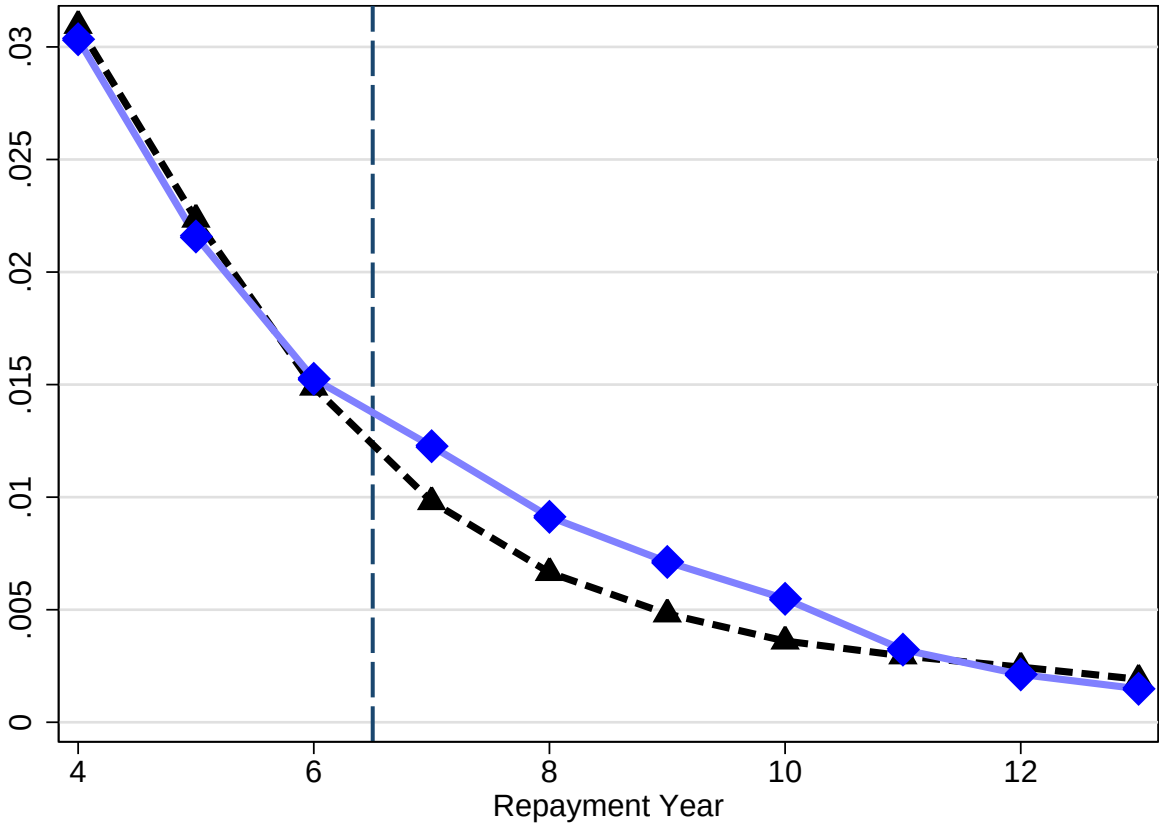

Figure 3: Trends Prior to Bankruptcy Reform

This figure shows the fraction of individuals defaulting in each year after repayment for cohorts used in the main analysis. Cohorts are noted in the legend below the figure. The horizontal axis denotes the year in which a loan is in repayment. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. Prior to 1998 student loans were dischargeable in bankruptcy after seven years in repayment. All data comes from a 4% random sample of the NSLDS.

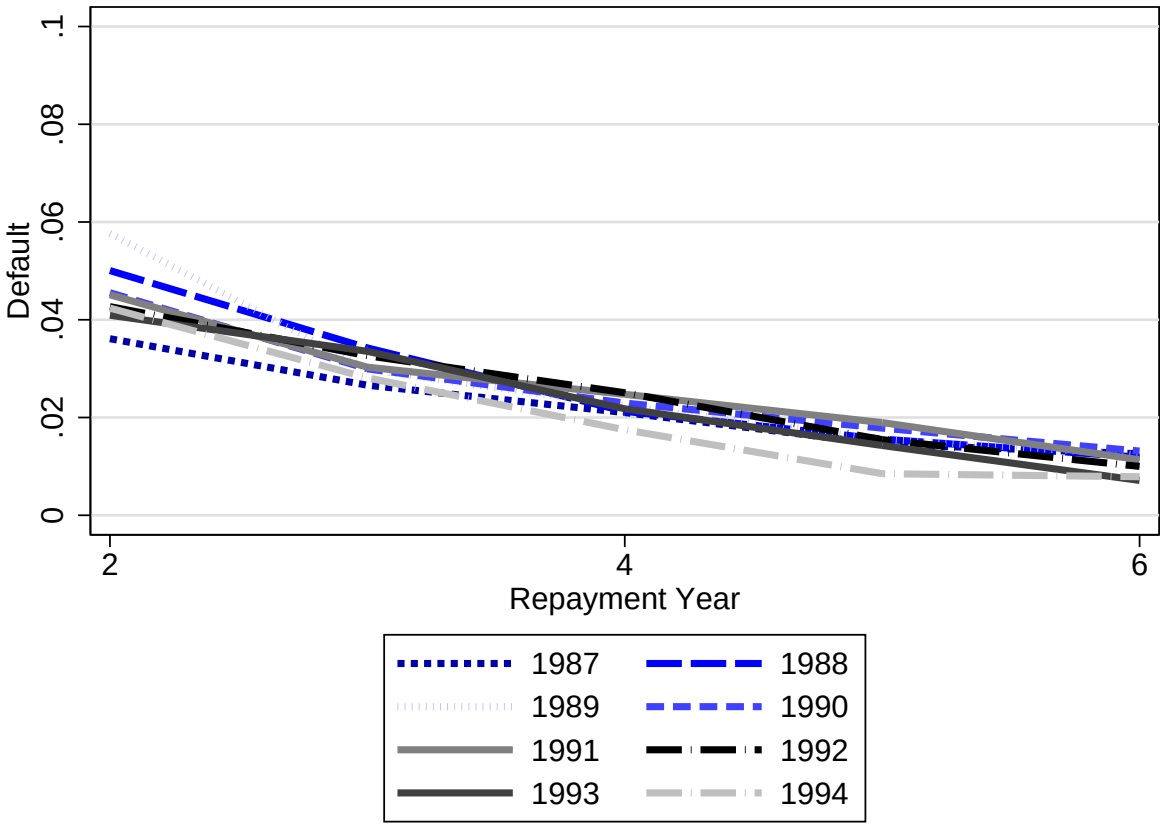

Figure 4: Bankruptcy Reform Estimates

This figure shows the coefficient β_t from the regression $\pi_{it} = \alpha_y + \alpha_i + \sum_{y=0}^{T} \beta_y \mathbb{1}[y = t] * \mathbb{1}[C < 1991]_i + \alpha_1 X'_{it} + e_{it}$. The coefficient β_y measures the difference in new defaults between the treatment and control groups. The dashed lines depicts a 99% confidence interval. The horizontal axis denotes the year in which a loan is in repayment. The treatment cohorts entered repayment between 1987 and 1990, before seven years prior to 1998 and are able to discharge loans in bankruptcy. The control cohorts entered repayment between 1991 and 1994, after seven years prior to 1998 and are unable to discharge loans in bankruptcy. The vertical dashed line shows the 1998 student loan bankruptcy reform, under which student loans were made non-dischargeable in bankruptcy. The dependent variable π_{it} measures first time defaults for individual i in year t. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. Prior to 1998 student loans were dischargeable in bankruptcy after seven years in repayment. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax data

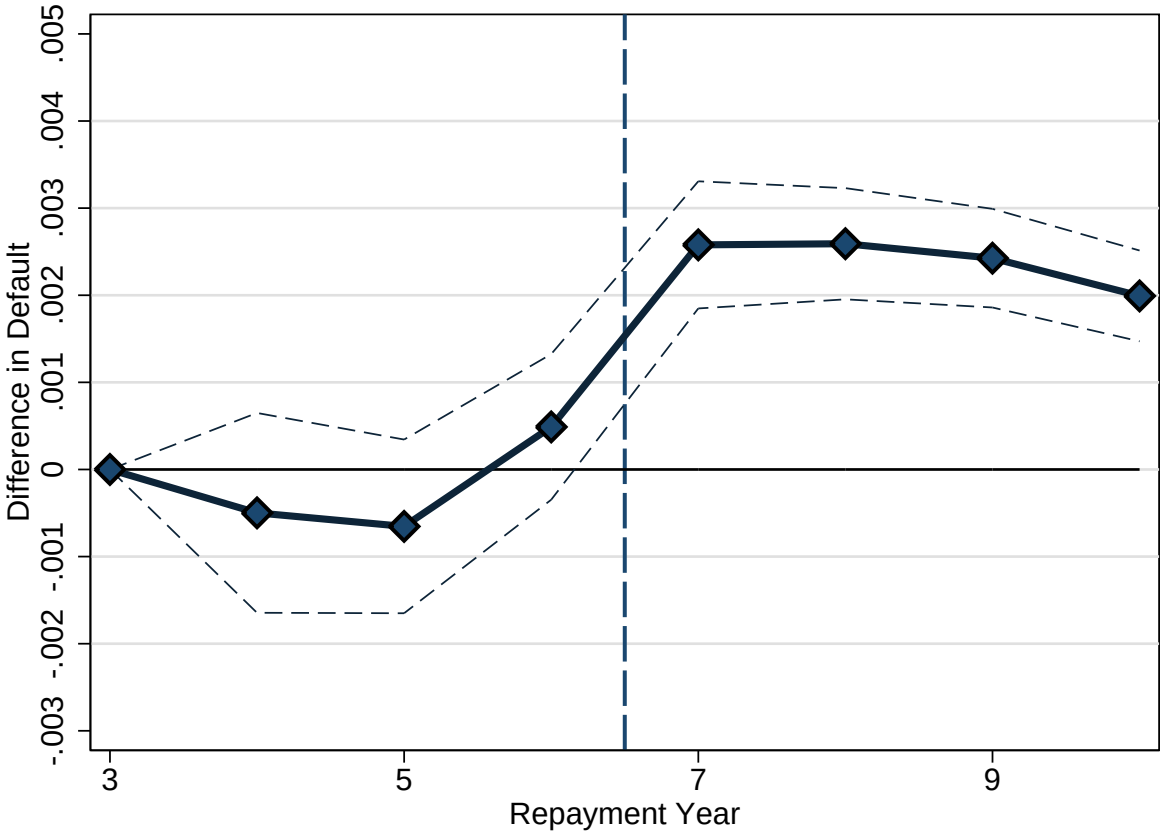

Figure 5: Wage Garnishment Reform Estimates

The figure shows the coefficients ω_t from the regression $\pi_{it} = \alpha_i^1 + \alpha_t^2 + \omega_1[Inc > \overline{Inc}] + \sum_{y=0}^{T} \omega_y[Inc > \overline{Inc}] \times \mathbb{1}[y = t]_{it} + \alpha_2 X_{it}' + v_{it}$. The dashed line depicts a 99% confidence interval. The treatment is defined as income above $\overline{Inc}$, the threshold above which wages can be garnished. The vertical dashed line shows the 2006 student loan wage garnishment reform, which increased the wage garnishment rate from 10% to 15%. The dependent variable π_{it} measures first time defaults for individual i in year t. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. All data comes from a 4% random sample of the NSLDS matched to de-identified tax data.

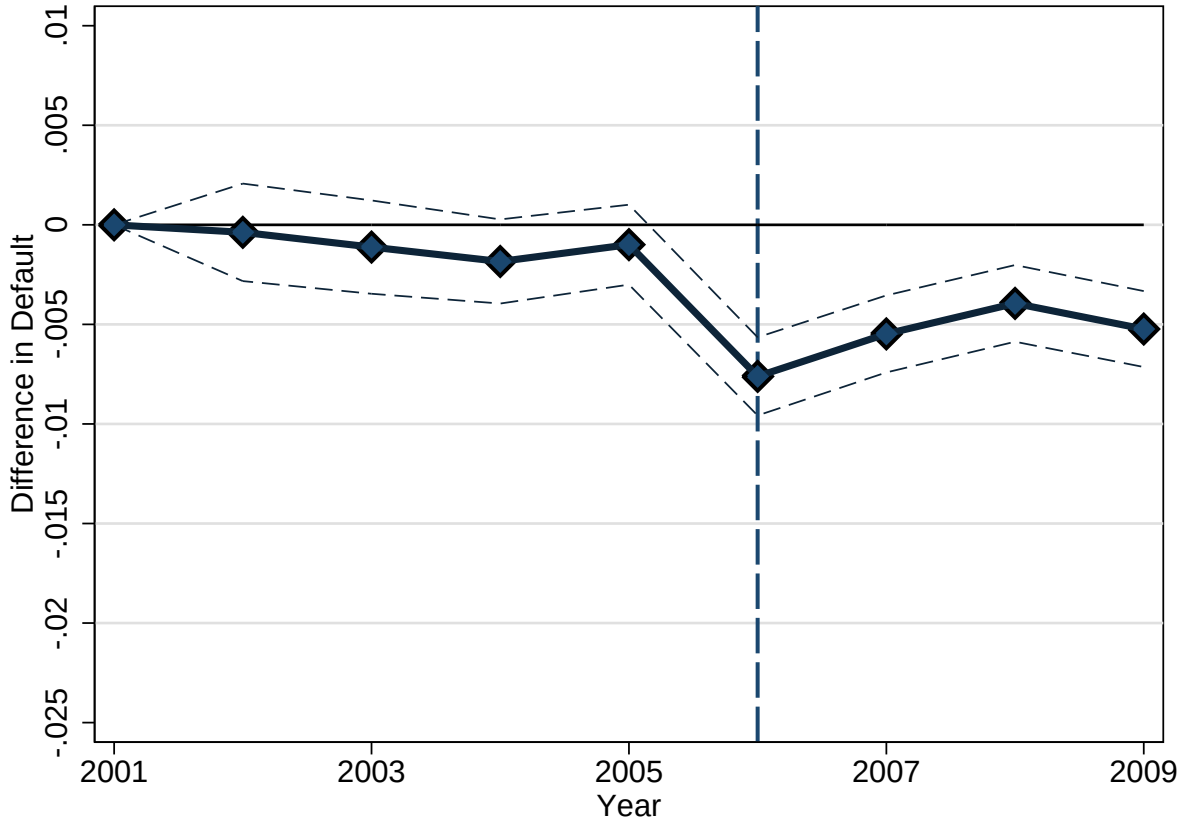

Figure 6: Income Density

The figure on the left shows the income density two years after entering repayment for borrowers who entered repayment in 2006, by school type. The panel on the right shows the income density by whether or not an individual defaults within three years of entering repayment in 2006. The kernel density is given by $\hat{f}_K = \frac{1}{hn}\sum_{t=1}^{n} K\left(\frac{x-x_i}{h}\right)$ where h is the bandwidth, K is an Epanechnikov kernel. The dashed line shows 150% of the poverty line. The poverty line is computed as the average poverty line for individuals in the sample based on household size filed in tax returns. All dollar values are in 2010 dollars. The sample is a .1% sample of the NSLDS matched to de-identified tax data.

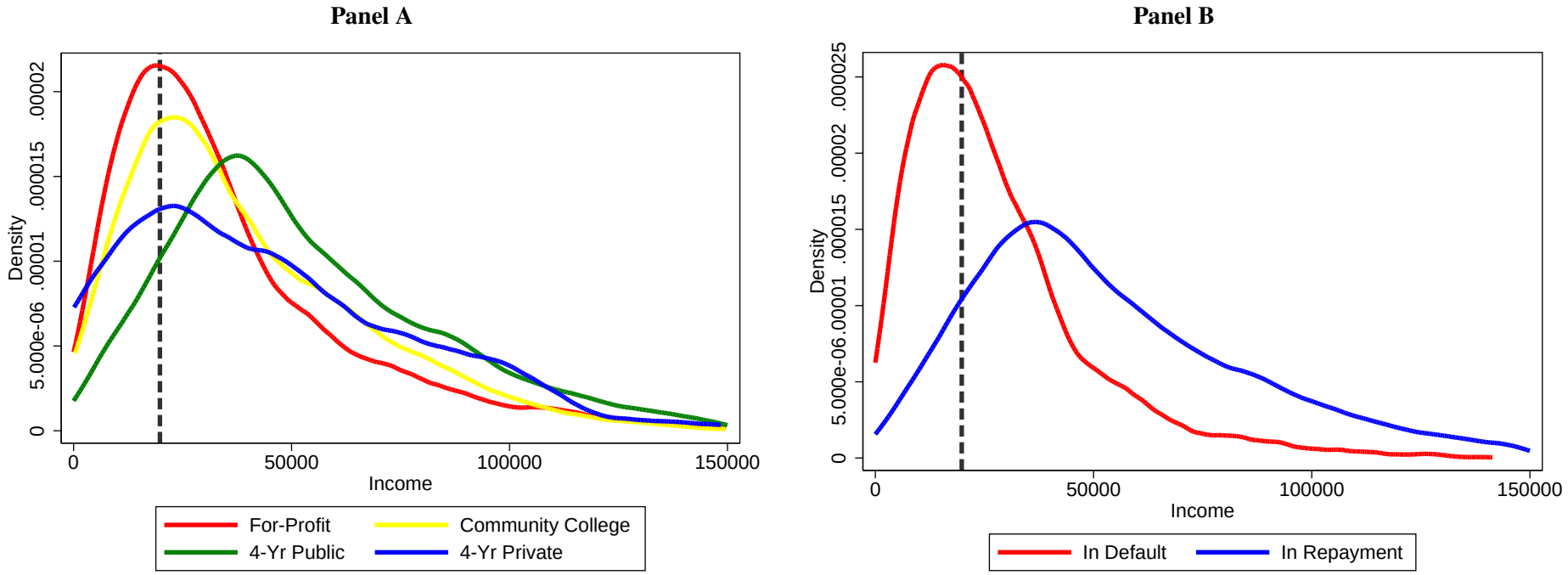

Table 1: Variable Descriptions

This table describes the outcome and control variables used in the main analysis. The first column presents the variable name, the second column presents the variable description, and the third column presents the variable data source. NSLDS refers to the National Student Loan Data System, Barron's refers to Barron's Profile of American Colleges (2008) and CDW refers to the Compliance Data Warehouse.

Variable	Description	Source
Default	Indicator of whether an individual defaults for the first time. A loan is in default if a payment is more than 270 days overdue.	NSLDS
For-Profit	For-profit institutions are identified using the ownership control type of the first institution which the student attended when their first loan was originated.	NSLDS
Community College	Community colleges are identified using the ownership control type of the first institution which the student attended when their first loan was originated.	NSLDS
Public 4-Year	Public four year non-profit institutions are identified using the ownership control type of the first institution which the student attended when their first loan was originated.	NSLDS
Very Selective	School selectivity is measured by Barron's Profile of American Colleges (2008). Very selective institutions are those classified by Barron's as "Very Competitive," "Highly Competitive," and "Most Competitive".	Barron's
Non-Selective	School selectivity is measured by Barron's Profile of American Colleges (2008). Non-selective institutions are those classified by Barron's as "Non-competitive."	Barron's
Cohort	Cohort or repayment year is defined by the fiscal year during which borrower's last loan enters in repayment, and all loans are in repayment.	NSLDS
Pell Recipient	Pell grants awarded are determined from Pell Grant records.	NSLDS
Grad. School	Indicator of whether student had graduate student loans to attend graduate school.	NSLDS
Black College	Black colleges are identified by the Department of Education Historically Black Colleges and Universities (HBCU), using the ownership control type of the first institution which the student attended when their first loan was originated.	NSLDS
Multiple Defaults	Indicator of whether a borrower defaults multiple times.	NSLDS
Children	Children are defined as the number of dependent children on the W-2 form.	CDW
Income	Income is defined as aggregate gross income (AGI). Income records are created from W-2 earnings.	CDW
Earnings	Earnings are defined as Medicare wages plus self-employment earnings. Earnings records are created from W-2 earnings.	CDW

Table 2: Summary Statistics

This table shows sample means and standard deviations for the analysis sample used in the main analysis. The three columns on the left, under the heading "Bankruptcy Sample" show sample means and standard deviations for variables used in the bankruptcy sample. The means are shown separately for the treatment and control groups. The treatment cohorts entered repayment between 1987 and 1990, before seven years prior to 1998 and are able to discharge loans in bankruptcy. The control cohorts entered repayment between 1991 and 1994, after seven years prior to 1998 and are unable to discharge loans in bankruptcy. The three columns on the right, under the heading "Garnishment Sample" show sample means and standard deviations for variables used in the garnishment sample. The means are shown separately for the treatment and control groups. The treatment group is defined as individuals with income above the garnishment threshold. The control group is defined as individuals with income below the garnishment threshold. Standard errors are shown in parentheses. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records.

	Bankruptcy Sample			Garnishment Sample		
	(1)	(2)	(3)	(1)	(2)	(3)
	Treatment	Control	Total	Treatment	Control	Total
Default	0.0144	0.0131	0.0136	0.0335	0.0626	0.0558
	(0.119)	(0.114)	(0.116)	(0.180)	(0.242)	(0.230)
Grad. School	0.122	0.116	0.118	0.130	0.0566	0.0737
	(0.327)	(0.320)	(0.323)	(0.337)	(0.231)	(0.261)
Children	1.052	0.958	0.969	0.511	0.672	0.631
	(1.193)	(1.129)	(1.137)	(0.890)	(0.987)	(0.965)
Black College	0.0121	0.0120	0.0120	0.0325	0.0372	0.0361
	(0.109)	(0.109)	(0.109)	(0.177)	(0.189)	(0.187)
For Profit	0.195	0.109	0.140	0.292	0.359	0.344
	(0.396)	(0.312)	(0.347)	(0.455)	(0.480)	(0.475)
Community College	0.0318	0.0248	0.0273	0.103	0.144	0.134
	(0.176)	(0.156)	(0.163)	(0.304)	(0.351)	(0.341)
Public 4-Year College	0.183	0.179	0.180	0.349	0.296	0.308
	(0.386)	(0.384)	(0.385)	(0.477)	(0.456)	(0.462)
Pell Recipient	0.0431	0.150	0.106	.1638	.1881	.1825
	(0.349)	(0.495)	(0.445)	(.1764)	(.1765)	(.1768)
Non-Selective	0.226	0.134	0.167	0.395	0.504	0.478
	(0.419)	(0.341)	(0.373)	(0.489)	(0.500)	(0.500)
Very Selective	0.265	0.256	0.260	0.430	0.318	0.344
	(0.441)	(0.437)	(0.438)	(0.495)	(0.466)	(0.475)
Income	58,277.8	59,855.0	59,657.6	36,789.2	14,512.3	19,712.7
	(49195.5)	(44986.7)	(45537.6)	(35194.4)	(47589.5)	(45978.5)
Income>$100k	0.0132	0.0480	0.0355	0.0000	0.0000	0.0000
	(0.114)	(0.214)	(0.185)	(0.000)	(0.000)	(0.000)
Multiple Defaults	0.0010	0.0021	0.0017	0.0316	0.0188	0.0218
	(0.032)	(0.046)	(0.042)	(0.175)	(0.136)	(0.146)
N			9,041,018			687,545

Table 3: Bankruptcy Filings and Discharge

This table shows bankruptcy filings and successful discharges by cohort, in their eighth year of repayment. The first column indicates the repayment cohort. The second column indicates the fraction filing for bankruptcy discharge in that cohort. The third column indicates the fraction of students discharging their loans in that cohort. The horizontal line indicates when cohorts became unable to discharge their loans in bankruptcy. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records.

	Year	
	(1)	(2)
Repayment Cohort	Bankruptcy Filings	Discharges
1985	0.0177	0.0109
1986	0.0215	0.0078
1987	0.0191	0.0084
1988	0.0179	0.0084
1989	0.0224	0.0102
1990	0.0173	0.0072
1991	0.0123	0.0067
1992	0.0059	0.0015
1993	0.0046	0.0006
1994	0.0042	0.0005
1995	0.0037	0.0002
1996	0.0038	0.0000
1997	0.0028	0.0000
1998	0.0028	0.0001
Total	0.0103	0.00393

Table 4: Bankruptcy Reform Results

This table shows results from variants of the following difference-in-difference specification, $\pi_{it} = \alpha_y + \alpha_i + \beta \mathbb{1}[y > 1998] * \mathbb{1}[C < 1991]_i + \alpha_1 X'_{it} + e_{it}$. The coefficient β measures the difference in new defaults between the treatment and control groups. The term α_y denotes repayment year fixed effects, and α_i fixed effects are noted beneath each specification. The treatment cohorts, denoted by dischargeable, entered repayment between 1987 and 1990, before seven years prior to 1998 and are able to discharge loans in bankruptcy. The control cohorts entered repayment between 1991 and 1994, after seven years prior to 1998 and are unable to discharge loans in bankruptcy. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. Prior to 1998 student loans were dischargeable in bankruptcy after seven years in repayment. Control variables are discussed further in table 1. The inclusion of fixed effects is denoted below the point estimates. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

	Default					
	(1)	(2)	(3)	(4)	(5)	(6)
Post X Dischargeable	0.00262***	0.00291***	0.00288***	0.00291***	0.00249***	0.00363***
	(0.000273)	(0.000273)	(0.000273)	(0.000273)	(0.000272)	(0.000148)
Dischargeable	-0.000339					
	(0.000240)					
Very Selective		-0.0104***		-0.00748***	-0.00196***	
		(0.000261)		(0.000309)	(0.000164)	
Non-Selective		0.00432***		0.00923***	0.00463***	
		(0.000311)		(0.00171)	(0.00132)	
For Profit			0.0142***	-0.00190	0.00387***	
			(0.000196)	(0.00167)	(0.00130)	
Community College			0.0180***	0.0111***	0.00691***	
			(0.000483)	(0.000569)	(0.000316)	
Public 4-Year College			0.00132***	0.000294	-0.000550***	
			(0.000191)	(0.000196)	(0.000121)	
Grad. School					-0.00411***	
					(0.000132)	
Children					0.0000669	
					(0.000233)	
Black College					0.00393***	
					(0.000480)	
Income>100k					0.00609***	
					(0.000210)	
Pell Recipient					0.00468***	
					(0.000126)	
Multiple Defaults					0.0215***	
					(0.00143)	
Repayment Year FE	Post	Year	Year	Year	Year	Year
Unit FE	None	Cohort	Cohort	Cohort	Cohort	Individual
R^2	0.004	0.008	0.008	0.009	0.076	0.117
Observations	9,041,018	9,041,018	9,041,018	9,041,018	9,041,018	9,041,018

Table 5: Income and Loan Default

This table shows the fraction of individuals who default within four years of entering repayment for the 2010 repayment cohort, broken down by bins of total household income. Income bins are shown in the left-most column, and are given in $10,000 intervals between $10,000 and $130,000. The middle column shows average household income in the interval, and the rightmost column shows the fraction of borrowers that default within four years of entering repayment. Total household income is measured in 2014, four years after borrowers have entered repayment. A loan is in default if a payment is more than 270 days overdue. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records.

Income Bin	**Total Income**	**Ever Default**
$10,000-$20,000	15,174.14	.448
$20,000 -$30,000	24,969.46	.345
$30,000-$40,000	34,828.39	.256
$40,000-$50,000	44,778.00	.195
$50,000-$60,000	54,765.67	.157
$60,000-$70,000	64,878.46	.132
$70,000-$80,000	74,849.79	.106
$80,000-$90,000	84,867.76	.088
$90,000-$100,000	94,826.70	.075
$100,000-$110,000	104,901.43	.076
$110,000-$120,000	114,822.52	.056
$120,000-$130,000	124,867.51	.045
Observations		84,359

Table 6: Wage Garnishment Reform Results

This table shows results from variants of the following difference in difference specification, $\pi_{it} = \alpha_i^1 + \alpha_t^2 + \omega_1[Inc > \overline{Inc}] + \omega[Inc > \overline{Inc}] \times \mathbb{1}[Post2006]_{it} + v_{it}$ The coefficient ω estimates the difference in new defaults for an additional $10,000 in garnishable income after the wage garnishment reform in 2006. In 2006 the rate at which wages above $\overline{Inc}$ are garnished was increased from 10% to 15%. The treatment is income above the garnishment threshold, $[Inc > \overline{Inc}]$, which can be garnished to collect on defaulted student loans. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. The inclusion of fixed effects is denoted below the point estimates. Control variables are discussed further in table 1. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

	Default					
	(1)	(2)	(3)	(4)	(5)	(6)
Post X	-0.00917***	-0.00829***	-0.00831***	-0.00828***	-0.00853***	-0.00546***
Garnishable Earnings	(0.000453)	(0.000454)	(0.000453)	(0.000454)	(0.000457)	(0.000528)
Garnishable Earnings	-0.00941***	-0.00828***	-0.00874***	-0.00823***	-0.00685***	-0.00860***
	(0.000410)	(0.000410)	(0.000410)	(0.000411)	(0.000433)	(0.000638)
Very Selective		-0.0206***		-0.0211***	-0.0146***	
		(0.000597)		(0.000600)	(0.000613)	
Non-Selective		0.0222***		-0.0356***	-0.0381***	
		(0.000600)		(0.00313)	(0.00318)	
For Profit			0.0383***	0.0622***	0.0647***	
			(0.000597)	(0.00317)	(0.00321)	
Community College			0.0332***	0.0569***	0.0586***	
			(0.000757)	(0.00321)	(0.00325)	
Public 4-Year College			0.00269***	0.00531***	0.00144**	
			(0.000572)	(0.000565)	(0.000566)	
Grad. School					-0.0200***	
					(0.000661)	
Children					-0.00611***	
					(0.000302)	
Black College					0.0211***	
					(0.00123)	
Pell Recipient					0.0146***	
					(0.000510)	
Repayment Year FE	Post	Year	Year	Year	Year	Year
Unit FE	None	Cohort	Cohort	Cohort	Cohort	Individual
Observations	687,545	687,545	687,545	687,545	687,545	687,545
R^2	0.007	0.014	0.014	0.015	0.016	0.003

Table 7: Heterogeneity

The first six columns show specifications using the bankruptcy reform. The main bankruptcy sample includes the treatment cohorts, denoted by dischargeable, which entered repayment between 1987 and 1990, before seven years prior to 1998 and are able to discharge loans in bankruptcy. The control cohorts entered repayment between 1991 and 1994, after seven years prior to 1998 and are unable to discharge loans in bankruptcy. The final four columns show specifications using the wage garnishment rate increase. In 2006 the rate at which wages above $\overline{Inc}$ are garnished was increased from 10% to 15%. The treatment is income above the garnishment threshold, $[Inc > \overline{Inc}]$, which can be garnished to collect on defaulted student loans. Interactions are denoted in the left-most column. "Pell" denotes recipients of Pell grants. "High Inc." denotes borrowers that earn more than $100,000. Balance denotes the outstanding loan balance, in $10,000s. The inclusion of controls, year fixed effects and cohort fixed effects is denoted beneath each specification. Controls include school selectivity indicators. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. Control variables are discussed further in table 1 Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

	Default									
	Bankruptcy Sample						Garnishment Sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post	0.00389***	0.00300***	0.00533***	0.00584***	0.00206***	0.00245***	-0.00942***	-0.00874***	-0.0100***	-0.00888***
X Dischargeable	(0.000321)	(0.000322)	(0.000523)	(0.000534)	(0.000273)	(0.000273)	(0.000551)	(0.000547)	(0.000805)	(0.000566)
Post X Pell	-0.00209***	-0.000283					-0.000370	0.000127		
X Dischargeable	(0.000252)	(0.000255)					(0.000761)	(0.000758)		
Post X High Inc.			-0.00287***	-0.00327***						
X Dischargeable			(0.000464)	(0.000478)						
Post X Balance					0.00130***	0.00106***			0.000155	0.0000502
X Dischargeable					(0.000188)	(0.000184)			(0.000202)	(0.0000864)
Year FE	Post	Year	Year	Year	Year	Year	Year	Year	Year	Year
Cohort FE		YES		YES		YES		YES		YES
Controls		YES		YES		YES		YES		YES
Observations	9,041,018	9,041,018	9,041,018	9,041,018	9,041,018	9,041,018	687,545	687,545	687,545	687,545

Table 8: Robustness

This table shows robustness results for the bankruptcy and garnishment samples. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. Each sample restriction is listed above the specification. The main bankruptcy sample includes the treatment cohorts, denoted by dischargeable, which entered repayment between 1987 and 1990, before seven years prior to 1998 and are able to discharge loans in bankruptcy. The control cohorts entered repayment between 1991 and 1994, after seven years prior to 1998 and are unable to discharge loans in bankruptcy. Columns (1) and (2) drop the 1987 cohort. Columns (3) and (4) drop the 1994 cohort. Columns (5) and (6) drop the 1990 and 1991 cohorts. Columns (7) and (8) drop borrowers in the first sample repayment year, and columns (9) and (10) drop borrowers in the final repayment year. The garnishment sample includes analogous robustness tests. In 2006 the rate at which wages above $\overline{Inc}$ are garnished was increased from 10% to 15%. The treatment is income above the garnishment threshold, $[Inc > \overline{Inc}]$, which can be garnished to collect on defaulted student loans. Columns (1) and (2) drop observations below half the garnishment threshold. Columns (3) and (4) drop observations with incomes above 125% of the garnishment threshold. Columns (5) and (6) drop borrowers within 10% of the garnishment threshold. Columns (7) and (8) drop borrowers in the first year included in the sample, 2001. Columns (9) and (10) drop borrowers in the final year included in the sample, 2010. The inclusion of fixed effects and controls are denoted below the point estimates. Control variables are discussed further in table 1. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

Bankruptcy Sample Robustness

	Default									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Drop First Cohort		Drop Last Cohort		Drop 90/91 Cohorts		Drop First Year		Drop Last Year	
Post X	0.00160***	0.00171***	0.00380***	0.00342***	0.00218***	0.00259***	0.00248***	0.00256***	0.00275***	0.00244***
Dischargeable	(0.000308)	(0.000308)	(0.000287)	(0.000284)	(0.000304)	(0.000306)	(0.000296)	(0.000296)	(0.000286)	(0.000284)
Observations	8,041,075	8,041,075	7,840,140	7,840,140	6,844,684	6,844,684	7,749,444	7,749,444	7,749,444	7,749,444
R^2	0.006	0.077	0.006	0.076	0.006	0.076	0.004	0.064	0.005	0.083

Garnishment Sample Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Drop <50% $\overline{Inc}$		Drop >125% $\overline{Inc}$		Drop +/- 10% $\overline{Inc}$		Drop First Year		Drop Last Year	
Post X	-0.0107***	-0.0103***	-0.0161***	-0.0132***	-0.00897***	-0.00807***	-0.00994***	-0.00921***	-0.0103***	-0.00969***
Garnishable	(0.000515)	(0.000517)	(0.00213)	(0.00212)	(0.000458)	(0.000461)	(0.000475)	(0.000477)	(0.000498)	(0.000499)
Cohort	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE
Year	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE
Controls		YES		YES		YES		YES		YES
Observations	366,821	366,821	602,666	602,666	507,877	507,877	636,977	636,977	605,281	605,281
R^2	0.010	0.016	0.007	0.015	0.009	0.018	0.009	0.017	0.011	0.019

Table 9: Placebo Results

This table shows placebo results, simulating bankruptcy and wage garnishment reforms. The first four columns simulate placebo bankruptcy reforms, while the last four columns simulate placebo wage garnishment reforms. Columns (1) and (3) simulate a placebo reform that affected the fifth year of repayment, in which all borrowers could not discharge their loans in bankruptcy. Columns (2) and (4) simulate a placebo reform that compares the 1991 and 1992 cohorts to other control cohorts. Columns (5) and (7) simulate a placebo reform in 2003, three years prior to the actual reform. The sample is restricted to years prior to the reform. Columns (6) and (8) simulate a placebo reform at a value 50% below the actual threshold value. The sample is restricted to individuals below the garnishment threshold. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. The inclusion of fixed effects is denoted below the point estimates. Control variables are discussed further in table 1. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

Bankruptcy Placebos

	Default			
	(1)	(2)	(3)	(4)
Post X Dischargeable	0.000548	0.000543	0.000829	-0.000167
	(0.000505)	(0.000344)	(0.000505)	(0.000344)
Controls	YES	YES	YES	YES
Year	Dummy	Dummy	FE	FE
Unit	Dummy	Dummy	FE	FE
R^2	0.099	0.011	0.099	0.079
Observations	5,166,296	5,810,308	5,166,296	5,810,308

Garnishment Placebos

	Default			
	(5)	(6)	(7)	(8)
Post X Dischargeable	0.000279	0.01623	0.00018	0.01098
	(0.000791)	(0.04235)	(0.000702)	(0.0422521)
Controls	YES	YES	YES	YES
Year	Dummy	Dummy	FE	FE
Unit	Dummy	Dummy	Earnings	Earnings
R^2	0.008	0.008	0.010	0.010
Observations	305,323	114,271	305,323	114,271

A Student Loan Default, Bankruptcy and Wage Garnishment

This appendix provides additional information and institutional details regarding the process of student loan default, bankruptcy and wage garnishment and various reforms which affected each procedure. Section A.1 discusses the default process and recording default in the NSLDS, section A.2 discusses student loan bankruptcy reforms and eligibility and A.3 discusses the wage garnishment process and borrower protections.

A.1 Default

A student loan becomes delinquent once a borrower misses a payment. Loan servicers are required to report delinquencies to credit bureaus after a payment is more than 90 days overdue. A loan goes into default if a payment is more than 270 days overdue.[21] After a student loan goes into default loan servicers are required to report the default to the NSLDS within 90 days. Once a loan goes into default, it is assigned to a collection agency. Defaulted borrowers' balances are owed in full, they lose eligibility for federal student aid in the future, are subject to collection fees, credit scores are impacted, tax refunds are withheld and wages can be garnished. Balances typically increase due to additional interest and collection fees. The garnishment process is discussed later in this section.

Table A.1 indicates events that occur after a student loan payment is missed and a loan becomes delinquent. It takes approximately nine months for a loan to go into a default after a payment is missed, and almost one year from a payment being missed for a default to enter the NSLDS. After a payment is missed, loan servicers begin assessing late fees between 15 to 30 days from the date that the payment is missed. Between 30 to 90 days of a missed payment, servicers contact borrowers via phone and email to let them know that a payment is missed and the consequences of loan non-repayment. After 90 days the servicer is required to report the delinquency to credit bureaus, and borrowers' credit scores suffer. Between 90 and 240 days, lenders continue to assess fees and remind the borrower that payments are due and that default has serious consequences. After 240 days in default the loan servicers send the borrower a final notice requesting full payment of the balance within 30 days. If the loan is not paid in full after the final notice, the loan goes into default 270 days after the initial missed payment. Default entails significant additional consequences, including the assessment of collection costs, withholding tax refunds and wage garnishment.

Borrowers can get out of default by paying a loan in full, loan rehabilitation, or loan consolidation. The simplest way to get out of default is to pay the balance owed in full, along with additional accrued interest and collection fees. Borrowers can also rehabilitate loans by making nine monthly payments within 20 days of the due date, and make those payments in a period of 10 months. For lower income borrowers, who face *partial financial hardship*, monthly payments under loan rehabilitation can be reduced. Once the loan is rehabilitated, the default status is removed and borrowers will become eligible for deferment, forbearance, alternative repayment plans and other repayment options. Additionally, credit agencies are instructed to remove the record of default. A third option for getting a loan out of default status is loan consolidation. Loan consolidation allows borrowers to pay off multiple loans with

[21] If a payment plan is not on a monthly schedule, which is rare, a student loan goes into default after a payment is 330 days overdue.

a single new loan. In order to qualify for consolidation borrowers must have three consecutive, on-time, and full monthly payments.

Recovery rates on defaulted loans vary during the time period studied, largely due to variation in wage garnishment rates and bankruptcy discharge, which is discussed in the next two subsections. Once collection costs and net present value are factored, the Department of Education (2014) estimates recovery rates to be around 75-85% in 2014 and Lucas and Moore (2010) estimate recovery rates closer to 50% in the early 2000s. Recovery rates on student loans were broadly similar to recovery rates on mortgage loans during the 2000s.[22]

A.2 Bankruptcy

Prior to 1976, student loans were treated under bankruptcy like other consumer debt. Students could file for bankruptcy and under Chapter 7 liquidate their debts, or under Chapter 13 reorganize debts. Under Chapter 7 borrowers liquidate their assets to repay debts. Student loans were considered unsecured debt similar to credit card debt, and were typically discharged under Chapter 7 which is the most common form of consumer bankruptcy in the United States. Under Chapter 13 borrowers could retain assets and pay a portion of future income to repay a portion of their debts. In 1976 the discharge of government student loans was precluded for a period of five years from the borrower first entering repayment, following the recommendation of the Report of the Commission on the Bankruptcy Laws of the United States (1973). The report noted strategic default as threatening the survival of student loan programs. The regulations took effect in 1978 under The Bankruptcy Reform Act of 1978 (P.L. 95-598). In 1990 an amendment to the Crime Control Act of 1990 (P.L. 101-647, 11/29/1990) increased the period during which loans were non-dischargeable from five to seven years.

The Higher Education Amendments of 1998 (P.L. 105-244) repealed student loan bankruptcy provisions after the seventh year of repayment. The reform took effect on October 7, 1998. Following the 1998 reform, student loans became dischargeable in bankruptcy only in cases that "*impose an undue hardship on the debtor and the debtor's dependents*." *Undue hardship* is defined by section 11 USC 523(a)(8) of the U.S. Bankruptcy Code, and undue hardship petitions are granted only in rare cases and only after an adversarial court proceeding. Courts determine undue hardship through the "Brunner test" under which borrowers must show that their students debts lead borrowers to be unable to maintain a minimal standard of living, are subject to long term conditions making the borrower unable to pay debts, such as illness or disability, and have made a good faith effort to repay debts. The undue hardship criteria is very strict. In 2008 only 0.04% student loan borrowers who filed for bankruptcy succeeded in obtaining full or partial discharge, and in 2007 just 71 borrowers achieved full or partial bankruptcy discharge (Iuliano, 2012) out of nearly 30 million student loan borrowers in that year. The undue hardship provision for student loan discharge has existed since the first restrictions on student loan bankruptcy protection in 1976, where P.L. 95-598 stated that students' loans were non-dischargeable in bankruptcy unless *"such loan first became due before five years before the date of the filing of the petition"* or *"excepting such debt from discharge under this paragraph will impose an undue hardship on the debtor and the debtor's dependents."* There are some rare cases under which debts are discharged, for example

[22] For example, Downs and Xu (2015) estimate that mortgage loans have an average recovery rate of approximately 70%.

if a school uses deceptive recruiting practices or if a school goes out of business, education debts are forgiven.

Figure A.2 shows that the reform was indeed binding, and presents time series evidence of bankruptcy filings and discharges from the NSLDS. The figure shows bankruptcy filings and discharges by each year and repayment cohort. This evidence can be thought of as a first stage for the 1998 bankruptcy discharge reform, that affected repayment rates. The dashed line in each panel shows the fraction of loans that filed for bankruptcy or were discharged, respectively. The top panels show bankruptcy filings and discharges in each year. The bottom panels show bankruptcy filings and discharges by repayment cohort, in their eighth year of repayment. The left panels show filings, while the right panel shows discharges. In the top panel, the vertical solid line shows 1999, after which loans could only be discharged if undue hardship was proven in court, which is extremely difficult even in the face of extreme difficulties via the standard Brunner test used by courts.[23] In the bottom panels, the solid vertical line shows the 1992 repayment cohort which reached their seventh year of repayment after the 1998 bankruptcy reform, and consequently was unable to discharge loans in bankruptcy.

A.3 Garnishment

Student loan wage garnishment was introduced in 1991 through an amendment to the Higher Education Act of 1965 made by the Emergency Unemployment Compensation Act (P.L. 102-164). As was noted in section 2.2, during this time period default rates were at historic highs, and wage garnishment was explicitly introduced with strategic default by borrowers in mind. The aim was to reduce opportunistic behavior and recover defaulted loans. Effectively wage garnishment collateralizes the student loan via a borrower's future earnings stream. Initially 10% of disposable pay could be garnished. Effective in 2006, the Deficit Reduction Act of 2005 (P.L. 109-171, 2/8/2006) raised the garnishment rate from 10 to 15%. The amount garnished can only exceed the statutory rate with the written consent of the defaulted borrower. In addition to Administrative Wage Garnishment, defaulted student borrowers can have their tax refunds withheld via the Treasury Offset Program. In 2015, approximately $600 million in wages were garnished to recover defaulted student loans.[24]

Garnishment can occur to collect on any number of debts. However, student loan wage garnishment differs as it can take place without a court order. Wage garnishment is regulated by Title III of the Consumer Credit Protection Act. The Department of Labor regulates and issues guidelines for wage garnishment. In the case of multiple garnishments, student loan debt takes precedence over other types of debt, with the exception of child support and IRS levies. Federal law requires that no more than 25% in total of a borrower's disposable income be garnished through multiple garnishments, and this

[23] For example, in Pennsylvania Higher Education Assistance Agency v. Faish 1994 the United States Third Circuit Court of Appeals states: *"[Faish] earns a yearly gross salary of approximately $27,000.00. Faish does not own an automobile and commutes to and from work by bus. She has been unsuccessful in her pursuit of a higher-paying job. Faish is thirty-years-old, unmarried and has an eleven-year- old son. Faish does not receive any child support payments from the father of her child. She is concerned about the quality of the neighborhood and school district that she lives in and is now saving money for an automobile and a new apartment in a better area. Faish suffers from Crohn's disease, a chronic condition affecting the bowel. She also has back problems. The bankruptcy court found, however, that although Faish's health problems are "significant," they "are not interfering with her ability to work... We further hold that Faish has failed to satisfy her burden to establish undue hardship under the Brunner standard and that her entire student- loan obligation is nondischargeable."*

[24] The Department of Education and the Department of Labor provide further information about the garnishment process and wage garnishment rules.

could affect student loan garnishment amounts if the borrower's wages are garnished for child support. Garnishment for federal debts is not subject to state garnishment law. Employers are prohibited from sacking employees due to federal wage garnishment and only wages above an individual's disposable pay can be garnished. Employees subject to wage garnishment can sue their employers for damages if they are fired due to wage garnishment. Additionally employers can face fine or jail time for sacking employees due to garnishment.

Since 1996 and the Debt Collection Improvement Act of 1996 (P.L. 104-134, 4/26/1996), social security income has been subject to wage garnishment. In 2001 the Department of Education began garnishing social security retirement and disability benefits, and the Supreme Court upheld the ability to garnish these payments in Lockhart v. US, 2005. Disposable earnings are defined as the amount left after legally required deductions are made. Additionally, weekly wage garnishment levels cannot exceed the difference between disposable pay and 30 times the federal minimum wage. Weekly levels are adjusted for alternative payment periods. For example, in 2009 wages above $435 bi-weekly and $942.5 monthly (based on 130 hours) could be garnished. In the same year, borrowers who earn $1,256.66 or more monthly are subject to the maximum garnishment rate.

Garnishment law requires that individuals be provided with written notice a minimum of 30 days prior to the beginning of garnishment proceedings. The notice must be sent to the last known address of borrowers, and it must inform borrowers of the loan amount due, how to obtain loan records, the intention of garnishment and borrowers' rights under the Consumer Credit Protection Act, including the right to a hearing if the borrower wishes to challenge the validity of the garnishment or debt. A final hearing must be conducted by an administrative law judge and a final ruling is issued within sixty days of the petition being filed. Borrowers are also given the opportunity to enter into a written agreement with the Department of Education to avoid wage garnishment and pay back their loans.

After borrowers are notified of the garnishment proceeding, a letter is sent to the defaulted borrowers' employers with instructions for garnishment withholding and a worksheet. Letters also note noncompliance costs, and if an employer does not comply with the garnishment order, the employer is liable for the defaulted student debt and any legal costs that are incurred due to non-compliance. In practice, self-employed individuals are often not subject to wage garnishment. Employers are required to complete an acknowledgement of wage withholding within 20 days of receipt, and are required to withhold earnings and remit them to the Department of Education or collection agency via a check or payment that includes the defaulted borrower's information. Employers are required to continue garnishment until they receive a *Release of Order of Withholding from Earnings* form. If a borrower subject to garnishment separates from employment, the employer is required to notify the Department of Education within 10 days and provide, if known, the borrowers last known address and the new employer.

B Data Appendix

B.1 Student Loan Data

The main data source used in this sample is the National Student Loan Data System or the NSLDS. The NSLDS is the primary national database for information about student loans awarded under Title IV of the Higher Education Act of 1965. The NSLDS contains the vast majority of student loans awarded

in the US, which are guaranteed by the federal government and hence contains billions of observations of hundreds of millions in disbursed student loans. As of January 2014, the NSLDS contained more than 31.7 billion records concerning 84,629,538 students and 386,943,660 loans. The analysis sample is constructed from a US Department of the Treasury 4% sample of the NSLDS for budgeting purposes, as repayment on guaranteed student loans impacts federal budgeting. The sample is a panel, and sampling is discussed later in this section. The raw loan and demographic data is used to construct a person-by-year individual panel at the close of each federal fiscal year, which is linked to administrative tax data. The Department of Education is legally required to administer the NSLDS as part of the Higher Education Act of 1965. The purpose of the NSLDS is to create a centralized database to assist the federal government in the administration of student loan programs. Educational records exist from 1970 to 2015. Perkins loans are not included in the sample, and private student loans are not included in the analysis sample unless they were federally guaranteed and made under the FFEL program. Looney and Yannelis (2015) provide further discussion of the data sources used and patterns over time.

The NSLDS was created to improve the quality and accessibility of student financial aid data, to reduce the administrative burden of Title IV aid and to minimize abuses within aid programs by tracking funds awarded to students. The NSLDS is used to assist schools to determine individual eligibility for Title IV aid programs, calculate performance measures for schools such as cohort default rates which determine eligibility for federal programs, data collection for Title IV administration, track enrollment, disseminate information to loan holders, calculate fees to guaranty agencies, check invoices submitted by participants in loan programs, and supply data to the Department of Education and other government and non-government offices for purposes such as program management and oversight, audit program review planning, research and policy development and budget analysis and development.

Schools, lenders, guaranty agencies and servicers are required to report loan data to the NSLDS within 30 to 120 days of new information arriving, depending on the information. For example, schools are required to report changes in enrollment within 30 days of a status change, outstanding balances are reported within 120 days of loans being disbursed, and as is discussed in section A.1, servicers are required to report defaults within 90 days of a loan entering default. Updates historically were done by mail but today are usually done online.

The NSLDS file has been matched to information from the Free Application for Federal Student Aid (FAFSA), which all recipients of federal direct or federally guaranteed student loans are required to fill out. The FAFSA contains detailed information on student demographics and family backgrounds. Missing demographic and control variables are coded as zero. All demographic information is obtained for the last FAFSA that a student files. The NSLDS was also matched to Pell grant records. The Pell grant is the largest federal grant program, and provides grants to students from low-income families.

School types are identified by the ownership control type of the first institution where a student borrowed. Control is defined by ownership type and the degree granting status of the institution attended. School types are defined as for-profit (proprietary) two-year or less, for-profit, four year and higher, public two-year or less, public four-year and higher, private two-year or less, and private four-year and higher. In addition to ownership control type, school selectivity data is obtained from Barron's Profile of American Colleges (2008), which is discussed in a subsequent subsection.

B.1.1 Sampling

The main analysis sample used in this paper is a 4% sample of the full NSLDS used by the Treasury. The sample is a randomly drawn panel, and the sampling methodology ensures a random and representative distribution of NSLDS records. The sample is drawn using Poisson sampling and the last three digits of a student's social security number. The last three digits of an individual's social security number contain 1,000 possible combinations, and of these 40 were selected at random. A Kolmogorov-Smirnov test was used to determined whether the random variable derived from the sample follows a uniform distribution. There was no significant difference between the sample and the hypothesized uniform distribution at conventional significance levels.

Given the randomized framework of construction, the sample of the NSLDS is thus representative of the student borrower population, with the caveat that direct private student loans are not observed. However, direct private student loans are a small portion of total borrowing, especially before the 2005 Bankruptcy Abuse and Consumer Protection Act.[25] Direct parent student loans (PLUS loans) are also in the NSLDS, however if parents take on private loans such as mortgage or other loans to finance educational expenses, this will be unobserved. The analysis sample focuses on direct student loans and does not include parent loans. Parent loans potentially differ greatly from direct student loans given that students' parents typically have assets, collateral and incomes when making borrowing decisions.

B.2 Tax Data

The student loan data has been matched to administrative tax data from the Compliance Data Warehouse, which has been been digitized ftom 1999 to 2015. The source of the tax data is W-2 returns. Income is measured at the tax unit level (household) while earnings is measured at the individual level. Earnings are defined as Medicare wages plus self-employment earnings. Information on dependent children and family size is also obtained from tax records. In the main analysis, federal poverty guidelines are defined by the the Department of Health and Human Services. Earnings and family size are determined by tax returns using the CDW.

B.3 Selectivity Measures

Barron's Profile of American Colleges (2008) classifies schools in terms of selectivity based on six categories, which are not competitive, less competitive, competitive, very competitive, highly competitive, and most competitive. The categories primarily are defined based on the fraction of students admitted. Most competitive schools admit less than 33% of applicants, and included schools ranging from Stanford to the University of Florida. Schools classified as highly competitive admit between 33 and 50% of applicants, and include schools such as Clemson or Northeastern University. Schools that are classified as very competitive admit between 50 and 75% of applicants, and include schools such as Ohio State University and the University of Arizona. School that are classified as competitive admit between 75 and 85% of applicants, and include schools such as Alabama State and Temple University. Schools

[25] Even after BAPCA, in recent years over 90% of student loans were disbursed directly or guaranteed by the federal government. Prior to 2005 the number of private student loans not guaranteed by the federal government was extremely low. The fraction of private student loans has varied from less than 1% prior to the 1994-1995 academic year to a high of 14% in the 2007-2008 academic year.

that are considered less competitive have some selection, but admit more than 85% of applicants and include schools such as Indiana State and several Cal State schools. The lowest selectivity ranking is non-competitive, and these schools admit almost any student that graduates high school. Most for-profits and community colleges are non-selective. All two-year institutions are classified as non-competitive.

Figure A.1: Individual Trends Prior to Bankruptcy Reform

This figure shows the fraction of individuals defaulting in each year after repayment for cohorts used in the main analysis. Cohorts are noted above each figure. The horizontal axis denotes the year in which a loan is in repayment. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. Prior to 1998 student loans becomes dischargeable in bankruptcy after seven years in repayment. All data comes from a 4% random sample of the NSLDS.

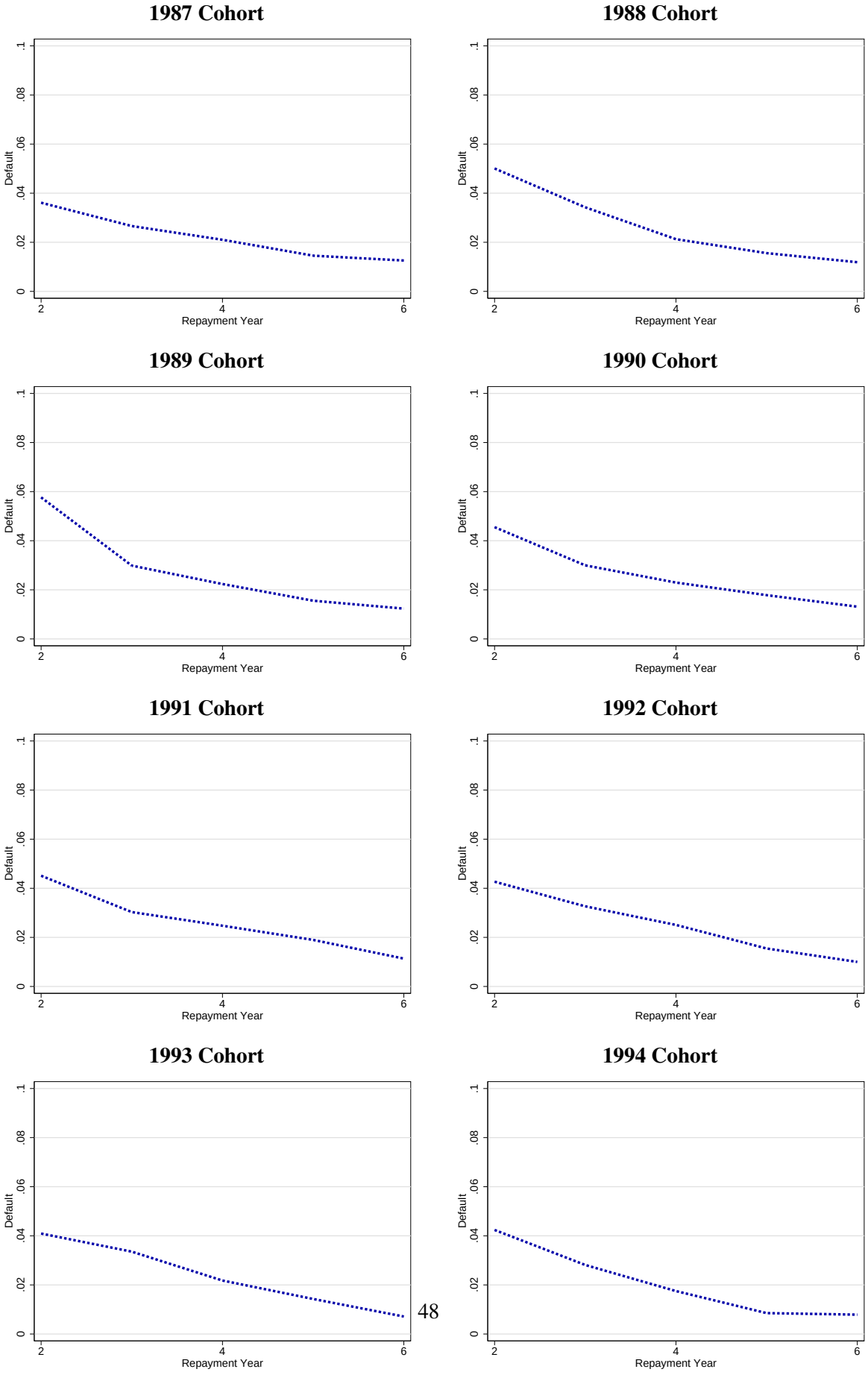

Figure A.2: Bankruptcy Claims and Discharges

The figures show bankruptcy filing and discharges by year and repayment cohort. The dashed line in each panel shows the fraction of loans that filed for bankruptcy or were discharged. The top panel shows bankruptcy filings and discharges by year. The bottom panel shows bankruptcy filings and discharges by repayment cohort, in their eighth year of repayment. The left panels show filings, while the right panel shows discharges. In the top panel, the vertical solid line shows 1999, after which loans could only be discharged if *undue hardship* was proven in courts. In the bottom panel, the vertical line shows the1992 repayment cohort which reached their seventh year of repayment after the 1998 bankruptcy reform, and consequently was unable to discharge loans in bankruptcy. Bankruptcy claims and discharges come from available claims code in the NSLDS. All data comes from a 4% sample of the NSLDS.

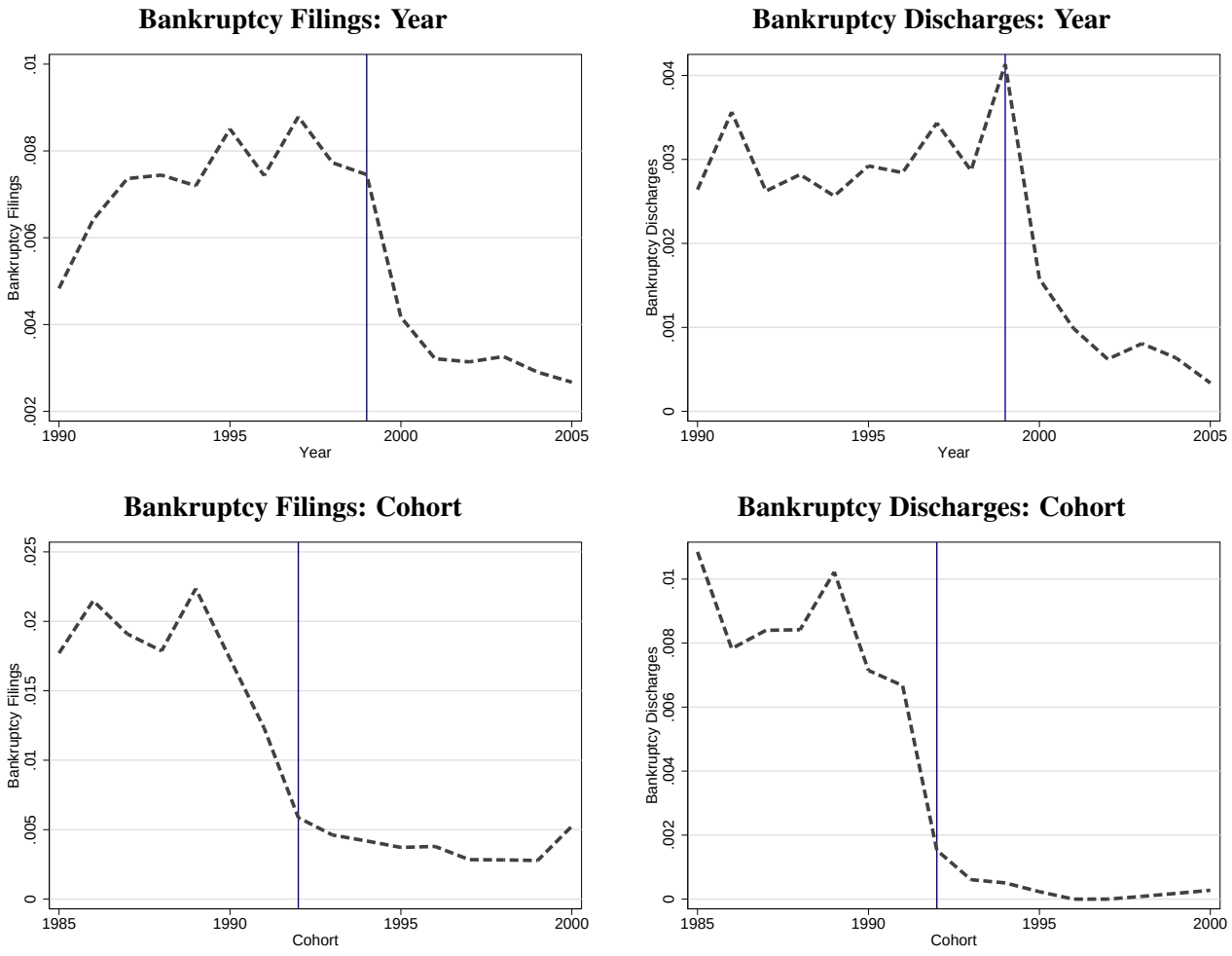

Figure A.3: Earnings Histogram

This figure shows the distribution of earnings for borrowers between 2001 and 2010. Borrowers are included whose earnings are between zero and $50,000, and whose loans are in repayment. All data comes from a 4% sample of the NSLDS matched to de-identified tax records from the CDW.

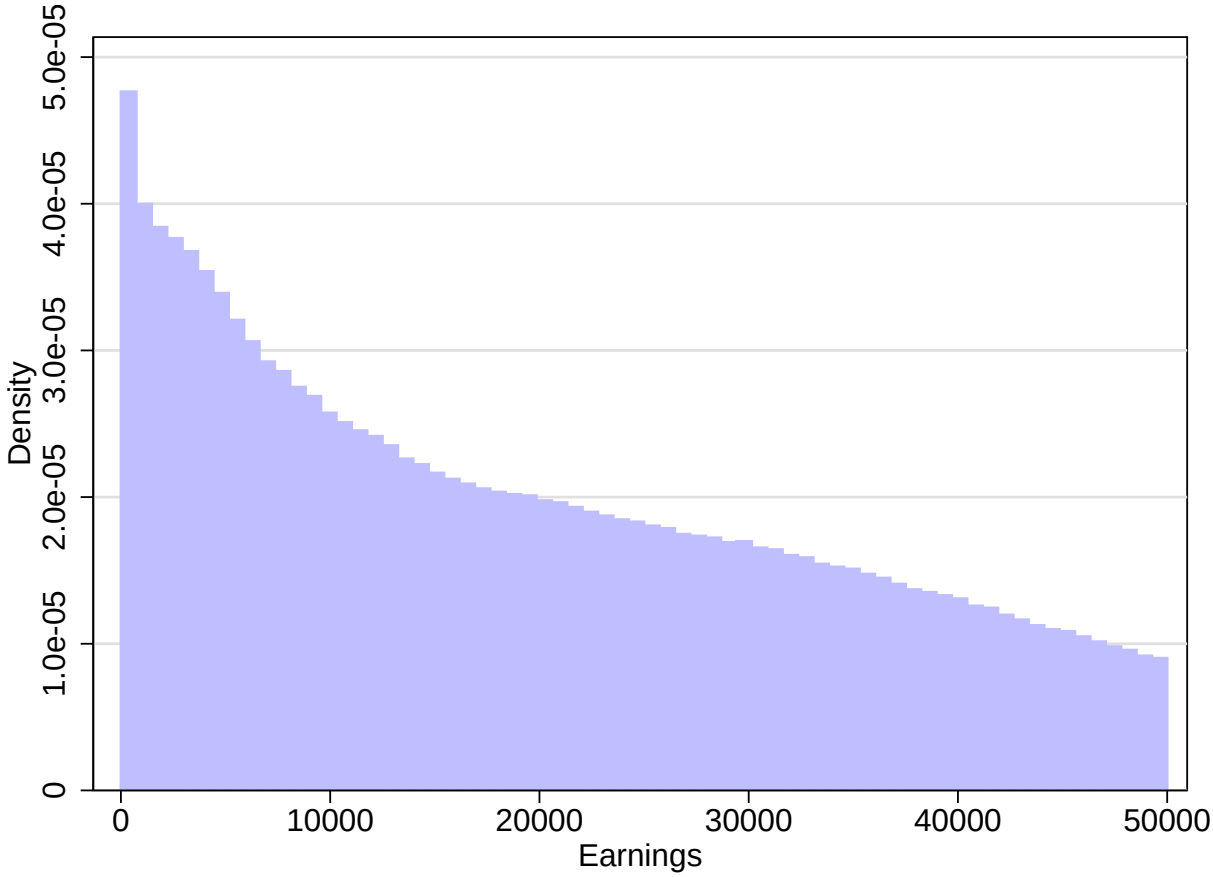

Table A.1: Delinquency and Default Timeline

This figure shows the timeline leading up to default of events after a borrower misses a payment, for borrowers on a standard monthly repayment plan. The left column shows the days since the first payment is missed and a loan becomes delinquent. The right hand column describes the events occurring during the period denoted in the columns on the left.

Days Since Default	Events
Days 0-15	Payment is missed and loan in delinquent.
Days 30-90	Servicers contact borrowers via phone and email. Borrowers are informed of default consequences.
Day 90	Servicers are required to report default to credit agencies. Borrowers' credit scores are impacted.
Days 90 to 240	Servicers continue to assess fees and contact delinquent borrowers.
Day 240	Servicers send the borrower a final notice requesting full payment of the balance within 30 days.
Day 270	Loan goes into default. Assessment of collection costs, withholding tax refunds and wage garnishment process begins.
Day 360	Loan servicer is required to report default to NSLDS within 90 days of default occurring.

Table A.2: Bankruptcy Reform Results Probit

This table shows results from a probit specification variant of the difference-in-difference specification in the main text. The coefficient β measures the difference in new defaults between the treatment and control groups. The term α_y denotes repayment year fixed effects, and α_i fixed effects are noted beneath each specification. The treatment cohorts, denoted by dischargeable, entered repayment between 1987 and 1990, before seven years prior to 1998 and are able to discharge loans in bankruptcy. The control cohorts entered repayment between 1991 and 1994, after seven years prior to 1998 and are unable to discharge loans in bankruptcy. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. Prior to 1998 student loans were dischargeable in bankruptcy after seven years in repayment. Control variables are discussed further in table 1. The inclusion of fixed effects is denoted below the point estimates. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

	(1)	(2)	(3)	(4)	(5)
Post X Discharge Available	0.119***	0.127***	0.126***	0.127***	0.142***
	(0.00757)	(0.00778)	(0.00777)	(0.00778)	(0.00869)
Discharge Available	-0.00632				
	(0.00448)				
Very Selective		-0.216***		-0.209***	-0.100***
		(0.00686)		(0.00711)	(0.00478)
Non-Selective		0.142***		-3.360	-2.835***
		(0.00694)		(3.054)	(0.552)
For Profit			0.332***	3.505	3.082***
			(0.00417)	(3.051)	(0.554)
Community College			0.392***	3.564	3.002***
			(0.00764)	(3.054)	(0.553)
Public 4-Year College			0.0583***	0.0279***	-0.0116***
			(0.00582)	(0.00603)	(0.00425)
Grad. School					-0.177***
					(0.00544)
Children					-0.0182***
					(0.00387)
Black College					0.123***
					(0.00962)
Income>100k					0.0338***
					(0.00618)
Pell Recipient					0.0826***
					(0.00397)
Observations	9,041,018	9,041,018	9,041,018	9,041,018	9,041,018

Table A.3: Bankruptcy Reform Results Logit

This table shows results from a logit specification variant of the difference-in-difference specification in the main text. The coefficient β measures the difference in new defaults between the treatment and control groups. The term α_y denotes repayment year fixed effects, and α_i fixed effects are noted beneath each specification. The treatment cohorts, denoted by dischargeable, entered repayment between 1987 and 1990, before seven years prior to 1998 and are able to discharge loans in bankruptcy. The control cohorts entered repayment between 1991 and 1994, after seven years prior to 1998 and are unable to discharge loans in bankruptcy. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. Prior to 1998 student loans were dischargeable in bankruptcy after seven years in repayment. Control variables are discussed further in table 1. The inclusion of fixed effects is denoted below the point estimates. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

	(1)	(2)	(3)	(4)	(5)
Post X Discharge Available	0.330***	0.345***	0.344***	0.345***	0.339***
	(0.0202)	(0.0202)	(0.0202)	(0.0202)	(0.0219)
Discharge Available	-0.0154				
	(0.0109)				
Very Selective		-0.542***		-0.526***	-0.176***
		(0.0169)		(0.0175)	(0.0102)
Non-Selective		0.349***		-12.05	-19.68
		(0.0168)		(11.93)	(.)
For Profit			0.828***	12.41	20.14***
			(0.0104)	(11.93)	(0.0116)
Community College			0.954***	12.54	19.97***
			(0.0179)	(11.94)	(0.0153)
Public 4-Year College			0.142***	0.0640***	-0.0252***
			(0.0148)	(0.0154)	(0.00931)
Grad. School					-0.366***
					(0.0123)
Children					-0.0405***
					(0.00885)
Black College					0.204***
					(0.0192)
Income>100k					0.0398***
					(0.0142)
Pell Recipient					0.129***
					(0.00869)
Observations	9,041,018	9,041,018	9,041,018	9,041,018	9,041,018

Table A.4: Wage Garnishment Reform Results Probit

This table shows results from probit variants of the following difference in difference specification in the main text. The coefficient ω estimates the difference in new defaults for an additional \$10,000 in garnishable income after the wage garnishment reform in 2006. In 2006 the rate at which wages above $\overline{Inc}$ are garnished was increased from 10% to 15%. The treatment is income above the garnishment threshold, $[Inc > \overline{Inc}]$, which can be garnished to collect on defaulted student loans. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. The inclusion of fixed effects is denoted below the point estimates. Control variables are discussed further in table 1. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

	(1)	(2)	(3)	(4)	(5)
Post X Discharge Available	-0.0692***	-0.0645***	-0.0643***	-0.0647***	-0.0673***
	(0.00777)	(0.00806)	(0.00800)	(0.00807)	(0.00832)
Garnishable Earnings	-0.119***	-0.119***	-0.123***	-0.118***	-0.105***
	(0.00939)	(0.00853)	(0.00842)	(0.00876)	(0.00780)
Very Selective		-0.226***		-0.234***	-0.167***
		(0.00626)		(0.00632)	(0.00652)
Non-Selective		0.168***		-0.936***	-0.980***
		(0.00497)		(0.327)	(0.325)
For Profit			0.329***	1.150***	1.190***
			(0.00577)	(0.327)	(0.325)
Community College			0.295***	1.115***	1.147***
			(0.00668)	(0.327)	(0.325)
Public 4-Year College			0.0328***	0.0668***	0.0287***
			(0.00655)	(0.00656)	(0.00658)
Grad. School					-0.336***
					(0.0127)
Children					-0.0526***
					(0.00283)
Black College					0.183***
					(0.00969)
Income>100k					-0.440***
					(0.0388)
Pell Recipient					0.140***
					(0.00530)
Observations	687,545	687,545	687,545	687,545	687,545

Table A.5: Wage Garnishment Reform Results Logit

This table shows results from logit variants of the following difference in difference specification in the main text. The coefficient ω estimates the difference in new defaults for an additional $10,000 in garnishable income after the wage garnishment reform in 2006. In 2006 the rate at which wages above $\overline{Inc}$ are garnished was increased from 10% to 15%. The treatment is income above the garnishment threshold, $[Inc > \overline{Inc}]$, which can be garnished to collect on defaulted student loans. A loan is in default if a payment is more than 270 days overdue, and the outcome measures new defaults. The inclusion of fixed effects is denoted below the point estimates. Control variables are discussed further in table 1. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

	(1)	(2)	(3)	(4)	(5)
Post X Discharge Available	-0.138***	-0.120***	-0.120***	-0.120***	-0.127***
	(0.0181)	(0.0187)	(0.0186)	(0.0187)	(0.0191)
Garnishable Earnings	-0.285***	-0.277***	-0.286***	-0.275***	-0.246***
	(0.0197)	(0.0187)	(0.0185)	(0.0191)	(0.0172)
Very Selective		-0.499***		-0.514***	-0.368***
		(0.0137)		(0.0138)	(0.0142)
Non-Selective		0.347***		-2.530**	-2.603***
		(0.0104)		(0.984)	(0.979)
For Profit			0.693***	2.974***	3.032***
			(0.0126)	(0.984)	(0.979)
Community College			0.624***	2.902***	2.945***
			(0.0143)	(0.984)	(0.979)
Public 4-Year College			0.0727***	0.143***	0.0604***
			(0.0145)	(0.0143)	(0.0142)
Grad. School					-0.790***
					(0.0305)
Children					-0.107***
					(0.00593)
Black College					0.379***
					(0.0199)
Income>100k					-1.068***
					(0.0971)
Pell Recipient					0.292***
					(0.0114)
Observations	687,545	687,545	687,545	687,545	687,545

Table A.6: Bankruptcy Reform Results Logit

This table shows results from the difference in difference specification in the main text, with the outcome being the fraction of the initial balance repaid. The coefficient β measures the difference in the share on the initial balance repaid between the treatment and control groups. The term α_y denotes repayment year fixed effects, and α_i fixed effects are noted beneath each specification. The treatment cohorts, denoted by dischargeable, entered repayment between 1987 and 1990, before seven years prior to 1998 and are able to discharge loans in bankruptcy. The control cohorts entered repayment between 1991 and 1994, after seven years prior to 1998 and are unable to discharge loans in bankruptcy. The outcome measures the share of the initial balance repaid. A dummy is included for balance that have been fully repaid. Prior to 1998 student loans were dischargeable in bankruptcy after seven years in repayment. Control variables are discussed further in table 1. The inclusion of fixed effects is denoted below the point estimates. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

	(1)	(2)	(3)	(4)	(5)
Post X Discharge Available	-0.00980***	-0.00873***	-0.00874***	-0.00869***	-0.00952***
	(0.000744)	(0.000749)	(0.000749)	(0.000749)	(0.000735)
Discharge Available	-0.00291***				
	(0.00104)				
Very Selective		-0.0779***		-0.0775***	-0.0677***
		(0.00223)		(0.00224)	(0.00215)
Non-Selective		0.0710***		0.0592	0.0931
		(0.00217)		(0.0565)	(0.0592)
For Profit			0.132***	0.0161	0.00648
			(0.00172)	(0.0565)	(0.0592)
Community College			0.0877***	-0.0284	-0.0473
			(0.00282)	(0.0566)	(0.0592)
Public 4-Year College			-0.0112***	-0.00652***	-0.00514***
			(0.00190)	(0.00189)	(0.00178)
Grad. School					0.0506***
					(0.00197)
Children					-0.0341***
					(0.00101)
Black College					0.124***
					(0.00493)
Income>$100k					-0.0845***
					(0.00146)
Pell Recipient					0.0128***
					(0.00243)
Observations	9041018	9041018	9041018	9041018	9041018
R^2	0.759	0.769	0.768	0.769	0.778

Table A.7: Wage Garnishment Reform Results Repayment Balance

This table shows results from the difference in difference specification in the main text, with the outcome being the fraction of the initial balance repaid. The coefficient ω estimates the difference in balance repaid for an additional \$10,000 in garnishable income after the wage garnishment reform in 2006. In 2006 the rate at which wages above $\overline{Inc}$ are garnished was increased from 10% to 15%. The treatment is income above the garnishment threshold, $[Inc > \overline{Inc}]$, which can be garnished to collect on defaulted student loans.The outcome measures the share of the initial balance repaid. A dummy is included for balance that have been fully repaid. The inclusion of fixed effects is denoted below the point estimates. Control variables are discussed further in table 1. Standard errors are clustered at the individual level. All data comes from a 4% random sample of the NSLDS matched to de-identified tax records. Coefficients marked with *, **,*** , denote $p < .1$, $p < .05$, $p < .01$, respectively.

	(1)	(2)	(3)	(4)	(5)
Post X Discharge Available	0.0191***	0.0176***	0.0184***	0.0180***	0.0250***
	(0.00547)	(0.00544)	(0.00545)	(0.00545)	(0.00550)
Garnishable Earnings	-0.0160**	-0.0693***	-0.0634***	-0.0710***	-0.0806***
	(0.00661)	(0.00688)	(0.00686)	(0.00690)	(0.00741)
Very Selective		0.276***		0.295***	0.294***
		(0.0173)		(0.0177)	(0.0183)
Non-Selective		-0.412***		-1.811***	-1.773***
		(0.0149)		(0.0756)	(0.0768)
For Profit			-0.627***	1.342***	1.344***
			(0.0169)	(0.0761)	(0.0772)
Community College			-0.585***	1.385***	1.388***
			(0.0190)	(0.0766)	(0.0778)
Public 4-Year College			-0.0564***	-0.0984***	-0.0852***
			(0.0182)	(0.0184)	(0.0186)
Grad. School					0.288***
					(0.0274)
Children					-0.0549***
					(0.00490)
Black College					0.119***
					(0.0350)
Income>\$100k					-0.0380
					(0.0301)
Pell Recipient					0.119***
					(0.0141)
Observations	687545	687545	687545	687545	687545
R^2	0.142	0.165	0.163	0.166	0.168