The Distributional Effects of Student Loan Forgiveness[⋆,⋆⋆]

Sylvain Catherine[a], Constantine Yannelis[b,**]

[a]Finance department of the Wharton School at University of Pennsylvania, 3620 Locust Walk, Philadelphia, 19104, PA, USA
[b]University of Chicago Booth School of Business and NBER, 5807 S Woodlawn Ave, Chicago, 60637, IL, USA

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ABSTRACT

We study the distributional consequences of student debt forgiveness in present value terms, accounting for differences in repayment behavior across the earnings distribution. Full or partial forgiveness is regressive because high earners took larger loans, but also because, for low earners, balances greatly overstate the benefits of debt cancellation. Consequently, forgiveness would benefit the top decile as much as the bottom three deciles combined. Enrolling households who would benefit from income-driven repayment is less expensive and distributes more funds to lower-income households.

1. Introduction

Education debt in the United States stood at $1.6 trillion in 2020 and is growing rapidly. Growing debt burdens have led to both increased calls for loan forgiveness as well as recent policies forgiving debts for some borrowers.[1] At the same time, income and wealth inequality has led to concerns about the distributional effects of debt forgiveness. Many holders of high loan balances completed graduate and professional degrees, and consequently earn high incomes. Untargeted debt forgiveness policies could thus disproportionately benefit high earners. On the other hand, high earners are likely to pay down debts earlier, and thus might have lower unpaid balances remaining, making debt cancellation less attractive to them. Which effect dominates is ultimately an empirical question.

Alleviating soaring student loan burdens by providing debt relief to borrowers has increasingly been discussed by policymakers, academics and the media. There are a number of ways in which debt can be discharged, with important distributional implications. For example, forgiveness can be universal, capped or targeted to specific borrowers. These debt cancellation policies can benefit different socioeconomic groups. This paper explores their distributional impacts. We find that the benefits of universal debt forgiveness policies largely accrue to high-income borrowers, while forgiveness through expanding income-contingent loan plans instead favors middle-income borrowers. Under universal loan forgiveness, the average dollar of forgiven debt benefits a household with $60,410 of earnings, and five dollars are transferred to the top 30% of the income distribution for each dollar transferred to the bottom 30%. In contrast, expanding income-driven programs would lead to forgiveness benefitting households with a much lower average income of $40,408, transferring approximately one dollar to the top 30% for each dollar transferred to the bottom 30%.

Measuring the distributional effects of loan forgiveness is challenging, as there are a number of programs which already promise future relief to borrowers. It is well known that student loan balances and income are positively correlated.[2] However, student loan balances do not accurately represent the actual cost of forgiving student debt nor the distribution of benefits between low and high-income households. Many low-income families struggle in making sufficient payments for their balance to decrease substantially –or at all– over time. However, to the extent that, under current law, their debt will ultimately be forgiven, their balance can greatly overstate the value of actual future payments, and therefore how much canceling their debt would benefit these families financially and how much it would cost taxpayers.

While direct debt discharge has dominated many public discussions, much of the public discourse misses the fact that significant targeted debt forgiveness already exists in the United States for some borrowers. Importantly for most borrowers, Income-Driven Repayment (IDR) plans offer substantial loan forgiveness to low-income borrowers who

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[**] Corresponding author
constantine.yannelis@chicagobooth.edu (C. Yannelis)
ORCID(s):

[1] There have been a number of recent policy proposals relating to student loan forgiveness. For example, see the *New York Times*, November 18, 2020 and *CNBC*, October 30, 2020. Significant student debt forgiveness also exists under current programs for public sector employees, teachers, and for borrowers in income-driven repayment plans for more than twenty years. Amromin and Eberly (2016) and Avery and Turner (2012) provide a review of work on student loans.

[2] For example, the People's Policy Project and the Brookings Institution provide analysis of the relationship between student loan balances and earnings.

have balances remaining after twenty to twenty-five years, depending on a borrowers' specific plan.[3] In the meantime, IDR plans link payments to income, so borrowers with persistently low incomes will only reimburse a fraction of their debt before it is forgiven.[4] Increasing enrollment in IDR, or increasing these plans' generosity is another option for targeted debt forgiveness.

In this paper, we use the 2019 Survey of Consumer Finances (SCF) to estimate the present value of each loan. The SCF contains information on student debt and, unlike administrative credit data, earnings, ethnicity and wealth, making it ideally suited to study the distributional impacts of loan forgiveness. We first present stylized facts as well as new measures of the distributional impact of loan forgiveness. Higher income households are more likely to have student debt, have higher loan balances if they borrow, and annual loan payments increase much faster with earnings than balances. For the bottom 40% of the income distribution, borrowers do not make payments large enough to cover interest rates.

These relationships motivate the necessity of computing discounted payment savings to evaluate the distributional impacts of loan forgiveness policies. We rely on detailed loan-level data to forecast future payments and the evolution of a loan's balance until it reaches zero or is forgiven. Our analysis takes into account the current balance and most recent payments, family size, earnings, and the number of years left before the loan is forgiven under current law. We define the present value as the sum of expected payments discounted at the risk-free rate, or at the risk-free rate plus a risk premium. We use these estimates to generate discounted payments savings and explore the distributional impacts of forgiveness policies.

We first explore universal and capped forgiveness policies, either discharging all debt, or all debt amounts up to a cap. Loan forgiveness from these policies disproportionately accrues to high-income households. Under a universal loan forgiveness policy, in present value terms, the average individual in the top earnings decile would receive $6,267 in forgiveness, while the average individual in the bottom earnings decile would receive $1,276 in forgiveness. Individuals in the bottom half of the earnings distribution would receive approximately one-quarter of the dollars forgiven. Households in the top 30% of the earnings distribution receive two-fifths of all dollars forgiven. Patterns are similar under policies forgiving debt up to $10,000 or $50,000, with higher-income households seeing significantly more loan forgiveness.

We then turn to a second form of loan forgiveness through expanding IDR plans, which tie loan payments to income and forgive balances after a certain number of years in repayment. We examine three potential expansions of IDR: enrolling all borrowers who would benefit from IDR, increasing the generosity of IDR by raising the threshold above which borrowers must pay a portion of their income, and accelerating loan forgiveness. In contrast to universal forgiveness, expanding IDR leads to substantial forgiveness for the middle of the earnings distribution. Under a policy enrolling all borrowers who would benefit from IDR, individuals in the bottom half of the earnings distribution would receive three-fifths of dollars forgiven, whereas borrowers in the top 30% of the earnings distribution would receive one-third of dollars in forgiveness. Raising the threshold above which borrowers pay a portion of their income and instating earlier loan forgiveness both lead to a large increase in forgiveness. However, under accelerating loan forgiveness, these benefits accrue to the top of the earnings distribution, while increasing the repayment threshold leads to large benefits for middle-income borrowers.

It is important to note that there are several important features that are not in our analysis that may impact welfare. While our analysis shows that majority of direct benefits to student loan cancellation accrue to high-income individuals, a full welfare analysis would need to take into account other possible benefits of student loan forgiveness. These benefits, if present, could stem from student loans alleviating credit constraints (Goodman, Isen and Yannelis, 2021). First, it is possible that student loan forgiveness may lower debt-to-income ratios. If households are credit constrained this effect may in turn foster homeownership, as debt-to-income ratios typically enter into credit scoring models (Mezza, Ringo, Sherlund and Sommer, 2016). Homeownership may in turn foster wealth accumulation (Bernstein and Koudijs, 2021). Second, student debt cancellation may impact labor market outcomes. Debt overhang can in theory lead to disemployment effects (Donaldson, Piacentino and Thakor, 2019). DiMaggio, Kalda and Yao (2020) find evidence that student debt discharge can lead to increases in earnings.

This paper primarily joins a literature within household finance on student loans. This paper presents a simple framework for computing the present value of student loans and uses it to present new results on the distributional effects of loan forgiveness options. Amromin and Eberly (2016) and Avery and Turner (2012) discuss the conceptual framework for student loans and review the literature, and Tracey and Yannelis (2022) provides an overview of the recent empirical literature.[5] While some studies such as Black, Denning, Dettling, Goodman and Turner (2020), DiMaggio et al. (2020), Eaton, Howell and Yannelis (2020) and Goodman et al. (2021) focus on students loans and labor income, few academic studies focus directly on the distributional effects of student loan policy. A notable exception is Ebrahimian

[3] In addition to forgiveness under IDR, Public Sector Loan Forgiveness (PSLF) offers loan forgiveness to borrowers who work in the public sector or qualified non-profits for ten years, and Teacher Loan Forgiveness offers partial loan forgiveness to some educators.

[4] Under current IDR plans, borrowers pay 10-15% of their income above 150% of the federal poverty line. Outstanding balances are forgiven after twenty to twenty-five years in repayment.

[5] Other notable papers include Looney and Yannelis (2015), Lucca, Nadauld and Shen (2019), Kargar and Mann (2018), Amromin, Eberly and Mondragon (2016), Solis (2017), Lucas and Moore (2010), Armona, Chakrabarti and Lovenheim (2022), Lochner and Monge-Naranjo (2011), Li and Scott-Clayton (2016), citecadenakeys2013, Cornaggia, Cornaggia and Xia (2021), Cornaggia and Xia (2021), Marx and Turner (2018) and Mueller and Yannelis (2021).

(2021), which studies the effects of taxpayer versus privately financed higher education on the earnings distribution.[6] This paper provides the first quantitative life-cycle exploration of the distributional effects of student loan forgiveness, an often-discussed policy option for providing relief to borrowers. We show that blanket forgiveness policies target more forgiveness towards the top rather than the bottom of the income distribution.

Within work on student debt, this paper links to a growing literature on IDR plans. Our paper shows that IDR plans are a useful tool for targeted loan forgiveness and the benefits of this forgiveness largely accrue to middle-income individuals. Income contingent loans for higher education have been discussed at least since Friedman (1955) and Nerlove (1975). Previous work has largely focused on the insurance benefits of IDR plans to borrowers and selection into these plans. Mueller and Yannelis (2022) show that IDR plans provided insurance to borrowers during the Great Recession. Herbst (2022) studies how IDR plans affect credit bureau outcomes and Britton and Gruber (2020) study the labor supply effects of IDR. Karamcheva, Perry and Yannelis (2020) discuss trends in IDR over time and selection of borrowers in these plans. Despite significant pushes to increase the utilization of these plans, take-up remains low. Mueller and Yannelis (2021) show that administrative costs are a significant barrier to enrollment, which is consistent with college students not having information about financial aid options (Bettinger, Long, Oreopoulos and Sanbonmatsu, 2012; Hoxby and Turner, 2015). This paper shows that expanding the utilization of IDR plans, and making these plans more generous is a relatively effective way of targeting spending on lower and middle income individuals.

The remainder of this paper is organized as follows. Section 2 discusses institutional background and the SCF data used in our main analysis. Section 3 presents our modeling of the present value of student loan balances. Section 4 analyzes the distributional effects of loan forgiveness options, with a focus on income heterogeneity. Section 5 further discusses implications of our findings. Section 6 discusses robustness and conducts sensitivity analysis. Section 7 concludes.

2. Institutional Background and Data

We begin by discussing the student loan market in the United States, along with the main analysis data used– the SCF. We further present stylized facts about the relationship between student debt and income. Student loan borrowers tend to earn more than non-borrowers, borrowers with higher balances earn more than borrowers with lower balances, and higher income individuals make larger loan payments.

2.1. Institutional Background

In 2020, there was approximately $1.6 trillion in outstanding student loan debt, according to the Federal Reserve Bank of New York. The vast majority of student debt in the United States is directly disbursed or guaranteed by the federal government. Modern federal student loan programs began in 1965 with the passage of the Higher Education Act. There have been two large federal student loan programs in the United States. The first was the Federal Family Education Loan Program (FFEL), which began in 1965 and was terminated in 2010. The FFEL was a program under which private lenders provided capital for highly regulated loans which were in turn guaranteed by the federal government. The second program was the William D. Ford Federal Direct Loan Program (DL) which was authorized in 1992. Under the DL program, the US Treasury directly provides funds for student loans. Borrowers take either Subsidized or Unsubsidized loans. All borrowers are eligible for Unsubsidized loans, and borrowers from lower-income families are eligible for Subsidized loans. While the loans are quite similar, for Subsidized borrowers, interest does not accrue while borrowers are in school. Though loan balances were relatively small historically, they grew rapidly from 2000 onwards (Looney and Yannelis, 2022).

Federal student loans are highly regulated, with interest rates and borrowing limits set by Congress. Pricing does not vary based on risk, and all students of the same level face the same interest rate.[7] Borrowing limits vary by class level and are higher for upper level and graduate students. Loans are serviced by private companies with contracts from the Department of Education (Amromin and Eberly, 2016). If borrowers default on their loans, 15% of their wages are garnished and tax payments can be withheld. Unlike other consumer loans, wages are garnished without a court order and are typically seized directly from payroll. Student loans are nearly impossible to discharge in bankruptcy, as borrowers have to prove a very stringent legal standard called "undue hardship."

Traditionally, most borrowers were in the Standard Plan. This plan is similar to a ten-year mortgage and, depending on the year, could be fixed or variable rate. Some borrowers also choose the Extended Repayment Plan, which increases the loan maturity to twenty-five years. There are also a number of IDR plans, which all have the same basic features. IDR plans tie a borrower's loan payment to their income. Under these plans, borrowers pay ten or fifteen percent of their discretionary income. After twenty or twenty-five years, outstanding balances are forgiven. These have increased in popularity since 2009 following the introduction of the Income-Based Repayment (IBR) Plan.[8] Under IBR, borrowers pay 15% of their discretionary income, defined as income

[6] This paper also joins a growing body of work in finance and inequality. Recent notable papers include Agarwal, Chomsisengphet, Kiefer, Kiefer and Medina (2021), Agarwal, Mikhed and Scholnick (2020), Bloom, Guvenen, Price, Song and Von Wachter (2019), Chiappori and Meghir (2015), Catherine, Miller and Sarin (2020), Fagereng, Guiso, Malacrino and Pistaferri (2016), Mian, Straub and Sufi (2021), Mueller, Ouimet and Simintzi (2017a) and Mueller, Ouimet and Simintzi (2017b).

[7] There are slight differences in effective interest rates based on whether borrowers are Subsidized or Unsubsidized. Additionally, in some years subsidized borrowers had lower interest rates. Interest rates also differ for graduate and undergraduate borrowers.

[8] Prior to the IBR plan, there was one IDR plan available, the Income-Contingent Plan. This was less generous, with borrowers paying 20% of their discretionary income and take-up was very low.

above 150% of the poverty line. Under most IDR plans, payment amounts are capped by a borrower's payment under the standard plan. Outstanding balances are forgiven after 25 years. Subsequently, a number of more generous IDR plans were introduced, including the Pay As You Earn Plan and the Revised Pay As You Earn Repayment (REPAYE) Plan. Under these plans borrowers pay 10% of their discretionary income, and outstanding balances are forgiven after 20 years.[9] Most new borrowers in 2020 who choose IDR plans are in the new, more generous plans. Borrowers are also able to stop payments through deferment or forbearance for a number of reasons, including job-loss, returning to school, joining the military, or at a loan servicer's discretion.

2.2. Data

Our primary data source is the 2019 SCF, a nationally representative survey conducted trienially by the Federal Reserve Board of Governors. The SCF surveys households on income, balance sheets, credit use, and financial outcomes including education debt. Crucially for our analysis, the survey contains information on earnings and demographics, as well as detailed information on student loan balances, interest rates and repayment. Importantly, the SCF includes information on whether borrowers are in IDR plans. Bhutta, Bricker, Chang, Dettling, Goodman, Volz, Hsu, Moore, Reber and Windle (2020) provide a detailed description of the 2019 SCF, with a discussion of student borrowing. We include individuals between the ages of 22 and 60 in our main analysis sample, excluding only borrowers at school or in the grace period. Due to the lack of granularity of the SCF, some households represent several centiles of the earnings distribution within a cohort and span over two deciles, in which case we allocate them on a proportional basis. Appendix Table A.1 provides a list of the main analysis variables.[10]

The SCF is ideal for our analysis, as it includes information on income, demographics, student debt balances and detailed loan repayment information. The SCF is also reasonably large, surveying thousands of households. This allows us to have precision within earnings deciles.[11] The main limitation of the SCF, that it does not contain panel data, is irrelevant in our context. This is because we project incomes, and hence need to make assumptions on earnings growth in our analysis.

Our analysis compares all individuals in the SCF and individuals with student debt. Out of 5,777 households in the sample, 1,052, or 22% after accounting for survey weights, have education debt. In our analysis of student loan borrowers, we restrict the sample to borrowers who left college and are between the ages of 22 and 60, leaving us with 757 households with debt. We impose these restrictions because our method of computing present values relies on observing initial repayment behavior. All estimates are weighted using SCF survey weights to ensure that the estimates are nationally representative. Table 1 shows summary statistics for the whole population and the share that has student debt.[12] The typical borrower in our sample left school in 2011, and their loan has an interest rate of 5.9%. Households with student debt have an average income of $98,200. In comparison, the average income for the whole population is slightly higher, but this reflects a highly skewed distribution. The median income of student loan borrowers is $72,300, while the median income of the full sample is $66,200. The average student loan balance, conditional on having any education debt, is $41,800 in the 2019 SCF, up from $36,400 in the 2016 survey. 40% of borrowers are in IDR plans. We compute age specific per capita earnings deciles, which are shown in Appendix Table A.2.[13]

2.3. Stylized Facts

Figure 1 shows the share of households between age 22 and 60 with student debt (Panel A), the mean balance (Panel B) and yearly payment (Panel C), by decile, along with a 95% confidence interval. While the relationship is non-monotonic, on average higher income households are more likely to have student debt and have higher student loan balances conditional on borrowing. Importantly, yearly payments increase much faster with earnings than balances. The average balance of borrowers in the top decile is only 13% larger than those in the bottom decile. But their payments are three times larger. These differences in repayment behavior motivate our computation of present values to estimate how much low earners would actually save as a result of debt forgiveness.

Figure 2 reports the balance-weighted average payment-to-debt ratio by decile. It clearly shows that, in the bottom four deciles of the distribution, borrowers do not make payments large enough to cover interest rates, let alone reimburse the principal. This clearly illustrates the disconnect between the present value of cash flows and loan balances.

3. Value of Student Debt

We next discuss how to compute discounted payment savings by projecting and discounting loan payments to generate present values of a loan under different repayment regimes. We present average student debt per person, broken down by income deciles.

[9] The Department of Education provides information on details of various repayment plans.

[10] The SCF has some limitations regarding student debt. In particular, it undercounts student debt aggregates relative to administrative sources as it only counts debt of the core economic unit of the household. Thus some individuals, such as adult children living with parents, may not be counted in student debt aggregates. This leads to the aggregate student debt in the 2019 SCF being about $1.2 trillion, which is lower than administrative sources. Approximately one-third of this debt is held by individuals still in school.

[11] The main alternative to using the SCF would be administrative data. Beyond administrative barriers, the main limitation of administrative student data is that it does not include information on income groups.

[12] Due to the sampling design of the SCF, standard procedures for variance estimation cannot be applied. This does not affect our analysis.

[13] We focus on earnings because they represent the main way households finance their lifetime consumption. Households with high student debt in the lower half of the wealth distribution tend to be in the upper half of the earnings distribution. Appendix Table A.3 shows the relationship by both income and wealth quartiles.

Table 1
Summary Statistics

This table provides summary statistics for the main variables used in the analysis. The left-hand panel is for our sample, that is, all households for which there are education loans and the school attendee has left their education program. The right-hand panel gives summary statistics for the full sample including individuals without any student debt. Both panels includes only households whose reference person is between the ages of 22 and 60. All statistics are weighted using SCF survey weights.

	Households with Education Debt					Full Population				
	Mean	*SD*	*Min.*	*Median*	*Max.*	*Mean*	*SD*	*Min.*	*Median*	*Max.*
Have Education Debt			100%					24%		
Balance	41,800	56,000	120	22,000	419,000	10,100	32,900	0	0	419,000
Initial Balance	51,900	59,200	400	32,000	555,000	12,500	36,600	0	0	555,000
Payment	3,300	4,300	0	2,000	38,400	800	2,500	0	0	38,400
Interest Rate	5.9%	3.3%	0%	5.5%	29.0%					
Year Left School	2011	5.4	1987	2012	2019					
First Repayment Year	2013	5.2	1999	2014	2019					
Total Income	98,174	132,300	0	72,300	2,433,300	109,200	240,800	0	66,200	118,712,500
Wage Income	82,100	72,100	0	66,200	842,000	83,800	133,500	0	56,000	15,770,600
Number of Adults	1.6	0.5	1	2	2	1.6	0.5	1	2	2
Number of Children	1.1	1.2	0	1	6	1.0	1.2	0	1	7

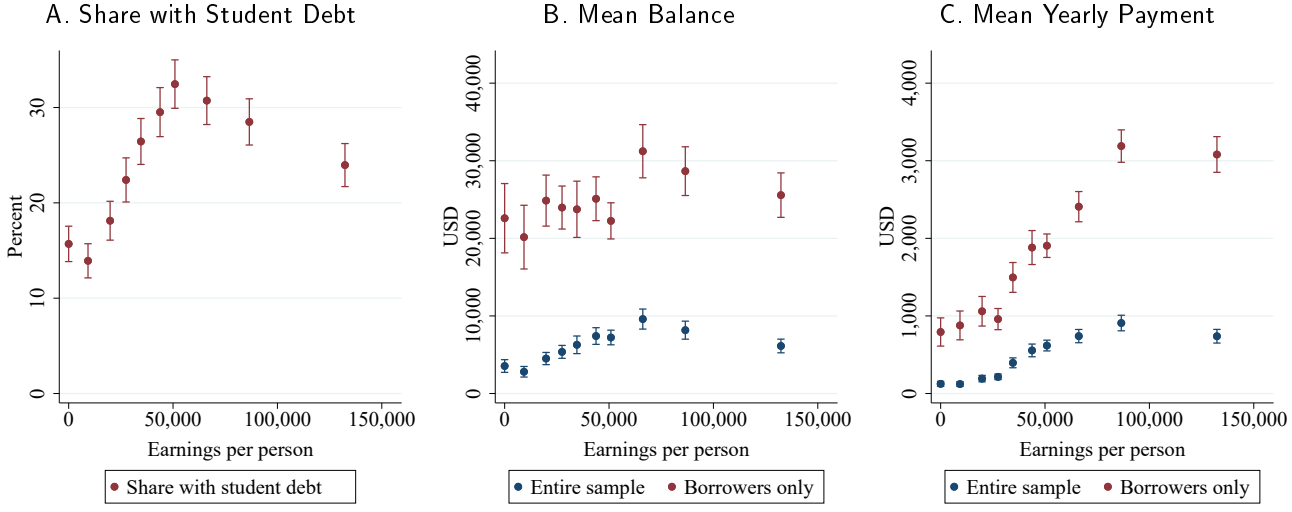

Figure 1: Student Debt and Payments by Earnings Decile.

This figure displays the share of households between age 22 and 60 with student debt (Panel A), the average per capita balance (Panel B), and yearly payment (Panel C), by within-cohort decile of earnings. We estimate debt levels and 95% confidence intervals by running OLS regressions on decile dummies using SCF sample weights. The x-axis reports the median earnings within each decile.

3.1. Computing Discounted Payment Savings

The outstanding balance of a loan is not its true present value, which depends on payments, maturity, and discount rates. Put simply, the present value of a loan reflects the timing of payments and how much future dollars are worth today. The present value of a loan is the sum of expected future payments $\mathbb{E}[\mathrm{P}_{ilk}]$ discounted at the appropriate nominal discount rate r. Specifically, we denote the present value PV_{ilt} of loan l of household i in year t:

$$\mathrm{PV}_{ilt} = \sum_{k=t} \frac{\mathbb{E}[\mathrm{P}_{ilk}]}{(1+r_d)^{k-t}}. \tag{1}$$

Payments are made until the loan is forgiven or the balance reaches zero. The balance evolves as follows:

$$\mathrm{B}_{ilt+1} = \mathrm{B}_{ilt}(1+r_{il}) - \mathrm{P}_{ilt}, \tag{2}$$

where r_{il} is the loan interest rate. Loans are forgiven after 25 years in repayment if they were originated before 2014, and 20 years otherwise.

By default, borrowers reimburse their loan over the ten years following their separation from school through a fixed-payment schedule under the Standard Plan. This fixed

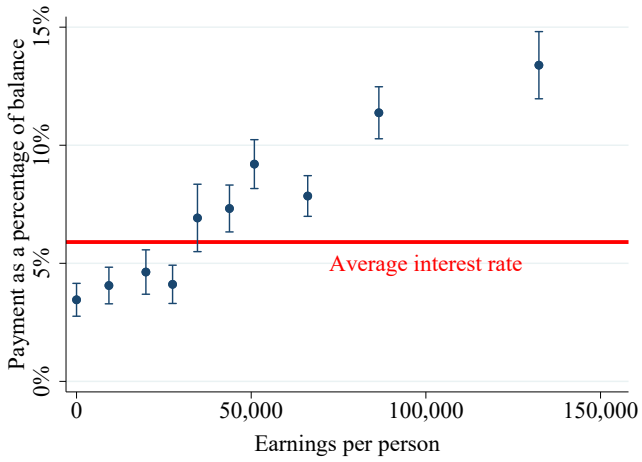

Figure 2: Payments-to-Debt Ratio by Earnings Decile.

This figure displays the ratio of annualized loan payments to loan balance by decile of earnings. We estimate these ratios and 95% confidence intervals by running OLS regressions on decile dummies using SCF sample weights multiplied by loan balance. The red horizontal line reports the average interest rate. The x-axis reports the median earnings within each decile.

payment is:

$$\mathrm{P}_{il}^{\text{Fixed}} = \frac{\mathrm{B}_{il}^{0} \times r_{il}}{1-(1+r_{il})^{-10}}, \tag{3}$$

where B_{il}^{0} is the total amount they borrowed. Borrowers can also enroll in IDR. In IDR, they pay a fraction θ_{il} of their discretionary earnings, which is defined as the share of their earnings above 1.5 times the federal poverty line, but no more than what they would have paid in the Standard Plan. If the household has a single student loan, the payment under IDR is:

$$\mathrm{P}_{ilt}^{\text{IDR}} = \min\left[\theta_{il} \times \max\left(\mathrm{Y}_{it} - 1.5 \times \mathrm{FPL}_{it}, 0\right), \mathrm{P}_{il}^{\text{Fixed}}\right], \tag{4}$$

where Y_{it} represents the borrower's earnings and FPL_{it} is the federal poverty line. If the household has several student loans, the payment is divided across loans. The IDR payment can be zero. $\mathrm{P}_{il}^{\text{Fixed}}$ is time invariant, since the cap under the Standard Plan is based on the balance when borrowers enter in IDR.[14] Households can also defer repayment because of economic hardship for up to five years. We assume θ is equal to .1 for borrowers in IDR in cohorts that left school after 2009, which is consistent with the newer IDR plans in which borrowers in recent cohorts tend to enroll. For earlier cohorts in IDR, we assume that θ is equal to .15, consistent with the Income-Based Repayment plan that is available to all borrowers.

To estimate the present value of each loan in the data, we forecast yearly payments and iterate over equations (1) and (2) until the balance reaches zero or the loan is forgiven. The initial balance is set to its observed 2019 value. Our forecast of future payments depends on whether a loan was in repayment in 2019.

Loans in repayment If we observe a payment in 2019, we assume that, in expectation, households will allocate the same share of their earnings towards repaying their loan. We make two exceptions. First, payments cannot exceed current balances and interest due for the year. Second, households will not pay more than in the Standard Plan, unless they did so in 2019. Hence, the expected future payment in year $s > t$ is:

- if $\mathrm{P}_{ilt} < \mathrm{P}_{il}^{\text{Fixed}}$, then[15] :

$$\mathrm{P}_{ils} = \min\left(\mathrm{P}_{ilt} \times \frac{Y_{is}}{Y_{it}}, \mathrm{P}_{il}^{\text{Fixed}}, \mathrm{B}_{ils} \times (1+r_{il})\right), \tag{5}$$

- otherwise:

$$\mathrm{P}_{ils} = \min\left(\mathrm{P}_{ilt} \times \frac{Y_{is}}{Y_{it}}, \mathrm{B}_{ils} \times (1+r_{il})\right), \tag{6}$$

where P_{ilt} is the payment observed in 2019. For example, we would expect IDR payments to increase with a family's earnings, but only up to the default payment under the standard plan.

Loans in IDR with zero payment Some households in IDR had no earnings above 1.5 times the poverty line and therefore made no payment in 2019, even though they were technically in repayment. We compute the present values of these loans by forecasting future IDR payments as a function of earnings. Hence, payment in year s will be:

$$\begin{aligned}\mathrm{P}_{ils} = \min(\ & 0.1 \times \max\left(\mathrm{Y}_{is} - 1.5 \times \mathrm{FPL}_{is}, 0\right), \\ & \mathrm{P}_{il}^{\text{Fixed}}, \mathrm{B}_{ils} \times (1+r_{il})\ ).\end{aligned} \tag{7}$$

Loans in deferment or forbearance For households who made no payment in 2019 because they were in forbearance or were in deferment, we assume that payments will start six years after leaving school. This assumption is motivated by the fact that payments can be deferred for up to three years and forbearance is allowed for several years. At this point, we assume that these borrowers will enroll in IDR with $\theta = 0.1$

[14] Whether payments are capped by payments in the standard plan depends on the particular plan. Under IBR and PAYE, payments are capped by the payment amount in the standard plan. If payments are uncapped as in REPAYE, this would make IDR plans distribute more forgiveness towards lower-income households. Capitalization rules also depend on the plan type and whether loans are Subsidized or Unsubsidized. Under IBR and PAYE, interest capitalizes if borrowers reach $\mathrm{P}_{il}^{\text{Fixed}}$, while under REPAYE interest does not capitalize. We abstract away from capitalization subsidies in our analysis. This is a conservative assumption, as interest subsidies for lower income borrowers make lower income households pay less under IDR plans.

[15] Note that in this case, we do not explicitly use the IDR formula because, in the data, observed payments do not exactly match what is predicted by the IDR formula. For example, in practice, IDR payments may or may not take into account the spouse's income depending on whether taxes are filed jointly. Therefore, we opt for a more flexible model.

and that interest accrues in the meantime.[16] Hence, expected future payment is:

- if $s >$ Graduation Year$_i + 5$, then:

$$\mathrm{P}_{ils} = \min\big(\, 0.1 \times \max\left(\mathrm{Y}_{is} - 1.5 \times \mathrm{FPL}_{is}, 0\right), \\ \mathrm{P}_{il}^{\mathrm{Fixed}}, \mathrm{B}_{ils} \times (1 + r_{il})\,\big), \tag{8}$$

- otherwise:

$$\mathrm{P}_{ils} = 0. \tag{9}$$

Family incomes in the first year are set to their observed value in the SCF. The poverty line is calibrated based on family size and federal guidelines for 2019. In our main analysis, we report pre-tax present values and discuss the taxation of forgiveness in Appendix B. The overall progressivity of loan forgiveness options does not change with the imposition of taxes, though levels and costs change somewhat. When a borrower has several loans and is in IDR, we split the total IDR payment across loans in proportion to balance size at that point.

Future earnings and poverty line We assume that log earnings follow a random walk:

$$\ln\left(Y_{it+1}\right) - \ln\left(Y_{it}\right) = g_E + g_P + \sigma_E \epsilon_{it}, \tag{10}$$

where g_E is the growth rate of earnings, g_P is the inflation rate and σ_E is the standard deviation of normally distributed permanent income shocks. In addition, we assume that the poverty line will grow at the rate of inflation:

$$\ln\left(\mathrm{FPL}_{it+1}\right) - \ln\left(\mathrm{FPL}_{it}\right) = g_P. \tag{11}$$

Calibration and simulation We set the inflation rate to $g_P = 2\%$. In our baseline specification, we start by setting the nominal discount rate to the level of the risk-free rate with $r_d = 3\%$. In Section 6, we show that this is the most conservative assumption and that adding a risk premium only reinforces our conclusions. We assume that households' earnings grow at a rate of $g_E = 2\%$, which combines the nationwide growth in per capita earnings, and the growth of earnings over the life cycle, which we estimate to be close to 1% among student debt borrowers in the 2019 SCF. We set the volatility of permanent income to $\sigma_E = .15$, a commonly found estimate across the literature (Carroll and Samwick, 1997). We conduct sensitivity analysis in Appendix C, and our basic conclusions remain unchanged.

For each borrower, we simulate 1,000 paths and average them to estimate expected payment in each year. We then sum the discounted value of expected cash flows to get to present values.

Figure 3 reports the average student debt per person, by within-cohort decile of per capita earnings.

[16] Borrowers could also not be making payments because loans are in default. We assume that default leads to a similar pattern of cashflows. If borrowers default, 15% of their wages are garnished above a threshold. In practice, some borrowers' wages are not garnished if they are self-employed, or it is difficult to contact their employer. We thus implicitly assume that recovery is imperfect and two-thirds of borrowers have their wages garnished.

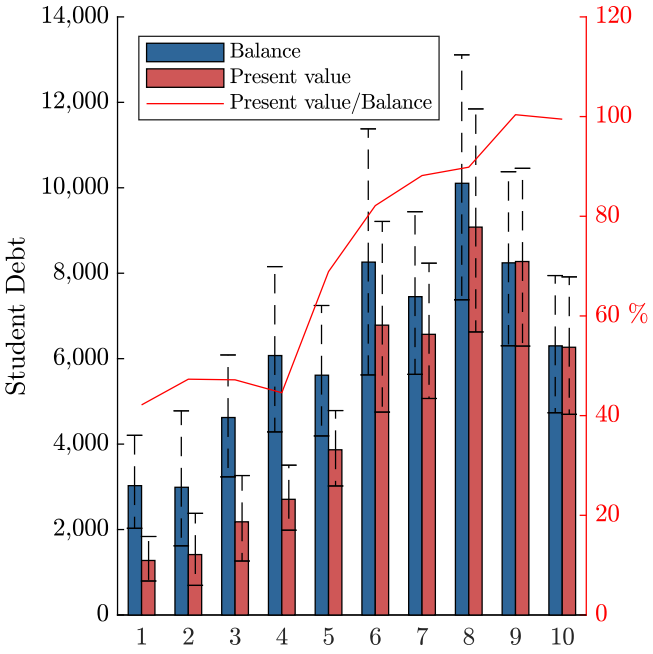

Figure 3: Average Student Debt

This figure displays the average student debt per capita in 2019 by within-cohort decile of labor earnings, including households without student loans. Present values represent the sum of expected future payments discounted at the risk-free rate. The red line reports the ratio of the average present value to the average balance for each group. Error bars represent bootstrapped 90% confidence intervals.

4. Distributional Impacts of Loan Forgiveness Policies

We next turn to exploring the distributional impacts of loan forgiveness. We consider four policies related to direct cancellation of debt: full cancellation, $50,000 per person, $10,000 per person, or $50,000 per person with a phase out range between $75,000 and $125,000 in earnings. We additionally consider four policies that increase IDR enrollment. The first policy is automatic enrollment in IDR of all borrowers who would benefit under current rules. In the second policy, loans are also forgiven 10 years after the first repayment. In the third policy, discretionary income is limited to earnings above three times the poverty line. Finally, in the fourth policy, IDR payments are limited to 7.5% of discretionary income.

To easily compare these policies, we also present various uniform metrics of the distributional impact of student loan forgiveness. In particular, for each policy, we estimate the expected earnings of beneficiaries for a random dollar of debt forgiven.

4.1. Loan Cancellation

Figure 3 shows student loan balances and present values by earnings decile. This figure effectively shows the benefits of universal loan discharge to borrowers in different groups, which can be viewed as the present values of the loans forgiven. Households with higher earnings have larger balances because they are more likely to be college graduates. However, the relationship between earnings and the present value of student debt is even steeper because low earners are less likely to fully repay their balance before it is forgiven. For the top decile, the present value is very close to the balance, but it is below 40% for the lowest decile.[17]

Figure 3 demonstrates that most of the benefits of universal loan forgiveness would largely accrue to higher income individuals.[18] The top panel shows balances and present values split by earnings decile. The figure shows that most of the benefits of universal loan forgiveness would accrue to high-income individuals. Both balances and present values are increasing for the first nine earnings deciles. The bottom earnings decile has a balance of $3,028, and a present value of $1,276, while the ninth earnings decile has a balance of $8,243 and a present value of $8,274. The highest earnings decile has a balance of $6,300 and a present value of $6,267, which is slightly lower than that of the ninth earnings decile and comparable to the seventh earnings decile. The average individual in the highest earnings decile would receive a little less than five times more forgiveness than the average individual in the bottom earnings decile. The solid red line shows the ratio of present value to balance, which is a measure of the disparity between considering the value of forgiveness based on balances and its true cost. The ratio is increasing in earnings deciles. This suggests that, while using only balances to analyze the distributional consequences of loan forgiveness would generate the same basic result– that higher-income households would see larger benefits, it would overestimate the true value of loan forgiveness, in particular for low-earners.[19]

Figure 4 presents similar analysis to Figure 3, but focuses on more targeted debt forgiveness policies which forgive debt below a cap. The figure shows the value of projected debt forgiveness under two policies: forgiving up to $10,000 of debt, and forgiving up to $50,000 of debt by borrower. We assume that partial forgiveness is determined at the individual level. For example, if one spouse has a balance of $5,000 and the other a balance of $15,000, forgiving $10,000 by borrower reduces the household's overall student debt by only $15,000. The left panel show average balances forgiven and present values of loan forgiveness under the policy forgiving $10,000 of debt. The right panel shows average balances forgiven and present values of loan forgiveness under the more generous policy forgiving $50,000 of debt.[20]

Under both limited forgiveness policies shown in Figure 4, the overall relationship between income and projected forgiveness is very similar to universal forgiveness. Under both policies, we see much greater levels of loan forgiveness for higher income households relative to lower income households. With a $10,000 cap, the ratio of average present value forgiveness between the top and the bottom deciles is 3.6. With a $50,000 cap, the ratio of average present value forgiveness between the top and the bottom decile rises to 4.75. While the general relationship between forgiveness and income is similar under each policy, the overall levels of forgiveness are much greater with a higher cap. With a $10,000 cap, households in the bottom decile receive $386 in forgiveness, whereas households in the top receive $1,391. With a $50,000 cap people in the bottom decile receive significantly more, or $886 in forgiveness, as do people in the top decile, who receive $4,223.

Finally, we consider a policy in which households with earnings below $75,000 per person receive $50,000 in balance forgiveness. Above $75,000, forgiveness generosity decreases by one dollar for each additional dollar of earnings. Hence, households with at least $125,000 of earnings per person do not benefit from the policy. Under this policy capping forgiveness by earnings, the bottom decile receives $886 and the top decile receives $1,527. As reported in Appendix Figure A.1, for the bottom 90%, this policy is similar to canceling $50,000 of debt and is still regressive within this sub-group. But the benefits going to the top 10% are substantially reduced.

4.2. Existing Forgiveness Policies

A central point of our study is that changes in balances do not accurately represent the distributional effects of new forgiveness policies because, under existing rules, a substantial share of these balances will not be repaid. In other words, because a dollar of debt cannot be forgiven twice, the distributional effects of new forgiveness policies depend on the distributional effects of the income-driven repayment programs already in place. To explore the role of current policies, we compare the present values of student debts to their balances when they left school. We focus on borrowers

[17] To the best of our knowledge, there is no public benchmark to which we can compare our present value computation. However, *The Wall Street Journal* recently reported that, based on internal estimates, the Department of Education expected to recover only 68% of the value of federal student debt. By comparison, we estimate the present value of student debt to represent 78% of the total balance.

[18] To obtain standard errors on the estimates, we bootstrap our estimation procedure 10,000 times, clustering by SCF household. Then, for each estimate, we take the 5th and 95th percentile values to construct confidence intervals.

[19] In Appendix Table A.4, we show balances and present values split by race and ethnicity. In terms of balances, Blacks have the highest average loan balance, at $10,634. Whites have a lower average loan balance, at $6,157, and Hispanics and others have a much lower average loan balance of $3,996. Computing present values presents similar overall patterns, but shrinks the gap between Blacks and Whites. Thus universal loan forgiveness would lead to larger average benefits for Whites and Blacks, and significantly lower average benefits for Hispanics and other groups. We caution interpreting these results as the sample size of Blacks in the SCF is relatively small.

[20] In comparing Figure 4 with Figure 3, it is important to note that the capped balance forgiveness will be much lower than the average balance, because under one policy the forgiveness is capped at $10,000, while the total balance is not. To take an example, suppose we have in this group some individuals with a total balance of $2,500, where their forgiveness will also then be $2,500. But then we also have in this group individuals with balances of $150,000, whose forgiveness is capped $10,000.

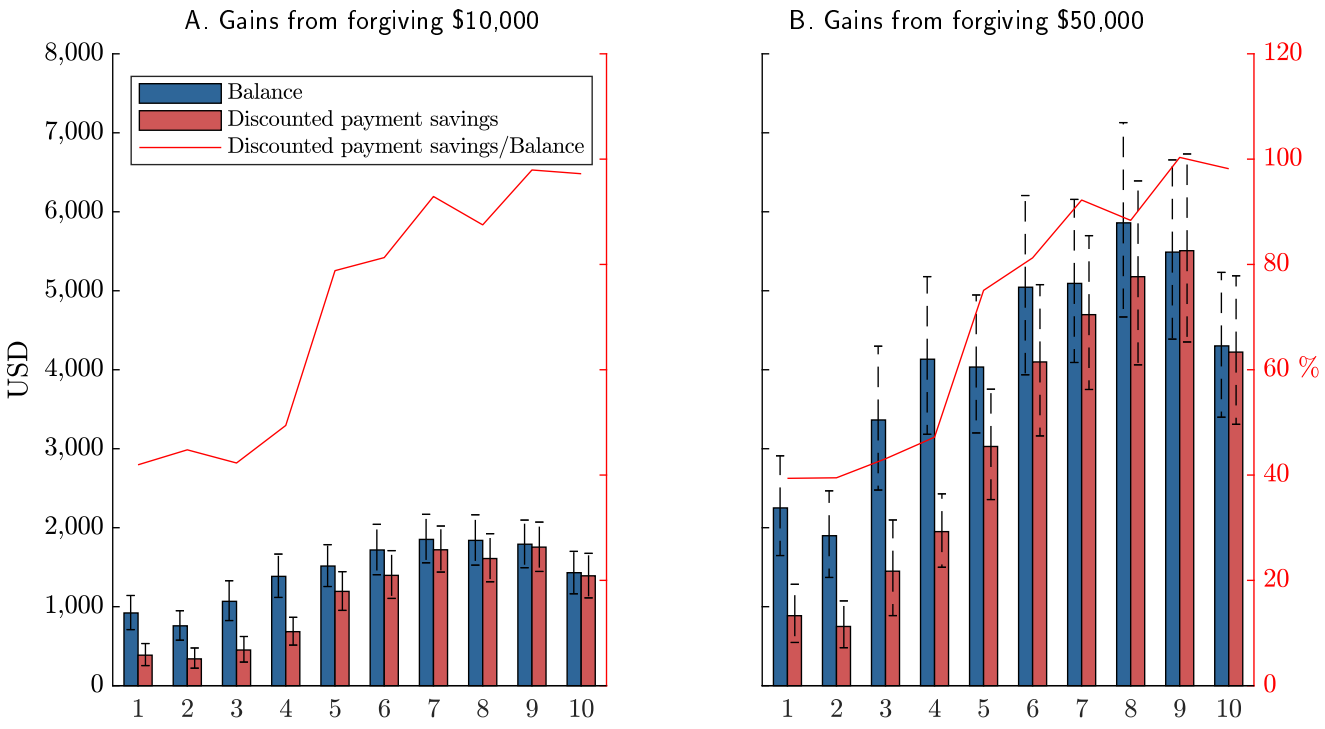

Figure 4: Partial Balance Forgiveness.

This figure displays the average change in student debt per capita after a partial balance forgiveness by within-cohort earnings decile, including households without student loans. Panel A and B consider balance reductions of $10,000 and $50,000 respectively. The new present value of each loan is computed as before but assuming a lower counterfactual balance as of 2019. The red line reports the ratio of the average present discounted payment saving to the average balance reduction in each group. Error bars represent bootstrapped 90% confidence intervals.

who graduated after 2014, when current IDR rules were already in place. The difference between balances and the present value measure is a reasonable proxy for the benefits of existing forgiveness policies.

Figure 5 compares the initial balance of borrowers that graduated or left school since 2014 to the value of their payments over the lifetime of their loan, including those made before 2019. Specifically, the discounted value of loan repayments is:

$$\mathrm{PV}_{ilj} = \sum_{k=j}^{2019-1} \frac{\mathrm{P}_{il}}{(1+r_f)^{k-j}} + \sum_{k=2019} \frac{\mathbb{E}[\mathrm{P}_{ilk}]}{(1+r_f)^{k-j}}, \quad (12)$$

where j is the year they left school. The second term of this equation is the present value of future payments, estimated as in Section 3.1, but discounted back to the year they left school. The first term is the value of payments made between that year and 2019. As we do not observe these payments, we approximate their value by assuming that borrowers made identical payments over this time period, and infer its value from the initial balance, the balance in 2019, and the loan interest rate. Specifically, the approximate average past payment is:

$$\mathrm{P}_{il} = \frac{B_{ilj}(1+r_{il})^{2019-j} - B_{il2019}}{\sum_{k=j}^{2019-1}(1+r_{il})^{k-j}}. \quad (13)$$

Figure 5 shows that, at graduation or drop-out year, the present value of student debt for households in the bottom three deciles of the current income distribution is roughly 40% lower than outstanding balances. This percentage can be interpreted as the share of their balances that current programs will forgive in expectation. On the other hand, for borrowers in the top two deciles, present values are 8% higher than balances, reflecting the fact that high-income borrowers are charged relatively high interest rates despite their low-risk profile. Therefore, through the IDR program, high-income borrowers subsidize the loans of low-income borrowers because Federal student debt does not adjust its interest rate to an individual's specific risk profile.

Figure 5 also shows that the present value-to-balance ratios are higher at departure from school than later on, as a comparison with Figure 3 reveals. This makes sense because as time goes by, the present value of all loans goes down, but the balance of non-performing loans increases when payments do not even cover interests. As Figure 2 shows, this is particularly true in the bottom 40% of the earnings distribution. Hence, the increase over time in the gap between balances and present values. This trend is reinforced by a composition effect because the relative weight of non-performing loans also increases over time.

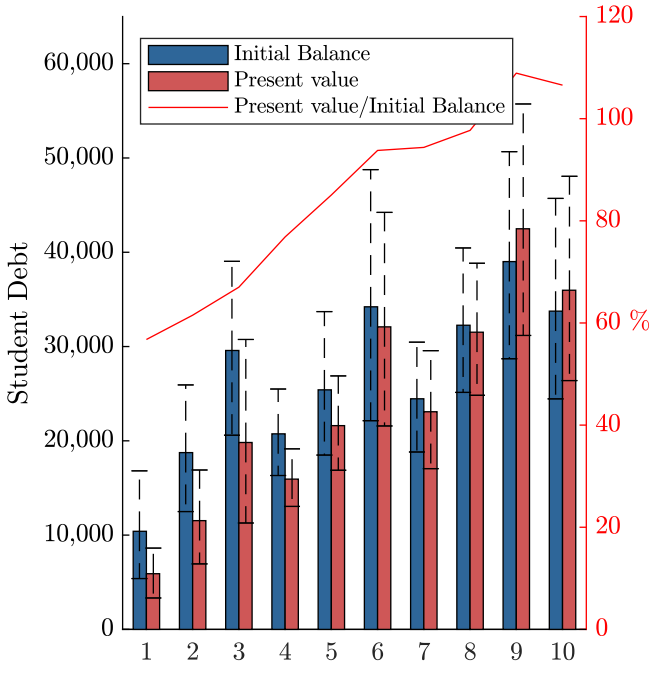

Figure 5: Student Debt at Beginning of Repayment Period.

This figure displays the average student debt and present value of past and future expected payments when borrowers graduated or dropped out of their degree program. The sample is restricted to borrowers who left their degree program after 2014. Average student debt is reported by within-cohort decile of labor earnings in 2019. The red line reports the ratio of the average present value to the average balance for each group. Error bars represent bootstrapped 90% confidence intervals.

4.3. Income Driven Repayment

We next turn to an alternative option for loan forgiveness, IDR. IDR plans tie borrowers' monthly payments to their income. There are a number of IDR plans, with slightly different parameters.[21] Under current IDR plans, borrowers pay 10 or 15 percent of their discretionary income above 150 percent of the poverty line. After 20 or 25 years, remaining balances are forgiven. IDR plans thus have a significant forgiveness component, but unlike more general forgiveness options, IDR targets forgiveness towards lower income borrowers. Indeed, some persistently low-income borrowers in IDR plans can end up paying nothing at all. Borrowers who earn below 150 percent of the poverty line for the duration of repayment will end up making no payments and receiving full loan cancellation.

We consider the potential distributional impact of expanding IDR. This can be achieved in two ways: by enrolling more borrowers[22] or making IDR plans more generous. We consider four policies. One, enrolling all borrowers in an IDR plan under which borrowers begin paying on income above 150% of the federal poverty line and pay 10% of this income. Two, putting all borrowers in IDR and forgiving remaining balances after ten years. Three, placing all borrowers in IDR and raising the repayment threshold to 300% of the federal poverty line, as opposed to 150% under current plans. Four, we consider a policy where borrowers pay 7.5% of their income over 150% of the poverty line.

Importantly, we assume that these policies is targeted towards borrowers for which it generates a discounted payment saving. Because interest rates on student loans exceed the discount rate, rolling debt is an NPV negative decision unless a substantial part of the balance is rolled until it is forgiven. Some middle-class earners have lower payments in IDR than under the ten-year schedule, but these payments would still be sufficient to fully repay their loan, or most of it. For them, it is better to repay sooner rather than later, and reducing their payments is not a good idea.

Figure 6 explores who benefits from the expansion of IDR, in terms of loan forgiveness. The figure shows a quartet of columns for income, each one depicting forgiveness under a different policy. In each quartet of columns, the first column shows projected forgiveness from enrolling all borrowers in the current most generous IDR plan, PAYE. The second column shows projected forgiveness from enrolling all borrowers in a plan slightly more generous than PAYE, under which remaining balances are forgiven after ten rather than twenty years. The third column shows forgiveness under a plan identical to PAYE but under which borrowers begin paying a portion of their income above 300% of the federal poverty line. The rightmost column shows a plan again identical to PAYE but under which borrowers pay 7.5% of their income rather than 10%.

The leftmost column in each quartet shows projected forgiveness under a loan repayment system similar to that in the UK or Australia, with all borrowers in IDR. Under this system, we see most projected forgiveness accrues to borrowers in the middle of the earnings distribution. Individuals in the lowest earnings decile receive almost six times ($316) as much forgiveness relative to borrowers in the top of the earnings distribution ($56). Borrowers in the next highest and lowest deciles see similar forgiveness, $209 and $108 respectively. The middle half of the income distribution receives substantially more forgiveness than the top and bottom combined. Putting all borrowers in IDR thus leads to significant forgiveness for middle income borrowers, in contrast to universal or capped forgiveness policies which disproportionately benefit high income borrowers. Individuals in the third through seventh deciles receive 53% of the total forgiveness, and people in the bottom half of the earnings distribution receive half of the gains.

[21] The first modern IDR plan, Income Based Repayment (IBR), was introduced in 2009. Under this plan, borrowers pay 15% of this discretionary income and remaining balances were forgiven after 25 years. Under more recent plans such as the Pay as You Earn and new IBR plan, borrowers pay 10% of their incomes and remaining balances are forgiven after 20 years. Most borrowers in recent cohorts who choose IDR repayment options are in these newer, more generous plans, and thus our repayment model uses 10% repayment and 20 year forgiveness.

[22] This is common in many countries with higher education systems similar to the US. For example, in the UK and Australia all student loan borrowers are automatically enrolled into IDR plans that are administered by tax authorities. Chapman (1997) provides a discussion of IDR plans in other countries.

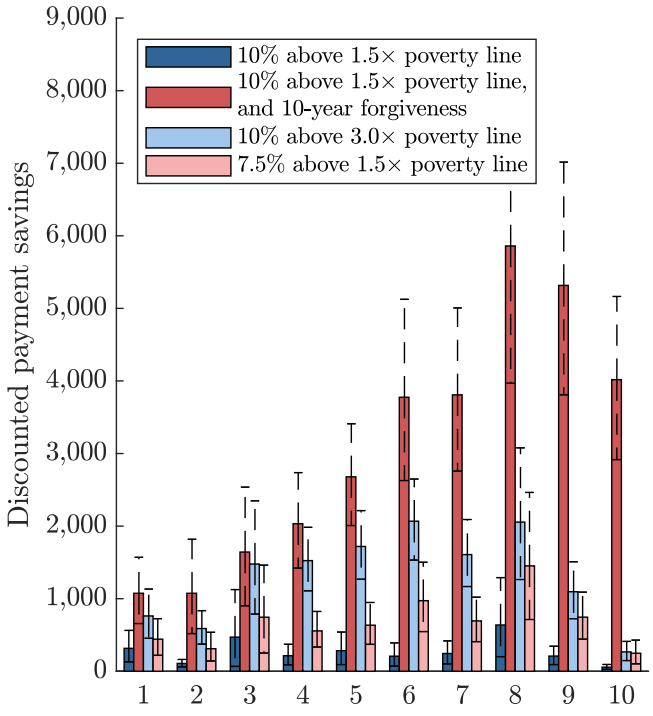

Figure 6: Targeted Enrollment in IDR

This figure displays the average discounted payment savings from targeted policies of automatic enrollment in income-driven repayment, by within-cohort earnings decile, including households without student loans. First, we consider the case in which households would pay 10% of their discretionary earnings, in line with current IDR rules. We also consider *(i)* a variation of this policy in which loans are forgiven 10 years after the first repayment, and *(ii)* a variation in which households pay 10% or 7.5% of share of their earnings above three times the poverty line. In all cases, payments are capped by the default fixed payment. We assume that these policies are targeted towards households for which they generate discounted payment savings. Error bars represent bootstrapped 90% confidence intervals.

We next turn to the second column, which depicts a more generous IDR plan under which loan balances are forgiven after ten years, as opposed to twenty under current plans. Unsurprisingly, earlier loan forgiveness leads to substantially more forgiveness across all groups. This increase in forgiveness amounts comes at the expense of income progressivity, with high earners seeing larger forgiveness amounts. With ten-year forgiveness, we see the highest earnings decile receiving $4,018 in loan forgiveness, almost four times the amount that the bottom earnings decile receives, $1,075. The bottom three income deciles receive roughly four times the forgiveness in this scenario as they would under a plan with forgiveness occurring after twenty years. This is likely due to the fact that they are paying very little under either plan, and hence receive substantial forgiveness after ten or twenty years. Higher earnings deciles see significantly more forgiveness under this plan.

The main reason for the fact that the share of forgiveness disproportionately accrues to high income borrowers under the 10 year forgiveness plan is that large balances are positively correlated with high income. Many high-income borrowers do not benefit from current IDR rules because their income is sufficiently high for their debt to be fully reimbursed within 20 years of IDR payments. However, many of them would take more than 10 years to reimburse their balance, and would therefore benefit if their balance were forgiven after only 10 years of payments. Under such a policy, many high-income borrowers with large balance would therefore enroll in IDR and see substantial shares of their debt erased after 10 years.

The third column of each quartet shows projected forgiveness under a different IDR plan with increased generosity. Rather than borrowers paying a fraction of their income above 150% of the federal poverty line, under this hypothetical plan borrowers pay a tenth of their income above 300% of the poverty line. This plan shows a similar pattern to the first option-enrolling all borrowers in IDR-albeit with higher forgiveness amounts for middle-income households. Individuals in the lowest and highest earnings deciles receive $762 and $267 respectively, which are close to the amounts under the system enrolling all borrowers in IDR.

The final column of each quartet shows projected forgiveness under an IDR plan with a different kind of increased generosity. Rather than borrower paying 10-15% of their income above 150% of the federal poverty line, they pay 7.5%. This plan again generates more forgiveness for the middle of the income distribution. Individuals in the lowest and highest earnings deciles respectively receive $442 and $248.

It is useful to directly compare IDR to other forgiveness policies. Table 2 indicates that enrolling borrowers in an IDR plan where borrowers pay a tenth of their income above 300% of the poverty line would lead to $174.0 billion in present value forgiveness. This is similar in aggregate to the $145.0 billion in forgiveness under a policy forgiving up to $10,000 of student debt per person. However, the bottom 60% of the income distribution would actually receive higher forgiveness amounts under the more generous IDR plan. The difference in aggregates arises from the fact that the top 40% of the income distribution receives substantially more forgiveness under the capped plan than under the more generous IDR plan. We see a similar pattern when we compare the more generous IDR plan to a policy forgiving up to $50,000 of student debt per person, which would lead to $422.2 billion in present value forgiveness. However, under the more generous IDR plan, the bottom 30% of the income distribution would receive more forgiveness than under the plan forgiving up to $50,000 of student debt.

The results of this section suggest that enrolling more borrowers in IDR or making IDR more generous leads to significant loan forgiveness that is somewhat targeted towards middle-income borrowers. Households in the bottom two earnings deciles receive roughly the same amounts for

forgiveness in a system expanding IDR as they would under a capped or universal forgiveness plan. However, households in the top income deciles see significantly more forgiveness under capped or universal forgiveness plans relative to expansions of IDR.

4.4. Comparing Policies

The first panel of Table 2 summarizes our main analysis of the discounted payment savings under different student loan forgiveness policies. Specifically, the table reports the total and per capita discounted payment savings of the policies we evaluate by earnings deciles, including households without any student debt. The first eight columns consider the present value of forgiveness amounts per person, the second eight columns consider aggregate amounts, and the final eight columns show the share of dollars given to each group.

To compare different policies more directly, we also construct a uniform measure of their progressivity. This measure answers the following question: for a random dollar of debt forgiven under a particular policy, what is the expected earnings of the borrower receiving that dollar? Specifically, for each policy j, we compute:

$$\mathbb{E}_j[y] = \sum_{d}^{D_j} \frac{y_{i(d)}}{D_j}, \tag{14}$$

where d indexes dollars of present value gains, D_j is the nationwide cost of the policy, and $y_{i(d)}$ the earnings of the individual $i(d)$ receiving dollar d. In the data, this can be estimated as:

$$\hat{\mathbb{E}}_j[y] = \frac{\sum_i y_i \mathrm{PV}_{ij} \omega_i}{\sum_i \mathrm{PV}_{ij} \omega_i}, \tag{15}$$

which is the weighted average earnings, where weights are the products of household i SCF survey weight, ω_i, and its present value gains under policy j, PV_{ij}. Equivalently, $\hat{\mathbb{E}}_j[y]$ can be estimated by regressing earnings on a constant, and weighted by the product of SCF survey weights and the household's present value of gains from the policy. The regression coefficient of the constant equals $\hat{\mathbb{E}}_j[y]$.

The first column of Table 3 reports our findings. Under full cancellation, the average dollar of forgiveness goes to borrowers with \$60,410 in earnings. The expected income of beneficiaries under partial forgiveness programs is quite similar. In contrast, under IDR and extended IDR plans, the average dollar of forgiveness goes to borrowers with significantly lower earnings, between \$40,408 and \$44,685. The exception to this rule is an IDR plan with a shorter duration, under which the average dollar of forgiveness would go to a borrower with \$61,396 in earnings.

Essentially, our approach considers a dollar cost to the taxpayer as an observation and the beneficiary's earnings as our variable of interest. Following that logic, we also present similar results for quantiles of the income distribution. This is again found by running an analogous quantile regressions of income for each percentile, weighted by SCF survey weights multiplied by the benefit from each policy for each household.

The last three columns of Table 3 show that quantile regressions lead to similar conclusions. Households with earnings above \$72,795 would receive as much as those below \$38,179, a quarter of the total cost of the policy. These numbers are similar for partial balance forgiveness policies. On the other hand, most extended IDR policies would distribute 25% of their total cost to borrowers earning less than \$25,000. The exception to this rule is an IDR plan with a shorter duration: 25% of the benefits would go to borrowers with earnings above \$76,359.

In Table 2, we also report how much certain groups of earners would benefit from each policy relative to others. These ratios present quite similar results. Under full balance forgiveness, \$3.23 are forgiven for the top half of the income distribution for each dollar forgiven for the bottom half. This ratio is even starker if we compare the top 30% to the bottom 30%, with \$4.85 forgiven at the top for each dollar forgiven at the bottom. In contrast, under an expanded IDR plan, the corresponding ratios are \$0.97 and \$1.28 forgiven at the top relative to the bottom. Under an IDR policy where payments start at 300% of the poverty line, approximately 60 cents is distributed to a household in the top 30% for each dollar given to one in the middle 40% of the income distribution. However, the very top of the distributions still receives more than the very bottom, which demonstrates that student loan forgiveness is not an effective way to transfer funds to the very bottom of the distribution.

Finally, Figure 7 presents similar estimates for each percentile. As such, it shows the share of the total present value cost of each policy going to borrowers below a certain earnings level. In other words, it represents the empirical cumulative distribution function (CDF) of forgiven dollars. A lower CDF is symptomatic of a policy which benefits high earners more. Confirming our previous findings, the CDF of balance forgiveness policies are lower than IDR extension policies, except for a reduction of the IDR payment period from 20 to 10 years.

Table 2
Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The dollar-weighted average income of beneficiaries represents the expected earnings of the beneficiary of the average forgiven dollar. All present values are in pre-tax dollars.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance Forgiveness				IDR Enrollment				Balance Forgiveness				IDR Enrollment				Balance Forgiveness				IDR Enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,276	886	386	886	316	1,075	762	442	14.7	10.2	4.4	10.2	3.6	12.4	8.8	5.1	2.3	2.4	3.1	2.8	10.1	3.0	5.0	5.7
2	1,414	750	339	750	108	1,075	588	311	17.6	9.3	4.2	9.3	1.3	13.4	7.3	3.9	2.7	2.2	2.9	2.5	3.7	3.2	4.2	4.3
3	2,181	1,450	452	1,450	470	1,642	1,477	745	29.2	19.4	6.0	19.4	6.3	22.0	19.8	10.0	4.5	4.6	4.2	5.2	17.5	5.3	11.4	11.1
4	2,708	1,951	684	1,951	214	2,033	1,525	556	36.1	26.0	9.1	26.0	2.9	27.1	20.4	7.4	5.6	6.2	6.3	7.1	7.9	6.5	11.7	8.3
5	3,867	3,029	1,194	3,029	283	2,679	1,720	635	50.6	39.6	15.6	39.6	3.7	35.0	22.5	8.3	7.9	9.4	10.8	10.7	10.3	8.4	12.9	9.2
6	6,784	4,099	1,397	4,099	207	3,776	2,067	973	91.6	55.3	18.9	55.3	2.8	51.0	27.9	13.1	14.2	13.1	13.0	15.0	7.8	12.3	16.0	14.6
7	6,570	4,698	1,721	4,698	245	3,808	1,608	694	89.3	63.9	23.4	63.9	3.3	51.8	21.9	9.4	13.9	15.1	16.1	17.3	9.2	12.5	12.6	10.5
8	9,079	5,178	1,610	5,002	637	5,860	2,055	1,452	120.4	68.6	21.3	66.3	8.4	77.7	27.2	19.2	18.7	16.3	14.7	18.0	23.5	18.7	15.7	21.4
9	8,274	5,507	1,754	4,378	209	5,317	1,096	745	111.8	74.4	23.7	59.2	2.8	71.8	14.8	10.1	17.4	17.6	16.3	16.0	7.9	17.3	8.5	11.2
10	6,267	4,223	1,391	1,527	56	4,018	267	248	82.2	55.4	18.2	20.0	0.7	52.7	3.5	3.3	12.8	13.1	12.6	5.4	2.1	12.7	2.0	3.6
All	4,922	3,229	1,109	2,824	275	3,173	1,331	687	643.5	422.2	145.0	369.3	36.0	414.9	174.0	89.8	100%	100%	100%	100%	100%	100%	100%	100%
Dollar-weighted average income of beneficiaries ($)																								
	60,410	58,062	60,466	49,697	40,408	61,396	40,845	44,685																
Ratios of per-person discounted payment savings																								
Top 50/Bottom 50	3.23	2.94	2.58	2.44	0.97	2.68	1.17	1.53																
Top 30/Bottom 30	4.85	4.83	4.04	3.54	1.01	4.01	1.21	1.63																
Top 30/Middle 40	1.77	1.64	1.45	1.20	1.28	1.79	0.64	1.13																

Table 3
Income of Policy Beneficiaries

This table displays the distribution of wage income for beneficiaries of different forgiveness and IDR policies. This is found by running a regression of income, weighted by SCF survey weights multiplied by the benefit from each policy for each household. The 25th percentile, median, and 75th percentile values are found by running the corresponding quantile regression.

		Income of beneficiaries ($)			
Policy	**Description**	**Mean**	**p25**	**Median**	**p75**
Full	Cancel all debt.	60,410	38,179	52,942	72,795
$10,000	Cancel $10,000 of debt.	58,062	35,634	49,888	71,268
$50,000	Cancel $50,000 of debt.	60,466	37,161	50,906	74,323
Capped	Cancel debt up to a cap.	49,697	35,125	48,361	65,160
Pay 10%	Current IDR rules.	40,408	23,926	39,707	61,596
Forgive 10 yr.	Forgiveness after 10 years.	61,396	37,670	52,942	76,359
Pay 3x Pov.	Discretionary income is 3x poverty line.	40,845	24,944	39,707	53,451
Pay 7.5%	Payments are 7.5% of discretionary income.	44,685	24,944	45,815	62,105

5. Discussion

In this section, we further discuss the implications of different forgiveness policies. First, we estimate the timing of forgiven payments. Second, we measure the benefits of debt forgiveness for college drop-outs and different ethnic groups. Finally, we show how the existence of IDR affects the distributional effects of forgiveness by estimating the distribution of benefits in a counterfactual world without IDR.

5.1. Timing of Forgiveness

We next explore the timing of forgiven payments. This is particularly relevant in determining the impact of student loan forgiveness on consumption, and any short term effects of loan forgiveness on aggregates. Some commentators and economists have argued that student loan forgiveness could act as stimulus during recessions, boosting consumption and housing investment.[23] Taking a classical Keynesian multiplier argument for stimulus at face value, the efficacy of such stimulus depends on the timing of cashflows, and whether they occur during recessions when aggregate demand is low.

Figure 8 displays the flows of canceled future student debt repayments over the next 25 years, split by quartiles, under our assumptions. Essentially, this shows payments that would have been paid under the standard plan but are not paid under the alternative plans. Canceled payments are computed as the difference between expected payments under the new policy and without any form of forgiveness. In some cases, the difference can be positive when borrowers decide to enroll in more generous IDR programs, which defer payments into the future. The top panel shows the timing of cashflows for full forgiveness, while the bottom panel shows the timing of cashflows for a plan forgiving up to $10,000 of debt. Panel A reports these cash flows in dollars, while Panel B reports the cumulated share of these cash flow paid after a given number of years. The figure shows that a larger portion of the cashflows forgiven in early years go to high income borrowers, who also have lower marginal propensities to consume (Baker, Farrokhnia, Meyer, Pagel and Yannelis, 2020; Baker, 2018). Higher income borrowers in the top two quartiles have a much steeper trajectory of forgiven payments, whereas forgiven payments are relatively flat for lower income borrowers. Figure 9 presents a similar exercise, instead showing the flows of canceled future student debt repayments under more generous IDR plans. Under these plans, most of the forgiven payments in early years go to borrowers in the middle of the income distribution. More generous IDR plans lead to higher cancelled payments for low-income borrowers in early years relative to partial forgiveness.

5.2. Gains for College Drop-outs

One potential policy goal of loan forgiveness is to alleviate the debt burden of individuals who did not complete college. Appendix Figure A.2 reports the discounted payment savings from full balance forgiveness for college drop-outs and other individuals, within each decile of earnings. Overall, discounted payment savings for drop-outs are lower across the top nine deciles, and even more so for higher earners. In the bottom decile, drop-outs benefit as much from full balance forgiveness as other individuals. Overall, student debt forgiveness does not appear to favor college drop-outs.

5.3. Gains by Ethnicity

Some advocates of student debt forgiveness argue that the benefits would largely accrue to Black Americans. Appendix Figure A.3 reports the average value of student debt by ethnic group. Black Americans have nearly twice as much student debt as Whites, but that difference is somewhat smaller in present value terms. The average Black and White

[23] This point has been echoed by some policymakers. For example, Senator Elizabeth Warren argued that student loan forgiveness is "the single most effective economic stimulus that is available through executive action."

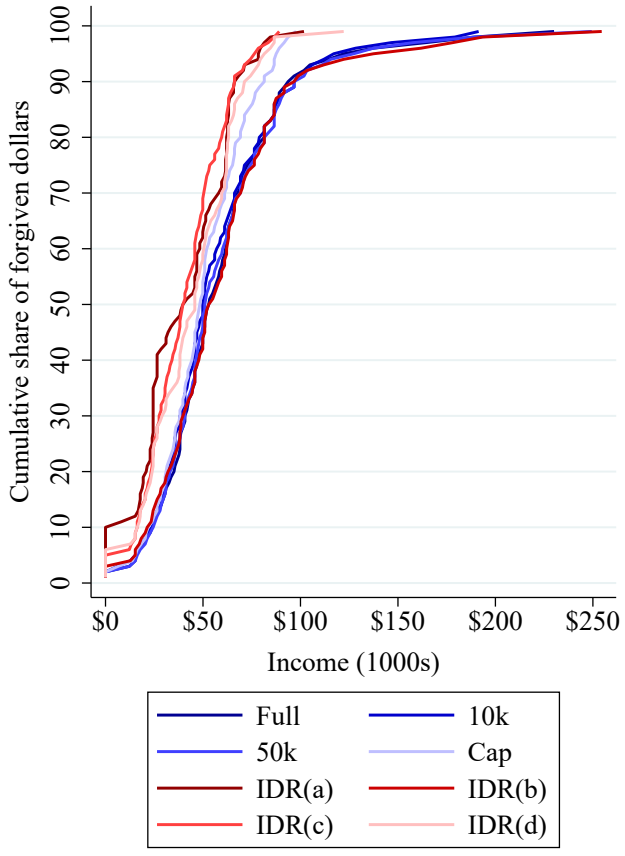

Figure 7: Cumulative Distribution Function of Forgiven Dollars.

This figure displays the distribution of wage income for beneficiaries of different forgiveness and IDR policies. This is found by running a quantile regression of income for each percentile, weighted by SCF survey weights multiplied by the benefit from each policy for each household. Forgiveness policies include full, $50,000, $10,000, and capped above a certain threshold of income. IDR policies refer to (a) the case in which households would pay 10% of their discretionary earnings, in line with current IDR rules, (b) a variation in which loans are forgiven 10 years after the first repayment, (c) a variation in which the threshold is increased to 300% the FPL, and (d) a variation in which households pay 7.5% of their discretionary earnings. We assume that these policies are targeted towards households for which they generate discounted payment savings. In all cases, payments are capped by the default fixed amount set by the standard repayment plan.

Americans would receive $7,942 and $4,885 respectively in discounted payment savings under a full forgiveness policy.

5.4. Benefits of balance forgiveness with and without IDR

One of our contributions is to show that, because of the existence of IDR, a greater share of the benefits of balance forgiveness goes towards high earners than the distribution of outstanding balances suggests. To further illustrate this point, we ask the following question: If policymakers were to fully or partially forgive the debt of new graduates, how would the benefits be distributed along the income distribution in the absence of IDR, and how much would that distribution differ in the presence of IDR? To do so, we follow the logic of our analysis in Section 4.2 and focus on individuals who graduated since 2014. We compute the change in the present value of their loan at graduation following a full or partial reduction of their balance. Specifically, we retroactively reduce the initial balance of these borrowers by the amount forgiven, and recompute the present value of their loan, relying on the observed 2019 payment to forecast payments as in the rest of the paper. The average discounted payment savings for decile d is:

$$\frac{1}{N_d}\sum_{i\in d}\Delta\text{PV}_{ilt}\left(1-x_i\right), \tag{16}$$

where ΔPV_{it} is the discounted payment savings for borrower i, N_d is the number of borrowers in decile d, and x_i is the share of individuals without student debt belonging to the same cohort and decile as borrower i. The multiplication by $(1-x_i)$ adjusts our estimates to reflect differences in the propensity to have any student debt along the income distribution.

Figure 10 reports the results of different forgiveness policies in the presence and absence of IDR. Throughout the three panels, even in the absence of IDR, individuals in the top deciles would have gained more from forgiveness than those at the bottom of the income distribution. This reflects the well-known fact that high earners are more likely to have attended college and graduate school, making them more likely to have student debt and larger balances. However, the relationship between payment savings and earnings is steeper in the presence of IDR, reflecting the fact that at the bottom of the distribution, balance forgiveness partially cancels debt that would have been canceled under IDR rules.

In the absence of IDR, panels B and C further confirm the hypothesis that the benefits of partial forgiveness are less concentrated towards the top of the earnings distribution. This result stems from the fact that low earners have lower balances, so capping the amount forgiven mostly reduces the present value gains for high earners without penalizing low earners as much. However, in the presence of IDR, this hypothesis no longer holds true. The reason being that partial forgiveness first cancels the part of the debt that would have already been forgiven under IDR. Intuitively, if a low earner would have only repaid $5,000 of his $20,000 debt, then forgiving $10,000 does not translate into actual payment savings.

6. Robustness

In our main analysis, we assume an earnings growth rate of 2% and a discount rate of 3%. This is slightly lower than those used by the CBO, who assume earnings grow at 3% and a discount rate of 4%. In appendices C and D, we show that the basic pattern of results is not sensitive to the earnings growth rate and discount rate used.

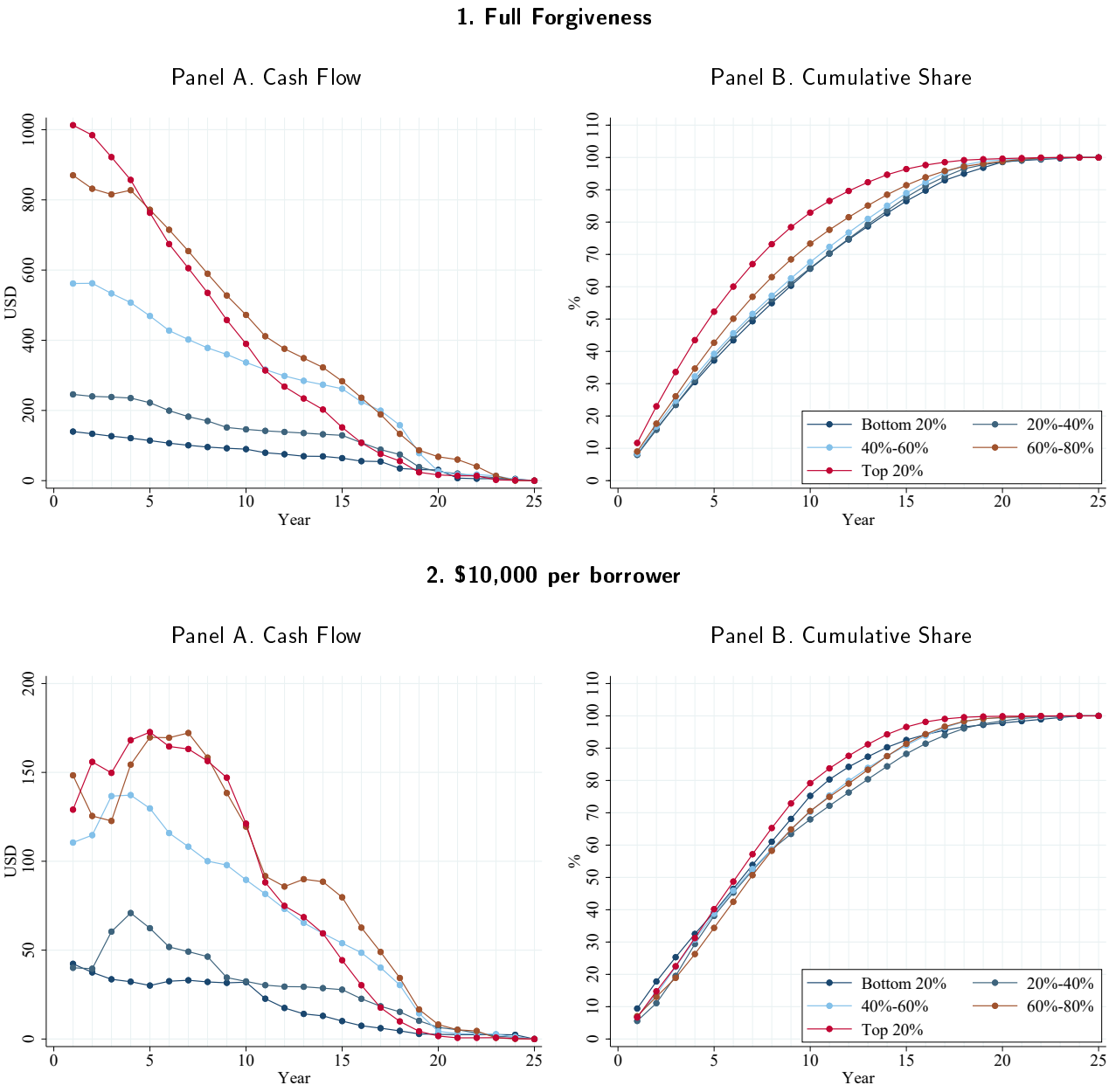

Figure 8: Cash Flow Timeline - Balance Forgiveness

This figure displays the flows of canceled future student debt repayments over the next 25 years, by quintile of earnings, including non-borrowers. Panel A reports these cash flows in dollars. Panel B reports the cumulative share of the forgiven cash flows after a given number of years.

6.1. Discounting Loan Payments

In our baseline specification, we assume a uniform discount rate of 3% for all loans. This is a very conservative assumption, as higher discount rates reinforce our main results. A more appropriate discount rate incorporates the cost of capital and a risk adjustment. In this section, we show that adjusting for risk makes student loan forgiveness even more regressive. There are two ways this assumption can be relaxed: (i) by increasing the discount rate for all borrowers or (ii) by using higher discount rates for riskier borrowers. In any case, such an adjustment is only warranted if it reflects some exposure to systematic risk.

Using private student loans as a benchmark, Lucas and Moore (2010) estimate that the cost of capital for student debt is 2.18% above the risk-free rate. This spread is an upper bound on the risk premium as it includes the cost of taxes and a liquidity premium. Table 4 reports all our key findings when we add a 2% risk premium to the discount rate of all borrowers. A higher discount rate reduces the benefits of forgiveness for all borrowers but disproportionately more for

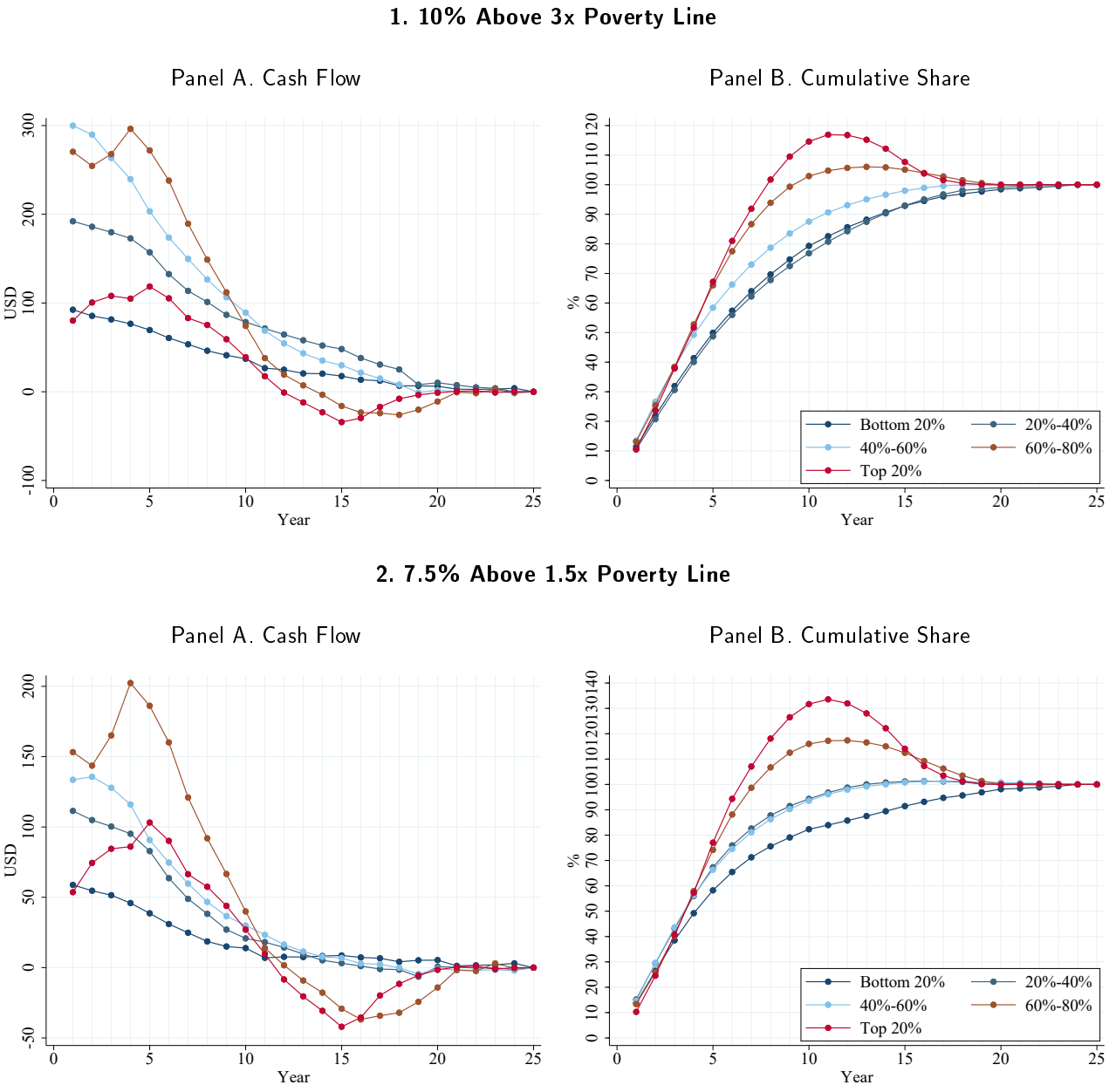

Figure 9: Cash Flow Timeline - IDR Plans

This figure displays the flows of canceled future student debt repayments over the next 25 years, by quintile of earnings, including non-borrowers. Panel A reports these cash flows in dollars. Panel B reports the cumulative share of the forgiven cash flows after a given number of years.

those at the bottom of the earnings distribution. Therefore, the addition of a risk premium to our discount factor reinforces our conclusions regarding the regressivity of student debt forgiveness.

To understand why this is the case, Figure 11 reports the percentage change in the present value of student debt when the discount rate increases by 1 percentage point, that is, the opposite of the debt duration. We calculate this sensitivity for each decile by increasing the discounting rate applied to future cash flows from 3% to 4%. Increasing discount rates generally reinforces our main conclusions: increasing interest rates would depress present value more for the bottom earnings decile. The debt of these groups tend to have higher duration because, in many cases, it will not be fully repaid within 20 or 25 years following graduation. On the other hand, high earners are more likely to reimburse their debt within ten years under the standard payment plan.

Should we use different discount rates for low earners? One argument is that, for borrowers under IDR or at risk of default or deferment, loan payments depend on earnings.

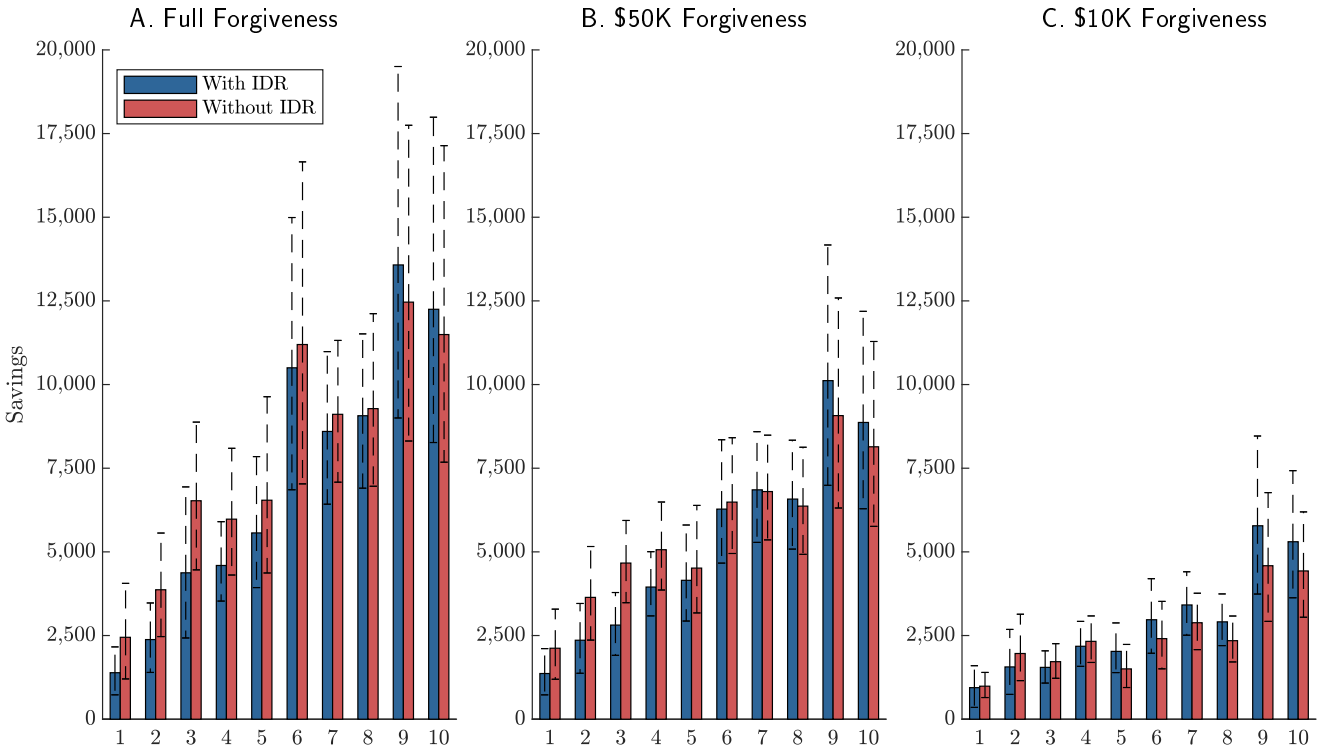

Figure 10: Debt forgiveness for new graduates with and without IDR.

This figure illustrates the hypothetical benefits of full or partial forgiveness of student debt at graduation, in the presence or absence of IDR, under different forgiveness policies. Including IDR shows the average discounted payment savings for cohort graduating between 2014 and 2019. Estimates are adjusted to reflect the propensity of individuals of the same age cohorts and earnings deciles to have any student debt. By excluding IDR we obtain a balance reduction, which represents the gains from forgiveness in a world without IDR in which borrowers are forced to repay their loan. Error bars represent bootstrapped 90% confidence intervals.

This is more likely to be the case for households who have a lower monthly payment in IDR, as a drop in their earnings would translate into lower IDR payment. Importantly, his or her reduction in payments does not necessarily translate into a lower market value for the loan. If the balance is expected to be reimbursed before it is forgiven, the payment reduction would only defer these cash flows. In fact, if interest rates accrue at a higher rate than the appropriate discount rate, the value of the loan could, theoretically, go up. Reductions in payments translate into losses only if the borrower is not expected to fully reimburse his or her loan. Loans are safe if they are expected to be fully repaid a few years before IDR forgiveness dates. Figure 12 shows the fraction of borrowers who are expected to fully repay their balance within two years before the remaining balance would be forgiven under current IDR rules. The share of borrowers who are expected to repay prior to IDR forgiveness occurring is increasing in income deciles. Given that debt is safer at the top of the income distribution, heterogeneity in discount rates would only reinforce our conclusions.

Note that as long as non-repayment risk is idiosyncratic, it should not be reflected in discount rates. Because student loans are not publicly traded, we cannot observe their returns and compute their stock market beta. Using delinquency as a proxy for returns, we find little evidence that student loan default risk is systematic. Appendix Figure A.4 shows that there is little correlation between student loan delinquency and market returns. More precisely, the figure shows mean annual 90-day delinquency rates by S&P-500 returns. The left panel shows contemporaneous annual returns, while the right panel shows lagged annual returns. The correlation, while insignificant, is actually positive, suggesting the higher market returns are weakly associated with higher loan defaults. The coefficient from a regression of delinquency rates on returns is .0185, with a standard error of .0161.[24] The coefficient from a regression of delinquency rates on lagged returns is .0266, with a standard error of .0112. While this may be surprising, Looney and Yannelis (2022) argue that almost all of the time series variation in loan defaults is driven by shifts in the composition of borrowers. In particular, increases in the share of for-profit borrowers drive most of the swings in loan defaults.[25]

[24] It is also worth noting that this is likely an overestimate of how actual collections vary with the business cycle. Collections rates are high, and students loans are effectively non-dischargeable in bankruptcy. Thus one of the main effects of delinquency is to push payments further into the future.

[25] Unfortunately, we cannot observe institution type in the SCF.

Table 4
Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment with a 2% risk premium

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,114	775	338	775	282	926	675	393	12.8	8.9	3.9	8.9	3.2	10.6	7.8	4.5	2.3	2.4	3.1	2.8	9.5	3.0	4.9	5.4
2	1,222	669	300	669	107	906	532	283	15.2	8.3	3.7	8.3	1.3	11.3	6.6	3.5	2.7	2.2	3.0	2.6	3.9	3.2	4.2	4.2
3	1,896	1,244	388	1,244	455	1,398	1,316	690	25.4	16.6	5.2	16.6	6.1	18.7	17.6	9.2	4.5	4.5	4.1	5.1	17.8	5.3	11.1	11.1
4	2,356	1,705	599	1,705	210	1,730	1,356	508	31.5	22.8	8.0	22.8	2.8	23.1	18.1	6.8	5.5	6.1	6.3	7.0	8.2	6.5	11.4	8.1
5	3,426	2,693	1,058	2,693	273	2,317	1,578	592	44.8	35.2	13.8	35.2	3.6	30.3	20.6	7.7	7.9	9.5	10.9	10.9	10.4	8.6	13.0	9.3
6	5,876	3,564	1,207	3,564	198	3,092	1,865	881	79.3	48.1	16.3	48.1	2.7	41.7	25.2	11.9	14.0	12.9	12.8	14.9	7.8	11.8	15.8	14.3
7	5,831	4,137	1,505	4,137	240	3,247	1,507	669	79.3	56.2	20.5	56.2	3.3	44.1	20.5	9.1	14.0	15.1	16.1	17.4	9.5	12.5	12.9	10.9
8	7,957	4,526	1,392	4,361	613	4,944	1,895	1,354	105.5	60.0	18.5	57.8	8.1	65.5	25.1	18.0	18.6	16.1	14.5	17.9	23.8	18.5	15.8	21.5
9	7,377	4,859	1,539	3,810	186	4,595	1,025	696	99.7	65.7	20.8	51.5	2.5	62.1	13.9	9.4	17.5	17.7	16.4	15.9	7.4	17.5	8.7	11.3
10	5,701	3,819	1,238	1,354	46	3,577	276	250	74.8	50.1	16.2	17.8	0.6	46.9	3.6	3.3	13.2	13.5	12.8	5.5	1.8	13.2	2.3	3.9
All	4,346	2,845	971	2,473	262	2,711	1,216	638	568.2	372.0	126.9	323.3	34.2	354.5	159.0	83.4	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries ($)																								
	60,870	58,270	60,824	49,686	39,698	62,116	41,190	44,889																
Ratios																								
Top 50/Bottom 50	3.27	2.95	2.56	2.43	0.97	2.67	1.20	1.56																
Top 30/Bottom 30	4.97	4.91	4.06	3.54	1.00	4.06	1.27	1.68																
Top 30/Middle 40	1.20	1.09	0.95	0.79	0.92	1.26	0.51	0.87																

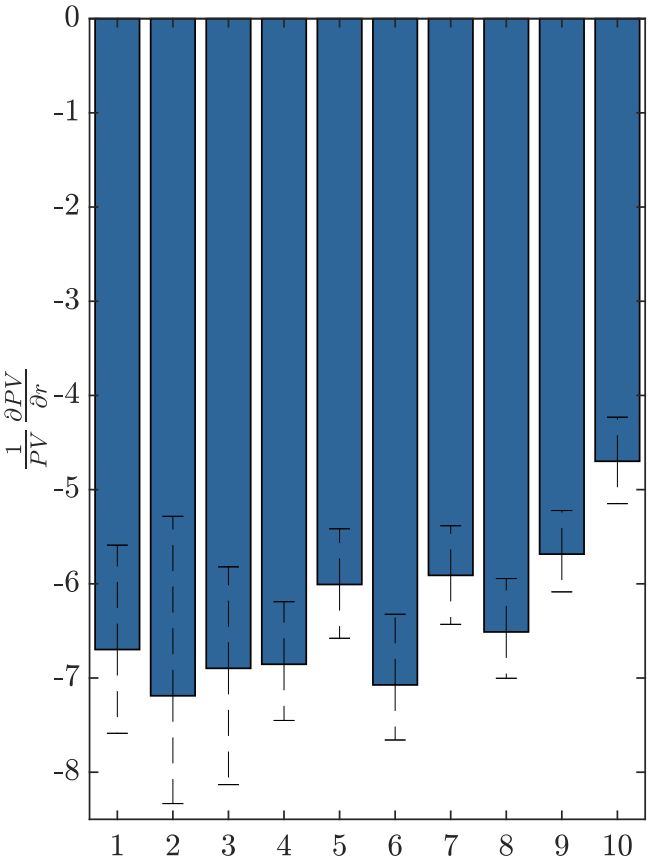

Figure 11: Sensitivity of Debt Present Value to Discount Rate

This figure displays the percentage change in the present value of student debt when the discount rate increases by 1 percentage point. We calculate this sensitivity for each decile by increasing the discounting rate applied to future cash flows from 3% to 4%.

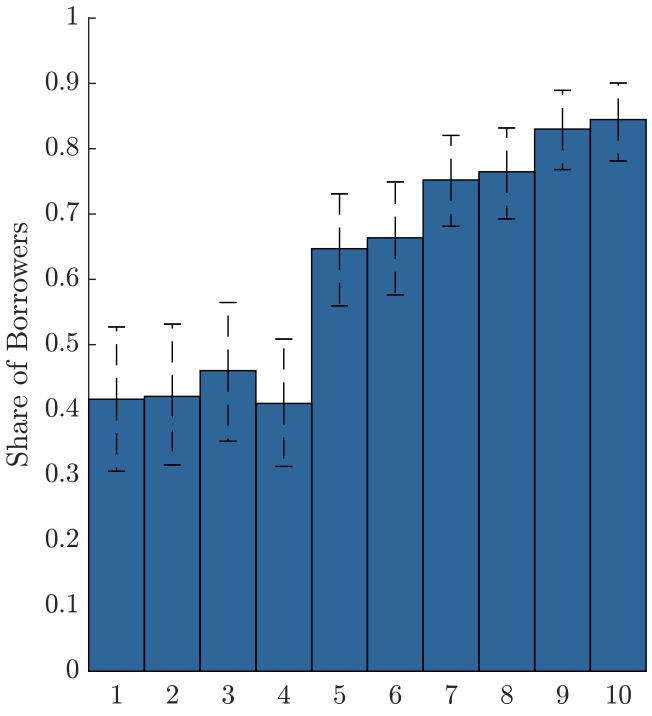

Figure 12: Share of Borrowers Expected to Repay More Than Two Years Before Forgiveness

This figure displays the percentage of borrowers who are expected to fully repay their balance, by decile, more than two years before the remaining balance would be forgiven under current IDR rules. For each borrower, we average the year the balance is fully repaid across simulations. Error bars represent bootstrapped 90% confidence intervals.

6.2. Sensitivity to Discount Rate, Earnings Growth and Volatility Assumptions

Tables C.1 to C.11 repeat the main analysis in Table 2, varying earnings growth and discount rate assumptions. Higher earnings growth rates decrease the generosity of forgiveness, with larger effects on IDR. This is because with higher earnings, more borrowers make the highest payment. Higher discount rates have a similar effect, since cash flows far into the future have a lower present value. The basic patterns remain unchanged regardless of earnings growth assumptions and discount rates. Universal loan forgiveness remains a regressive policy, while expanding IDR options leads to more forgiveness for lower and middle-income borrowers.

Tables D.1 to D.2 repeat the analysis for different levels of earnings volatility. Higher volatility decreases the present value of student debt, and thus reduces the discounted payment savings from forgiveness policies. Under the assumption that low earners have higher income volatility, the financial benefits of loan forgiveness would be more concentrated towards the top of the earnings distribution. However, our results are not very sensitive to the volatility of earnings overall.

7. Concluding Remarks

The ultimate distributional effects of student loan forgiveness depend on the present value of loans discharged to different individuals. This paper computes the present value of student loan forgiveness under different options. We find that universal and capped forgiveness policies are highly regressive, with the vast majority of benefits accruing to high-income individuals. On the other hand, enrolling more borrowers in IDR plans linking repayment to earnings leads to higher relative forgiveness for borrowers in the middle of the income-distribution. These results are important for studying the distributional consequences of loan forgiveness and in designing policies aimed at student debt relief.

While the distributional effects of student loan forgiveness are an important aspect of student loan forgiveness, other factors may play a role in determining the desirability of debt forgiveness. Student loans may distort career choices (Rothstein and Rouse, 2011), credit constraints may hinder entrepreneurship (Barrios, Hochberg and Yi, 2022),

debt overhang may distort labor supply decisions (Donaldson, Piacentino and Thakor, 2019) and debt relief may have macroeconomic consequences (Auclert, Dobbie and Goldsmith-Pinkham, 2019). Future work should study tradeoffs between the distributional impacts of loan forgiveness and other potential benefits of borrower relief.

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Internet Appendix

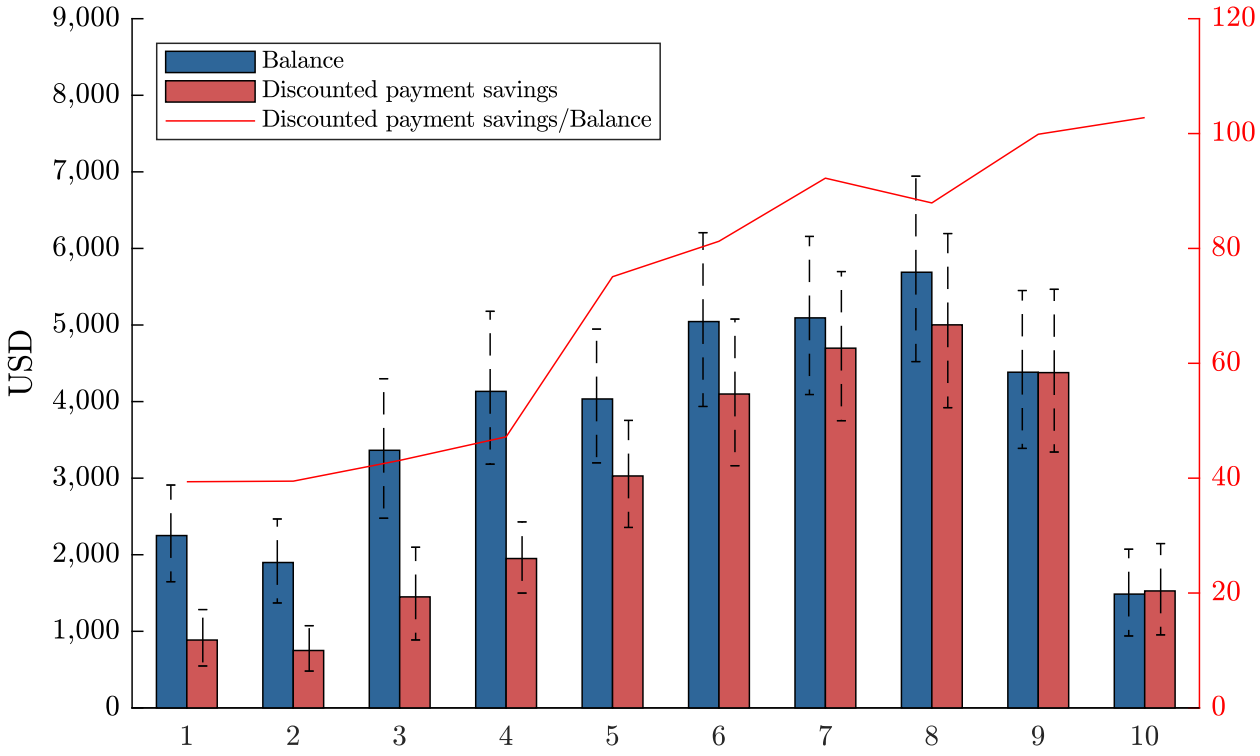
The Distributional Effects of Student Loan Forgiveness

Sylvain Catherine* Constantine Yannelis†

A Additional Tables and Figures

Figure A.1: Partial Balance Forgiveness - Phased out Above $75,000

This figure displays the average change in student debt per capita after a partial balance forgiveness of $50,000 per person for households with per capita earnings below $75,000. For each additional dollar of per capita earnings, the amount forgiven per person is reduced by one dollar. The red line reports the ratio of the average discounted payment saving to the average balance reduction in each group. Error bars represent bootstrapped 90% confidence intervals.



*University of Pennsylvania, Wharton School of Business
†University of Chicago, Booth School of Business, constantine.yannelis@chicagobooth.edu

Figure A.2: Discounted Payment Savings for Drop-outs

This figure displays discounted payment savings from full balance forgiveness by decile and drop-out status. A person is considered to have dropped out of college if their educational status in the SCF is "some college but no degree." Error bars represent bootstrapped 90% confidence intervals.

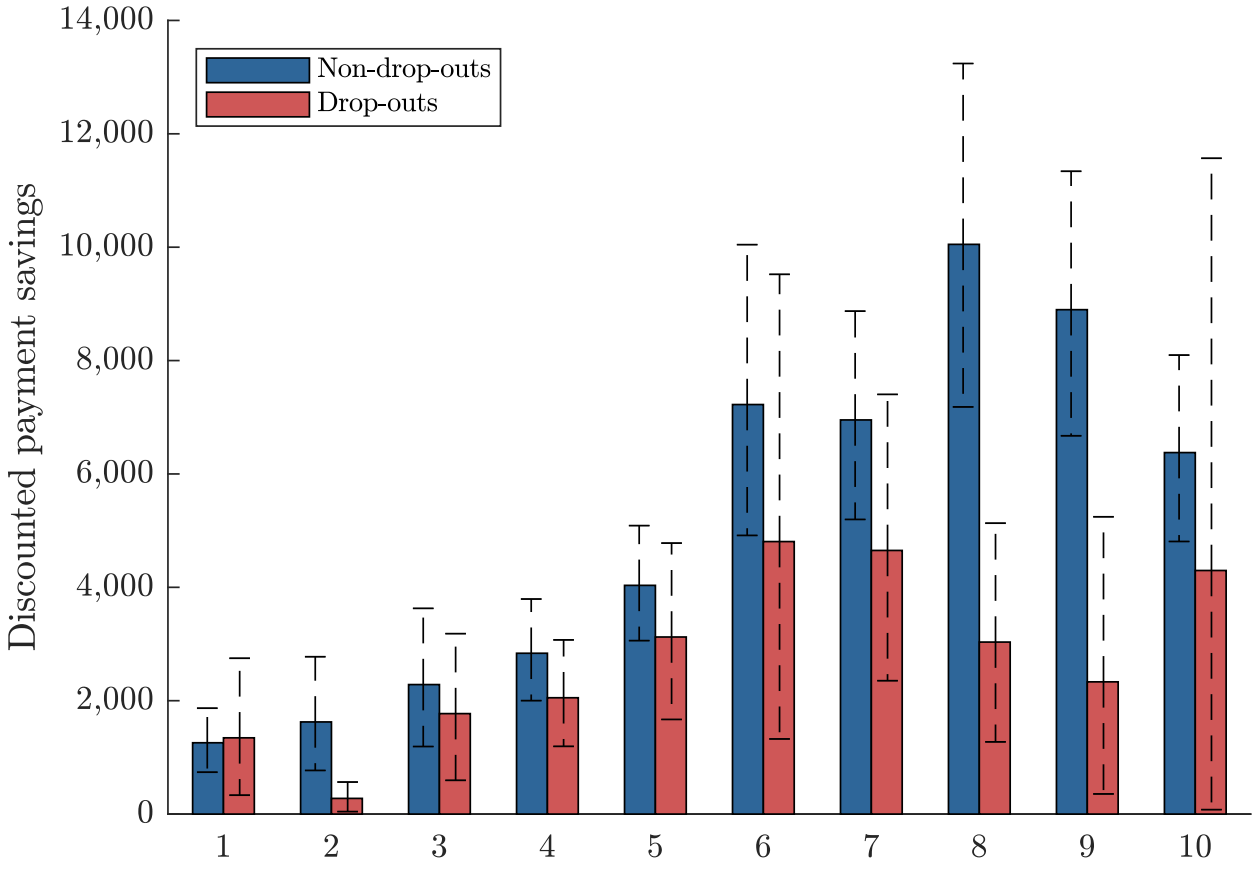


Figure A.3: Average Student Debt by Race/Ethnicity

This figure displays balances and present values of loans by race and ethnicity. Error bars represent bootstrapped 90% confidence intervals.

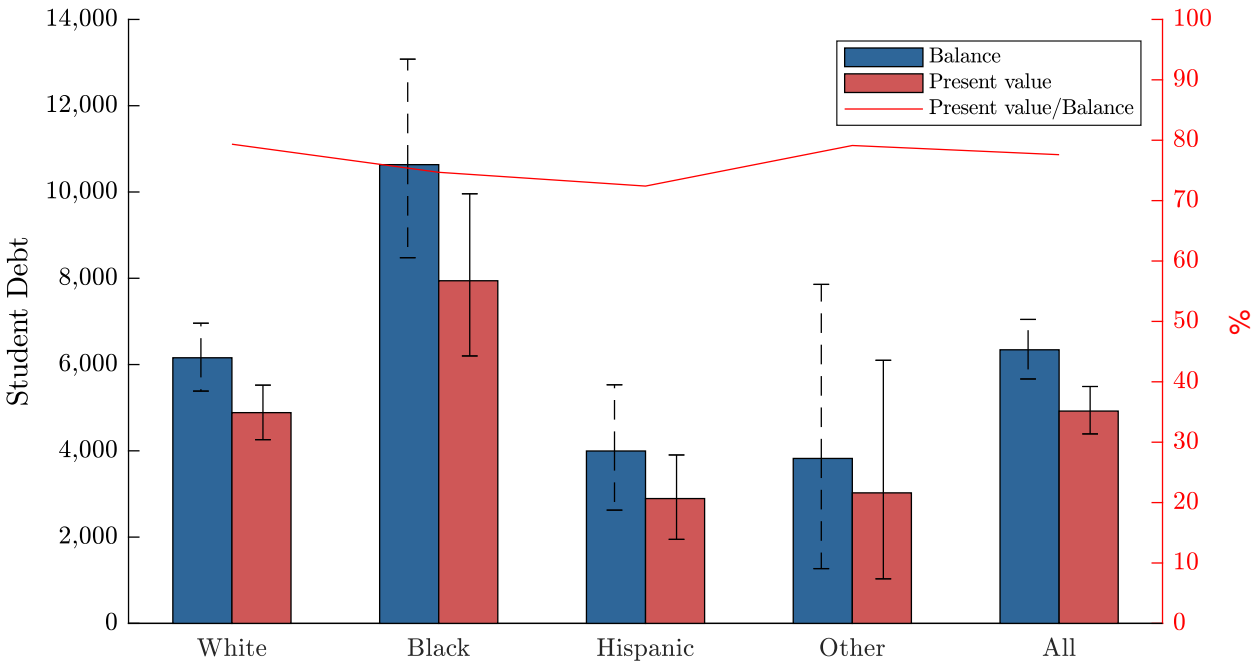


Figure A.4: Student Loan Delinquency and Market Returns

This figure displays mean annual 90-day delinquency rates by S&P-500 returns. The left panel uses contemporaneous returns, while the right panel uses lagged returns. The coefficient from a regression of delinquency rates on returns is .0185, with a standard error of .0161. The coefficient from a regression of delinquency rates on lagged returns is .0266, with a standard error of .0112. 90-day delinquency rates are obtained from the Federal Reserve Bank of New York.

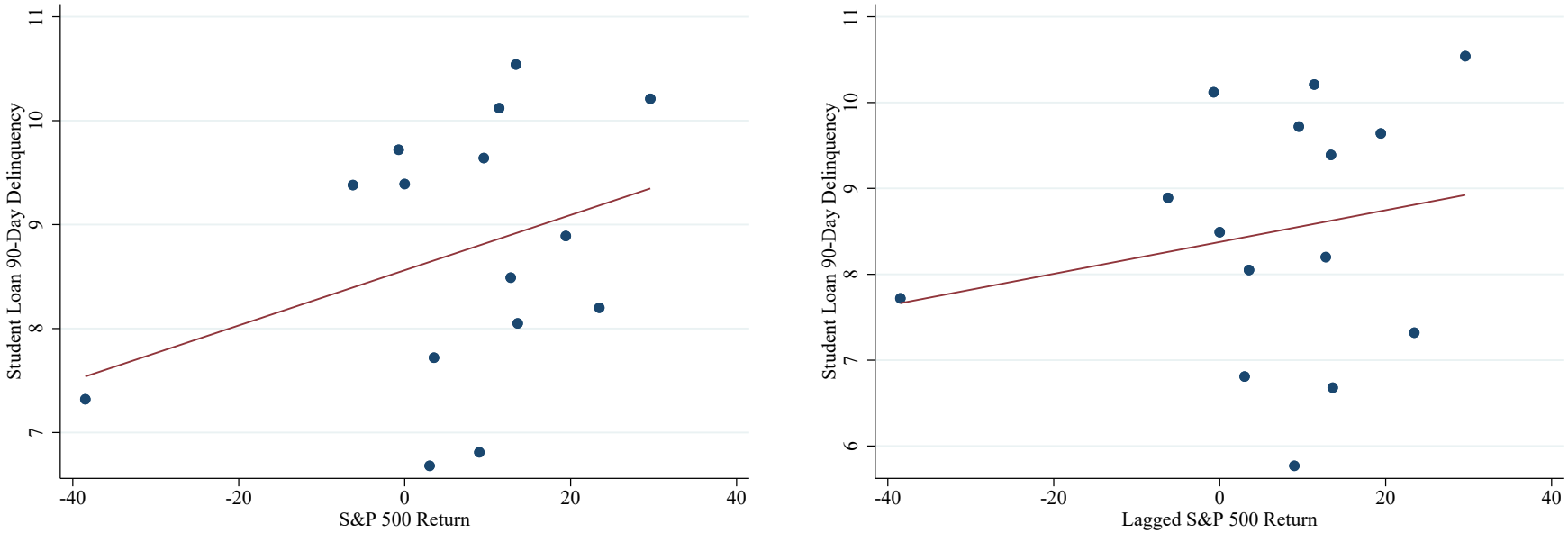


Table A.1: Variable Descriptions

This table describes the main variables used in the analysis. All variables are taken from the Federal Reserve's 2019 Survey of Consumer Finances (SCF). The actual variable labels from SCF are included in the description. Any monetary variables are in terms of 2019 dollars.

Name	Description
Balance	Current balance of each education loan. SCF main dataset: x7824 x7847 x7870 x7924 x7947 x7970
Initial Balance	Original amount borrowed for each education loan, excluding finance charges. SCF main dataset: x7805 x7828 x7851 x7905 x7928 x7951
Payment	Yearly payment on each education loan. Converted to annual payments based on the frequency of payments. SCF main dataset: x7815 x7838 x7861 x7915 x7038 x7961
Interest Rate	The annual rate of interest charged on each education loan. SCF main dataset: x7822 x7845 x7868 x7922 x7945 x7968
Year Left School	The last year that the borrower attends the program that they used each education loan for. SCF main dataset: x7880 x7885 x7890 x7895 x7900 x7995
First Repayment Year	The year that a borrower begins making payments on each education loan. SCF main dataset: x7811 x7834 x7857 x7911 x7934 x7957
Why Zero	Explains why the payments on an education loan are zero. Options include being in forbearance or a job or public service loan forgiveness program, not being able to afford payments, and still being enrolled or in the post-graduation grace period. SCF main dataset: x9300, x9301, x9302, x9303, x9304, x9305
IDR	Indicates whether the payments on an education loan are affected by either being in an income-based repayment program or hardship deferral. SCF main dataset: x7422 x7424 x7426 x7428 x7430 x7432
Family Income	Total income for each household. Taken directly from SCF Survey Extract data.
Wage Income	Income from wages and salaries for each household. Taken directly from SCF Survery Extract data.
Number of Adults	Number of adults in each household. Value is either one or two depending on whether the reference person is married. Taken directly from SCF Survey Extract data.
Number of Children	Number of children in each household. Taken directly from SCF Survey Extract data.

Table A.2: Income Decile Cutoffs

This table shows highest level of each earnings decile, by age and earnings decile. Age groups go from youngest to oldest vertically, and earnings deciles go from lowest to highest horizontally. Each observation shows the top income in the group. All data comes from the Federal Reserve's 2019 Survey of Consumer Finances (SCF). Any monetary variables are in terms of 2019 dollars.

Age	**Earnings Decile**									
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
25	0	12,200	21,900	25,500	28,000	33,600	38,200	40,700	47,900	85,500
30	12,200	20,400	25,500	32,600	40,700	49,400	56,000	71,300	87,600	214,800
35	4,400	16,300	20,900	26,500	36,100	47,900	56,000	66,200	73,800	189,400
40	1,000	14,300	23,400	30,000	39,200	49,400	67,200	91,600	119,600	381,800
45	0	15,300	25,500	34,600	40,700	48,900	58,000	74,300	113,000	743,200
50	4,100	13,200	18,800	36,700	39,700	46,300	64,100	87,600	115,600	1,730,800
55	0	0	18,800	30,500	44,300	50,900	66,200	89,100	127,300	7,885,300
60	0	0	13,200	21,400	31,600	36,700	59,100	69,200	130,300	3,563,400

Table A.3: Student Debt by Earnings and Wealth Quartile

This table reports the average student debt per person by quartile of wealth and earnings, including households without debts. Wealth is defined using the SCF "networth" variable, which is the sum of all assets minus liabilities. Quartiles are built within age groups. Panel A reports the average balance while Panel B reports present values.

Panel A. Outstanding Balance

Earnings	Wealth quartile			
quartile	1	2	3	4
1	5,950	1,248	1,887	917
2	12,664	2,338	3,402	2,449
3	30,226	3,634	3,660	3,551
4	45,952	10,907	6,040	3,938

Panel B. Present Value

	1	2	3	4
1	2,216	657	1,012	1,114
2	5,890	2,169	2,020	1,334
3	22,903	3,672	3,838	3,952
4	38,752	11,648	6,357	4,064

Table A.4: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment

This table reports the total and per capita discounted payment savings of the policies we evaluate, by race/ethnic group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. Panel A is analogous to Table 2 and Panel B is analogous to Table 4. All present values are in pre-tax dollars.

Panel A: Discounted Payment Savings

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
White	4,885	3,382	1,206	2,920	219	3,142	1,139	568	413.7	286.5	102.2	247.3	18.5	266.1	96.5	48.1	64.3	67.8	70.5	67.0	51.6	64.1	55.5	53.6
Black	7,942	4,887	1,392	4,423	790	5,309	3,002	1,625	149.9	92.2	26.3	83.5	14.9	100.2	56.6	30.7	23.3	21.8	18.1	22.6	41.4	24.1	32.5	34.1
Hispanic	2,894	1,763	631	1,595	112	1,831	888	380	52.1	31.8	11.4	28.7	2.0	33.0	16.0	6.8	8.1	7.5	7.8	7.8	5.6	8.0	9.2	7.6
Other	3,025	1,286	567	1,068	54	1,705	530	453	27.7	11.8	5.2	9.8	0.5	15.6	4.9	4.1	4.3	2.8	3.6	2.7	1.4	3.8	2.8	4.6

Panel B: With a 2% risk premium

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
White	4,347	2,999	1,060	2,573	210	2,713	1,057	541	368.2	254.0	89.8	217.9	17.8	229.8	89.5	45.8	64.8%	68.3%	70.8%	67.4%	52.0%	64.8%	56.3%	54.9%
Black	6,907	4,216	1,190	3,792	740	4,454	2,687	1,475	130.3	79.6	22.5	71.6	14.0	84.0	50.7	27.8	22.9%	21.4%	17.7%	22.1%	40.8%	23.7%	31.9%	33.4%
Hispanic	2,528	1,548	553	1,393	108	1,537	792	338	45.6	27.9	10.0	25.1	1.9	27.7	14.3	6.1	8.0%	7.5%	7.9%	7.8%	5.7%	7.8%	9.0%	7.3%
Other	2,633	1,147	510	946	56	1,414	487	403	24.1	10.5	4.7	8.7	0.5	13.0	4.5	3.7	4.2%	2.8%	3.7%	2.7%	1.5%	3.7%	2.8%	4.4%

B Taxation of Loan Forgiveness

In the main analysis, we assume that loan forgiveness under IDR is untaxed and compute deciles based on pre-tax income. This is consistent with any forgiveness that happens after Dec. 31, 2020, and before Jan. 1, 2026, under the American Rescue Plan Act of 2021. However, under current law forgiveness after Jan. 1, 2026 is still taxed. While many experts believe that these rules will be changed before forgiveness under IDR occurs,[1] under current law loan forgiveness is treated as taxable income. In this appendix we explore the implications of taxes on loan forgiveness programs.

First, we project how much taxes borrowers will pay under the current system. We assume that 2019 tax brackets (Table B.1) will grow at the same rate as consumer prices. For couples, we multiply the cutoffs by two, which is equivalent to assuming that they will file jointly. Taxable income is the sum of a family's earnings and forgiven balances in a given year, minus the standard deduction. Family earnings evolve under the same assumptions as in Section 3.1. As for tax brackets cutoffs, we assume the standard deduction to be twice as large for couples and to grow at the same rate as inflation. We define the tax cost related to balance forgiveness as the increase in taxes resulting from the inclusion of the forgiven balance to its taxable income.

Figure B.1 shows the average present value of these tax costs. The top panel shows amounts for all households, the middle panel shows households with student debt and the bottom panel shows households with any projected tax bill. These tax bills largely mirror the benefits of IDR forgiveness, with the middle of the income distribution paying the largest tax bills. Effectively, taxing loan forgiveness under IDR undoes some of the benefits of IDR loan forgiveness. Panel C reports the average balance by decile and per person for households who will have to pay such taxes. These present values are quite substantial. It is important to note that it is not clear how much the IRS will actually collect from individuals in the bottom 10% if they owe $14,000.

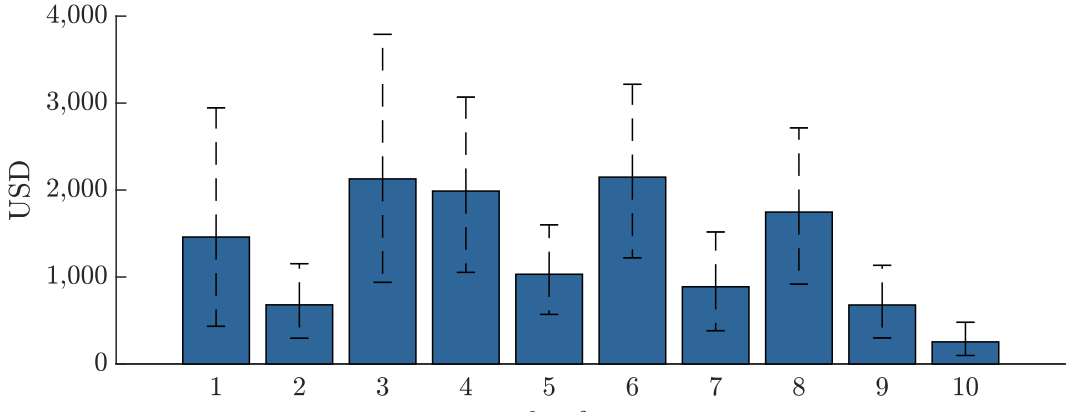
Nonetheless, we can assume that these taxes will be paid and estimate the benefits of combining the policies we previously considered with an end to such taxation. To that purpose, Table B.2 repeats the analysis in Table 2, but assumes that these taxes are removed and reports the results in post-tax dollars. To be specific, we measure the discounted payment saving of each policy, under the assumption that borrowers would have paid taxes when their loan is forgiven under the status-quo, but that all taxes are removed under new policies. The levels of forgiveness increase substantially–because it now includes the benefit from eliminating IDR forgiveness taxes–but the basic patterns regarding income progressivity and regressivity of various options do not. Under universal and capped forgiveness plans, the majority of benefits accrue to the top income deciles, while under IDR plans the majority of forgiveness accrues to the middle and bottom of the income distribution.

[1] For example, the Wall Street Journal, June 24, 2018 writes that "the IRS would likely be forced to cut deals or write off taxable amounts altogether, some experts say."

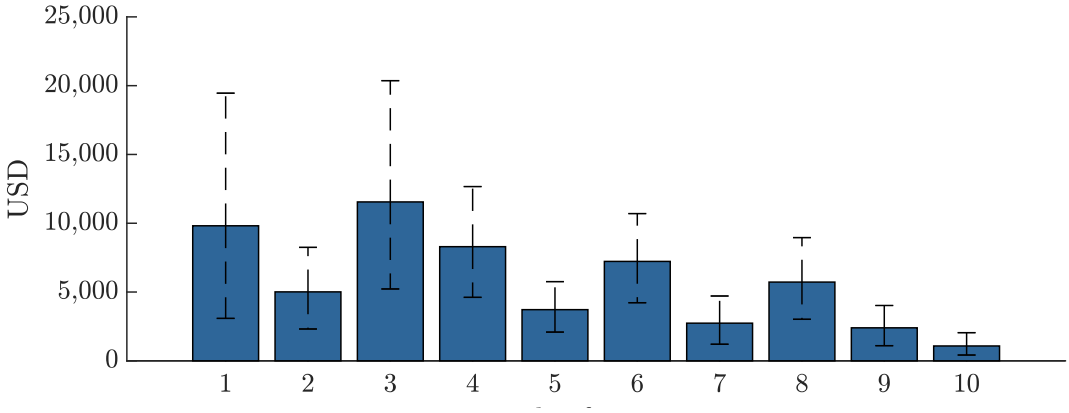
Figure B.1: Present value of taxes on forgiven balances

This figure displays the average present value of projected taxes on balances forgiven in the future, per person and within-cohort decile of earnings. Panel A reports the mean for the entire sample. Panel B reports the mean for households with student debts. Panel C reports the mean for households projected to have to pay such taxes.

Panel A. All households



Panel B. Households with student debt



Panel C. Households with projected tax bill

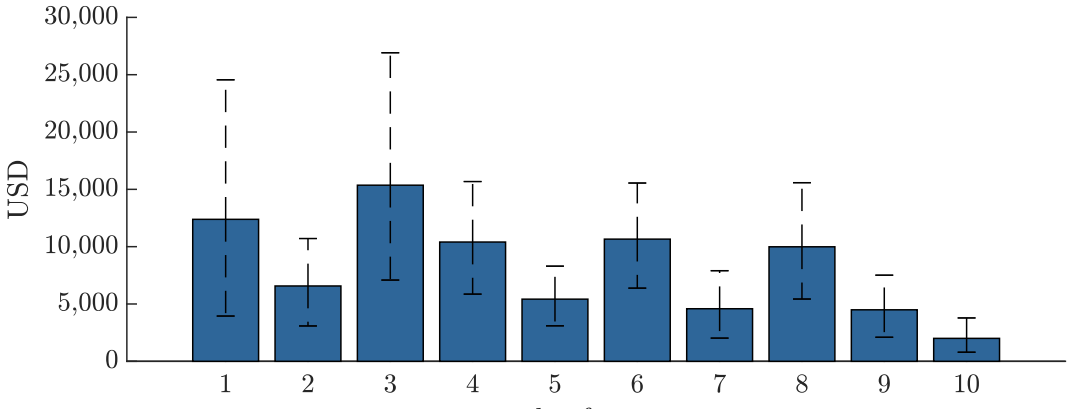


Table B.1: 2019 Tax Brackets

This table displays the tax rates applicable to each income bracket for single individuals. The standard deduction is $12,200 in 2019.

Bracket	Rate
Up to $9,700	10%
$9,701 –$39,475	12%
$39,476 –$84,200	22%
$84,201 –$160,725	24%
$160,726 –$204100	32%
$204,101 –$510,300	35%
Over $510,301	37%

Table B.2: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Post-Tax Dollars

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt combined with ending taxation on canceled balances. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. Unlike in Table 2, we combine these policies with end to forgiveness taxation, including under IDR. All present values are in post-tax dollars and include the benefits of this change in the tax policy.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance Forgiveness				IDR Enrollment				Balance Forgiveness				IDR Enrollment				Balance Forgiveness				IDR Enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	2,736	2,346	1,846	2,346	1,673	2,464	2,140	1,801	31.5	27.0	21.2	27.0	19.2	28.3	24.6	20.7	3.9	4.5	6.7	5.0	10.7	4.9	7.5	8.7
2	2,094	1,429	1,019	1,429	723	1,741	1,252	930	26.1	17.8	12.7	17.8	9.0	21.7	15.6	11.6	3.2	3.0	4.0	3.3	5.0	3.8	4.8	4.8
3	4,309	3,578	2,580	3,578	2,275	3,584	3,403	2,581	57.6	47.8	34.5	47.8	30.4	47.9	45.5	34.5	7.1	8.1	10.9	8.9	16.9	8.3	13.9	14.4
4	4,696	3,939	2,672	3,939	1,765	3,772	3,164	2,143	62.7	52.6	35.7	52.6	23.6	50.4	42.2	28.6	7.7	8.9	11.3	9.7	13.1	8.8	12.9	12.0
5	4,899	4,060	2,226	4,060	1,188	3,655	2,676	1,555	64.1	53.1	29.1	53.1	15.5	47.8	35.0	20.3	7.9	9.0	9.2	9.8	8.6	8.3	10.7	8.5
6	8,933	6,247	3,545	6,247	2,199	5,883	4,154	3,030	120.6	84.3	47.9	84.3	29.7	79.4	56.1	40.9	14.8	14.2	15.2	15.6	16.5	13.8	17.1	17.1
7	7,458	5,585	2,608	5,585	847	4,632	2,329	1,381	101.4	75.9	35.5	75.9	11.5	63.0	31.7	18.8	12.5	12.8	11.2	14.1	6.4	11.0	9.7	7.8
8	10,826	6,925	3,357	6,749	2,047	7,503	3,635	2,986	143.5	91.8	44.5	89.5	27.1	99.5	48.2	39.6	17.6	15.5	14.1	16.6	15.0	17.3	14.7	16.5
9	8,952	6,186	2,432	5,057	844	5,993	1,731	1,377	121.0	83.6	32.9	68.3	11.4	81.0	23.4	18.6	14.9	14.1	10.4	12.7	6.3	14.1	7.1	7.8
10	6,521	4,477	1,645	1,781	227	4,269	441	424	85.5	58.7	21.6	23.4	3.0	56.0	5.8	5.6	10.5	9.9	6.8	4.3	1.7	9.7	1.8	2.3
All	6,226	4,533	2,413	4,128	1,380	4,398	2,509	1,830	814.0	592.7	315.5	539.8	180.5	575.0	328.1	239.2	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	55,345	46,263	53,495	45,444	35,904	54,474	38,151	38,789																
Ratios																								
Top 50/Bottom 50	2.28	1.92	1.31	1.66	0.81	1.86	0.97	1.02																
Top 30/Bottom 30	2.88	2.39	1.37	1.85	0.67	2.28	0.85	0.90																
Top 30/Middle 30	1.42	1.23	0.88	0.95	0.61	1.33	0.58	0.71																

C Alternative Discount Rates and Earnings Growth

In the main analysis, we assume a discount rate of 3%, and an earnings growth rate of 2%. In this section, we repeat the analysis in Table 2 but vary these assumptions. We vary earnings growth rates from 1 to 3%, and allow discount rates to be 1, 3, 5 and 7%. The results are shown in tables C.1 to C.11. Our basic pattern of results and conclusions remain unchanged.

Table C.1: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 1% | Discount Rate: 1%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,371	963	419	963	366	1,165	850	497	15.8	11.1	4.8	11.1	4.2	13.4	9.8	5.7	2.24	2.39	3.01	2.73	9.66	2.87	4.72	5.48
2	1,519	797	368	797	123	1,174	667	345	18.9	9.9	4.6	9.9	1.5	14.6	8.3	4.3	2.69	2.15	2.87	2.45	3.53	3.14	4.02	4.12
3	2,305	1,539	482	1,539	536	1,770	1,632	827	30.8	20.6	6.4	20.6	7.2	23.7	21.8	11.1	4.39	4.45	4.03	5.07	16.46	5.08	10.54	10.61
4	2,849	2,047	734	2,047	244	2,170	1,691	611	38.0	27.3	9.8	27.3	3.3	29.0	22.6	8.2	5.41	5.91	6.12	6.74	7.47	6.22	10.91	7.83
5	4,160	3,272	1,298	3,272	326	2,938	1,993	716	54.4	42.8	17.0	42.8	4.3	38.4	26.1	9.4	7.74	9.25	10.62	10.56	9.77	8.25	12.60	8.98
6	7,443	4,491	1,547	4,491	264	4,324	2,508	1,134	100.5	60.6	20.9	60.6	3.6	58.4	33.9	15.3	14.30	13.11	13.06	14.96	8.17	12.53	16.36	14.69
7	7,230	5,206	1,910	5,206	305	4,360	1,992	831	98.3	70.8	26.0	70.8	4.1	59.3	27.1	11.3	13.98	15.30	16.23	17.46	9.52	12.72	13.08	10.84
8	10,060	5,745	1,800	5,559	776	6,710	2,559	1,719	133.4	76.2	23.9	73.7	10.3	89.0	33.9	22.8	18.97	16.47	14.92	18.18	23.60	19.09	16.39	21.85
9	9,118	6,114	1,951	4,899	287	6,033	1,397	904	123.2	82.6	26.4	66.2	3.9	81.5	18.9	12.2	17.53	17.86	16.48	16.33	8.91	17.49	9.12	11.71
10	6,828	4,624	1,543	1,707	97	4,481	355	310	89.6	60.7	20.2	22.4	1.3	58.8	4.7	4.1	12.74	13.11	12.65	5.52	2.91	12.62	2.25	3.91
All	5,376	3,538	1,223	3,101	333	3,564	1,583	797	702.9	462.5	159.9	405.4	43.6	466.0	206.9	104.3	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	60,591	58,237	60,670	50,060	42,383	61,487	42,042	45,708																
Ratios																								
Top 50/Bottom 50	3.33	3.04	2.65	2.54	1.08	2.81	1.29	1.64																
Top 30/Bottom 30	5.01	5.00	4.17	3.69	1.13	4.19	1.37	1.76																
Top 30/Middle 40	1.20	1.10	0.96	0.81	1.02	1.25	0.53	0.89																

Table C.2: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 1% | Discount Rate: 3%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,187	834	363	834	321	994	743	436	13.6	9.6	4.2	9.6	3.7	11.4	8.5	5.0	2.2	2.4	3.0	2.7	9.3	2.9	4.6	5.3
2	1,303	708	323	708	121	981	596	311	16.2	8.8	4.0	8.8	1.5	12.2	7.4	3.9	2.6	2.2	2.9	2.5	3.8	3.1	4.0	4.1
3	1,991	1,310	411	1,310	511	1,496	1,438	757	26.6	17.5	5.5	17.5	6.8	20.0	19.2	10.1	4.3	4.3	4.0	5.0	17.2	5.1	10.4	10.7
4	2,465	1,779	638	1,779	235	1,836	1,489	552	32.9	23.8	8.5	23.8	3.1	24.5	19.9	7.4	5.3	5.9	6.1	6.8	7.9	6.2	10.7	7.8
5	3,657	2,887	1,142	2,887	304	2,520	1,804	655	47.8	37.8	14.9	37.8	4.0	33.0	23.6	8.6	7.8	9.3	10.8	10.7	10.0	8.4	12.7	9.1
6	6,386	3,870	1,324	3,870	241	3,506	2,224	1,010	86.2	52.3	17.9	52.3	3.3	47.3	30.0	13.6	14.0	12.9	12.9	14.9	8.2	12.0	16.2	14.4
7	6,359	4,543	1,656	4,543	279	3,680	1,823	768	86.4	61.8	22.5	61.8	3.8	50.0	24.8	10.4	14.0	15.3	16.2	17.6	9.5	12.7	13.4	11.1
8	8,731	4,976	1,542	4,802	721	5,603	2,307	1,566	115.7	66.0	20.4	63.7	9.6	74.3	30.6	20.8	18.8	16.3	14.7	18.1	24.0	18.8	16.5	22.0
9	8,057	5,344	1,697	4,223	237	5,162	1,265	810	108.9	72.2	22.9	57.1	3.2	69.7	17.1	10.9	17.7	17.9	16.5	16.2	8.1	17.7	9.2	11.6
10	6,167	4,152	1,363	1,501	62	3,953	328	280	80.9	54.5	17.9	19.7	0.8	51.9	4.3	3.7	13.1	13.5	12.9	5.6	2.1	13.1	2.3	3.9
All	4,707	3,091	1,062	2,691	304	3,016	1,418	722	615.4	404.1	138.8	351.8	39.8	394.4	185.5	94.4	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	61,051	58,440	61,030	50,034	40,693	62,192	42,087	45,419																
Ratios																								
Top 50/Bottom 50	3.37	3.04	2.63	2.52	1.03	2.80	1.31	1.64																
Top 30/Bottom 30	5.12	5.08	4.19	3.69	1.07	4.24	1.40	1.77																
Top 30/Middle 40	1.22	1.11	0.97	0.80	0.96	1.28	0.53	0.89																

Table C.3: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 1% | Discount Rate: 5%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,040	731	319	731	285	860	658	388	12.0	8.4	3.7	8.4	3.3	9.9	7.6	4.5	2.2	2.4	3.0	2.7	8.7	2.9	4.5	5.1
2	1,132	634	287	634	118	832	537	283	14.1	7.9	3.6	7.9	1.5	10.4	6.7	3.5	2.6	2.2	2.9	2.6	3.9	3.1	4.0	4.0
3	1,742	1,130	356	1,130	487	1,283	1,280	697	23.3	15.1	4.8	15.1	6.5	17.2	17.1	9.3	4.3	4.2	3.9	4.9	17.3	5.1	10.2	10.7
4	2,158	1,565	561	1,565	227	1,573	1,325	505	28.8	20.9	7.5	20.9	3.0	21.0	17.7	6.7	5.3	5.9	6.2	6.8	8.1	6.2	10.5	7.7
5	3,251	2,574	1,014	2,574	291	2,189	1,648	609	42.5	33.7	13.3	33.7	3.8	28.6	21.6	8.0	7.8	9.4	10.9	10.9	10.1	8.5	12.8	9.1
6	5,548	3,376	1,147	3,376	230	2,880	1,990	909	74.9	45.6	15.5	45.6	3.1	38.9	26.9	12.3	13.8	12.8	12.7	14.8	8.2	11.5	16.0	14.1
7	5,651	4,003	1,452	4,003	277	3,144	1,685	739	76.8	54.4	19.7	54.4	3.8	42.7	22.9	10.1	14.1	15.3	16.2	17.6	10.0	12.6	13.6	11.5
8	7,665	4,357	1,336	4,193	687	4,735	2,095	1,441	101.6	57.8	17.7	55.6	9.1	62.8	27.8	19.1	18.7	16.2	14.6	18.0	24.2	18.6	16.5	21.9
9	7,186	4,716	1,490	3,675	211	4,463	1,166	753	97.1	63.7	20.1	49.7	2.9	60.3	15.8	10.2	17.8	17.9	16.5	16.1	7.6	17.8	9.4	11.6
10	5,609	3,753	1,212	1,330	57	3,518	338	287	73.6	49.2	15.9	17.4	0.7	46.1	4.4	3.8	13.5	13.8	13.1	5.7	2.0	13.7	2.6	4.3
All	4,166	2,728	931	2,361	288	2,584	1,288	668	544.7	356.7	121.7	308.7	37.7	337.9	168.4	87.4	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	61,461	58,607	61,342	49,989	40,226	62,851	42,353	45,652																
Ratios																								
Top 50/Bottom 50	3.40	3.05	2.62	2.50	1.04	2.78	1.34	1.66																
Top 30/Bottom 30	5.23	5.14	4.20	3.69	1.07	4.27	1.45	1.81																
Top 30/Middle 40	1.23	1.11	0.97	0.80	0.93	1.30	0.54	0.90																

Table C.4: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 1% | Discount Rate: 7%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	921	648	283	648	257	751	589	349	10.6	7.4	3.2	7.4	3.0	8.6	6.8	4.0	2.2	2.3	3.0	2.7	8.0	3.0	4.4	4.9
2	996	573	256	573	114	716	488	260	12.4	7.1	3.2	7.1	1.4	8.9	6.1	3.2	2.6	2.2	3.0	2.6	3.9	3.0	3.9	3.9
3	1,541	987	313	987	463	1,114	1,151	645	20.6	13.2	4.2	13.2	6.2	14.9	15.4	8.6	4.2	4.2	3.9	4.8	16.8	5.1	10.0	10.5
4	1,909	1,390	498	1,390	221	1,364	1,190	465	25.5	18.6	6.6	18.6	3.0	18.2	15.9	6.2	5.2	5.8	6.2	6.8	8.0	6.2	10.3	7.5
5	2,917	2,316	908	2,316	286	1,922	1,518	576	38.2	30.3	11.9	30.3	3.7	25.1	19.9	7.5	7.8	9.5	11.0	11.1	10.1	8.6	12.9	9.2
6	4,875	2,978	1,003	2,978	224	2,395	1,796	831	65.8	40.2	13.5	40.2	3.0	32.3	24.3	11.2	13.5	12.7	12.6	14.7	8.2	11.0	15.7	13.6
7	5,068	3,559	1,284	3,559	287	2,715	1,565	719	68.9	48.4	17.5	48.4	3.9	36.9	21.3	9.8	14.2	15.2	16.2	17.7	10.6	12.6	13.8	11.9
8	6,798	3,853	1,169	3,698	670	4,049	1,925	1,345	90.1	51.1	15.5	49.0	8.9	53.7	25.5	17.8	18.5	16.1	14.4	17.9	24.0	18.3	16.5	21.7
9	6,464	4,198	1,321	3,228	210	3,897	1,088	720	87.3	56.7	17.8	43.6	2.8	52.6	14.7	9.7	17.9	17.8	16.6	16.0	7.7	18.0	9.5	11.8
10	5,134	3,413	1,086	1,185	79	3,156	352	316	67.3	44.8	14.2	15.5	1.0	41.4	4.6	4.1	13.8	14.1	13.2	5.7	2.8	14.1	3.0	5.0
All	3,723	2,431	824	2,091	283	2,239	1,181	630	486.8	317.8	107.7	273.4	36.9	292.8	154.4	82.3	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	61,824	58,744	61,612	49,928	40,975	63,463	42,720	46,255																
Ratios																								
Top 50/Bottom 50	3.42	3.04	2.60	2.48	1.10	2.76	1.36	1.71																
Top 30/Bottom 30	5.32	5.19	4.20	3.67	1.15	4.30	1.51	1.90																
Top 30/Middle 40	1.25	1.12	0.97	0.79	0.94	1.32	0.55	0.92																

Table C.5: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 2% | Discount Rate: 1%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,480	1,026	447	1,026	360	1,264	872	504	17.0	11.8	5.1	11.8	4.1	14.5	10.0	5.8	2.3	2.4	3.1	2.8	10.5	3.0	5.2	5.9
2	1,660	848	387	848	109	1,294	658	345	20.7	10.6	4.8	10.6	1.4	16.1	8.2	4.3	2.8	2.2	2.9	2.5	3.5	3.3	4.2	4.4
3	2,542	1,713	533	1,713	482	1,958	1,674	807	34.0	22.9	7.1	22.9	6.4	26.2	22.4	10.8	4.6	4.7	4.3	5.4	16.4	5.3	11.6	10.9
4	3,151	2,259	790	2,259	218	2,421	1,733	617	42.1	30.2	10.5	30.2	2.9	32.3	23.1	8.2	5.7	6.2	6.3	7.1	7.4	6.6	12.0	8.3
5	4,415	3,443	1,361	3,443	301	3,137	1,890	695	57.7	45.0	17.8	45.0	3.9	41.0	24.7	9.1	7.8	9.3	10.6	10.6	10.0	8.3	12.8	9.2
6	7,933	4,773	1,636	4,773	232	4,670	2,309	1,092	107.1	64.4	22.1	64.4	3.1	63.1	31.2	14.7	14.5	13.3	13.2	15.1	8.0	12.8	16.1	14.9
7	7,481	5,387	1,987	5,387	272	4,520	1,743	748	101.7	73.2	27.0	73.2	3.7	61.5	23.7	10.2	13.8	15.1	16.1	17.2	9.4	12.5	12.3	10.3
8	10,480	5,990	1,883	5,802	683	7,031	2,239	1,585	138.9	79.4	25.0	76.9	9.1	93.2	29.7	21.0	18.9	16.4	14.9	18.0	23.1	19.0	15.4	21.2
9	9,368	6,301	2,019	5,079	255	6,216	1,201	825	126.6	85.1	27.3	68.6	3.4	84.0	16.2	11.1	17.2	17.6	16.3	16.1	8.8	17.1	8.4	11.3
10	6,937	4,702	1,573	1,735	90	4,554	290	280	91.0	61.7	20.6	22.8	1.2	59.7	3.8	3.7	12.4	12.7	12.3	5.3	3.0	12.2	2.0	3.7
All	5,636	3,705	1,280	3,262	300	3,760	1,477	757	736.8	484.4	167.4	426.4	39.3	491.6	193.0	98.9	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	59,895	57,814	60,055	49,686	42,422	60,633	40,752	44,994																
Ratios																								
Top 50/Bottom 50	3.19	2.92	2.59	2.45	1.04	2.68	1.14	1.53																
Top 30/Bottom 30	4.71	4.74	4.00	3.52	1.08	3.94	1.16	1.62																
Top 30/Middle 40	1.17	1.07	0.95	0.80	1.01	1.21	0.49	0.85																

Table C.6: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 2% | Discount Rate: 5%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,114	775	338	775	282	926	675	393	12.8	8.9	3.9	8.9	3.2	10.6	7.8	4.5	2.3	2.4	3.1	2.8	9.5	3.0	4.9	5.4
2	1,222	669	300	669	107	906	532	283	15.2	8.3	3.7	8.3	1.3	11.3	6.6	3.5	2.7	2.2	3.0	2.6	3.9	3.2	4.2	4.2
3	1,896	1,244	388	1,244	455	1,398	1,316	690	25.4	16.6	5.2	16.6	6.1	18.7	17.6	9.2	4.5	4.5	4.1	5.1	17.8	5.3	11.1	11.1
4	2,356	1,705	599	1,705	210	1,730	1,356	508	31.5	22.8	8.0	22.8	2.8	23.1	18.1	6.8	5.5	6.1	6.3	7.0	8.2	6.5	11.4	8.1
5	3,426	2,693	1,058	2,693	273	2,317	1,578	592	44.8	35.2	13.8	35.2	3.6	30.3	20.6	7.7	7.9	9.5	10.9	10.9	10.4	8.6	13.0	9.3
6	5,876	3,564	1,207	3,564	198	3,092	1,865	881	79.3	48.1	16.3	48.1	2.7	41.7	25.2	11.9	14.0	12.9	12.8	14.9	7.8	11.8	15.8	14.3
7	5,831	4,137	1,505	4,137	240	3,247	1,507	669	79.3	56.2	20.5	56.2	3.3	44.1	20.5	9.1	14.0	15.1	16.1	17.4	9.5	12.5	12.9	10.9
8	7,957	4,526	1,392	4,361	613	4,944	1,895	1,354	105.5	60.0	18.5	57.8	8.1	65.5	25.1	18.0	18.6	16.1	14.5	17.9	23.8	18.5	15.8	21.5
9	7,377	4,859	1,539	3,810	186	4,595	1,025	696	99.7	65.7	20.8	51.5	2.5	62.1	13.9	9.4	17.5	17.7	16.4	15.9	7.4	17.5	8.7	11.3
10	5,701	3,819	1,238	1,354	46	3,577	276	250	74.8	50.1	16.2	17.8	0.6	46.9	3.6	3.3	13.2	13.5	12.8	5.5	1.8	13.2	2.3	3.9
All	4,346	2,845	971	2,473	262	2,711	1,216	638	568.2	372.0	126.9	323.3	34.2	354.5	159.0	83.4	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	60,870	58,270	60,824	49,686	39,698	62,116	41,190	44,889																
Ratios																								
Top 50/Bottom 50	3.27	2.95	2.57	2.43	0.97	2.67	1.20	1.56																
Top 30/Bottom 30	4.97	4.91	4.06	3.54	1.00	4.06	1.27	1.68																
Top 30/Middle 40	1.20	1.09	0.95	0.79	0.92	1.26	0.51	0.87																

Table C.7: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 2% | Discount Rate: 7%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	983	685	298	685	255	806	603	354	11.3	7.9	3.4	7.9	2.9	9.3	6.9	4.1	2.2	2.4	3.1	2.8	8.6	3.0	4.7	5.1
2	1,070	602	268	602	106	774	484	260	13.3	7.5	3.3	7.5	1.3	9.6	6.0	3.2	2.6	2.3	3.0	2.6	3.9	3.1	4.1	4.1
3	1,669	1,081	338	1,081	439	1,206	1,184	642	22.3	14.5	4.5	14.5	5.9	16.1	15.8	8.6	4.4	4.4	4.0	5.1	17.3	5.3	10.8	10.8
4	2,074	1,506	529	1,506	206	1,491	1,218	469	27.7	20.1	7.1	20.1	2.8	19.9	16.3	6.3	5.5	6.1	6.3	7.0	8.1	6.5	11.1	7.9
5	3,065	2,417	946	2,417	269	2,028	1,461	562	40.1	31.6	12.4	31.6	3.5	26.5	19.1	7.3	7.9	9.6	11.0	11.1	10.4	8.7	13.0	9.3
6	5,149	3,134	1,053	3,134	196	2,563	1,696	808	69.5	42.3	14.2	42.3	2.6	34.6	22.9	10.9	13.7	12.8	12.7	14.8	7.8	11.3	15.6	13.8
7	5,223	3,676	1,330	3,676	256	2,800	1,418	660	71.0	50.0	18.1	50.0	3.5	38.1	19.3	9.0	14.0	15.1	16.1	17.5	10.2	12.4	13.1	11.3
8	7,047	3,997	1,216	3,840	608	4,221	1,764	1,278	93.4	53.0	16.1	50.9	8.1	56.0	23.4	16.9	18.4	16.0	14.4	17.8	23.7	18.3	15.9	21.4
9	6,632	4,325	1,363	3,345	188	4,011	972	674	89.6	58.4	18.4	45.2	2.5	54.2	13.1	9.1	17.7	17.7	16.4	15.8	7.5	17.7	8.9	11.5
10	5,219	3,474	1,109	1,207	66	3,211	297	284	68.5	45.6	14.5	15.8	0.9	42.1	3.9	3.7	13.5	13.8	13.0	5.5	2.6	13.7	2.7	4.7
All	3,876	2,530	857	2,186	260	2,344	1,122	605	506.7	330.8	112.1	285.8	34.0	306.4	146.8	79.1	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	61,279	58,443	61,136	49,656	40,476	62,787	41,676	45,591																
Ratios																								
Top 50/Bottom 50	3.30	2.96	2.55	2.42	1.03	2.67	1.24	1.62																
Top 30/Bottom 30	5.08	4.98	4.08	3.54	1.08	4.11	1.34	1.78																
Top 30/Middle 40	1.22	1.10	0.96	0.78	0.93	1.29	0.52	0.90																

Table C.8: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 3% | Discount Rate: 1%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,594	1,090	476	1,090	350	1,368	889	507	18.3	12.5	5.5	12.5	4.0	15.7	10.2	5.8	2.4	2.5	3.1	2.8	11.4	3.0	5.7	6.2
2	1,812	904	405	904	94	1,425	642	350	22.6	11.3	5.0	11.3	1.2	17.8	8.0	4.4	2.9	2.2	2.9	2.5	3.3	3.4	4.5	4.7
3	2,790	1,896	590	1,896	423	2,155	1,687	775	37.3	25.3	7.9	25.3	5.7	28.8	22.6	10.4	4.8	5.0	4.5	5.7	16.1	5.6	12.7	11.1
4	3,468	2,482	850	2,482	190	2,686	1,753	615	46.3	33.1	11.3	33.1	2.5	35.9	23.4	8.2	6.0	6.6	6.5	7.4	7.2	6.9	13.1	8.8
5	4,664	3,603	1,423	3,603	279	3,330	1,760	674	61.0	47.1	18.6	47.1	3.7	43.6	23.0	8.8	7.9	9.3	10.7	10.6	10.4	8.4	12.9	9.4
6	8,406	5,048	1,722	5,048	205	4,999	2,079	1,052	113.5	68.2	23.3	68.2	2.8	67.5	28.1	14.2	14.7	13.5	13.3	15.3	7.9	13.1	15.8	15.2
7	7,705	5,543	2,052	5,543	247	4,656	1,490	670	104.8	75.4	27.9	75.4	3.4	63.3	20.3	9.1	13.6	14.9	16.0	16.9	9.5	12.3	11.4	9.8
8	10,875	6,220	1,959	6,029	602	7,326	1,933	1,449	144.2	82.4	26.0	79.9	8.0	97.1	25.6	19.2	18.7	16.3	14.9	17.9	22.6	18.8	14.4	20.6
9	9,589	6,459	2,076	5,232	223	6,371	1,014	737	129.6	87.3	28.0	70.7	3.0	86.1	13.7	10.0	16.8	17.3	16.1	15.8	8.5	16.7	7.7	10.7
10	7,033	4,772	1,600	1,757	83	4,616	239	251	92.3	62.6	21.0	23.0	1.1	60.6	3.1	3.3	12.0	12.4	12.0	5.2	3.1	11.7	1.8	3.5
All	5,887	3,864	1,335	3,416	270	3,949	1,361	714	769.7	505.2	174.5	446.6	35.3	516.3	178.0	93.4	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	59,212	57,396	59,452	49,296	42,603	59,807	39,470	44,197																
Ratios																								
Top 50/Bottom 50	3.04	2.81	2.51	2.37	1.02	2.55	1.00	1.42																
Top 30/Bottom 30	4.44	4.49	3.83	3.35	1.05	3.70	0.99	1.49																
Top 30/Middle 40	1.13	1.05	0.93	0.78	0.99	1.17	0.45	0.81																

Table C.9: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 3% | Discount Rate: 3%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,370	939	409	939	309	1,159	776	445	15.7	10.8	4.7	10.8	3.6	13.3	8.9	5.1	2.3	2.5	3.1	2.8	11.0	3.1	5.5	6.0
2	1,534	795	355	795	95	1,176	576	311	19.1	9.9	4.4	9.9	1.2	14.7	7.2	3.9	2.9	2.3	2.9	2.6	3.7	3.4	4.4	4.6
3	2,380	1,596	495	1,596	426	1,795	1,494	724	31.8	21.3	6.6	21.3	5.7	24.0	20.0	9.7	4.7	4.9	4.4	5.5	17.6	5.5	12.4	11.4
4	2,963	2,130	732	2,130	191	2,241	1,543	555	39.5	28.4	9.8	28.4	2.6	29.9	20.6	7.4	5.9	6.5	6.5	7.4	7.9	6.9	12.8	8.7
5	4,072	3,162	1,245	3,162	263	2,833	1,614	615	53.3	41.4	16.3	41.4	3.4	37.1	21.1	8.1	7.9	9.4	10.8	10.7	10.7	8.5	13.1	9.5
6	7,170	4,321	1,467	4,321	182	4,032	1,885	932	96.8	58.3	19.8	58.3	2.5	54.4	25.5	12.6	14.4	13.3	13.1	15.1	7.6	12.5	15.8	14.8
7	6,760	4,833	1,775	4,833	216	3,918	1,395	626	91.9	65.7	24.1	65.7	2.9	53.3	19.0	8.5	13.7	14.9	16.0	17.0	9.1	12.3	11.7	10.0
8	9,408	5,368	1,673	5,191	553	6,098	1,795	1,332	124.7	71.2	22.2	68.8	7.3	80.8	23.8	17.7	18.6	16.2	14.7	17.8	22.7	18.6	14.7	20.8
9	8,467	5,648	1,804	4,512	182	5,449	935	675	114.4	76.3	24.4	61.0	2.5	73.6	12.6	9.1	17.1	17.4	16.2	15.8	7.6	16.9	7.8	10.7
10	6,356	4,288	1,416	1,549	51	4,074	214	218	83.4	56.2	18.6	20.3	0.7	53.4	2.8	2.9	12.4	12.8	12.3	5.3	2.1	12.3	1.7	3.4
All	5,130	3,362	1,154	2,952	247	3,324	1,235	649	670.7	439.6	150.9	386.0	32.3	434.5	161.4	84.9	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	59,779	57,688	59,911	49,345	40,141	60,620	39,595	43,901																
Ratios																								
Top 50/Bottom 50	3.10	2.84	2.51	2.37	0.92	2.56	1.04	1.43																
Top 30/Bottom 30	4.59	4.60	3.89	3.38	0.95	3.78	1.03	1.50																
Top 30/Middle 40	1.16	1.06	0.94	0.78	0.92	1.20	0.46	0.82																

Table C.10: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 3% | Discount Rate: 5%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,192	820	356	820	277	995	687	397	13.7	9.4	4.1	9.4	3.2	11.4	7.9	4.6	2.3	2.4	3.1	2.8	10.3	3.1	5.3	5.8
2	1,319	706	314	706	96	985	522	283	16.4	8.8	3.9	8.8	1.2	12.3	6.5	3.5	2.8	2.3	3.0	2.6	3.9	3.3	4.4	4.5
3	2,059	1,362	422	1,362	421	1,519	1,335	676	27.5	18.2	5.6	18.2	5.6	20.3	17.9	9.0	4.7	4.7	4.3	5.4	18.1	5.5	12.0	11.4
4	2,564	1,851	638	1,851	192	1,895	1,373	507	34.2	24.7	8.5	24.7	2.6	25.3	18.3	6.8	5.8	6.4	6.5	7.3	8.2	6.8	12.3	8.6
5	3,597	2,805	1,100	2,805	255	2,442	1,493	574	47.0	36.7	14.4	36.7	3.3	31.9	19.5	7.5	8.0	9.5	10.9	10.9	10.8	8.6	13.1	9.5
6	6,195	3,746	1,265	3,746	173	3,293	1,721	846	83.6	50.6	17.1	50.6	2.3	44.5	23.2	11.4	14.2	13.1	13.0	15.0	7.5	12.0	15.6	14.4
7	5,993	4,256	1,552	4,256	212	3,336	1,325	604	81.5	57.9	21.1	57.9	2.9	45.4	18.0	8.2	13.8	15.0	16.0	17.2	9.3	12.2	12.1	10.4
8	8,234	4,686	1,444	4,519	544	5,138	1,689	1,257	109.1	62.1	19.1	59.9	7.2	68.1	22.4	16.7	18.5	16.1	14.5	17.8	23.3	18.4	15.1	21.1
9	7,547	4,984	1,582	3,928	163	4,710	886	636	102.0	67.3	21.4	53.1	2.2	63.6	12.0	8.6	17.3	17.4	16.2	15.7	7.1	17.2	8.1	10.9
10	5,784	3,879	1,261	1,374	38	3,629	220	216	75.9	50.9	16.5	18.0	0.5	47.6	2.9	2.8	12.8	13.2	12.6	5.3	1.6	12.9	1.9	3.6
All	4,521	2,957	1,008	2,580	237	2,833	1,137	605	591.1	386.6	131.8	337.3	31.0	370.4	148.6	79.2	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	60,287	57,936	60,315	49,368	39,236	61,396	40,000	44,085																
Ratios																								
Top 50/Bottom 50	3.15	2.86	2.51	2.36	0.91	2.57	1.08	1.46																
Top 30/Bottom 30	4.72	4.69	3.93	3.40	0.94	3.85	1.10	1.56																
Top 30/Middle 40	1.18	1.07	0.94	0.78	0.90	1.23	0.47	0.83																

Table C.11: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment– Earnings Increase: 3% | Discount Rate: 7%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use alternative earnings growth and discount rate assumptions.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,049	723	314	723	251	864	614	358	12.1	8.3	3.6	8.3	2.9	9.9	7.1	4.1	2.3	2.4	3.1	2.8	9.3	3.1	5.1	5.4
2	1,149	634	280	634	97	837	477	260	14.3	7.9	3.5	7.9	1.2	10.4	5.9	3.2	2.7	2.3	3.0	2.7	3.9	3.3	4.3	4.3
3	1,803	1,178	365	1,178	413	1,302	1,203	633	24.1	15.8	4.9	15.8	5.5	17.4	16.1	8.5	4.6	4.6	4.2	5.3	17.7	5.4	11.6	11.2
4	2,245	1,627	561	1,627	191	1,623	1,233	469	30.0	21.7	7.5	21.7	2.5	21.7	16.5	6.3	5.7	6.3	6.4	7.3	8.2	6.8	11.9	8.3
5	3,209	2,513	982	2,513	254	2,129	1,390	546	42.0	32.9	12.8	32.9	3.3	27.9	18.2	7.1	8.0	9.6	11.0	11.0	10.7	8.7	13.1	9.4
6	5,415	3,285	1,102	3,285	173	2,723	1,579	781	73.1	44.4	14.9	44.4	2.3	36.8	21.3	10.5	13.9	12.9	12.8	14.9	7.5	11.5	15.4	13.9
7	5,364	3,780	1,370	3,780	229	2,873	1,267	602	72.9	51.4	18.6	51.4	3.1	39.1	17.2	8.2	13.9	15.0	16.0	17.3	10.0	12.2	12.4	10.8
8	7,283	4,132	1,260	3,974	545	4,381	1,600	1,203	96.5	54.8	16.7	52.7	7.2	58.1	21.2	15.9	18.3	16.0	14.4	17.7	23.2	18.2	15.3	21.1
9	6,784	4,436	1,401	3,449	167	4,111	857	624	91.7	59.9	18.9	46.6	2.3	55.5	11.6	8.4	17.4	17.5	16.3	15.7	7.2	17.4	8.4	11.1
10	5,296	3,530	1,130	1,227	56	3,259	249	253	69.5	46.3	14.8	16.1	0.7	42.7	3.3	3.3	13.2	13.5	12.8	5.4	2.4	13.4	2.4	4.4
All	4,024	2,626	889	2,277	238	2,444	1,058	579	526.1	343.3	116.3	297.7	31.1	319.5	138.3	75.7	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	60,741	58,144	60,668	49,369	39,984	62,124	40,625	44,891																
Ratios																								
Top 50/Bottom 50	3.19	2.87	2.50	2.35	0.97	2.57	1.13	1.53																
Top 30/Bottom 30	4.84	4.77	3.95	3.41	1.01	3.91	1.18	1.66																
Top 30/Middle 40	1.19	1.08	0.94	0.77	0.91	1.26	0.49	0.87																

D Alternative Earnings Volatility

In the main analysis, we assume earnings volatility of 15%. In this section, we repeat the analysis in Table 2 but vary this assumption. We allow earnings volatility to be 10% and 20%. The results are shown in tables D.1 and D.2. Our basic pattern of results and conclusions remain unchanged.

Table D.1: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment –Volatility: 10%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use an alternative earnings volatility assumption.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,304	907	397	907	329	1,102	805	459	15.0	10.4	4.6	10.4	3.8	12.7	9.2	5.3	2.25	2.38	3.04	2.71	10.76	2.94	5.21	5.72
2	1,440	753	353	753	109	1,096	612	318	17.9	9.4	4.4	9.4	1.4	13.7	7.6	4.0	2.70	2.14	2.92	2.44	3.86	3.17	4.30	4.30
3	2,248	1,506	464	1,506	472	1,714	1,637	783	30.1	20.1	6.2	20.1	6.3	22.9	21.9	10.5	4.52	4.60	4.12	5.24	17.95	5.31	12.32	11.36
4	2,800	2,009	699	2,009	214	2,123	1,697	600	37.4	26.8	9.3	26.8	2.9	28.3	22.6	8.0	5.62	6.12	6.21	6.98	8.13	6.57	12.75	8.68
5	4,035	3,176	1,249	3,176	274	2,812	1,872	652	52.8	41.5	16.3	41.5	3.6	36.8	24.5	8.5	7.94	9.49	10.87	10.81	10.22	8.52	13.79	9.24
6	7,084	4,262	1,453	4,262	196	4,000	2,112	994	95.6	57.5	19.6	57.5	2.6	54.0	28.5	13.4	14.38	13.14	13.05	14.98	7.53	12.52	16.06	14.55
7	6,808	4,905	1,793	4,905	208	3,963	1,532	678	92.5	66.7	24.4	66.7	2.8	53.9	20.8	9.2	13.92	15.23	16.22	17.36	8.04	12.49	11.73	9.99
8	9,415	5,396	1,674	5,217	628	6,121	1,985	1,503	124.8	71.5	22.2	69.2	8.3	81.1	26.3	19.9	18.77	16.33	14.77	18.01	23.69	18.81	14.81	21.60
9	8,523	5,728	1,825	4,590	200	5,505	987	757	115.1	77.4	24.7	62.0	2.7	74.4	13.3	10.2	17.32	17.67	16.40	16.15	7.70	17.24	7.51	11.09
10	6,377	4,307	1,420	1,556	57	4,093	205	244	83.7	56.5	18.6	20.4	0.8	53.7	2.7	3.2	12.58	12.90	12.40	5.31	2.14	12.44	1.52	3.47
All	5,086	3,350	1,150	2,938	269	3,300	1,358	706	665.0	438.0	150.3	384.1	35.1	431.5	177.6	92.2	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	60,286	58,020	60,412	49,801	40,524	61,211	39,457	44,447																
Ratios																								
Top 50/Bottom 50	3.23	2.95	2.58	2.46	0.92	2.68	1.03	1.48																
Top 30/Bottom 30	4.87	4.87	4.05	3.59	0.97	4.02	1.04	1.60																
Top 30/Middle 40	1.17	1.08	0.95	0.79	0.99	1.22	0.44	0.86																

Table D.2: Discounted Payment Savings from Forgiving Balances and Targeted IDR Enrollment –Volatility: 20%

This table reports the total and per capita discounted payment savings of the policies we evaluate, by within-cohort decile of earnings group, including households without student debt. First, we consider canceling all student loan balances, or only $50,000 or $10,000 per person, or up to $50,000 with a phase out range between $75,000 and $125,000 in earnings. Second, we consider enrolling households who would benefit from income-driven repayment. In IDR policy (a), they pay 10% of their discretionary income, in line with current IDR rules. In policy (b), loans are also forgiven 10 years after the first repayment. In policy (c), discretionary income is limited to earnings above three times the poverty line. In policy (d), payments are reduced to 7.5% of discretionary income. The last two rows report the discounted payment savings and change in balance for the entire population. In comparison to Table 2, we use an alternative earnings volatility assumption.

	Per person ($)								Total ($bn)								Share of total cost (%)							
	Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment				Balance forgiveness				Targeted IDR enrollment			
Earnings Decile	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%	Full	50K	10K	Cap	Pay 10%	Forgive 10 Yr	Pay 3x Pov.	Pay 7.5%
1	1,240	860	372	860	301	1,040	715	422	14.3	9.9	4.3	9.9	3.5	12.0	8.2	4.8	2.31	2.45	3.08	2.81	9.18	3.02	4.83	5.47
2	1,371	740	325	740	110	1,035	556	300	17.1	9.2	4.1	9.2	1.4	12.9	6.9	3.7	2.77	2.28	2.92	2.62	3.64	3.26	4.07	4.22
3	2,113	1,396	436	1,396	470	1,570	1,345	715	28.2	18.7	5.8	18.7	6.3	21.0	18.0	9.6	4.57	4.61	4.20	5.29	16.65	5.31	10.57	10.80
4	2,601	1,882	662	1,882	219	1,932	1,372	523	34.7	25.1	8.8	25.1	2.9	25.8	18.3	7.0	5.62	6.21	6.37	7.13	7.76	6.52	10.76	7.88
5	3,692	2,883	1,138	2,883	300	2,545	1,587	628	48.3	37.7	14.9	37.7	3.9	33.3	20.8	8.2	7.82	9.33	10.73	10.70	10.41	8.42	12.20	9.27
6	6,430	3,897	1,332	3,897	235	3,516	1,971	943	86.8	52.6	18.0	52.6	3.2	47.5	26.6	12.7	14.05	13.01	12.96	14.92	8.42	12.01	15.64	14.38
7	6,282	4,460	1,634	4,460	285	3,623	1,656	729	85.4	60.6	22.2	60.6	3.9	49.2	22.5	9.9	13.82	14.99	16.01	17.20	10.26	12.45	13.23	11.19
8	8,687	4,945	1,533	4,772	666	5,564	2,098	1,427	115.2	65.6	20.3	63.3	8.8	73.8	27.8	18.9	18.64	16.21	14.65	17.94	23.42	18.65	16.34	21.37
9	7,963	5,253	1,676	4,142	222	5,083	1,200	743	107.6	71.0	22.6	56.0	3.0	68.7	16.2	10.0	17.42	17.55	16.32	15.87	7.95	17.37	9.52	11.34
10	6,114	4,116	1,348	1,484	67	3,915	369	275	80.2	54.0	17.7	19.5	0.9	51.4	4.8	3.6	12.98	13.35	12.75	5.52	2.32	12.99	2.84	4.07
All	4,725	3,093	1,061	2,696	288	3,025	1,302	677	617.8	404.4	138.7	352.5	37.7	395.4	170.2	88.6	100%	100%	100%	100%	100%	100%	100%	100%
Income of beneficiaries																								
	60,540	58,111	60,540	49,591	40,729	61,599	42,410	45,142																
Ratios																								
Top 50/Bottom 50	3.22	2.92	2.56	2.42	1.05	2.67	1.31	1.59																
Top 30/Bottom 30	4.82	4.78	4.02	3.47	1.08	4.00	1.40	1.70																
Top 30/Middle 40	1.20	1.09	0.96	0.79	0.92	1.25	0.56	0.87																