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Student Loan Safety Nets: Estimating the Costs and Benefits of Income-Based Repayment

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EXECUTIVE SUMMARY

The plight of underemployed college graduates struggling to make their student loan payments has received a great deal of media attention throughout the recent economic recession. The primary safety net available to borrowers of federal loans facing unaffordable monthly payments is income-based repayment, in which borrowers make monthly payments based on their earnings rather than a traditional schedule of flat payments. The perceived strengths and weaknesses of these programs have received increased attention recently, in part due to a push by the Obama administration to increase borrowers' awareness of their repayment options.

The importance of these programs is widely recognized, but relatively little is known about their long-term implications for borrowers and taxpayers. How much these programs will cost and how the benefits will be distributed among borrowers is not well understood, in large part because these costs and benefits will be realized over multiple decades. Without this knowledge, it is difficult to know whether these programs are meeting the goal of effectively and efficiently protecting borrowers without creating significant unintended consequences.

This report seeks to fill that gap by providing some of the first detailed evidence about the predicted costs and benefits of existing income-based repayment programs. We develop an empirical framework for understanding

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the costs and benefits of these programs. We use simulation methods to apply this framework to a nationally representative sample of bachelor's degree recipients, which enables us to estimate the cost components of two popular income-based repayment programs as well as how the benefits are distributed among borrowers. Our methods cannot accurately estimate the overall cost of the programs, but they provide fairly robust estimates of the relative cost of different program components, and of the share of benefits received by different groups of borrowers.

This analysis produces several noteworthy findings:

1. The core mission of income-based repayment systems—allowing borrowers to pay off their loans over a longer period of time based on their income—accounts for only one-quarter to one-third of overall program costs.
2. The forgiveness of remaining debt after set periods of participation in income-based repayment generates approximately half of overall program costs.
3. Existing programs effectively target borrowers with low incomes, with three-quarters of benefits accruing to borrowers with incomes in the lowest quartile.
4. Bachelor's degree recipients who attended more expensive colleges receive a disproportionate share of benefits.

These findings suggest that existing programs may be as much as four times more costly than they need to be to accomplish their core mission of protecting borrowers from unaffordable monthly payments. Not only is loan forgiveness unnecessary for ensuring that monthly payments are affordable for borrowers, loan forgiveness creates incentives for students to borrow too much to attend college, potentially contributing to rising college prices for everyone. This is highlighted by our finding that graduates of expensive colleges receive the largest benefits of income-based repayment.

For these reasons, we recommend that policy makers revise the existing income-based repayment programs to eliminate forgiveness, or at least significantly reduce its generosity. Likewise, policy makers should replace the Public Service Loan Forgiveness Program, in which the debts of borrowers in the public- and non-profit sectors are forgiven after 10 years, with a more efficient and equitable program for subsidizing the wages of individuals in these sectors of the economy.

This analysis represents a significant first step toward better understanding the benefits and costs of income-based repayment systems, but there is still much to

be done. We recommend that analysts in the federal government, such as those in the Congressional Budget Office and the Office of Management and Budget, use administrative records on student borrowing and earnings to carry out an analysis similar to the one piloted in this work. This effort would generate the evidence needed to ensure that future reforms to student loan repayment systems succeed in continuing to protect borrowers from unaffordable monthly payments while minimizing the introduction of unnecessary costs and perverse incentives.

Introduction

The returns to a college degree are higher than they have ever been. Over the last 30 years, the increase in lifetime earnings brought by a college degree has increased by 75 percent, whereas costs have increased by 50 percent.[1] In 2011, college graduates ages 23-25 earned $12,000 more per year on average than high school graduates, and had employment rates 20 percentage points higher. These economic benefits accrue to individuals, but also to society in the form of increased tax revenue, reduced crime, and faster economic growth.

The rising costs of going to college have led more students to borrow, and to take out larger loans, in order to pay for tuition, fees, and living expenses while in college. The total outstanding balance on student loans recently passed $1 trillion. This large sum, coupled with media reports of students with large debt loads—often in excess of $100,000—have garnered a great deal of public attention. However, the debt picture for the typical college graduate is much less dire. For example, students who completed a four-year college degree in 2011 accumulated on average approximately $25,000 in student loan debt ($23,800 at public institutions and $29,900 at private, non-profit institutions). Debt per borrower is growing at a rate exceeding inflation, but is still a manageable burden if the graduate is able to find a job with adequate pay. The burden of student loan debt is particularly acute during hard economic times. In 2011, 54 percent of recent college graduates were jobless or underemployed, the highest since at least 2000, when a strong economy put this rate at a low of 41 percent.[2]

Increasing levels of debt driven by rising college prices, coupled with a weak economy, have led many to wonder whether the student loan market is doing more harm than good. At a minimum, these trends suggest the need for a safety net for borrowers in financial distress. Repayment programs in which loan payments are capped based on borrowers' incomes are the most common example of such a safety net. In addition to providing relief to struggling borrowers, these programs might also alleviate some of the fear of debt that prevents many low-income students from ever enrolling in college in the first place.

The 2007 reauthorization of the Higher Education Act created the first income-based repayment program that is still available to new borrowers of federal student loans.[3] The program capped borrowers' monthly payments at 15 percent of their disposable earnings, and promised forgiveness of loan balances after 25 years of payments. In

2010, Congress increased the generosity of the program by lowering the fraction of earnings to be spent on debt repayment to 10 percent and shortening the time period before forgiveness to 20 years. The program was originally intended to impact only students taking on their first loans after July 1, 2014, but in 2011, the Obama administration announced that earlier cohorts of borrowers would be eligible to enroll beginning in 2012.

Little is known about the effects and costs of the current income-based repayment program simply because it is so new. Because the benefits of this program will largely be paid out many years into the future, little evidence exists regarding the effectiveness of the program based on experience. We do not know which borrowers will enjoy the greatest benefits of the program, nor do we have a firm understanding of the costs. New America Foundation researchers Jason Delisle and Alex Holt have provided some of the earliest evidence that begins to answer these questions.[4] Delisle and Holt developed a calculator that indicates how borrowers with various income profiles will benefit from Congress's increase in program generosity. They found that high-income, high-debt borrowers, like those who earned professional degrees, would receive the greatest financial benefit from the program changes, and low-income borrowers would see only minimal benefits.

In this report, we develop an empirical framework for answering many of the outstanding questions surrounding optimal design of income-based repayment systems, and apply it to a nationally representative group of bachelor's degree recipients. The primary limitation of existing analyses is that they are not able to systematically measure the distribution of benefits of the program, and the associated costs to taxpayers, because such estimates require information on individuals' earnings over their entire careers (not just at a single point in time). We overcome this limitation by creating simulated lifetime earnings profiles that can be used to estimate cost components of the program as well as the distribution of benefits. Given that our model is based on several assumptions, our estimates of the breakdown of program costs and benefits by source and borrowers' characteristics are more reliable than the rough estimates of the total cost of income-based repayment programs.

How Federal Student Loan Repayment and Income-Based Repayment Work

Student borrowers begin making payments on federal loans six months after their enrollment ends (either due to graduation or withdrawal). During the six-month grace period, borrowers have the opportunity to enroll in a number of different payment plans. If a borrower does not enroll in an income-based plan, either because they do not elect to do so or because they are ineligible, their payments will be based on the standard repayment plan. In this plan, monthly payments are determined by the total outstanding principal, the interest rate, and the term of the loan. Borrowers face a standard 10-year repayment term, but by consolidating their loans can extend their repayment term to up to 30 years depending on the amount of their total indebtedness (see table below).

Total Indebtedness	Repayment Term (Years)
Less than $7,500	10
$7,500-$10,000	12
$10,000-$20,000	15
$20,000-$40,000	20
$40,000-$60,000	25
More than $60,000	30

Under the standard repayment plan, monthly payments are the same throughout repayment and do not fluctuate with the borrower's income. However, there are some instances in which borrowers are not required to make payments. Monthly payments can be deferred under the standard repayment plan for up to three years if a borrower is enrolled in school (at least half time), faces economic hardship due to unemployment or underemployment, or is active in the military. If a borrower does not qualify for deferment but cannot make payments as scheduled, they may also apply to their lender for a forbearance which allows them to make reduced payments or no payments at all for up to 12 months. Reasons for forbearance include illness, severe financial hardship, and employment in some particular areas of public service (e.g., national guard, teaching).

Borrowers who are not behind on loan payments are generally eligible to participate in income-based repayment if the payment on the plan they choose is less than it would be in a ten-year standard repayment plan. This will be true for borrowers that have a high ratio of debt to earnings, which can be caused by a large debt burden, low earnings, or

both. The set of income-based repayment programs include the original Income-Based Repayment Plan (IBR), the Pay As You Earn Plan (PAYE), and the Income-Contingent Plan. We do not discuss the Income-Sensitive Repayment Plan here because it is not available to recent borrowers.

Each of these plans has different eligibility criteria and payment requirements, but all are designed such that payments are based on ability to pay rather than a fixed loan term. The monthly payments in these programs are equal to a percentage of the household's disposable income, which is defined as: adjusted gross income (as defined by the IRS) minus 150 percent of the poverty threshold. For 2014, the poverty level for a single-person household is $11,670, so 150 percent of this level is $17,505.[5] These payment plans also allow debts to be forgiven after a borrower makes on-time payments for a given period of time (which varies by plan and sector of employment as illustrated below). Some interest capitalization is also forgiven under these plans such that borrowers who make monthly payments less than the accrued interest will not see their balances increase during their first three years of participation. The table below details the policy parameters for each plan.

	Non-standard Repayment Plans		
Policy Parameter	Income-Based (IBR)	Pay As you Earn (PAYE)	Income-Contingent (ICR)
% of disposable income	15%	10%	20%
Forgiveness Term	25 years	20 years	25 years
Public Service Loan Forgiveness (PSLF) term	10 years	10 years	10 years
Balance on subsidized loans cannot increase for 3 years	Yes	Yes	No
Interest capitalization	No	No	Up to 10% of principal
Eligible borrowers	All	Borrowers with first loan after 2007 and new loans after 2011	All

We focus our analysis on IBR and PAYE because they feature lower monthly payments that likely make them more generous and thus most attractive to borrowers.

Data

The benefits to borrowers and costs to taxpayers of the existing income-based repayment programs will not be known until many years from now, after borrowers have extended their repayment periods and some have received forgiveness. To provide much-needed evidence on these questions now, we estimate the benefits and costs of two prominent income-based repayment programs, IBR and PAYE, by combining actual and simulated information on American borrowers and workers. No existing dataset tracks a nationally representative group of borrowers from college into the labor market and records their earnings for a sufficiently long period of time—at least 25 years. The best data sets that track individuals' incomes over many years, such as the National Longitudinal Survey of Youth and the Panel Survey of Income Dynamics, do not contain information on education loans. Conversely, datasets with detailed information on current and former college students, including their borrowing behavior, usually do not track individuals for more than a couple of years after graduation.

We carry out our analysis using what is, to our knowledge, the best available dataset for the purpose. We use the U.S. Department of Education's Baccalaureate and Beyond (B&B) nationally representative cohort of students who earned bachelor's degrees in 1993, and were followed up by survey in 1994, 1997, and 2003. B&B contains a rich set of background information on students, such as race/gender and measures of their families' socioeconomic status, as well as detailed information on college financing, including borrowing. The B&B follow-up surveys gather information on former students' employment outcomes, including income and sector of the economy in which they were working.

In order to simplify the analysis, we restrict the B&B data to borrowers who participated in all surveys (and apply the appropriate survey weights to maintain the representativeness of the sample) and who never earned a graduate degree during the period we observe them (through 2003, approximately 10 years after graduation from college).[6] Students attend graduate school at different times, and their incomes are not always observed after finishing their graduate degrees, so the B&B data are not an appropriate data source to analyze the costs and benefits of the IBR program as they relate to graduate students. Consequently, our results only apply to students who earn baccalaureate degrees, not those who earn associate's degrees, graduate degrees, or who drop out of college without earning any degree. However, the empirical framework we develop below could be applied with some modest modifications to other datasets to estimate

IBR costs and benefits for these other groups of students.

Our final sample includes 2,637 borrowers who earned bachelor's degrees in 1993, whose characteristics are summarized in Table 1. The average borrower completed college with $14,119 in federal debt (in 2013 dollars), an amount we inflate to $19,131 to reflect the higher propensity to borrow observed among more recent graduates and thus more accurately estimate the costs and benefits of existing income-based repayment plans. These degree recipients are largely of traditional college-going age (the median age at bachelor's receipt was 23), and most are white (80 percent). These borrowers come from a socioeconomically diverse group of families (measured in terms of parents' education in Table 1).

Table 1. Summary Statistics

	Mean	Median	Std Dev
Actual borrowing	$14,119	$12,725	$9,666
Simulated borrowing	$19,131	$17,243	$13,097
Age at BA receipt	26.0	23.0	6.5
Female	54%		
White	80%		
Black or Hispanic	15%		
Race other or missing	5%		
Parents have no college	39%		
Parents have some college	20%		
Parents have BA+	37%		
Dependent	46%		
Household income, 1996	$68,445	$59,388	$54,975
Household income, 2002	$105,282	$93,233	$77,664
Tuition	$6,778	$3,947	$7,059
Net cost	$4,124	$2,197	$5,269

Notes: Weighted summary statistics based on N=2,637. All dollar amounts are in 2013 dollars.

These borrowers paid an average of $4,124 in tuition and fees after grants, and attended colleges with an average sticker price of $6,778. About three years after graduation, the median income for these borrowers was just under $60,000, a figure that increased by more than 50 percent, to about $93,000, six years later.

Methods

We model the benefits of income-based repayment plans to borrowers and the associated costs to taxpayers as two sides of the same coin—the benefits borrowers receive are funded by taxpayers—and divide them into four categories:

1. Loan balances forgiven to borrowers working in the public sector after 10 years of participation in income-based repayment
2. Loan balances forgiven to borrowers working in the private sector after the stated number of years in their program's income-based repayment program
3. The interest benefit, in which any interest that would increase the balance of the loan is forgiven during participants' first three years in the program[7]
4. The additional interest-rate subsidy borrowers receive from the federal government by virtue of extending the repayment period of their loan. The federal government offers loans at below-market interest rates, so this category of benefit reflects the fact that even though students who extend their repayment period likely pay more interest, they benefit from the prolonged access to credit at a below-market rate.[8]

It is important to emphasize that we are estimating the relative costs of different repayment plans, not the absolute cost to the government of the student loan program. Consequently, program features that are the same under all repayment programs, such as origination fees, do not need to be factored into our calculations.[9]

In order to estimate these costs, we need three key pieces of information about each borrower:

1. Cumulative borrowing from the federal government
2. Household income every year following graduation from college
3. Sector of employment (public/non-profit or private)

B&B contains fairly complete information on federal borrowing, which has been verified through a data match to the National Student Loan Data System for Students. However, borrowing has increased substantially between the early 1990s, when most of the loans in the dataset were taken out, and the late 2000s, when the IBR program was enacted. Consequently, we use the distribution of cumulative federal borrowing in the 2008 cohort of B&B to calculate an inflation factor that we then apply to the 1993 cohort used in our analysis. We increase all 1993 borrowing by 39 percent because that was the

inflation-adjusted increase in mean total federal borrowing between the 1993 and 2008 B&B cohorts.

Household income data are only available for B&B participants in 1996 and 2002. We use the implied annual growth rate in income for each household between 1996 and 2002 to estimate incomes in 1994, 1995, and 1997-2001. We also estimate incomes from 2003 to 2023 using an assumed five percent nominal annual growth rate for this period (using the 2002 data point as a base). All of our calculations use nominal dollar amounts, and we discount all costs/benefits to 1994 (the beginning of repayment) using a discount rate of three percent. We report our estimates in 2013 dollars for convenience of interpretation. B&B only includes information on the sector of the economy students were working in during 1994 and 1997. We use employment in the public or non-profit sectors during both years as a proxy for eligibility for PSLF, which may overstate eligibility, but may also miss some borrowers who become eligible by virtue of the jobs they held in other years, which would understate eligibility.

We model (simulated) participation in income-based repayment as follows. First, we calculate each borrower's standard monthly payment, assuming that all borrowers consolidate their loans and choose the longest possible repayment term. In general, borrowers are better off extending the repayment period because it gives them additional flexibility and they can still pay off their loans more quickly if they prefer (there is no pre-payment penalty).[10] Next, we calculate, for each year, each borrower's income-based payment and their alternative income-based payment. The income-based payment, which is based on income and household size, is defined above.[11] The alternative payment is how much the borrower would pay over a standard 10-year repayment period, starting with their outstanding balance when they enter the income-based program. Income-based program participants pay the minimum of the income-based payment and the alternative income-based payment. Our analysis is conducted at the annual level, but all of the calculations reflect the fact that interest accrues on a monthly basis. A complete description of these calculations is provided in Appendix A. We conduct this analysis separately for IBR and PAYE.

We assume that a borrower chooses to begin participating in income-based repayment if he is eligible to do so (because his standard payment is greater than his income-based payment) and his monthly payment would fall by at least $20 by virtue of participating.[12] In other words, we assume that borrowers do not go to the trouble of enrolling in income-based repayment if they would only experience a small decline in their monthly

payment. We assume that income-based repayment participants continue to participate in the program as long as they could not reduce their monthly payment by at least $20 by exiting income-based repayment.

We calculate forgiveness as the balance remaining after PSLF-eligible participants have spent 10 years in IBR/PAYE and after non-PSLF IBR participants have spent 25 years in the program (20 years under PAYE). We calculate the interest benefit as the amount of interest forgiven for borrowers who, during their first three years of participation in income-based repayment, would have experienced an increasing balance. We calculate the value/cost of the interest-rate subsidy, using an assumed subsidy rate of 0.02 (i.e. we assume that the true cost of the federal loan program in interest rate terms is two percentage points higher than the 3.86 percent interest rate currently charged on these loans), as the difference in the total interest-rate subsidy under income-based repayment compared to the total subsidy had all borrowers been in the standard repayment program.

The numerical assumptions built into our model are summarized below:

Interest rate	3.86%	Current interest rate on federal loans
Borrowing inflation factor	39%	Real increase in federal borrowing, B&B cohorts, 1993-2008
Interest-rate subsidy	2%	Assumption
Discount rate	3%	Assumption
Annual income increase, 2002-2023	5%	Assumption
Annual increase, poverty schedule	3%	Set by law
Monthly payment reduction needed to move in/out of IBR	$20	Assumption

Note that throughout our analysis we assume that borrowers always make on-time payments and that all eligible borrowers participate in income-based repayment (given the assumptions described above). We also assume that the availability of and participation in income-based repayment has no effects on borrowers' behavior, such as how likely they are to make on-time payments and even how much they borrow in the first place.[13] Given the limitations of the available data, we do not believe that our estimates represent even rough approximations of the total cost of the income-based repayment programs. However, we have more confidence in our estimates of the

breakdown of program costs by source (forgiveness, interest subsidies, etc.) and the breakdown of program benefits by student and college characteristics (tuition, income, etc.). In the concluding section, we discuss the implications of our results for future work on this issue aimed at better approximating the total cost of the program.

Results

We begin with an analysis of IBR and PAYE eligibility and participation, reported in Table 2. Our simulations estimate that 52 percent of borrowers in the examined cohort are eligible to participate in IBR in at least one year; the corresponding figure for PAYE is 62 percent. But our simulations assume that borrowers only participate if they can reduce their monthly payment by at least $20, leading to simulated participation rates of 40 and 47 percent in IBR and PAYE, respectively. Of course, in reality, participation may in fact be significantly lower if borrowers do not know about the program, find it too difficult to sign up, or prefer to make significantly higher monthly payments in order to pay their loans off more quickly. Figure 1 shows that IBR and PAYE participation decrease over time, as increases in income decrease eligibility and, in later years, as borrowers pay off their loans.

Figure 1. Simulated IBR and PAYE Participation and Loan Payoff

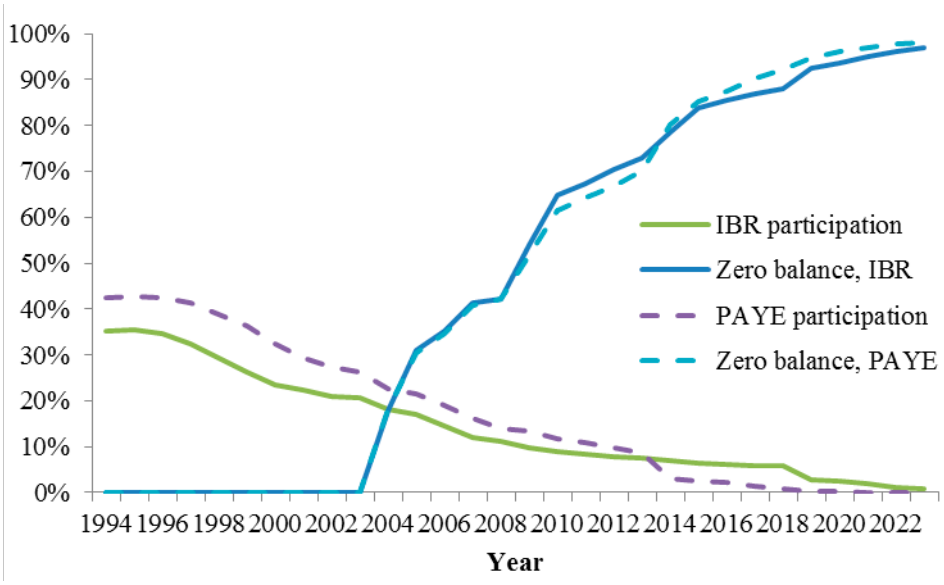

Table 2 shows that roughly one in 10 borrowers are eligible for loan forgiveness, three-to-four percent under the public service provision and five-to-eight percent under the provisions available to other borrowers. Our simulations indicate that, among those who receive forgiveness, the loan balances forgiven are substantial, on average. PSLF forgiveness averages about $17,000 under both IBR and PAYE, and regular forgiveness

averages about $44,000 and $32,000 under IBR and PAYE, respectively. We suspect that average forgiveness is larger under IBR despite the longer period before forgiveness because borrowers who still have outstanding balances under IBR are those who had larger balances to begin with (i.e. the five percent of borrowers who get regular forgiveness under IBR can be loosely thought of as a higher-borrowing subset of the eight percent of borrowers who reach regular forgiveness under PAYE).

Table 2. Program Participation Simulation Estimates

	IBR	PAYE
Ever eligible	52%	62%
Ever participates	40%	47%
Receives any forgiveness	7%	12%
PSLF forgiveness	3%	4%
Regular forgiveness	5%	8%
Amount of PSLF forgiveness	$16,305	$18,319
Amount of regular forgiveness	$44,221	$32,584

Notes: Dollar amounts are expressed in 2013 dollars.

Despite the indication that forgiven balances are rather large, only a relatively small share of borrowers have low enough incomes over a long enough period of time (coupled with sufficiently high initial borrowing) to be eligible for forgiveness. Consequently, it is unclear without further analysis whether loan forgiveness amounts to a small or substantial share of the costs of income-based repayment programs.[14]

We calculate the breakdown of simulated program costs and report the results in Table 3. We find that forgiveness accounts for a substantial share of program costs: 50 percent under IBR and 43 percent under PAYE, with the cost of regular forgiveness two-to-three times that of PSLF. The interest benefit (under which interest that would increase the balance during the first three years of participation is forgiven) is less than one-fifth of the costs of both programs. The additional interest-rate subsidy, enjoyed by borrowers as a result of extended periods of repayment, accounts for one-third of program costs under IBR and one-quarter under PAYE.

Table 3. Breakdowns of Simulated Program Costs

	IBR	PAYE
Share of total cost		
Public service loan forgiveness	13%	14%
Regular forgiveness	37%	43%
Interest benefit	18%	16%
Interest subsidy	33%	27%
Total cost per borrower	$2,628	$3,458
Total cost per participant	$6,214	$6,923

Notes: Dollar amounts are expressed in 2013 dollars.

Table 3 also reports our estimates of the per-borrower costs of the programs, at $2,600 for IBR and $3,400 for PAYE. It is not surprising that PAYE is a more expensive program, as it caps monthly payments at 10 percent of disposable income (rather than 15 percent) and provides forgiveness after 20 years (rather than 25 years), but the difference of about $800, or one-third, is substantial.

As we explain above, we do not believe that our analysis can be used to produce credible estimates of the total cost of these income-based repayment programs, in large part because we only analyze data on bachelor's degree recipients, and any such estimates are subject to significant uncertainty given the several assumptions built into the model (including high rates of participation). But a back-of-the-envelope calculation provides a sense of the scale of the cost of these programs. In the 2010 fiscal year, just over four million postsecondary student borrowers entered repayment.[15] Applying our per-borrower cost estimates suggests total per-cohort costs in the ballpark of $11 billion for IBR and $14 billion for PAYE. Our estimates assume nearly universal participation, so these totals are likely to more accurately reflect the cost of a passive repayment system, where borrows enter income-based repayment by default, than the existing programs which require borrowers to actively apply.

Our estimates of the breakdown of program costs are our key results, so we test their sensitivity to alterations in some of our assumptions. Specifically, we estimate cost breakdowns for discount rates of three and four percent and for interest-rate subsidies of one, two, and three percent, and report the results in Appendix Table 1. Increasing the discount rate to four percent has little effect on the breakdown of costs, but decreases the per-borrower cost estimates (as we would expect given that this assumption is used to discount a stream of benefits to an earlier point in time). Larger values of the interest

rate subsidy imply a larger share of costs corresponding to this component of the programs and larger total costs, as we would expect. However, the interest-rate subsidy never accounts for more than half of total program costs over this range of assumed values.

We next turn to estimates of the distribution of program benefits to different kinds of borrowers. Income-based repayment programs are aimed at borrowers who experience financial hardship, so it is not surprising that the benefits accrue largely to those with low incomes: Table 4 shows that roughly three-quarters of benefits go to borrowers with incomes in the bottom quarter of the distribution.[16] Conversely, high-income borrowers reaped few benefits: under both IBR and PAYE, two percent of benefits go to borrowers with incomes in the top quarter, and six percent to those in the second-highest quarter. It is important to emphasize that this finding applies only to BA recipients, whose federal borrowing is subject to loan limits. The picture may be different for graduate degree holders, who typically have significantly larger loan balances because they are not subject to loan limits and often borrow on top of their existing undergraduate debt. In 2012, the median graduate borrower had $57,600 in combined undergraduate and graduate debt.[17]

Table 4. Distribution of Simulated Program Benefits, by Borrower Characteristics

	IBR	PAYE
Income, 1996/2002 average		
Bottom quartile	78%	73%
Second quartile	14%	19%
Third quartile	6%	6%
Top quartile	2%	2%
Tuition (average borrowing)		
Bottom quartile ($15,511)	14%	16%
Second quartile ($17,373)	22%	23%
Third quartile ($18,821)	20%	21%
Top quartile ($24,464)	44%	40%
Parents' education (% in group)		
No college (39%)	46%	45%
Some college (20%)	18%	20%
BA degree or more (37%)	31%	32%
Missing (4%)	5%	4%

Table 4 also shows that benefits disproportionately go to BA recipients who attended more expensive postsecondary institutions. Borrowers who attended institutions with

tuition in the top quarter (where average borrowing was over $24,000) received more than 40 percent of the benefits of IBR/PAYE, whereas those who attended the least expensive institutions (where borrowing levels were below $16,000) only received 15 percent of the benefits. Borrowing more to attend more expensive colleges translates into larger benefits, on average, because the additional borrowing increases eligibility for the program (by virtue of standard payments tending to be higher than income-based payments) and increases the likelihood of forgiveness with a balance remaining when forgiveness occurs. Increases in income that result from attending higher-priced institutions could offset some of these effects, but that does not appear to be the case in our simulations.

We also examine whether program benefits disproportionately accrue to students from different socioeconomic backgrounds, measured by parents' education. The relationship here is much weaker than that for income or tuition, because the latter factors are directly tied to program eligibility whereas the former is not. However, we do observe modest concentration of benefits among borrowers from less advantaged backgrounds, perhaps because these students are somewhat more likely to be disadvantaged themselves later on in life.

We next examine average PAYE benefits per borrower by benefit type, income quartile, and tuition quartile.[18] Table 5 shows that regular forgiveness is especially concentrated among borrowers who earn low incomes, with average forgiveness among bottom-quartile borrowers more than 10 times that of second-quartile borrowers (as compared to a ratio of two-to-three between the bottom two quartiles for the other three benefit categories). The relationship between tuition quartile and program benefits does not vary markedly, with benefits of all types concentrated to roughly the same degree among borrowers from more expensive institutions. Finally, we calculate total benefits per borrower by tuition and income, largely to see if substantial benefits accrue to high-income borrowers who attended expensive institutions. In general, this is not the case, with borrowers in the top quartile of the income distribution who attended the most expensive institutions only receiving benefits of about $350 per borrower. Low-income borrowers who attended these institutions receive benefits averaging $9,364.

Table 5. Simulated PAYE Benefit per Borrower, by Borrower Characteristics

Income quartile:	Bottom	Second	Third	Top
PSLF	$911	$310	$54	$4
Regular forgiveness	$3,523	$308	$6	$0
Interest benefits	$726	$385	$213	$79
Interest subsidies	$1,390	$587	$296	$110
Total	*$6,550*	*$1,590*	*$569*	*$193*
Tuition quartile:	Bottom	Second	Third	Top
PSLF	$216	$397	$248	$409
Regular forgiveness	$568	$785	$884	$1,367
Interest benefits	$236	$309	$319	$504
Interest subsidies	$390	$499	$593	$824
Total	*$1,411*	*$1,990*	*$2,044*	*$3,104*
Tuition quartile:	Bottom	Second	Third	Top
Bottom income	$3,986	$5,832	$6,169	$9,364
Second income	$1,369	$1,675	$1,155	$2,163
Third income	$341	$520	$517	$813
Top income	$138	$130	$134	$348

Notes: Dollar amounts are expressed in 2013 dollars.

Conclusions and Policy Recommendations

The most compelling case for income-based loan repayment systems is that they provide a type of insurance for borrowers who experience financial hardship after graduation. The most straightforward way to provide such insurance is to allow borrowers with low incomes to extend their period of repayment. But that is only one component of the existing IBR and PAYE programs, which also forgive outstanding balances after 20-25 years and the balances of workers in the public and non-profit sectors after 10 years.

A common worry about any insurance-like program is moral hazard, where the insured engage in more risky behavior because they don't have to bear the full cost of their actions. In the case of income-based repayment programs, the moral hazard is that students take on more loans than they otherwise would because they know they won't have to pay the full cost if they experience low incomes later on. There is no way to get rid of moral hazard entirely, but eliminating the forgiveness provisions would reduce the potential for over-borrowing by requiring borrowers to eventually pay off their debt, while protecting them from unaffordable payments at any given point in time. As for the PSLF provision, policymakers wishing to encourage public service employment could

likely do so more efficiently and fairly by providing direct benefits to all such workers (e.g., through tax credits), rather than benefits targeted at the subset of these workers who borrowed to pay for college.

Our simulations indicate that the core component of income-based repayment programs—extended repayment—only accounts for one-quarter to one-third of the total program costs (and, under plausible changes to our assumptions, never more than half of total costs). This means that the most recent program (PAYE) may cost taxpayers as much as four times as much as a more limited program that still fulfilled the core mission of protecting borrowers from unaffordable monthly payments.[19] Simulating the costs and benefits of alternative income-based repayment programs is a ripe area for future research.

Future work in this area is especially important given an emerging consensus that income-based repayment programs should be passive in that borrowers should enter them by default.[20] Such programs will likely be significantly more expensive as more borrowers participate. Our back-of-the-envelope calculation indicated a yearly cost of $14 billion for PAYE under our assumption of nearly universal participation. Scaling back such a program to only include extended repayment implies potential savings of up to $10 billion. Such savings could be redeployed to more effective uses in higher education policy. In 2013, the largest federal education budget item was the Pell grant program, which provided grants to low-income college students at a cost of $33 billion.[21] Would it be better to increase Pell by 30 percent, perhaps by restoring the summer component of the program or increasing the income eligibility thresholds, or to continue to provide loan forgiveness?

A second key result of our simulations is that the vast majority of program benefits go to borrowers with low incomes, as we would expect, but that benefits also disproportionately go to borrowers who attended more expensive institutions. We do not find much evidence that high-income borrowers from expensive institutions receive significant benefits, but there still remains a concern that income-based repayment programs provide incentives for students to attend more expensive institutions, since taxpayers bear some of the risk. Eliminating the forgiveness provisions of these repayment programs should mitigate this problem.

Finally, we need more and better estimates of the likely costs of income-based repayment programs. Our analysis represents an empirical proof of concept of how such estimates

can be produced, but is subject to the limitations discussed above. Some of these limitations could be addressed in future research with tweaks to the simulation model and the embedded assumptions. But the most important limitation is that data that link information on student borrowing to many years of income are not publicly available. The most straightforward solution would be for the analysts in the federal government, such as those in the Congressional Budget Office or the Office of Management and Budget, to link NSLDS data to IRS data on income tax returns, and use the linked data to calculate cost estimates along the lines of those in this analysis.

Our more limited analysis makes it clear that the costs of income-based repayment programs are potentially substantial, and are much more expensive than they need to be in order to accomplish their core purpose. Until we have better estimates based on better data, we won't know the contours of these issues nearly well enough to make smarter policy choices. But taxpayers will still be on the hook for the costs of these poorly designed programs.

Appendix A. Formulas

Monthly payment under standard repayment:

$$StdPay = Borrow * \frac{\frac{i}{12}}{1-\left(1+\frac{i}{12}\right)^{-12N}}$$

where Borrow is the starting balance (cumulative federal borrowing), i is the interest rate and N is the period of repayment in years.

Balance at beginning of each year under standard repayment:

$$StdBal = StdBal_{t-1} * \left(1+\frac{i}{12}\right)^{12} - StdPay * \frac{\left(1+\frac{i}{12}\right)^{12}-1}{\frac{i}{12}}$$

where $StdBal_{t-1}$ is the balance under standard repayment at the start of the previous year.

Monthly payment under IBR for household:

$$NormalIBRPay = \frac{[0.15 * (AGI - 1.5 * Poverty)]}{12}$$

where AGI is the household adjusted gross income (approximated by total income in our analysis) and Poverty is the poverty level (approximated as the average poverty level for the borrower's family size). We calculate this at the individual borrower level, approximated by dividing by two for married borrowers.

Monthly payment under PAYE for household:

$$NormalPAYEPay = \frac{[0.10 * (AGI - 1.5 * Poverty)]}{12}$$

Alternative monthly payment under IBR and PAYE is calculated using the monthly payment formula for a 10-year period with a starting balance of the balance upon entry into IBR or PAYE.

Monthly payment made by IBR participants (same for PAYE):

$$Payment = \min(NormalIBRPay, AltIBRPay)$$

Balances under IBR/PAYE are calculated using the same balance formula as for under standard repayment, but with the actual balance from the beginning of the previous year and with the monthly payments made under IBR/PAYE.

The interest rate benefit for borrowers in their first through third years of IBR/PAYE for whom their balance would increase due to accumulation of interest is simply the difference between their balance the previous year and what their balance would have been in the current year in the absence of the benefit.

Forgiveness is the remaining balance upon reaching eligibility for forgiveness.

Interest rate subsidy under various repayment programs. First, we calculate the balance at the end of each month for each set of yearly payments:

$$Bal_1 = Balance * \left(1 + \left(\frac{i}{12}\right)\right) - Payment$$

$$Bal_m = Bal_{m-1} * \left(1 + \left(\frac{i}{12}\right)\right) - Payment$$

for months m=2,3,…,11

We then calculate the interest-rate subsidy for that repayment program:

$$InterestRateSub = Balance * \left(\frac{irs}{12}\right) + \sum_{m=1}^{11} Bal_m \frac{\frac{irs}{12}}{1 + \left(\frac{dr}{12}\right)^m}$$

where irs is the interest rate subsidy and dr is the discount rate.

We repeat this calculation for standard repayment, IBR, and PAYE. We then calculate the additional interest-rate subsidy due to IBR as the difference between the interest-rate subsidies for IBR and standard repayment (and likewise for a comparison for PAYE and standard repayment).

Appendix Table 1. Sensitivity of Simulated Program Costs to Assumptions

Discount = 3%, IR Subsidy =	1%		2%		3%	
	IBR	PAYE	IBR	PAYE	IBR	PAYE
Share of total cost						
Public service loan forgiveness	15%	17%	13%	14%	11%	13%
Regular forgiveness	44%	50%	37%	43%	32%	38%
Interest benefit	21%	18%	18%	16%	15%	14%
Interest subsidy	20%	15%	33%	27%	42%	35%
Total cost per borrower	$2,197	$2,995	$2,628	$3,458	$3,058	$3,921
Total cost per participant	$5,195	$5,996	$6,214	$6,923	$7,233	$7,850

Discount = 4%, IR Subsidy =	1%		2%		3%	
	IBR	PAYE	IBR	PAYE	IBR	PAYE
Share of total cost						
Public service loan forgiveness	16%	17%	13%	15%	11%	13%
Regular forgiveness	40%	47%	33%	40%	29%	35%
Interest benefit	24%	20%	20%	18%	17%	16%
Interest subsidy	20%	16%	33%	27%	43%	36%
Total cost per borrower	$1,887	$2,615	$2,263	$3,026	$2,640	$3,437
Total cost per participant	$4,463	$5,236	$5,353	$6,058	$6,243	$6,881

Notes: Dollar amounts are expressed in 2013 dollars.

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End Notes

1. Michael Greenstone and Adam Looney, "Regardless of the Cost, College Still Matters," Brookings on Job Numbers, Washington, DC: Brookings Institution, 2012. See also Figure 1.6 of Education Pays 2010, New York: College Board, 2010.
2. Associated Press, "Half of recent college grads underemployed or jobless, analysis says," April 23, 2012, available at http://www.cleveland.com/business/index.ssf/2012/04/half_of_recent_college_grads_u.html.
3. An earlier program, the Income-Sensitive Repayment Plan, is only available for borrowers in the Federal Family Education Loan (FFEL) Program, which no longer makes new loans.
4. Jason Delisle and Alex Holt, "Safety Net or Windfall? Examining Changes to Income-Based Repayment for Federal Student Loans," Federal Education Budget Project, Washington, DC: New America Foundation, 2012.
5. This poverty level is for the contiguous 48 states; poverty levels are higher in Alaska and Hawaii. To simplify our analysis we only use the poverty levels for the 48 contiguous states. Source: "2014 Poverty Guidelines," U.S. Department of Health & Human Services, available at http://aspe.hhs.gov/poverty/14poverty.cfm.
6. We define borrowers as those who borrowed from the federal student loan programs.
7. This benefit only applies to subsidized loans. In order to simplify the calculations, we calculate this benefit as if it were applied to all federal loans. Consequently, we likely overstate the cost of this program component. Additionally, interest is not allowed to capitalize (i.e. be added to the principal and itself begin accruing interest) in IBR and PAYE. We do not analyze this benefit both in order to simplify the calculations and because it is unlikely to be substantial for most borrowers.
8. Some commentators argue that the federal government turns a profit off of student loans, citing official estimates showing negative subsidies (i.e. profits) of the federal student loan program. However, the official estimates use a methodology mandated by Congress in the Federal Credit Reform Act (FCRA) that does not capture the market value of the loans made by the government. Most importantly, FCRA does not capture market risk—the possibility that economic conditions will be worse than expected and, as a result, borrowers will be less likely to make their payments. An alternative methodology favored by the Congressional Budget Office, fair-value accounting, shows that the student loan program is subsidized by the federal government in most years between 2013 and 2023 ("Options to Change Interest Rates and Other Terms on Student Loans," Congressional Budget Office, Pub. No. 4705, June 2013). However, the value of the benefit to borrowers is not dependent on this issue. The

interest rate subsidy is defined as the difference between the market rate (i.e. the rate that would be offered by private lenders if a market were to exist) and the rate offered on federal loans.

9. We implicitly assume that administrative costs are the same under all repayment plans. This causes us to understate the relative cost of income-based plans to the extent that these plans are more costly to administer (due to income verification, etc.) than the standard repayment plan.
10. We also conducted an alternative version of our simulation in which we use a 10-year standard repayment term for all borrowers. The main results are qualitatively similar to those reported here, and are available from the authors upon request.
11. We use household size in 2003 for all years.
12. This assumption aims to capture the fact that enrollment is costly and may discourage enrollment for borrowers when the monthly benefit is small. However, lowering the participation threshold to zero (while maintaining a $20 threshold for opting out) has only a negligible impact on the resulting estimates.
13. Loan forgiveness programs may encourage borrowers to take on more debt. This may be a desirable outcome if current borrowing levels reflect an irrational aversion to debt. However, this is not a desirable outcome if the possibility of loan forgiveness causes students to begin taking on debts without the intention of repaying them in the future. These changes in borrowing may have a significant impact on program costs, but this impact is not captured in this analysis.
14. Under current law, loan balances forgiven under IBR/PAYE are treated as taxable income by the IRS. However, given that borrowers who are eligible for forgiveness would be unlikely to be in a financial position to be able to pay the tax liability, we think it is likely that this provision will be changed before any forgiveness actually occurs. Consequently, we have not factored taxation on loan forgiveness into our simulations (i.e. we have treated forgiveness as a transfer from taxpayers to borrowers).
15. Table 400, 2012 Digest of Education Statistics, National Center for Education Statistics, http://nces.ed.gov/programs/digest/d12/tables/dt12_400.asp.
16. The income distribution is based on the average of all borrowers' incomes in 1996 and 2002.
17. Jason Delisle, "The Graduate Student Debt Review," New America Foundation, March 2014.
18. We carry out this analysis for PAYE only because it is more generous than IBR and is therefore likely the program of choice for recent borrowers. We obtain a similar pattern of results for IBR (results available from the authors upon request).
19. The actual cost increase would be less, because eliminating forgiveness would increase the interest-rate subsidy (because the previously forgiven amount would now be financed over a longer period of time). However, those cost increases would be largely in the later years of repayment, so the impact on total program costs in net present value terms may not be that

large.

20. Young Invincibles, National Association of Student Financial Aid Administrators, Institute for Higher Education Policy, New America Foundation, and HCM Strategists, "Automatic for the Borrower: How Repayment Based on Income Can Reduce Loan Defaults and Manage Risk," March 2014, available at http://younginvincibles.org/wp-content/uploads/2014/03/Automatic-for-the-Borrower-3.19.14.pdf.
21. New America Foundation, "Federal Pell Grant Program," available at http://febp.newamerica.net/background-analysis/federal-pell-grant-program.

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