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Student Loan Relief Programs: Implications for Borrowers and the Federal Government*

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Abstract

As college costs increase and more students fund their education through borrowing, debt load and delinquency rates have become significant problems on a number of levels. Student loan obligations are challenging to manage for new graduates with lower earnings and for borrowers in financial hardship. This paper discusses the various federal student loan repayment relief programs that are available and their borrower and fiscal impacts. The implications of relief plans on borrowers' costs and the federal budget vary significantly for different loan amounts, income levels and relief program.

It is challenging for policy makers to design and evaluate programs that adequately balance the risks between borrowers and taxpayers. Existing programs are also tremendously complicated, making it difficult for borrowers to make an informed decision on repayment program. Thus, we feel that an analysis of how the various programs work in practice and their likely outcomes over a set of income-debt-program scenarios would bring much-needed clarity to the repayment environment. In our analysis, in general, lower income-borrowers and borrowers who have significant remaining balance forgiven at the end of the required repayment period are more likely to benefit from the programs, but their participation can be very costly from a fiscal perspective. Even when paid as agreed, fiscal cost, expressed as net present value, is as high as \$80,032 for a \$100,000 debt. Taxation of cancelled debt, as required in most cases under current law, would reduce this cost, but an account for delinquency and default would make income-driven repayment more costly.

Keywords: student loan; repayment; relief programs; fiscal impact

JEL Codes: I22, I23, H81

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Student Loan Relief Programs: Implications for Borrowers and the Federal Government

At the end of the first quarter 2016, the U.S. Department of Education (ED) reported that 3.7 million Federal Direct Loan (Direct Loan) borrowers and 4.3 million Federal Family Education Loan (FFEL) borrowers were in default, accounting for 24.7 percent and 39.8 percent of borrowers in repayment, respectively, and a cumulated \$124.8 billion of distressed student loan debt.⁴ During the 2007-09 recession and recovery, aggregate student loan debt increased consistently while most other forms of consumer debt fell, the exception being auto debt, which has been increasing over the last few years (Federal Reserve Board, Statistics Series G.19).

The consequences of being unable (or unwilling) to repay student debt can be severe for debtors and has been shown to have a broader economic impacts. Student loan debt can delay household formation. For example, Gicheva (2016) found that MBA students are less likely to marry over a period of seven years if they have student loan debt. Delinquency or default on student loan debt mars credit history and disqualifies borrowers from additional access to credit, including federal student aid. Ambrose, Cordell and Ma (2015) found that student loan debt is negatively correlated with the formation of new businesses that rely heavily on personal debt to finance. Student loan debt may also reduce personal and retirement saving (Munnell, Hou, and Webb 2016). Finally, mortgage-qualified student loan borrowers often delay purchasing homes due to increased economic uncertainty arising from student loan repayment (National Association of Realtors and Association of Student Assistance 2016).

⁴The FFEL program provided federal guarantees for student loans made by private lenders. In July, 2010, the FFEL program was replaced by a direct loan program: the William D. Ford Federal Direct Loan Program (Direct Loan) (that is, student loans are provided directly by the ED). Private loans continue to be available to students, but they are not guaranteed by the federal government or otherwise subsidized. Subsidized student loans from revolving loan funds controlled by educational institutions also continue to be available. For additional details, see Edmiston (2013). The Direct Loan and FFEL Portfolios by Loan Status are available at: <https://studentaid.ed.gov/sa/about/data-center/student/portfolio>.

Borrowers who do not repay in a timely fashion face accruing interest, which is usually capitalized, increasing the amount of debt principal. Some recent research suggests that student loan debt is the most significant factor holding back millions of Americans who have either zero or negative net worth (Armantier, Armona, De Giorgi, and van der Klaauw 2016). For many families, student loans are still the only financial tool available to bridge the gap between college costs and funds from family savings and other sources of aid, such as scholarships and grants. However, some students and families may be reluctant to borrow for college because of the uncertainty over job prospects and the repayment burden associated with the debt; thereby keeping some potentially highly successful students out of the higher education system.

In light of these concerns, considerable political attention has been focused on providing financial relief to student loan debtors, resulting in a number of programs that extend repayment terms, graduate payments, or tie required payments to discretionary income. The aim of student debt relief programs is quite clear: to provide a safety net for distressed borrowers, in the process reducing the likelihood of delinquency and default, and possibly diffuse the fear of debt for reluctant, promising borrowers. But, the costs and outcomes for participating borrowers are not clear. The consequences of the numerous IDR and other relief programs, such as extended and graduated repayment, for the federal budget is even less clear.

This paper seeks to contribute to the policy discussions on student loan debt relief by analyzing borrowers' repayment obligations and likely outcomes under alternative repayment programs and estimating the associated fiscal implications for the federal government. We focus on income-driven repayment plans administered through the Department of Education. The federal government also operates some loan forgiveness and debt relief programs outside the

Department of Education, but these loans are comparatively very small in the number of recipients and in aggregate disbursements.⁵

There are substantial variations in earnings prospects and other labor market conditions for borrowers. Without IDR programs, the risks are largely shouldered by borrowers because lenders are protected from most consequences of unpaid debt (including when the federal government is the direct lender). The projected cash recovery rate for defaulting Stafford loans is 105.4 percent, meaning that the collection of principal, interest, and penalty fees would more than offset the dollars that were defaulted (U.S. Department of Education, 2015). This number has led many to believe (erroneously) that the federal government benefits when borrowers default on their student loans (Field, 2011). The cash recovery rate does not reflect collection costs paid to collection agencies or the time value of money. The net present value of principal, interest, and fees collected, net of collection costs that are paid to collection agencies, yields a recovery rate of 81.8 percent, which, nonetheless, is exceptional for defaulted debt.

Federal Student Loan Debt Relief Programs

Student loan debt has increased dramatically over the last several years, from about \$346 billion in the fourth quarter of 2004 to \$1.26 trillion the end of the first quarter of 2016.⁶ At the end of the first quarter of 2016, about 43 million, or one in six of 258 million consumers with credit reports had student loan debt.⁷ The average balance for those with student debt was

⁵In calendar year 2014, the latest date at which data are available, student loans outside of the Department of Education were offered by 33 agencies to 8,469 students at a total cost of \$58.7 million. By contrast, the Department of Education disbursed about \$140 billion in student loans. See United States Office of Personnel Management (2015).

⁶Federal Reserve Bank of New York Quarterly Report on Household Debt and Credit. May, 2016. Available at https://www.newyorkfed.org/medialibrary/interactives/householdcredit/data/pdf/HHDC_2016Q1.pdf.

⁷These figures and other statistics in this session that are not sourced are calculated using data from the Federal Reserve Bank of New York Consumer Credit Panel, a 5 percent longitudinal sample of Equifax credit reports. All

\$28,377, and the median was \$15,300. The median is significantly lower than the average because the distribution of student loan debt is heavily skewed due to a small share of very-high-balance borrowers. About 15.5 percent of borrowers have student debt in excess of \$50,000, and 4.7 percent have student debt above \$100,000. Although borrowers with loan balances in excess of \$200,000 account for only one percent of all student loan debtors, the share has doubled from 0.5 percent since the first quarter of 2014.

By default, both the Direct Loan and FFEL programs put borrowers into a standard repayment plan, which is characterized by fully amortized, fixed, level payments for 10 years. Currently about 54 percent of student loan debtors in repayment are in this standard plan (Figure 1; see also Edmiston, 2016). There are other programs for student loan borrowers to consider when repayment becomes a challenge.

Non-Income-Driven Repayment Plans

Borrowers who have difficulty repaying their loans can apply for deferment or forbearance, both of which eliminate required payments for a fixed period of time, ostensibly to avoid default. Interest usually accrues during both deferment and forbearance, except for deferment of a subsidized loan.⁸ Currently 11 percent of outstanding student loan debt is in forbearance and another 11 percent is deferred (Edmiston, 2016). Only 51 percent of student debt is in repayment.

Another option is to extend the repayment term, which reduces the monthly payment but increases the aggregate cost. Many borrowers have multiple federal loans with different terms and repayment periods. They can consolidate these loans and make a single monthly payment.

identifying information is removed from individual credit reports. Consumers are linked overtime by an ID that is a scramble of their Social Security numbers.

⁸ <https://studentaid.ed.gov/sa/repay-loans/deferment-forbearance>.

For Direct Consolidation loans, the repayment period can be extended up to 30 years, depending on the loan amount. More generally, borrowers who have more than \$30,000 in outstanding federal loans originated after October 7, 1998 have the opportunity to extend their repayment plan to 25 years.

Borrowers with low initial income but higher expected income in the future (such as physicians) may benefit from the Graduated Repayment Plan. Payments are low at the beginning of the repayment term and increase over time, usually every two years, so that the principal is fully paid at the end of the repayment term (typically 10 years or 25 years). Graduated Repayment schedules cannot negatively amortize and the payment due cannot exceed three times of payment under any other program. The specific repayment schedules differ across individuals depending on the number of years in the repayment plan and the rate of graduation.

Income-Driven Repayment Plans

Student loan debtors increasingly have turned to repayment programs that limit the required payment to a formulaic amount determined largely by student debt and income, but also additional factors, such as type of loan (for example, subsidized or not subsidized) and family structure (marital status and dependents). Income-driven repayment plans (IDR plans) include Income-Contingent Repayment (ICR), Income-Based Repayment (IBR), Pay-As-You-Earn (PAYE), and the Revised PAYE (REPAYE) (Table 1).

Most borrowers are eligible for one or more IDR plans, but currently only 25 percent of borrowers in repayment take advantage of the programs (Figure 1; see also Edmiston, 2016). An additional, potentially very lucrative (for borrowers) benefit of IDR plans is that at the end of the repayment term (typically 10, 20, or 25 years), any remaining debt, including unpaid interest, usually is forgiven. Eligibility, payment amount, interest benefits, repayment period, and amount

forgiven at the end of repayment period vary by plan, amount of student debt, date of origination, income, and family size. Because the monthly payments for IDR plans are based on the difference between a borrower's income and some multiple of the poverty threshold, the monthly payment can be zero for some borrowers. The remainder of the section details these programs.

Payment and Term. The oldest existing repayment plan, which came into effect in 1994, is the ICR plan. The computation of payments under ICR is extraordinarily complicated. The monthly payment under ICR is the lesser of 20 percent of the borrower's discretionary income, defined under ICR as IRS adjusted gross income (AGI) less the poverty threshold, or the fixed payment on a fully-amortized loan over 12 years, adjusted by an "income percentage factor." Because of the higher valuation of discretionary income and the allocation of 20 percent of that income to student loan repayment, ICR is usually less advantageous for student loan debtors than other plans. The ICR plan remains the only income-driven option for Parent PLUS borrowers (if borrowers consolidate these loans into a Direct Consolidation Loan).

The loan repayment period of REPAYE, PAYE and IBR plans are generally 20 years, with the exception of 25 years for older loans in IBR or for loans borrowed for graduate and professional study in the REPAYE plan. Borrowers must have a Partial Financial Hardship (PFH) to qualify for IBR or PAYE plans. A borrower satisfies Personal Financial Hardship requirements for IBR/PAYE if the 10-year standard repayment amount exceeds 15 or 10 percent of discretionary income, respectively. For these programs, discretionary income is AGI less 150 percent of the poverty threshold for the debtor, which is determined by family size and structure. The most recent plan, REPAYE, which was conceived as an expansion of the PAYE program,

does not have the Personal Financial Hardship requirement and brings many older loans into the IDR space.⁹

The required payments under IDR are 10 percent of discretionary income for PAYE, REPAYE, and IBR borrowers (for IBR, Direct Loans disbursed after July, 2014). In our simulations, we evaluate IBR under its original requirements, where payments are 15 percent of discretionary income. Because the calculation of repayment schedules under ICR is so individualized and cumbersome, we choose not to include the ICR program in most of our simulations and only compute an ICR repayment schedule for income of \$30,000 and debt of \$50,000 (the computation is described in detail in the appendix). With more appealing features of the recent plans for student loan borrowers, we expect that ICR participation is likely to decrease substantially, with borrowers largely moving into REPAYE.¹⁰

Interest Capitalization. Under IDRs, monthly payments often do not cover the full amount of interest accrued during the month. The unpaid interest is not capitalized except under a triggering event, explained below. PAYE and IBR both void the first three years of unpaid interest on subsidized loans, while REPAYE voids unpaid interest on subsidized loans for the first three years and 50 percent thereafter. Unpaid interest on unsubsidized loans also is reduced by 50 percent throughout the repayment period under REPAYE. Under IBR and PAYE, the loss of Partial Financial Hardship status would lead to capitalization of accumulated, unpaid interest. Unpaid interest also would be capitalized if borrowers voluntarily leave the plans or fail to recertify their Personal Financial Hardship status. To recertify the Partial Financial Hardship

⁹See “Student Assistance General Provisions, Federal Family Education Loan Program, and William D. Ford Federal Direct Loan Program,” *Federal Register*, vol. 80, no. 210, pp. 67204-67242, October 15, 2015. Addition changes include that the REPAYE allows the monthly payments to be higher than those under a standard plan, different treatment of married couples’ income PAYE plan, and different interest benefits.

¹⁰Graduate and professional students likely will opt for PAYE over REPAYE because the latter has “harsh” spousal income inclusion rules (Crespi, 2016).

Status, borrowers typically submit their previous year's tax return to verify their income, marital status, and number of dependents. (income, dependents, etc., usually through the submission of the previous year's tax return) or voluntarily leave the plans.

Forgiveness. After making the required number of payments under an IDR plan, any remaining debt is forgiven. In a number of cases in our simulations, the entire amount of principal is forgiven. Moreover, unless a capitalization event occurs, unpaid interest is forgiven as well. In some cases, this unpaid interest can be nearly as high as the unpaid principal. In other cases, however, principal is completely paid by the debtor in an IDR plan, typically before the end of the repayment term.

The Public Service Loan Forgiveness (PSLF) program forgives remaining balances on Direct Loans after 10 years working full-time for a qualifying employer, usually government or 501(c)(3) organizations. Candidates for the program must make 120 timely payments to qualify for forgiveness. The PSLF program is essentially an add-on to existing IDR plans because a standard, fully amortizing plan would pay off the principal in ten years. Thus, candidates for PSLF are necessarily enrolled in an IDR plan. Because of the way the plan is structured, the Department of Education does not have a good grasp on the cost. Importantly, candidates for the PSLF program can claim the benefit retroactively. That is, they can submit the necessary paperwork at the end of required 10-year repayment period and receive all of the benefits of the program. The program was implemented in 2007, and thus the first applications to receive assistance will not be submitted until 2017. A program implemented in 2012 provides an option to certify qualification for PSLF, which has provides more certainty to both borrower and federal

government.¹¹ Another critical issue affecting PSLF costs is that the program arguably favors those with the largest debts (Delisle, 2016). Of those who have enrolled in the program (which is optional), 80 percent have student debt exceeding the maximum allowed for dependent undergraduates, suggesting that the program heavily favors those who attended graduate or professional degree programs.

Program Take-Up. The Government Accountability Office (GAO, 2015) estimates that the majority of borrowers of federal student loans are qualified for an IDR plan. But, as noted above, only 25 percent of borrowers in repayment currently are taking advantage of an IDR plan. The take-up rate of these programs depends largely on borrowers' understanding of the programs (GAO, 2015).

In recent years, federal agencies, institutions, and counselors have made efforts to raise awareness of these programs. The Department of Education emails borrowers with a balance higher than \$25,000 and/or who have missed payments information about repayment plans. The Congressional Budget Office reports increasing take-up rates. Figure 1 shows the share of borrowers who participated in various student debt relief programs in the second quarter of 2016. About one-fourth of the student-loan borrowers were enrolled in an IDR plan at that time.

Analysis of Borrower and Fiscal Impacts

In this section, we use simulations to evaluate how the IBR, PAYE, and REPAYE programs affect borrowers and the federal budget (fiscal impact) under a number of alternative

¹¹See U.S. Department of Education, Federal Student Aid, "Public Service Loan Forgiveness (PSLF): Employment Certification Form." Available at <https://studentaid.ed.gov/sa/sites/default/files/public-service-employment-certification-form.pdf>. As cited in Delisle (2016).

income-debt scenarios when entering repayment. The income basis for IDRs is adjusted gross income (AGI, as defined by the IRS). Given our assumptions about the borrower in our simulations, described below, AGI would rarely differ from gross income. In our simulations, income ranges from \$25,000 to \$50,000, while initial student debt load ranges between \$20,000 and \$100,000. We believe that the scenarios we examine cover the large bulk of people with outstanding student loan debt entering a repayment program. About 30 percent of outstanding student loan debtors owe between \$25,000 and \$100,000, new graduates in 2015 were expected to average over \$37,000 in student debt (Kantrowitz, 2014). More importantly, student loan borrowers with low levels of debt are unlikely to meet the requirements for the IDR plans because their payments under the default program would not be higher than under the IDR plans. They would not benefit by enrolling in an IDR plan. Those who have very low incomes along with low debt, say due to job loss, would likely be better off with a hardship forbearance than a long-term IDR plan and would be expected to take that route.

Currently, independent the Department of Education limits undergraduate students to \$57,500 in accumulated debt, while those who use student loans to finance graduate school are limited to \$138,500, inclusive of any undergraduate borrowing (medical school and health professions student can borrow up to \$224,000 in total).¹² However, these principal balances could potentially grow significantly with capitalized interest in forbearance, or in the case of deferment, capitalized interest on unsubsidized loans.

Consider an undergraduate who attends college over 5-years, borrows the maximum \$24,500 in subsidized loans and the maximum \$33,000 in unsubsidized loans, for an aggregate

¹²Dependency status for student aid purposes is determined by answers to a series of questions posed in the Free Application for Federal Student Aid (generally known as FAFSA). Details are available at <https://studentaid.ed.gov/sa/fafsa/filling-out/dependency>.

of \$57,500 (borrowing is limited to the cost of attendance less other financial aid; see U.S. Department of Education, Award Year 2016-2017). Interest (at an assumed 6 percent) would accumulate on the unsubsidized loans during school, and in the 6-month grace period that follows, assuming no interest payments are made during the loan period. The subsidized amount would remain \$24,500, but the unsubsidized amount, following interest capitalization, will have grown from \$33,000 to \$59,721, and total student loan debt when entering repayment would be \$84,221.¹³

All graduate student loans are unsubsidized, so a student borrowing the maximum would be expected to leave school with a much higher balance if not paying accruing interest while in deferment. Further, graduate students may borrow additional amounts from the graduate PLUS program with no limits other than the cost of attendance. For some programs, particularly those leading to professional degrees, the cost of attendance can be extraordinarily high, and graduates often enter their careers (and repayment) with very large student debt loads. About 80 percent of medical students (pursuing an MD) graduate with over \$100,000 in student debt, and almost two-thirds graduate with more than \$150,000 in education debt. The median is about \$175,000 (AMA Insurance, 2014).

Payments and outcomes of IDRs depend not only on income and debt, but also marital status, number of dependents (as defined by the IRS), the interest rate on the student debt, the rate used to discount payments to calculate the net present value (NPV), the growth rate of income, and the rate of growth in the poverty threshold. To proceed with our analysis, we must make assumptions about these factors. Later in the paper we test the sensitivity of the results to these assumptions.

¹³ The calculation is $\$24,500 + [\$6,000 (1+0.06/12)^{66} + \$6,000 (1+0.06/12)^{54} + \$7,000 (1+0.06/12)^{42} + \$7,000 (1+0.06/12)^{30} + \$7,000 (1+0.06/12)^{18}] (1+0.06/12)^6$

First, we assume that the borrower entering a repayment program is single and has no dependents. We believe that this assumption reflects the modal family structure of those entering repayment, if not the majority (Nau et al., 2014; Anderson, 2013). We assume that interest rate charged on student debt is 6 percent, based on the average in the Department of Education student loan portfolio (authors' calculation).¹⁴ In calculating discretionary income over time, we assume that income grows at 3.4 percent annually, which is the compound annual growth rate (CAGR) in employee compensation between 2000 and 2015.¹⁵ We assume the poverty threshold grows at a CAGR of 2.14 percent, based on the annualized rate of increase for a one-person household between 2000 and 2016.¹⁶ We assume that the future stream of student loan payments is discounted at the same rate as investment grade U.S. corporate bonds (S&P Dow Jones Index, U.S. Corporate Bonds, U.S. Investment Grade Bonds), which was approximately 2.8 percent at time of analysis.¹⁷

Our most critical assumption is that the debt is paid as agreed. Currently, 82 percent of outstanding student loans in the Department of Education portfolio and in repayment are being paid as agreed. We feel it important to get a firm grasp on how these programs work as designed, which is a necessary foundation for any additional analyses, including the effects of delinquency and default. Indeed, the impetus behind IDRs was an expected decline in delinquencies and defaults, and early results bear that out (GAO, 2015). Finally, we feel that focusing on the structure of student loan repayment programs is critical in making informed policy decisions.

¹⁴ Data sources include interest rates enumerated at <https://studentaid.ed.gov/sa/types/loans/interest-rates> and ED portfolio composition from The National Student Loan Data System / ED.

¹⁵ U.S. Department of Commerce, Bureau of Economic Analysis, Personal Income and Outlays, Table 1. Retrieved from Haver Analytics.

¹⁶ U.S. Census Bureau, Historical Poverty Tables: People and Families - 1959 to 2015, Table 1: Weighted Average Poverty Thresholds for Families of Specified Size: 1959 to 2015

¹⁷ Under the FCRA, expected repayments are discounted to present value using the U.S. Treasury's borrowing rates, and thus, at that risk-free rate, they do not reflect the risk that default rates could be higher than projected

Budget Process for the Federal Student Loan Program

The net costs of student loan programs are recorded in the federal budget on an accrual basis in the year the loan is disbursed (see Edmiston, 2012). The cost is calculated as the net present value of the federal government's expected cash flow over the life of the loan (or loan guarantee) less the amount disbursed.¹⁸ We follow the same procedure in our simulations. These estimates do not account for the costs of administering the programs, such as those associated with origination, servicing, and collection, which are treated separately in the federal budget on a cash basis.¹⁹ In the 2017 Federal Budget Request, administrative costs were about 1.4 percent of disbursements (U.S. Office of Management and Budget, 2016).

Methodology

We evaluate the outcomes of student loan debt relief programs with simulations. Specifically, for 25 combinations of income and debt when entering repayment, we use each IDR program's criteria to develop a repayment schedule. That is, we compute the required payment for each month over the repayment term. In the PAYE and REPAYE cases, these are 240 monthly payments (unless the balance is paid before 20 years), while for IBR, we compute up to 300 payments.

Each payment made during the repayment term must be calculated and appropriately discounted. Thus, critical for an analysis of fiscal impact is the calculation of a repayment

¹⁸ The CBO budget calculations do account for the risk of default or exercise of options to prepay or to seek forbearance or deferment. The cost estimates under the former FFEL program also account for payments to lenders. The CBO uses annual ED data to update default rates for the outstanding loan portfolio to make allowances in the current budget for any difference in expected costs to the federal government.

¹⁹Recent federal budget estimates project a negative net cost for the Direct Loan program. While federal budget numbers suggest that the federal government "profits" from the student loan program, more widely accepted accounting methodologies, specifically fair value, reflect a net cost. For detailed description of fair-value accounting, see Financial Accounting Standards Board, 2010, "Statement of Financial Accounting Standards, No. 157, Fair Value Measurements" (<http://www.fasb.org/>).

schedule for student debt under each repayment program. Figure 2 shows repayment schedules for each IDR program for an individual with income of \$30,000 and student debt of \$50,000 upon entering repayment. For comparison, schedules for the standard repayment plan, Extended Repayment plan, Graduated Repayment plan, and ICR also are included.

The repayment schedules under PAYE and REPAYE are the same in this case because the individual does not lose PFH status during the loan period under PAYE or exit either program. If that were not the case (e.g., income were higher or grew more quickly or there was an exit), interest would have been capitalized by up to \$5,000 for PAYE and \$9,126 for REPAYE, and the required payments under REPAYE would have exceeded those under PAYE at some point during the repayment term (there is no payment cap under REPAYE).

PAYE and REPAYE typically yield nearly the same results in any kind of analysis, as seen in the simulations below. REPAYE was conceived as an extension of PAYE to a larger pool of debtors, and the income-driven payment calculation is identical. While there are some significant differences between the programs (like the PFH requirement for PAYE and rules on capitalization of unpaid interest), these differences usually result in significantly different outcomes only under special circumstances. This issue is discussed further below.

In the specific case considered here, payments and total amount paid (area under the curve) are lowest under PAYE/REPAYE, and thus one of these programs would clearly be the best choice among IDR programs for this candidate. However, PAYE or REPAYE may not be the best options for others, depending on their individual circumstances (participation in IBR remains relatively high). Indeed, PAYE or REPAYE may not be the best solutions even in this specific case under certain circumstances, such as exit from the program. Finally, if forgiven debt and interest are taxable at the end of the repayment period, PAYE and REPAYE could be

considerably more costly to the debtor. Combined forgiveness of principal and unpaid interest would likely be about \$60,000 under both programs. Forgiveness is discussed in more detail later in the paper. Tax implications are briefly discussed later in the paper but are not considered in detail because it is outside the scope of our analysis. Of course, many borrowers entering repayment do not qualify for an IDR plan or for only some plans.

An important factor in the NPVs we calculate is the capitalization of unpaid interest. Unpaid interest (typically arising from negative amortization) is treated differently across IDR programs. Under IBR and PAYE, a “capitalizing event” includes the loss of PFH status. Unpaid interest is capitalized at that point, and that is how capitalization is treated in our simulations. Under ICR, IBR, PAYE, and REPAYE, exit from the program is a “capitalizing event.” In our simulations, we assume that the hypothetical debtor does not exit the program. We do track unpaid interest, however, which gives an upper bound of the amount of capitalization that is possible under each program if one were to exit.

Under IBR, PAYE, and REPAYE, unpaid interest is fully subsidized during the first three years of repayment if the loan is a subsidized loan; however, in our simulations we assume debt is unsubsidized. REPAYE subsidizes unpaid interest by 50 percent throughout the program even if the debt is made up of unsubsidized loans. PAYE limits interest capitalization to 10 percent of the debt when entering repayment.

Simulation Results

For each IDR and income-debt combination, we compute total payments (decomposed into interest, capitalized interest, and principal), the upper bound for capitalized interest, the amount of forgiveness of loan principal and unpaid interest, and the NPV to the ED (or fiscal

impact) (Table 2). The simulations abstract from delinquencies, tax implications, and program exits.

Fiscal Impact. As outlined above, the fiscal impact is the present value of the future stream of repayments less the disbursed amount, or the NPV. For exposition, we discuss two scenarios in some detail. We then summarize all of the simulations in a series of charts that highlight the variation in fiscal impact across scenarios.

To demonstrate, consider the first scenario in the table, where a borrower enters the IBR program with \$25,000 in income and \$20,000 in student debt. Payments over the repayment term sum to \$36,290 (Table 2), of which \$16,157 is interest, \$20,000 is the original principal, and \$133 is capitalized interest (due to the loss of PFH status in the 181st month of repayment). The present value of the stream of payments is \$27,085, which, less the disbursement of \$20,000, yields a fiscal impact (NPV) of \$7,085. In this specific case, the fiscal impact is positive (would be a negative entry in the Department of Education budget),

Now consider the same borrower entering the IBR program with \$75,000 in student debt. Total payments would be \$59,988, all of which is interest. The borrower would remain qualified for PFH throughout the repayment term, and thus no unpaid interest (amounting to \$52,512 over the repayment term) would be capitalized. Further, the required payment would never exceed the monthly interest accrual, and thus payment of the original principal would be \$0. In this scenario, the fiscal impact is a loss of \$35,059.

Figures 3, 4, and 5 show the fiscal impact of all 25 income-debt scenarios under IBR, PAYE, and REPAYE, respectively. The fiscal impact varies greatly by income level and debt level.

Consider first the IBR program (Figure 3). The greatest fiscal gain is derived from the participant with \$50,000 in income and \$100,000 in student debt, resulting in a fiscal gain of \$41,777. About 4.5 percent of consumers with student loan debt have outstanding student loan debt in excess of \$100,000 (Federal Reserve Bank of New York, 2016). The most expensive participant from a fiscal impact perspective has \$25,000 in income and \$100,000 in debt, resulting in a fiscal cost of \$60,059. Under PAYE and REPAYE, the highest-cost participant is also the one with \$25,000 in income and \$100,000 in debt, both resulting in fiscal costs of about \$80,000. Also under both PAYE and REPAYE, the participant with \$50,000 in both student debt and income yields the greatest fiscal gain—about \$17,000 in both cases.

Considered together, the charts reveal that, generally, PAYE and REPAYE yield greater fiscal cost (or lower gains) than IBR. Again, tax implications could alter the calculus. The charts also reveal that high-income, high-debt individuals often result in fiscal gains, which are substantial in some cases, while low-income, high-debt borrowers typically result in substantial fiscal losses. High-income, low-debt borrowers are not likely to qualify for IDR. Low-income borrowers with relatively low debts typically would still generate fiscal gains under IBR, although much smaller in magnitude. But those with lower incomes and low debt loads remain costly from a fiscal perspective under PAYE and REPAYE. The difference in fiscal impact between IBR and PAYE/REPAYE for lower-income, low-debt borrowers is largely the share of discretionary income allocated to required payments, which is 15 percent under IBR (original plan) but 10 percent under PAYE/REPAYE. With lower incomes, payments usually are income-driven throughout the repayment period.

The simulations assume a continuous growth in income at 3.4 percent (explained above). While this treatment of income is necessary in a simulation because each individual's income

stream is different and unpredictable, it can obscure the potential for substantial interest capitalization. For example, consider an individual who enters repayment under IBR with \$25,000 in income and \$75,000 in debt. If income grows at 3.4 percent annually, the individual never loses PFH status and no interest is capitalized. Suppose he is promoted or takes a new job in the 120th month of repayment, and his income increases from \$34,980 (projected at 3.4 percent) to \$75,000. The individual would immediately lose PFH status and have nearly \$30,000 of unpaid interest added to his principal balance (capitalized). While the simulations are effective in understanding how the IDRs work and their implications for borrowers and the federal government, individuals each face unique circumstances that can result in very different outcomes both personally and fiscally.

Forgiveness. The forgiveness of debt principal and unpaid interest are by far the most attractive feature of IDR programs for many borrowers. Forgiveness occurs at the end of the repayment period after a specified number of payments have been made. Figure 6 shows forgiveness for the 25 income-debt combinations simulated for the REPAYE program. The chart shows clearly that debt load is the dominant factor affecting the amount of forgiveness, with initial income a secondary factor. For the REPAYE program, under the assumption of our simulations, an individual entering repayment with \$25,000 in income and \$100,000 in student debt could expect nearly \$200,000 in forgiveness of principal and unpaid interest. Those with relatively low debt, especially if incomes are relatively high, likely would not see any principal or interest forgiven.

It is important to note that the forgiveness of principal and unpaid interest is not a real cost to the government and does not enter into fiscal impact calculations. The fiscal impact is determined by the discounted stream of repayments and the disbursement amount. The fiscal

impact of forgiveness is zero. Rather, forgiven balances represent “paper losses” in the sense that the ED is “leaving money on the table.” Forgiveness is critically important in the incentives for acquiring student debt, however. In particular, the combination of income-driven repayment and forgiveness of principal and unpaid interest creates a severe moral hazard.

Moral Hazard. Krugman (2009) suggests that moral hazard occurs when the person deciding on the amount of risk to bear (the student loan borrower) is not the person who pays if “things go badly” (taxpayers) (p. 63). This definition is particularly appropriate for the moral hazard inherent in IDR programs. Looking through Table 2, which provides complete results from the simulations, the moral hazard is quite striking and obvious.

Under all of the IDRs, a threshold is reached at which a student can borrow more at no cost to himself but at potentially substantial fiscal cost. For example, consider a borrower who expects to have income of \$25,000 after completing school and entering repayment. If he accumulates \$20,000 in student debt, his payout over the repayment term in, say, REPAYE, would be \$27,459. Because his payments are based entirely on discretionary income, his payment would remain \$27,459 for any level of borrowing above \$20,000. While there are limits on borrowing—a maximum at the undergraduate level and cost of attendance at the undergraduate and graduate levels—the accumulation of large amounts of student debt is not at all uncommon. While this hypothetical student bears no additional cost if he borrows more, the fiscal cost is substantially higher. In our simulations, at \$20,000 of student debt, the fiscal cost is \$32. At \$30,000 it is \$10,032. At \$75,000, it is \$55,032.

Moral hazard is not limited to low levels of income on entering repayment. At \$50,000 in income, the debtor would pay \$99,661 whether borrowing \$75,000 or \$100,000. In these cases,

the fiscal cost is \$1,511 and \$26,511, respectively. The difference is the \$25,000 in additional borrowing.

Sensitivity Analysis

The methodology section above noted a number of assumptions that were required in order to undertake the simulations we use to evaluate borrower and fiscal outcomes of IDR programs. While we use what we think are the best assumptions given current economic data and research, we recognize that our results are sensitive to these assumptions—some more than others. To gauge the sensitivity of our results to assumptions, we consider a single case: an individual in the REPAYE programs with income of \$35,000 and debt of \$30,000. We consider specifically the sensitivity of fiscal impact to the assumptions. The results of the analysis are provided in Figure 7.

The fiscal impact changes with a change in any of the assumptions, but they are not qualitatively different—for example, positives do not become negatives. The fiscal impact is highly sensitive to the rate of interest on student loan debt, which is not surprising given that interest has priority over principal, and in many cases, only interest is paid. While different assumptions about income growth affect the fiscal outcome, the effect does not appear to be as strong as changes in assumptions of student loan interest. Comparatively, this result is sensible because only a fraction of income is considered in calculating payments. Finally the discount rate can significantly alter the NPV, as would be expected. However, the impact should be proportional to the discount rate, which would not change the results of our simulations at all except for a scalar multiplier.

Related Issues

Tax Implications

A detailed discussion of the tax implications of the cancellation of debt and unpaid interest is outside the scope of our paper, they can be substantial and potentially create significant financial hardship. Under current law, debt forgiveness is taxable in the year it is cancelled except under circumstances where the debt is forgiven for participation in certain specified professions, such as under the Public Service Loan Forgiveness Program. Debt cancelled because of closed schools (e.g., Corinthian College) also are not generally taxable. If an individual were to have \$100,000 of debt and unpaid interest cancelled and faces a marginal income tax rate of 28 percent, the cancellation would obviously result in a tax cost of \$28,000 in the year the debt is cancelled, which would be a huge tax bite for most people, but especially for lower-income borrowers who are the most likely to benefit from IDR programs.

An indirect but critically important tax implication of the student loan program is the effect of the generally higher incomes that come with higher education on federal, state, and local tax collections. That is, these higher earnings generally translate into higher tax contributions. Further, college graduates typically impose less cost on the government from public assistance, crime, and other sources. On the other hand, at least a portion of student loan interest is deductible on personal income tax returns for most borrowers in repayment.²⁰

²⁰The limit in student loan interest that may be deducted was \$2,500 for the 2014 tax year. The deduction is available even to those who do not itemize deductions, but there are income limitations. For single borrowers in the 2014 tax year, the deduction was phased out beyond income of \$80,000. For borrowers who were married and filing jointly with their spouses, the phase out began at \$160,000. Borrowers who are married but file separately from their spouses are not allowed to take the student loan interest deduction.

Delinquency and Default

About 16.3 percent of student loan borrowers and 11.3 percent of student loan debt were in any stage of delinquency (late in payment) at the end of first quarter of 2016 according to our calculations using the CCP/Equifax. These numbers include borrowers who are not in active repayment. The average and median balances for delinquent borrowers were \$25,193 and \$12,423 respectively, lower than the amounts when considering all borrowers. The average and median delinquent balances were \$19,664 and \$10,436, respectively, implying that some borrowers were delinquent on some student loans but current on others.²¹

While a consideration of delinquency and default is outside the scope of this paper in that our goal is to lay out the mechanics of IDR programs and estimate outcomes when these programs are working as intended, we recognize that delinquencies and defaults are critically important in evaluating the fiscal impact of IDR programs. As noted earlier, a reduction in defaults was a driving force in conceptualizing IDR programs, and our expectation is that defaults are and will be much lower for those in IDRs, all else equal. Indeed, research using early data from these IDRs shows lower default rates (GAO, 2015). Missed or late payments under an IDR plan extend the repayment period for the purposes of forgiveness of unpaid principal and interest (e.g., one late payment extends the repayment period by one month). Implications of default are more serious because payments made on a defaulted loan do not count towards forgiveness. Default also may lead to interest capitalization and program exit. Unfortunately little accessible data are available on the default rates across payment programs. Future research needs

²¹ The CCP/Equifax data contain servicer-reported defaults which are not consistent because of various criteria for defaults from different lenders. Also about 10 percent of the loans are private loans and won't have an impact on the federal government budget.

to take into account of how defaults and delinquencies in these IDR plans can affect the costs to the federal government.

Conclusion

Student loans make higher education possible for many individuals who otherwise may not be able to pursue higher education. There is a considerable body of research on the returns to higher education that almost uniformly supports the notion that higher education yields private benefits that are worth the cost, however financed, but also social benefits (see survey in Toutkoushian and Paulsen, 2016). Baum, Ma and Payea (2014) estimate that the median lifetime earnings for those with a bachelor's degree are more than two thirds higher than those with only a high school diploma.

The myriad of student loan repayment plans often is bewildering for borrowers. An important goal of this paper is to bring clarity to the repayment "system" by comparing and contrasting alternative programs. We then turn to an analysis of borrower outcomes and fiscal impact.

Using simulations under a large number of income and debt scenarios, we find that the fiscal implications can vary significantly depending on income and debt load of the borrowers and the relief program chosen. The computations of fiscal impact show that fiscal costs are especially high for borrowers with low incomes and high debts. A natural policy question arising from this analysis is whether the fiscal cost of IDRs for this cohort and fiscal gains from higher-income, high-debt borrowers could be used in a way that would serve the purpose of the student loan program but at less cost and risk to the neediest borrowers.

The simulations uncover a moral hazard that is a significant concern given its costs. While we are not aware of any general tendency to over-borrow, we believe most economists would argue that a good program should not have these kinds of incentives that come at such great cost to taxpayers.

Recent policy debates on student loan debt have increasingly focused on efforts to relieve debtors of burdensome payments. These efforts, as embodied in IDR plans, are largely successful in making student loan repayment more manageable for borrowers, but there are many unknowns. The implementation of IDR plans, which have become increasingly debtor-friendly, shifts a significant share of risk (say, from uncertain labor market outcomes) from borrowers to taxpayers.

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Table 1: Characteristics of Alternative Income-Driven Repayment Plans for Federal Student Loan Debt

Program	Income-Based Repayment (old)	Income-Based Repayment (new)	Income-Contingent Repayment	Pay-As-You-Earn	Revised Pay-As-You-Earn
Abbreviation	IBR	IBR (new)	ICR	PAYE	REPAYE
Eligibility	FFEL; DL with no loans after Jul 14 2014	DL with loans after Jul 14 2014 “new borrowers”	DL; Direct Consolidated FFEL and FDLP	DL disbursed on/after Oct 1 2011; Direct Consolidated loans in some cases	DL; Direct Consolidated FFEL and FDLP
Hardship Requirement (PFH)	Yes	Yes	No	Yes	No
Discretionary Income	AGI – 1.5 (Poverty)	AGI – 1.5 (Poverty)	AGI – Poverty	AGI – 1.5 (Poverty)	AGI – 1.5 (Poverty)
Income-Driven Payment (share of discretionary income)	Lesser of 15% or 10-yr level payment	Lesser of 10%; or 10-yr level payment	Lesser of 20% or payment on 12-yr level payment plan	Lesser of 10%; or 10-yr level payment	10%; no limit on payment
Interest Capitalization	If no longer PFH (incl. not recertifying); no maximum	If no longer PFH (incl. not recertifying); no maximum	No limit	If no longer PFH, fail to recertify, or voluntarily leave PAYE; Limit of 10% of original debt amount	If fail to recertify or voluntarily leave REPAYE
Subsidy of Interest (if capitalized)	100% for 3 years if subsidized loan, else none	100% for 3 years if subsidized loan, else none	None	100% for 3 years if subsidized loan, else none	100% for 3 years if subsidized loan, else 50% life of repayment term
Repayment Term	300 payments over at least 25 years	240 payments over at least 20 years	300 payments over at least 25 years	240 payments over at least 20 years	240 payments over at least 20 years; 300 payments over at least 25 years if debt financed graduate or professional education
Notes: “AGI” is adjusted gross income, as defined by the IRS for tax purposes. “Poverty” is the Department of Health and Human Services poverty threshold for a single individual. “FFEL” is the Federal Family Education Loan Program, which is the former guaranteed student loan programs. “DL” refers to loans made directly by the Department of Education to borrowers (direct loans) under the William D. Ford Federal					

Direct Loan Program (FDLP). “PFH” is “partial financial hardship,” which is met when the payment on the standard/default 10-year level payment program exceeds 10 percent of discretionary income, or AGI less 150 percent of the poverty threshold.
 Sources: National Council of Higher Education Resources, “Income Driven Repayment Comparison Chart; U.S. Department of Education, Office of Federal Student Aid, “Income-Driven Repayment Plans for Federal Student Loans” and “Income-Driven Repayment Plans: Questions and Answers.

Table 2: Comprehensive Accounting of Income-Driven Repayment Outcomes

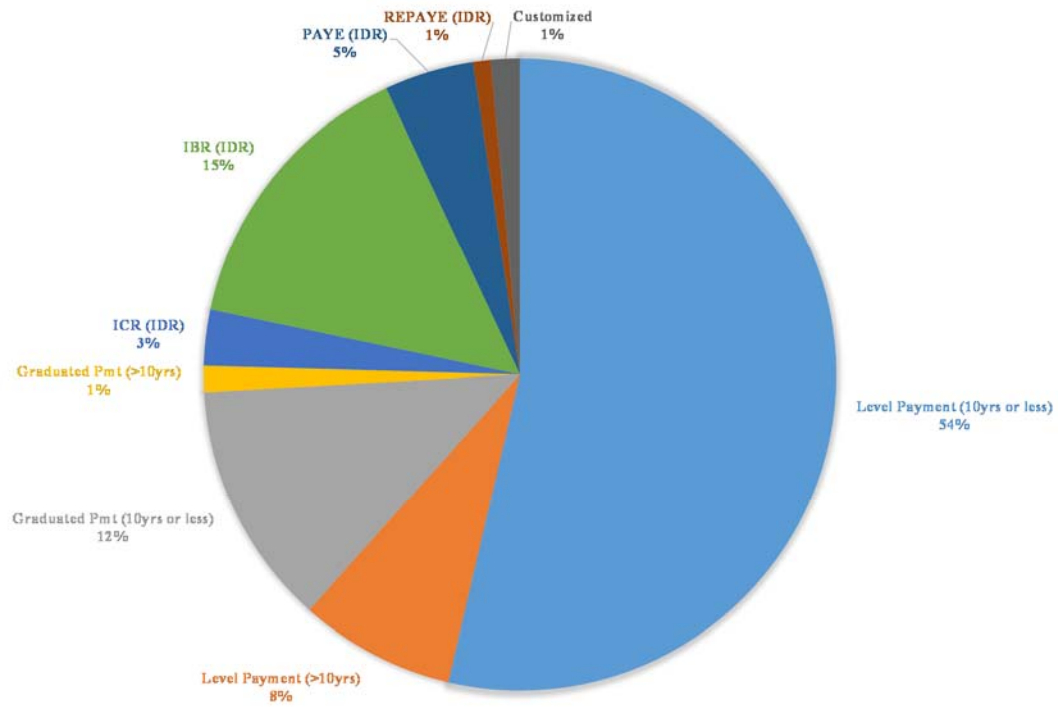
IBR										
AGI	Initial Debt	Payments				Upper Bound for Capitalized Interest	Loan Forgiveness	Unpaid Interest (forgiven if not capitalized)	NPV	
		Interest	Capitalized Interest	Principal	Total					
\$25,000	\$20,000	\$16,157	(\$133)	\$20,133	\$36,290	\$0	\$0	\$0	\$7,085	
\$25,000	\$30,000	\$45,064	(\$2,341)	\$14,790	\$59,854	\$0	\$17,551	\$0	\$9,873	
\$25,000	\$50,000	\$55,225	\$0	\$4,763	\$59,988	(\$19,147)	\$45,237	\$19,147	(\$10,059)	
\$25,000	\$75,000	\$59,988	\$0	\$0	\$59,988	(\$52,512)	\$75,000	\$52,512	(\$35,059)	
\$25,000	\$100,000	\$59,988	\$0	\$0	\$59,988	(\$90,012)	\$100,000	\$90,012	(\$60,059)	
\$30,000	\$20,000	\$8,741	\$0	\$19,919	\$28,660	\$0	\$81	\$0	\$4,080	
\$30,000	\$30,000	\$22,727	\$0	\$29,810	\$52,537	\$0	\$190	\$0	\$9,930	
\$30,000	\$50,000	\$61,545	\$0	\$28,210	\$89,755	(\$5,902)	\$21,790	\$5,902	\$10,308	
\$30,000	\$75,000	\$84,483	\$0	\$5,272	\$89,755	(\$27,377)	\$69,728	\$27,377	(\$14,692)	
\$30,000	\$100,000	\$89,755	\$0	\$0	\$89,755	(\$60,245)	\$100,000	\$60,245	(\$39,692)	
\$35,000	\$20,000	\$6,718	\$0	\$20,000	\$26,718	\$0	\$0	\$0	\$3,249	
\$35,000	\$30,000	\$14,464	\$0	\$30,000	\$44,464	\$0	\$0	\$0	\$6,776	
\$35,000	\$50,000	\$49,947	(\$674)	\$50,674	\$100,622	\$0	\$0	\$0	\$20,951	
\$35,000	\$75,000	\$94,411	\$0	\$25,112	\$119,522	(\$12,296)	\$49,888	\$12,296	\$5,675	
\$35,000	\$100,000	\$113,653	\$0	\$5,869	\$119,522	(\$35,667)	\$94,131	\$35,667	(\$19,325)	
\$40,000	\$20,000	\$6,645	\$0	\$20,000	\$26,645	\$0	\$0	\$0	\$3,216	
\$40,000	\$30,000	\$10,939	\$0	\$30,000	\$40,939	\$0	\$0	\$0	\$5,261	
\$40,000	\$50,000	\$35,363	\$0	\$50,000	\$85,363	\$0	\$0	\$0	\$15,767	
\$40,000	\$75,000	\$89,930	\$0	\$59,360	\$149,289	(\$3,982)	\$15,640	\$3,982	\$26,042	
\$40,000	\$100,000	\$125,821	\$0	\$23,469	\$149,289	(\$19,348)	\$76,531	\$19,348	\$1,042	
\$50,000	\$20,000	\$6,645	\$0	\$20,000	\$26,645	\$0	\$0	\$0	\$3,216	
\$50,000	\$30,000	\$9,967	\$0	\$30,000	\$39,967	\$0	\$0	\$0	\$4,824	
\$50,000	\$50,000	\$21,337	\$0	\$50,000	\$71,337	\$0	\$0	\$0	\$10,119	
\$50,000	\$75,000	\$57,479	\$0	\$75,000	\$132,479	\$0	\$0	\$0	\$25,297	
\$50,000	\$100,000	\$115,506	\$0	\$93,318	\$208,824	(\$3,023)	\$6,682	\$3,023	\$41,777	
PAYE										
AGI	Initial Debt	Payments								NPV

		Interest	Capitalized Interest	Principal	Total	Upper Bound for Capitalized Interest	Loan Forgiveness	Unpaid Interest (forgiven if not capitalized)	
\$25,000	\$20,000	\$20,464	\$0	\$6,996	\$27,459	(\$2,000)	\$13,004	\$2,056	\$56
\$25,000	\$30,000	\$26,543	\$0	\$916	\$27,459	(\$3,000)	\$29,084	\$9,384	(\$9,944)
\$25,000	\$50,000	\$27,459	\$0	\$0	\$27,459	(\$5,000)	\$50,000	\$32,541	(\$29,944)
\$25,000	\$75,000	\$27,459	\$0	\$0	\$27,459	(\$7,500)	\$75,000	\$62,541	(\$54,944)
\$25,000	\$100,000	\$27,459	\$0	\$0	\$27,459	(\$10,000)	\$100,000	\$92,541	(\$79,944)
\$30,000	\$20,000	\$15,152	\$0	\$20,000	\$35,152	\$0	(\$0)	\$0	\$6,798
\$30,000	\$30,000	\$31,423	\$0	\$10,477	\$41,900	(\$2,229)	\$19,523	\$2,229	\$804
\$30,000	\$50,000	\$41,744	\$0	\$156	\$41,900	(\$5,000)	\$49,844	\$18,251	(\$19,196)
\$30,000	\$75,000	\$42,061	\$0	\$0	\$42,061	(\$7,500)	\$75,000	\$47,939	(\$44,076)
\$30,000	\$100,000	\$42,061	\$0	\$0	\$42,061	(\$10,000)	\$100,000	\$77,939	(\$69,076)
\$35,000	\$20,000	\$9,592	\$0	\$20,000	\$29,592	\$0	\$0	\$0	\$4,561
\$35,000	\$30,000	\$25,825	(\$82)	\$30,082	\$55,907	\$0	(\$0)	\$0	\$11,336
\$35,000	\$50,000	\$51,099	\$0	\$5,442	\$56,541	(\$5,000)	\$44,558	\$8,090	(\$8,298)
\$35,000	\$75,000	\$56,541	\$0	\$0	\$56,541	(\$7,500)	\$75,000	\$33,459	(\$33,298)
\$35,000	\$100,000	\$56,541	\$0	\$0	\$56,541	(\$10,000)	\$100,000	\$63,459	(\$58,298)
\$40,000	\$20,000	\$7,267	\$0	\$20,000	\$27,267	\$0	\$0	\$0	\$3,545
\$40,000	\$30,000	\$18,010	\$0	\$30,000	\$48,010	\$0	\$0	\$0	\$8,336
\$40,000	\$50,000	\$53,149	\$0	\$17,872	\$71,021	(\$2,590)	\$32,128	\$2,590	\$2,480
\$40,000	\$75,000	\$69,676	\$0	\$1,346	\$71,021	(\$7,500)	\$73,654	\$20,231	(\$22,520)
\$40,000	\$100,000	\$71,021	\$0	\$0	\$71,021	(\$10,000)	\$100,000	\$48,979	(\$47,520)
\$50,000	\$20,000	\$6,645	\$0	\$20,000	\$26,645	\$0	(\$0)	\$0	\$3,261
\$50,000	\$30,000	\$11,316	\$0	\$30,000	\$41,316	\$0	(\$0)	\$0	\$5,503
\$50,000	\$50,000	\$38,105	\$0	\$50,000	\$88,105	\$0	(\$0)	\$0	\$17,040
\$50,000	\$75,000	\$80,618	\$0	\$19,364	\$99,982	(\$5,169)	\$55,636	\$5,169	(\$963)
\$50,000	\$100,000	\$96,948	\$0	\$3,034	\$99,982	(\$10,000)	\$96,966	\$22,778	(\$25,963)
REPAYE									
AGI	Initial Debt	Payments				Upper Bound for Capitalized Interest	Loan Forgiveness	Unpaid Interest (forgiven if not capitalized)	NPV
		Interest	Capitalized Interest	Principal	Total				
\$25,000	\$20,000	\$20,464	n/a	\$6,996	\$27,459	(\$1,028)	\$13,004	\$2,056	(\$32)
\$25,000	\$30,000	\$26,543	n/a	\$916	\$27,459	(\$4,692)	\$29,084	\$9,384	(\$10,032)
\$25,000	\$50,000	\$27,459	n/a	\$0	\$27,459	(\$16,270)	\$50,000	\$32,541	(\$30,032)
\$25,000	\$75,000	\$27,459	n/a	\$0	\$27,459	(\$31,270)	\$75,000	\$62,541	(\$55,032)
\$25,000	\$100,000	\$27,459	n/a	\$0	\$27,459	(\$46,270)	\$100,000	\$92,541	(\$80,032)
\$30,000	\$20,000	\$15,141	n/a	\$20,000	\$35,141	\$0	(\$0)	\$0	\$6,694
\$30,000	\$30,000	\$31,423	n/a	\$10,477	\$41,900	(\$1,114)	\$19,523	\$2,229	\$672
\$30,000	\$50,000	\$41,744	n/a	\$156	\$41,900	(\$9,126)	\$49,844	\$18,251	(\$19,328)
\$30,000	\$75,000	\$41,900	n/a	\$0	\$41,900	(\$24,050)	\$75,000	\$48,100	(\$44,328)
\$30,000	\$100,000	\$41,900	n/a	\$0	\$41,900	(\$39,050)	\$100,000	\$78,100	(\$69,328)
\$35,000	\$20,000	\$9,592	n/a	\$20,000	\$29,592	\$0	\$0	\$0	\$4,498

\$35,000	\$30,000	\$25,960	n/a	\$30,000	\$55,960	(\$44)	\$0	\$89	\$11,159
\$35,000	\$50,000	\$51,019	n/a	\$5,321	\$56,340	(\$4,099)	\$44,679	\$8,197	(\$8,623)
\$35,000	\$75,000	\$56,340	n/a	\$0	\$56,340	(\$16,830)	\$75,000	\$33,660	(\$33,623)
\$35,000	\$100,000	\$56,340	n/a	\$0	\$56,340	(\$31,830)	\$100,000	\$63,660	(\$58,623)
\$40,000	\$20,000	\$4,483	n/a	\$20,000	\$24,483	\$0	(\$0)	\$0	\$2,240
\$40,000	\$30,000	\$18,101	n/a	\$30,000	\$48,101	\$0	(\$0)	\$0	\$8,252
\$40,000	\$50,000	\$53,172	n/a	\$17,608	\$70,781	(\$1,327)	\$32,392	\$2,655	\$2,081
\$40,000	\$75,000	\$69,492	n/a	\$1,288	\$70,781	(\$10,210)	\$73,712	\$20,421	(\$22,919)
\$40,000	\$100,000	\$70,781	n/a	\$0	\$70,781	(\$24,610)	\$100,000	\$49,219	(\$47,919)
\$50,000	\$20,000	\$4,483	n/a	\$20,000	\$24,483	\$0	(\$0)	\$0	\$2,240
\$50,000	\$30,000	\$11,049	n/a	\$30,000	\$41,049	\$0	\$0	\$0	\$5,318
\$50,000	\$50,000	\$38,319	n/a	\$50,000	\$88,319	\$0	\$0	\$0	\$16,865
\$50,000	\$75,000	\$80,607	n/a	\$19,055	\$99,661	(\$2,638)	\$55,945	\$5,276	(\$1,511)
\$50,000	\$100,000	\$96,731	n/a	\$2,931	\$99,661	(\$11,505)	\$97,069	\$23,010	(\$26,511)

Note: Interest does not capitalize under REPAYE unless the borrower leaves the program. The calculations assume that the debtor is single with no dependents, does not exit the program, and pays the debt as agreed.

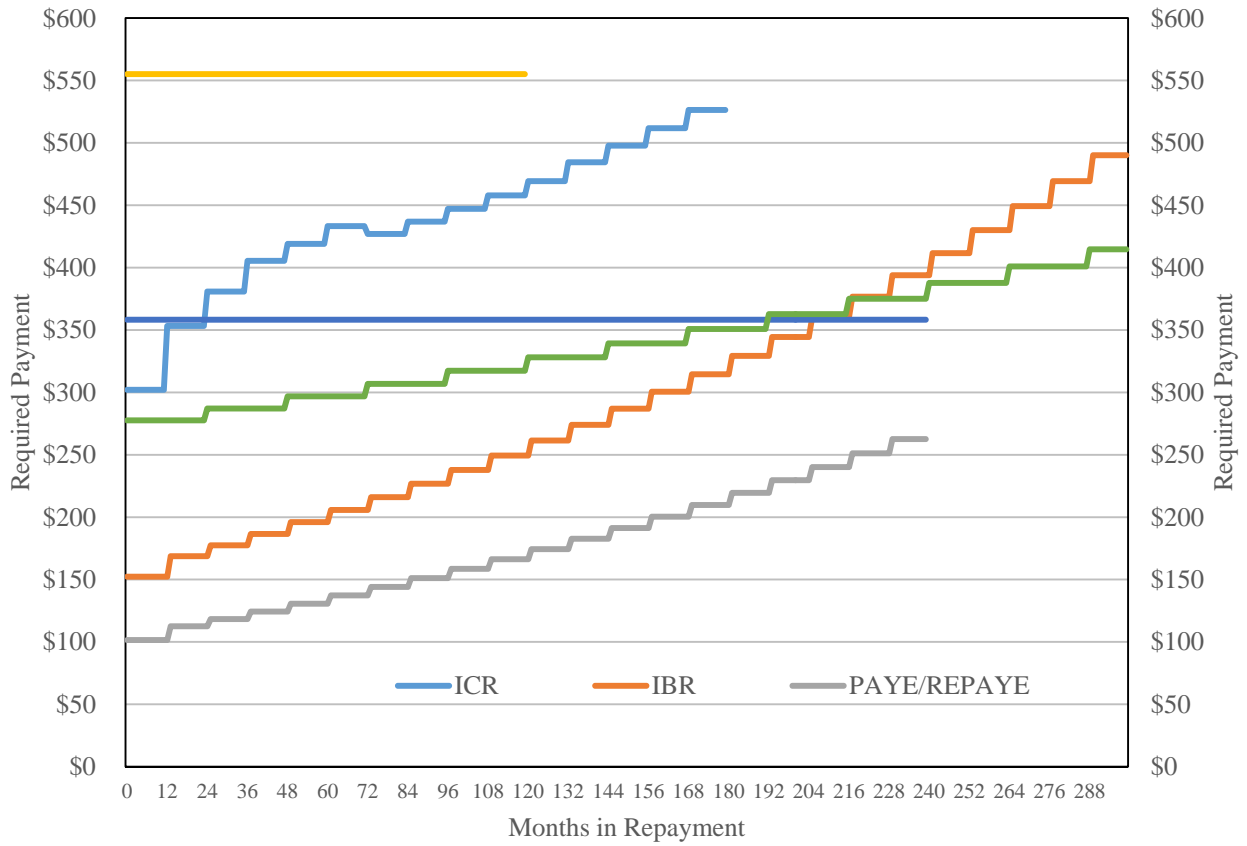
Figure 1: Department of Education Direct Loan Portfolio by Repayment Program (debtors)



Note: "IDR" indicates an income-driven repayment program.

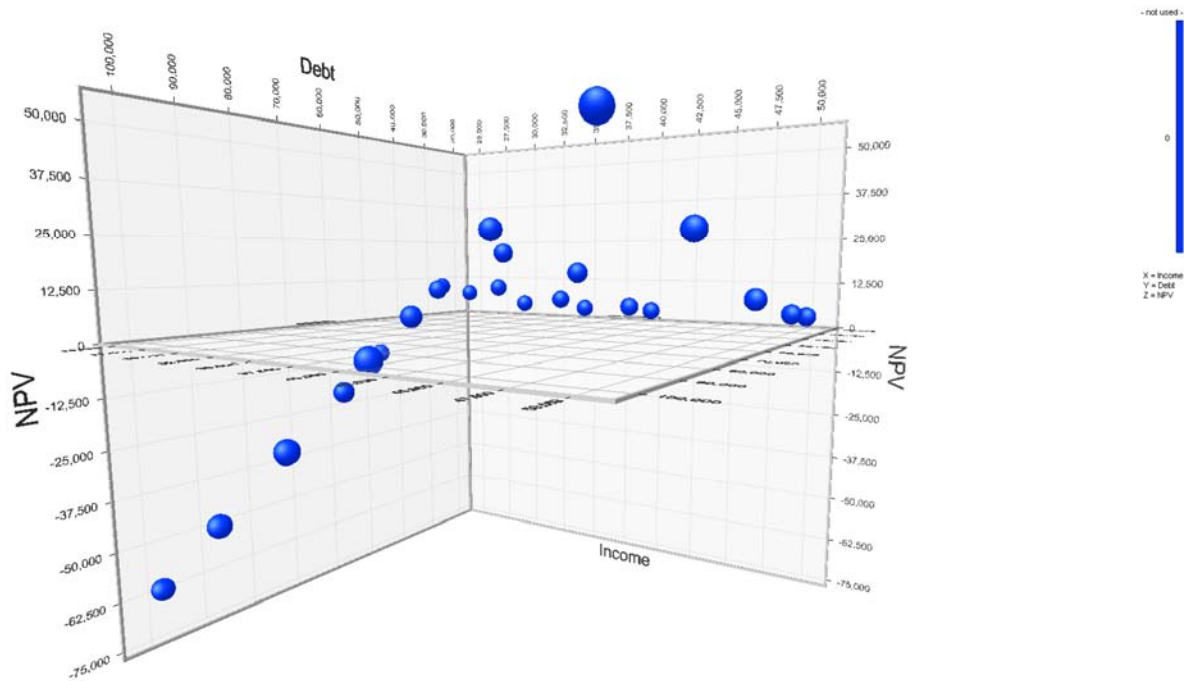
Source: Authors' calculations; National Student Loan Data System (NSLDS)

Figure 2: Repayment Schedules Under Alternative Repayment Plans



Source: Authors' calculations

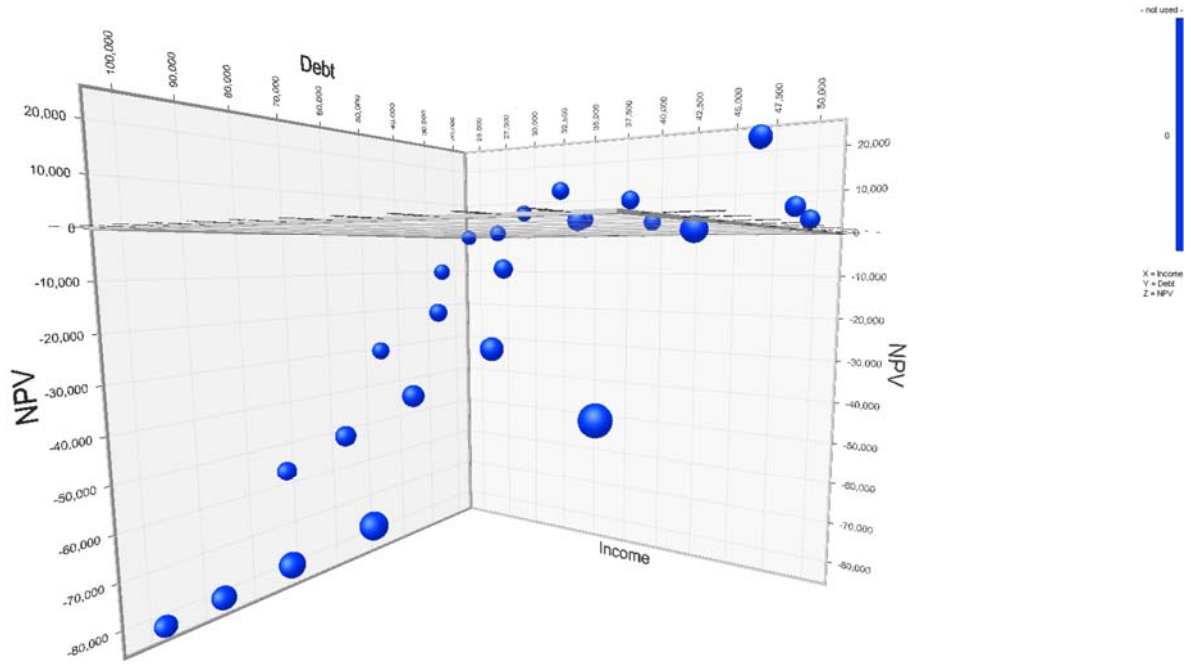
Figure 3: Fiscal Impact Under the IBR Plan



Source: Authors' calculations; Image created with *XLSTAT-3D Plot*

Note: The simulated NPV is lower (most negative) the lower is the bubble on the z-axis (NPV). In this case, NPV is most negative when income is \$25,000, the lowest value on y-axis (income) and debt is \$100,000, the highest value on the x-axis (debt).

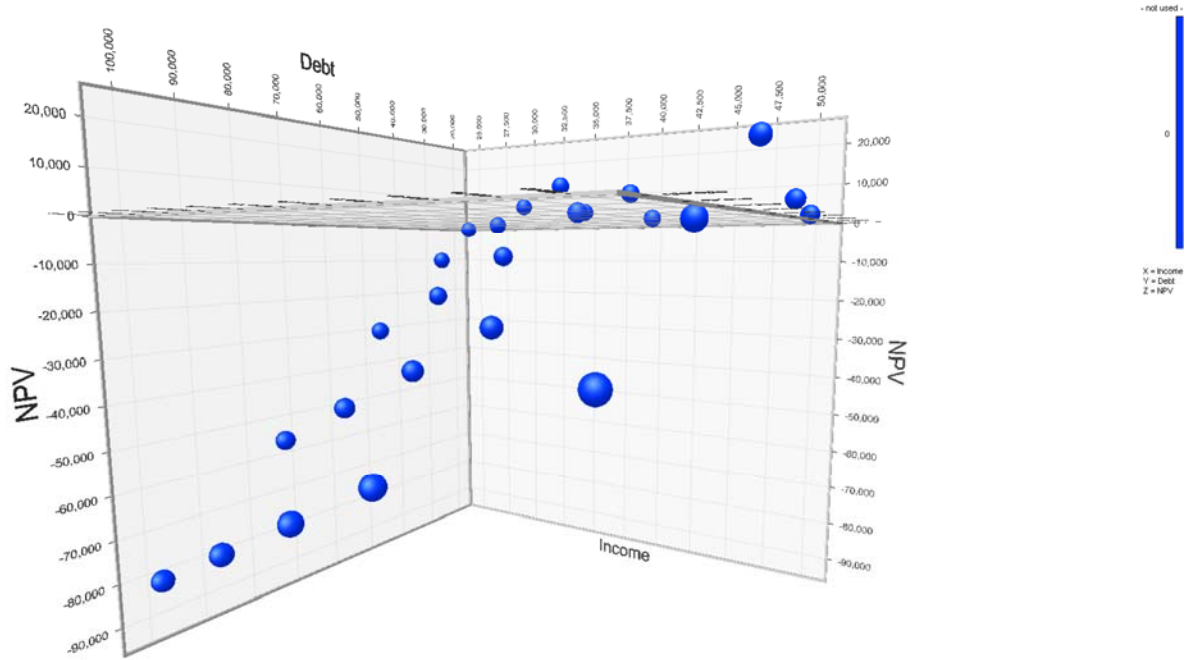
Figure 4: Fiscal Impact Under the PAYE Plan



Source: Authors' calculations; Image created with *XLSTAT-3D Plot*

Note: The simulated NPV is lower (most negative) the lower is the bubble on the z-axis (NPV). In this case, NPV is most negative when income is \$25,000, the lowest value on y-axis (income) and debt is \$100,000, the highest value on the x-axis (debt).

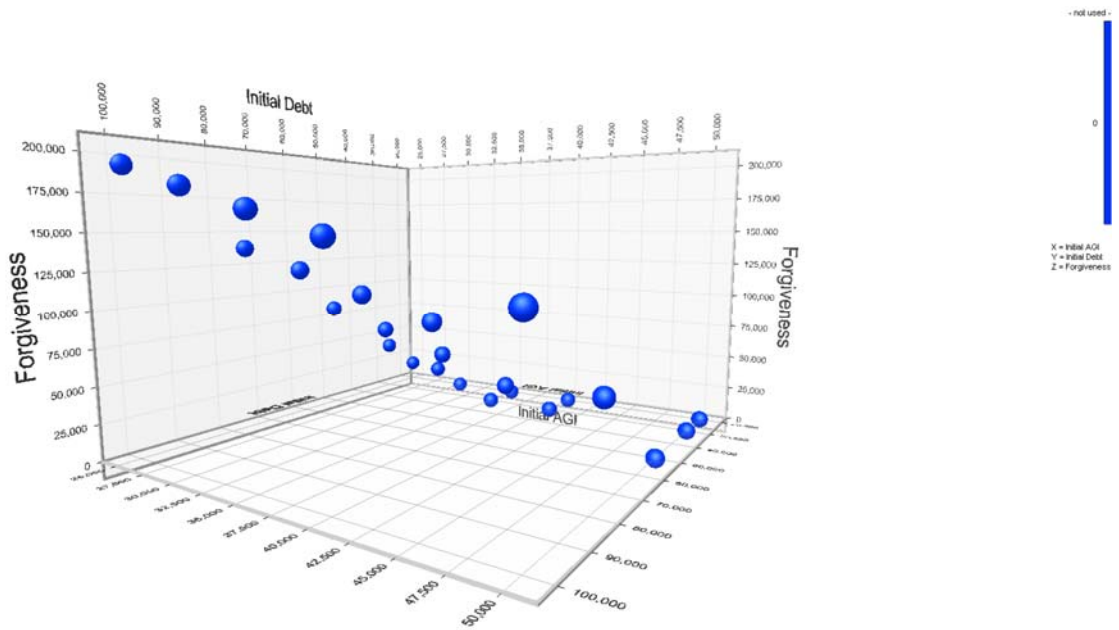
Figure 5: Fiscal Impact Under the REPAYE Plan



Source: Authors' calculations; Image created with *XLSTAT-3D Plot*

Note: The simulated NPV is lower (most negative) the lower is the bubble on the z-axis (NPV). In this case, NPV is most negative when income is \$25,000, the lowest value on y-axis (income) and debt is \$100,000, the highest value on the x-axis (debt).

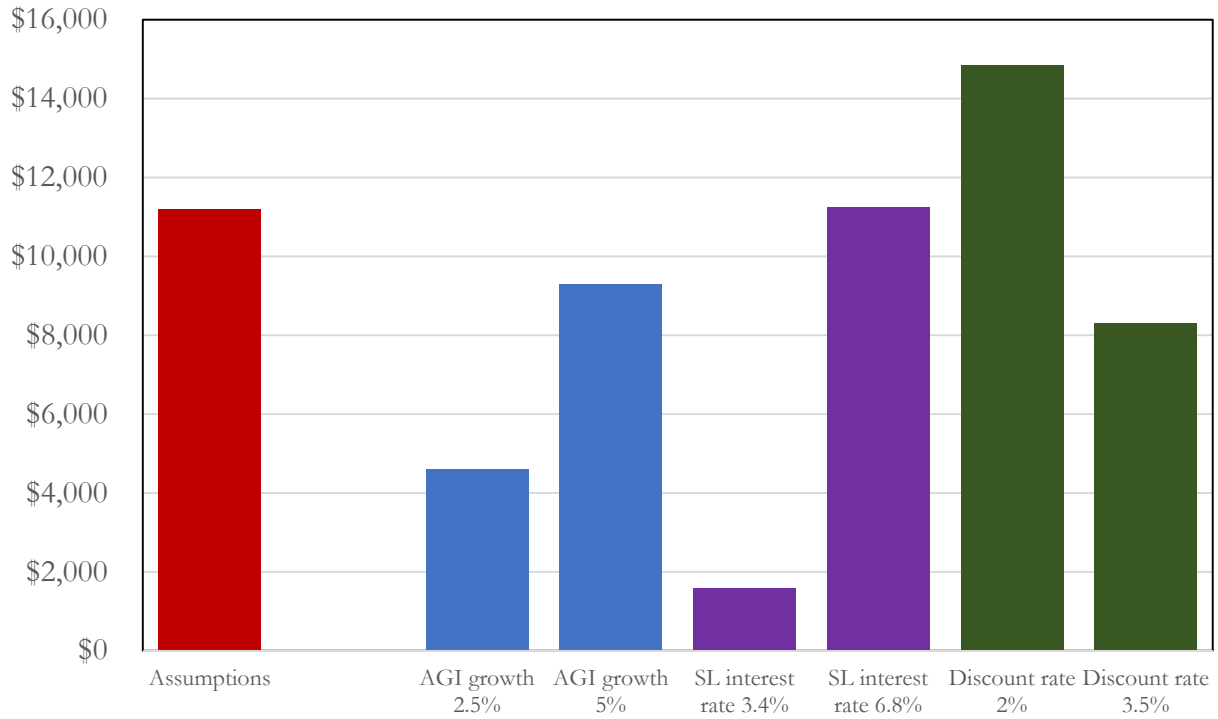
Figure 6: Debt and Unpaid Interest Forgiveness Under the REPAYE Programs



Source: Authors' calculations; Image created with *XLSTAT-3D Plot*

Note: Simulated forgiveness of principal and interest is higher the higher is the bubble on the z-axis (forgiveness). In this case, forgiveness is highest when income is \$25,000, the lowest value on y-axis (income) and debt is \$100,000, the highest value on the x-axis (initial debt).

Figure 7: Sensitivity Analysis (REPAYE, AGI \$35K, Debt \$30K)



Note: The first column refers to the scenario with the baseline assumptions: income (AGI) grows at 3.4%, student loan interest rate at 6% and discount rate at 2.8% annually.

Appendix: Calculating Required Payments Under the Income-Contingent Repayment Plan

“Note that I decided not to bother describing the deal with Income-Contingent Repayment; a’int [sic] nobody got time for that.”

-- Heather Jarvis, financial planner and student loan expert
(<http://askheatherjarvis.com/blog/what-triggers-student-loan-interest-capitalization>)

Steps:

[Step 1] Determine the total monthly payment amount based under 12 year, fulling amortized payment plan

[Step 2] Multiply the result of Step 1 by the income percentage factor (IPF) shown in the income percentage factors table that corresponds to the borrowers’ AGI

Must interpolate from “Chart E,” similar to tax tables:

- (a) compute income interval = (closest greater value in Chart E) – (closest lesser value in Chart E) [Chart E available at <https://ifap.ed.gov/dlbulletins/attachments/dlb98-35e.pdf>]
- (b) find the IPFs and do a similar calculation to get the IPF interval
- (c) subtract closest lesser value in Chart E from income and divide the result by the income interval
- (d) multiply this result by the IPF interval

Add this result to the IPF associated with the closest lesser value in Chart E

[Step 3] Determine 20 percent of the borrower’s discretionary income and divide by 12 (discretionary income is IRS AGI minus the HHS Poverty Guideline amount for a borrower's family size and State of residence).

[Step 4] Compare the amount from Step 2 with the amount from Step 3. The lower of the two will be the monthly ICR payment amount.

Source: *Federal Register*, Volume 78, Number 107 (Tuesday, June 4, 2013), pp. 33395-33398.